UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✔*Biologie*
✔*Horticultură*
✔*Tehnologia prelucrării produselor agricole*
✔*Ingineria mediului*

Vol. XIV (XLX) - 2009

TOPWORKING OF MATURE WALNUT TREES AS AFFECTED BY DIFFERENT BLEEDING CONTROL METHODS AND SCION CULTIVARS

Babak Dehghan[1], Kourosh Vahdati[1], Reza Rezaee[2], Darab Hassani[3], Alexandros Papachatzis[4]

KEY WORDS: Juglans regia L., Bark grafting, Sawdust, Perlite, Cocopeat

ABSTRACT

Temporary covering of grafting point with moist sawdust has been reported effective on improving callus formation and grafting success in Persian walnut. In this study, we compared the effects of five kinds of grafting covers including sawdust, perlite, vermiculite, cocopeat and no covering (control) on callus quality, number of callused grafts, graft take, graft survival and scions growth. 'Pedro' and 'Chandler' were used as scion cultivars and modified bark grafting method was used to graft the main branches in the scaffolds of 10 to 15 years old walnut trees before mid April, 2008 and 2009. According to the results of first year experiment, among sawdust, perlite and no covering, the highest graft take (75.00%) and survival (66.04%) and the lowest graft take (10.00%) and survival (8.33%) was observed with sawdust cover and no covering, respectively. The results of second year experiment, among sawdust, coco peat and vermiculite showed the highest graft take (88.00%) and graft survival (84.67%) in sawdust cover treatment. Also the lowest graft take (38.33%) and survival (54.44%) was observed with vermiculite cover. The effect of scion cultivars was not statistically significant for all the studied characters except the scion growth in two years experiment. Our observations provide more support on the efficacy of moist sawdust for improvement of grafting success in Persian walnut.

INTRODUCTION

Traditionally walnut orchards have been established by seedling trees in most of walnut growing countries which limits orchard uniformity, profitability and causes production of large amount of commercially unacceptable nuts (Forde and McGranahan 1996; Stanisavljevic and Mitrovic 1997; Vahdati 2000; Achim and Botu 2001). In recent years higher market demands for high quality nuts and increased productivity of the superior walnut cultivars encouraged researchers to find satisfactory methods of vegetative production (Millikan 1971; Vahdati 2000). Vegetative propagation in walnut is very difficult and mostly limited to budding and grafting (Gautam 1990; Ferhatoglu 1997). However, walnut grafting is difficult as compared with the other fruit trees, and requires more attention in terms of grafting methods, date and selecting/handling of scions and stocks (Kuniyuki and Forde 1985; Rathore 1991; Rongting and Pinghai 1993; Vahdati 2000; Achim. and Botu 2001; Hartmann et al. 2001; Rezaee et al. 2008). Thus, propagation

[1] Department of Horticulture, College of Abooraihan, University of Tehran, Tehran, Iran.
[2] Department of Seed and Plant Improvement, Agricultural and Natural Resources Research Center, West Azerbaijan, Uromia, Iran.
[3] Department of Horticulture, Seed and Plant Improvement Institute (SPII), Karaj, Iran
[4] Department of Plant Production, Technological Educational Institute (TEI) of Larissa, Greece

of superior walnut cultivars and selected genotypes has always been restricted by poor graft take of walnut trees (Ozkan and Gumus 2001; Vahdati 2003). In the other hand, higher cost of orchard replanting as well as higher rate of tree mortality during transplanting of grafted or budded trees were referred as major limiting factors in establishing of uniform orchards using grafted plants (Rathore 1991; Vahdati 2003; Rezaee et al. 2008).

Therefore, topworking of walnut trees is suggested as a good alternative method for walnut propagation and also to improve the yield and quality of previously established walnut orchards (Rathore 1991; Rezaee and Vahdati 2008). Unfortunately, limited research activities have been carried out around the world in relation to walnut topworking, in terms of suitable methods and conditions. In one study, topworking of 25 years old walnut trees resulted that chip budding was more promising compared to other methods with 58% grafting success (Gautam and Banyal 2005). A modified bark grafting method characterized mainly by temporary covering of grafting place with moist sawdust has been reported very effective to improve grafting success (>80%) both on mature and young walnut trees (Rezaee and Vahdati 2008; Rezaee et al. 2008). These reports claimed that sawdust cover absorbs xylem bleeding (sap) and as a result provides a moist and aerated condition in graft union suitable for better callus formation. Therefore, characterization of physical properties of sawdust and similar covers such as perlite, cocopeat and vermiculite would be very beneficial for developing a standard graft cover for commercial purposes. Thus, the main objectives of this experiment were to compare sawdust cover with another water absorbing materials (perlite, cocopeat and vermiculite) in terms of their effects on the callus quality, number of callused grafts, graft take, graft survival and scions growth as well as to understand their most important physical properties that affect on grafting success factors.

MATERIAL AND METHODS

The experiment was performed on 10 to 15 years old walnut seedling trees during April 2008 and 2009 in Department of Horticulture, College of Abouraihan University of Tehran (50.20 ºE; 35.11 ºN; altitude 940 m) with an ambient temperature and relative humidity of 17.6 ºC and 27.17 %, respectively during callusing period.

In first year replication of experiment, three grafting covers include sawdust, perlite and plastic bag (control) were assayed on the grafting success factors. In second year replication, treatments were factorial combination of three grafting covers (sawdust, cocopeat and vermiculite). In both replications, scion cultivars of ‘Pedro’ and ‘Chandler’ were used. These experiments were done on completely randomized design with six treatments, in three replication and ten grafted scaffolds per plot.

Modified bark grafting method as described by Rezaee and Vahdati (2008) and Rezaee et al. (2008) was applied. All grafting operations were carried out by the same person. To cover grafting place, small amount of well drained sawdust and other mentioned materials was closely wrapped and fastened using plastic bag on the graft area. The mentioned covers (sawdust, perlite, vermiculite and cocopeat) washed gently and sterilized with fungicide (1.5% (v/v) benomyl) and were applied as above mentioned.

The scions woods were obtained in late January from walnut collection of Horticulture Department of Seed and Plant Improvement Institute (SPII) and were stored in damped cloths and plastic bags in a refrigerator (3 to 4°C) until they were used for topworking. Two weeks before grafting operation, rootstocks were headed back to minimize sap bleeding of trees (Kuniyuki and Forde, 1985; Rezaee et al., 2008).

After removing of covers, data were recorded for number of callused grafts, graft take and amount of callus formation (based on a visual scale of 1 to 4 in which 1= low, 2 =

medium, 3 = high and 4 = very high callusing). Subsequently, the percentage of graft survival (as a percentage of grafted branches where the graft took) and scion growth were measured for each treatment after 6 months. The data were analyzed using the SAS software (SAS Institute, Cary, N.C.)

RESULT AND DISCUSSION

The results of both year experiments showed that grafting cover have a significant effect on the all studied characters. According to the results of first year experiment the highest callus quality (3.02 out of 4), callused grafts (86.66%), graft take (75.00%) and grafting survival (66.40 %) as well as the highest scion growth (83.12 cm) was obtained by sawdust followed by the perlite cover (Table 1). The lowest graft take (10.00%) was observed in no grafting cover. In the case of non-covered grafts, a higher amount of sap accumulated around the grafting union (Figure 1) and most of them (approx. 90%) were failed.

Also in second year experiment, the highest callus quality (3.7 from 4), callused grafts (95%), graft take (88.33 %) and grafting survival (84.37 %) as well as the highest scion growth (82.8 cm) was obtained in sawdust cover treatment followed by the cocopeat cover. In this trial, the lowest graft take (38.33%) and survival (54.44%) was observed with vermiculite cover (Table 1).

Accumulation of sap under grafting tape or wax could cause irreversible damage on actively dividing cells necessary for callus formation and as a result grafting failure in walnut (Rongthing and Pinghai 1993; Rezaee et al. 2008; Rezaee and Vahdati 2008) and grapevine (Hartmann et al. 2001). There are also evidences that high intensity of light prevents callus formation (Hartman et al. 2001). Therefore, reduction of light may be another reason for increasing success in covered grafts.

In both trials, effects of cultivars on all studied parameters were non-significant, except on scions growth. This observation is in agreement with Rezaee and Vahdati, (2008) and is in contrary with the result of Rongting and Pinghai (1993), Stanisavljevic and Mitrovic (1997) who reported the graft-take varies in different walnut cultivars. It should be noted that grafting result could be affected by scion cultivars but this is mainly by scion quality which is a management related issue rather than genetic structure (Rezaee and Vahdati 2008). In both experiments of this study between used cultivars, ‘Pedro’ showed the highest scions growth compared to ‘Chandler’ (Figure 2).

In first year experiment, the interaction of grafting cover and cultivar was statistically non significant on studied characters except for graft take but in second year experiment interaction of grafting cover and cultivar was statistically non significant on all studied characters. In first year experiment the highest percentage of graft take (83.33%) was achieved by sawdust covered grafts in the ‘Chandler’ variety. Also the lowest percentage of graft take (6.66 %) was obtained by non-covered grafts in ‘Chandler’ variety.

In both experiments, percentage of graft take showed a positive correlation (first year R^2 = 0.73, second year R^2= 0.89) with callus quality as observed with different grafting cover and cultivars (Figure 3). This is in agreement with the result of Rongting and Pinghai (1993) and Rezaee et al., (2008) who reported that callus quality and amount of callus formation plays an important role in the grafting success.

According to the results, sawdust cover was better than perlite for absorbing of sap. Sawdust likely providing a suitable condition for callus formation and scions growth without any wood-rot around the graft area as reported by Rezaee et al. (2008) (Figure 4). Physical properties of used covers showed that the water holding porosity of sawdust is more than the perlite and vermiculite but less than cocopeat , which demonstrating that

sawdust and cocopeat provide a better condition by xylem sap absorbing and optimum moisture preparation. On the other hand, sawdust and cocopeat had lower aeration porosity compared to perlite and vermicolite but the experiment results indicated the sufficiently and suitability of this amount of aeration for callus formation (table 2).

CONCLUSION

This is verified with our results that covering of grafting places specifically by moist sawdust increases grafting success in topworking of walnut. The obtained results of bleeding control method are promising and helpful for making special grafting tapes and/or prefabricated covers which provide suitable condition for grafting success artificially. Future researches could be focused on optimization and improvement of grafting condition by controlling of moisture, size and quantity of used sawdust also using of any other materials such as sponge for covering the graft point during the callus formation period.

ACKNOWLEDGMENT

We thank Dr. Reza Amiri from Department of Agronomy and Crop Breeding, College of Abouraihan, University of Tehran for his assistant in analyzing the data. University of Tehran and Iran National Science Foundation (INSF) are also acknowledged for their financial supports.

REFERENCES

1. Achim G, Botu I 2001. Results in walnut propagation using different methods. Acta Hort. 544: 503-509.
2. Ferhatoglou Y 1997. The studies on the effect of potting and omega grafting in relation to different time on graft taking percents of some standard walnut varieties. Acta Hort. 442: 303-308.
3. Forde H, McGranahan GH 1996. Walnuts. PP. 241-274. In: J. Janick and J.N. Moore (eds.) Fruit breeding. Vol. III: Nuts. John Wiley and Sons, New York.
4. Gautam DR, Banyal A 2005. Suitability of shoots portion and methods of summer budding/grafting in topworking of walnut. Acta Hort. 705: 319-323.
5. Hartmann HT, Kester DE, Davies FT, Geneve R 2001. Hartmann and Kester's plant propagation: principles and practices. 7 th edition. Prentice Hall, New Jersey. pp.880.
6. Kuniyuki AH, Forde HI 1985. Propagation. PP. 38-45. In: D.E. Ramos (ed.).Walnut orchard management. Division of Agriculture and Natural Resources, University of California, Davis, USA.
7. Millikan DF 1971. 'Propagation of *Juglans* species by fall grafting. Annual Report: Northern Nut Growers Association. 61: 41-44.
8. Ozkan Y, Gumus A 2001. Effects of different applications on grafting under controlled conditions of walnut. Acta Hort. 544: 515-520.
9. Rathore DC 1991. Walnuts. PP. 377-414. In: S.K. Mirta and D.C. Rathore (ed.). Temperate fruits. Calcutta, India.
10. Rezaee R, Vahdati K 2008. Introducing of a simple and effective procedure for topworking Persian walnut tree. Journal of the American Pomological Science 62: 21-26.
11. Rezaee R, Vahdati K, Grigoorian V, Valizadeh M 2008. Walnut grafting success and bleeding rate as affected by different grafting methods and seedling vigour. J. Hort. Sci. Biotech. 62(1): 21-26.
12. Rongting X, Pinghai D 1993. A study on the uniting process of walnut grafting and the factors affecting. Acta Hort.

13. Stanisavljevic M, Mitrovic M 1997. Effect of variety on successful grafting and development of nursery trees of walnut (*Juglans regia* L.). Acta Hort. 442: 281-284.
14. Vahdati K 2000. Walnut situations in Iran. Nucis Newsletter 9: 32-33.
15. Vahdati K 2003. Nursery management and grafting of walnut. Khaniran Publ., Tehran, Iran. PP. 99.

Table 1.

Callus quality, number of callused grafts, graft take, graft survival and scion growth in different sap bleeding control methods.

Year	Cover type	Callus quality[A]	Callused grafts (%)	Graft take (%)	Survival (%)	Shoot growth (cm)
1st	Sawdust	3.02 a[B]	86.66 a	75.00 a	66.04 a	83.12 a
	Perlite	2.08 b	55.00 b	40.00 b	52.22 a	78.46 a
	Only plastic bag	0.94 c	21.66 c	10.00 c	8.33 b	13.32 b
2nd	Sawdust	3.37 a	95 a	88.33 a	84.67 a	82.83 a
	Cocopeat	2.59 b	66.66 b	58.33 b	68.19 b	70.33 ab
	Vermiculite	1.76 c	48.33 b	38.33 b	54.44 b	59.66 b

[A]Values are means of callus scoring ratings from 1 (low callus) to 4 (very good callus).

[B]Means with different letters in each column are significantly different at P≤0.05.

Table 2.

Effective physical properties and porosities in used covers (sawdust, perlite, cocopeat and vermiculite)

Type of covers	Total porosity (% by vol)	Water-holding porosity	Aeration porosity
Sawdust	56	49.72	6.28
Perlite	45	23.29	21.71
Cocopeat	78	76	2
vermicolite	50	31.8	18.2

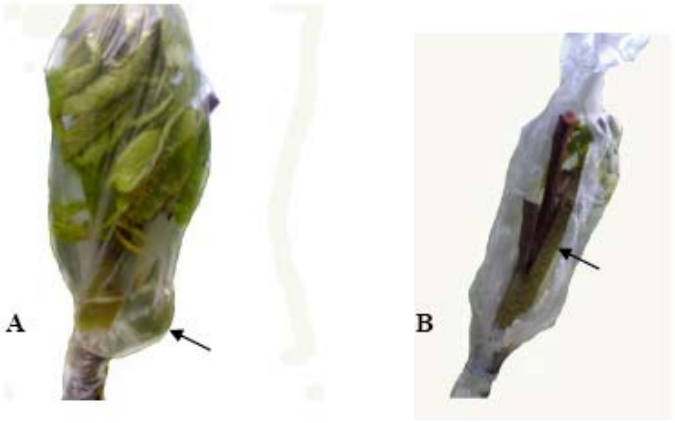


Fig. 1. A) High root pressure and accumulated sap under plastic bag. B) grafting failure in non-covered grafts after callus formation period.

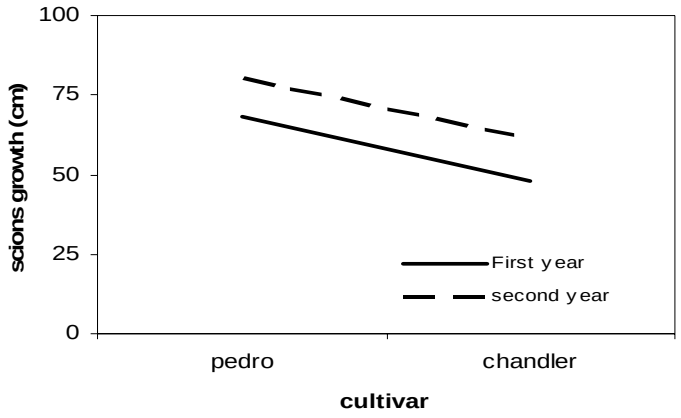


Fig. 2. Effects of cultivar type ('Pedro' and 'Chandler') on scion growth in two years experiments

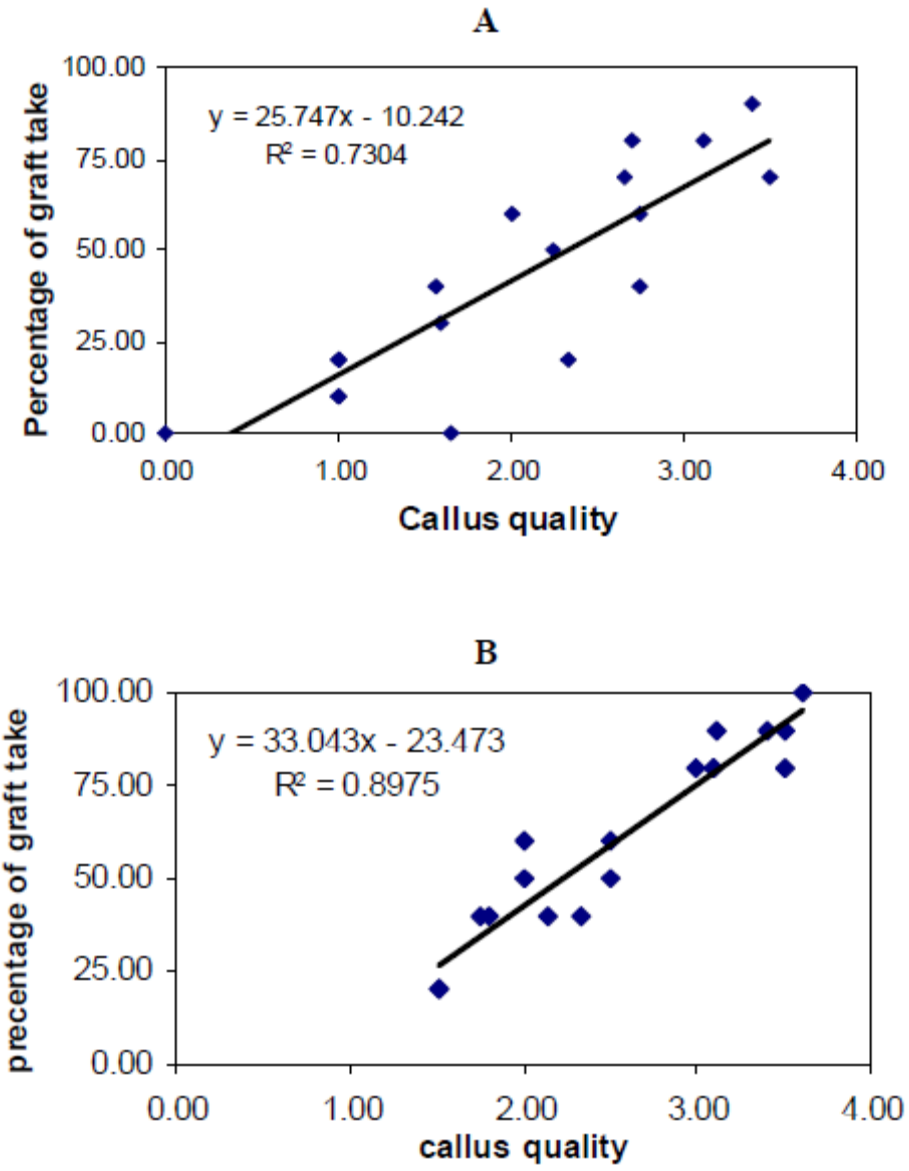


Fig. 3. Correlation between callus quality and percentage of graft take in different bleeding control methods and cultivars. A) First year replication B) Second year replication.

Fig. 4. A & B) Covered graft with sawdust C) scions growth and callus bridge formed.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

A REVIEW OF THE NEW OLIVE TREE "SUPER- INTENSIVE PLANTATION SYSTEM", WORLDWIDE.

Alexandros Papachatzis, Theodoros Arvanitis, Ioannis Vagelas[1]

KEY WORDS: olive tree cultivation, super-intensive system

REVIEW

1994. SPAIN, THE STARTING POINT.

Since February 1994 when Mr. José María Ferrer the owner of the Valonga Plantation in Binéfar (Huesca) planted the first 6 hectares of olive trees grown grown at 3 x 1.35 m, used the Arbequina variety, with the aim to harvest olive oil fruits by machines, until today the situation has changed a lot.

Right from the beginning Mr. Ferre's new olive oil plantation system was the first commercial plantation system called super-intensive. In that period Mr. Ferrer followed the recommendations of Agromillora. Agromillora was a commercial plant supplier, who suggested to him to try out this system in search of possible advantage to mechanizing of olive oil fruits harvest.

Soon after, in 1996, other Agromillora customers dared to copy Mr. Ferrer's new plantation system, like Hacienda San Miguel (Alhama de Murcia, Murcia), Duquesillo (Alcazar de San Juan, Ciudad Real), La Boella (Reus, Tarragona) and Valonga (Binefar, Huesca), planted altogether, that year 90 ha.

Over the next few years more and more companies were encouraged farmers based of the first results, the growing interest in olive oil and the enormous difficulty in finding labor. Year after year, this system of cultivation has spread throughout the Spanish region and beyond the borders of the country.

1997: FRANCE, THE FIRST COUNTRY ADOPTED THE SUPER-INTENSIVE SYSTEM.

A group of French fruit growers in the region of Provence decide to adopt this technology. The idea was that our neighbor country, Spain, is the area in the world where olive oil is sold at a high price for the bulk market, and of course to be bottled.

Concerning these high prices can range around 9 € / kg olive oil, with the obligation to prove that the olive oil have been produced in Spain. This group started in 1997 planted their first acre. Today, after having overcome fierce criticism from local producers, this group has been formed as an association called Union de Provence (UOP) and has approximately 250 planted ha.

[1] Department of Plant Production, Technological Education Institution of Larissa, 41110 Larissa, Greece

Despite its obvious agronomic and economic success, outside the UOP such plantations have been developed mainly to the still persistent reluctance of them to use foreign varieties.

1999: CALIFORNIA (UNITED STATES), ENTER THE MARKET.

California is the third country in the world with olive oil import and could be the second and even first importing country within a few years or even the first. Imports of olive oil general in U.S. are around 250,000 tons.

Local production is only 1%. However the state of California has the optimal conditions of olive tree cultivation. For this reason a group of Spanish investors who believed in this case thought it would be a good opportunity to invest in this type of plantation in 1999 when there was no olive tree cultivation or any relevant in the country. Thus, California Olive Ranch (COR) was born.

This was the trigger for the creation of many other plantations and oil mills. Currently, it is the area in the world with the most expectations for growth in this kind of plantation. Local production of olive oil is absolutely necessary in order to increase American consumer awareness about the product and therefore increase its consumption as has happened years ago with the California wine industry.

2000: PORTUGAL, GOING ALONG WITH SPAIN.

Concerning Portugal and Portuguese investors, company was Todolino form Cordoba which first promotes the realization to introduce the new plantation system. Since that time in Portugal the number of plantations has not stopped growing.

Local and Spanish investors have been attracted by the still lower land values compared with Spanish land, and have made Portugal into a country to keep in mind with regards to European olive oil production in the future.

The growth potential for the new plantations in Portugal that period was very high, probably even higher than countries with much higher production such as Italy and Greece.

2000: TUNISIA, GREAT DYNAMISM FROM LOCAL AGRICULTURE.

In 2000 the local company Sadira, after several years of the first super-intensive plantations in Spain realized that it was time to make also a decision. Tunisia is the first olive oil producer of Africa, and the second country in the world in planted with olive trees surface area.

Olive cultivation in Tunisia is too important to consider alternative crops not so important. So Sadira made the first plantation of 25 ha on its own estate, and from then on become dedicated to promoting these plantations in the country. Further, it is estimated that in late 2007 will exceed 3,000 ha.

This evolution is very important given that it is a country where labor is still available and very cheap. Yet, the local producers themselves feel that this situation will be threatened in the future and prefers to use the super-intensive system in order to alleviate this variable among others.

2001: CHILE, AN OPPORTUNITY THAT CAN'T MISSED.

Encouraged by their success in production and especially export of quality wines, many producers began to wondering why they didn't take advantage of these already existing trade channels to introduce a product that has always been very connected to wine.

The reality is that the cultivated surface area of olive trees in Chile at that time may have been around 3000 ha, most of them in wide frames with table varieties and some

Italian oil merchants with low productions and no clear direction to go in. Via Wine, owned by the Coderch family, planted the first 80 ha. in San Rafael.

After that, large families who were linked to the wine world as well as other sectors like Elvio Olave, Clemente Eblen and Alfonso Swett, threw themselves into undertaking plantations as they understood that they already had an efficient production system that would allow them to grow so as to position Chilean oil in the world.

2003: MOROCCO, OF NATIONAL INTEREST.

After observing what happened in Spain and having undertaken a small experiment in the country when the late Michel Ayello convinced Atlas Farming (Marrakech) to create the first Arbequina plantation under this model.

Some time later, the King of Morocco established olive tree cultivation as the most strategic for the Maghreb country for the future, officially announcing a new National Olive-Growing Plan which is an attempt to go from 500,000 ha of olive trees to 1 million by 2010.

The redistribution of public land (SODEA) into private hands on the condition of developing new farming projects has made it so that the number of hectares of olive trees planted using this system has grown spectacularly in very little time. Companies like Zniber, Tazi and Agrohealth have led this movement in the country. Morocco is set to be one of the new olive-growing poles in the Mediterranean.

2004: ITALY, THE LAST CHANCE.

Moreno Bernardini, a restless young Tuscan, was the first to create the first commercial plantation in the Transalpine country on his family's Scarlino farm. Driven simultaneously by Professors Godini and Bellomo of the University of Bari, Mr. Giovanni Cantore undertook the first plantation in La Puglia. Currently, companies like Innova (Puglia) are promoting this system in a very professional manner. It is surprising that the second-leading olive oil producer in the world has become involved in modernizing his such inefficient olive groves so late.

There are basically 3 reasons: little available land, difficulty in pulling out and reconverting the old olive groves and major difficulty with the use of imported varieties in order to conserve their genuineness. Many of us fear that these problems will be too large an obstacle and except for the region of La Puglia where new olive-growing developments can be undertaken, it will not be possible to reconvert the rest of the olive groves. It is very complicated for Italy to quickly adapt its olive-growing culture without subsidies for 2013. Most likely, Italy will lose the hegemony it had in the sector to other countries.

2006: GREECE, AUSTRALIA, SOUTH AFRICA, ARGENTINA, FINALLY ARRIVES.

These countries have recently incorporated the use of this new plantation. Every country has different motivations, but in common all countries in greater or lesser extent they want to be present in the olive oil market of the future.

AND THE FUTURE

The advancement of this technology is worldwide growing fast (Table 1). Associated advantages (rapid entry into production and total mechanization of the harvest) with more than 13 years of accumulated experience on the specific plantation system is suggested as a new optimization system of olive oil plantations. This system is expected to reach the 250,000 ha planted worldwide (Fig. 1).

REFERENCES

1. www.olint.com
2. www.agromillora.com
3. www.geolivo.gr
4. www.agripro.gr
5. www.agrotypos.gr
6. Papanikolopoulos Fanis., 2007, «Το σύστημα πολύ πυκνής γραμμικής φύτευσης της ελιάς» (The Super intensive on the row plantation system of olive trees), Γεωργία – Κτηνοτροφία (Agriculture – Husbandry) magazine, issue 2, pages 46-51. Agrotypos (www.agrotypos.gr).
7. Arvanitis Theodoris, 2009, «Το σύστημα Υπέρπυκνης Ελαιοκαλλιέργειας ως Επιχειρηματική Επένδυση» (The Super Intensive Olive Trees Plantation System as a Business Investment), Γεωργία – Κτηνοτροφία (Agriculture – Husbandry) magazine, issue 6, pages 40-45. Agrotypos (www.agrotypos.gr).

Table 1.

Current olive oil consumption per person in European Union (EU) countries

Member state of the EU	Current olive oil consumption in L per person
Greece	18
Iatly	10,5
Spain	10,2
Portugal	0,8
UK	0,3
Germany	0,2

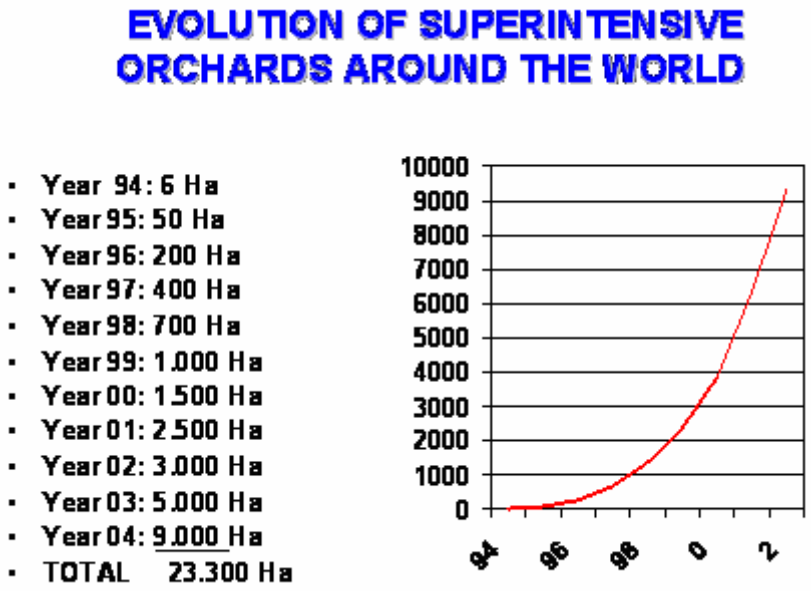


Figure 1. Super-intensive olive grown farms in the world

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

CULTURE SYSTEM OF TREES THE PRECOCITY OF FRUCTIFICATION

Valerian Balan[1]

KEYWORDS: biological material, cutting trees, crown type

ABSTRACT

The fruit-growing is obviously part of the fruit-growing ecosystem of anthropogenic origin and its production targets well. These objectives must be defined in terms of technological and economic factors that are willing and suited to the financial possibilities of households. When designing an orchard, fruit growers' main objective is to capitalize on maximum investment and production costs, criteria to be considered in defining the culture of trees. We present here a bibliographical review of some of the elements which constitute the ground of their conception such as plant density, biological material, cutting trees, canopy form.

INTRODUCTION

Biological material. Different vigour of species, varieties and rootstocks allows a good mastery of the vegetation. Apple tree due to a very large range of rootstocks and even different varieties of force enables the use of all of offers the possibility of the use of our systems of culture, allowing the adaptation of the orchard to soils less fertile or to different systems of management of tree crown (J. M. Lespinase, et al., 1992; Gh. Cimpoies, 2000; N. Braniste, 2004; V. Balan, 2005; V. Bucarciuc, 2007; V. Babuc, et al., 2008).

Cutting trees. Obtaining of economic crops in a time as shorter as of the planting is done faster when the trees grow with no or minimal cuts. In this case the tree is gains in speed of development enter more rapidly in the fructification phase and its vegetative growths being dominant in this period (V. Babuc, 1985; S. Sansavini, 1998; V. Balan, 2007).

Crown Type. Specific forms of crown to the extensive orchards, which require the formation of the skeleton elements, are sufficiently strong, progressively replaced by the forms in the iron system (palmetto) or spindle. Range of shapes has everywhere biological origins (variety, rootstocks etc.), climate (light, heat, rain etc.) and soil, but certainly responds also to the factors like tradition and a maximum and economic production potential (J. E. Jacson, 1980; J. M. Lespinase, 1994; Gh. Cimpoies, 2005).

MATERIAL AND METHOD

The fruit-growing system is determined by the methods and technological tools by which is achieved using soil as a main source of production. The concept of fruit-growing

[1] Faculty of Horticulture, the Agrarian State University of Moldova

system is used to integrate the relationships between the genetic characteristics of the soil with the technological and economic factors governing productivity. Other factors contributing to the realization of biological production potential of the variety are related to the fructification type precocity of fructification, the mode of cutting and management, the resistance to diseases and pests, planting density and used rootstock.

The culture is oriented to continuous improvement of assortment in terms of quality, quantity and consistently to meet the needs of integrated production. Such a system can be highlighted by the constantly relations between the species, rootstock, the management of crown, crown shape and distance of planting

RESULTS AND DISCUSSION

Density of planting. The use of space-time achieved by the size and shape of the planting area is an essential factor that makes the early entry of trees in the production. The table 1 it shows the distance between the rows of simple trees from 3.5 up to 6 m. The parameters determining the structure of fruit growing plantation was observed the relationship between the crown height, the angle of inclination of the crown and the crowns of remaining free lines described by V. Balan (1996).

Table 1

The optimum productive potential of the plantation according to the geometric structure of the canopy in geographic latitude and 47^0 and the inclination angle of 12^0 crown.

Model Crown	The distance between rows, m	Crown height, m	The coverage of the soil,%	The actual volume of the crown m^3/ha	The crown area, thousand m^2/ha	Production potential,%
1	6	4	41,6	11,1	15,0	65,7
2		3,5	50,0	13,2	14,4	67,6
3	5,5	3,5	45,4	11,2	14,9	67,2
4		3	54,5	12,9	14,3	70,2
5	5	3,5	40,0	8,6	15,3	65,5
6		3	48,8	10,6	14,5	67,0
7	4,5	2,9	44,4	9,0	14,9	66,2
8		2,5	51,1	9,7	14,1	67,5
9	4	2,9	37,5	6,5	16,4	71,7
10		2,3	50,0	8,8	14,4	68,3
11	3,5	2,5	42,9	6,8	15,7	67,4
12		2	51,4	7,8	14,4	68,0

From undertaken research resulted that canopy volume gradually decreases at the same time with increasing density of trees. So, the distance between rows of 6 m get 11,1-13,2 thousand m^3/ha and the distance of 3.5 m - only 6,8-7,8 thousand m^3/ha. This shows that in of high density plantations, the volume of productive canopy reaches maximum settee by the plantation during the first 2-3 years after planting. Meanwhile, the lateral side of the canopy, regardless of the structure of plantation is 14.1 - 15.7 thousand m^2/ha. It follows that high-density plantings enter the fruiting in the 3-4 year after planting, due to the rapid use of the geometry of the space reserved for the whole vegetative orchard.

The calculations showed that the value of the potential production of the canopy, calculated according to the coefficient of volumetric density of lateral surface of the crown (N. V. Agafonov, 1983), gradually increases with decreasing crown height. This is ripening because with decreasing crown height increased width at its peak and the rate increases last over the side of the crown, less illuminated. So there fore once, with the decreasing height crown, it improves the lighting that can be characteristic in the development of productive trees and fructification.

The rootstocks vigour. The different vigour of trees is directly proportional to the rootstock vigour and allows diversification of crown forms and systems of culture. The rootstock reduces the force favours the early entry of fruit trees and economic crops, due to the combination of juvenile short-stock variety and low volume crowns well lighted. So the different vigour of rootstocks and multiple possible combinations variety / rootstock determine the typical range of the density of trees (Gh. Cimpoies, 2000; N. Braniste, 2004). Thus, the use of the vigour of biological material associated with a low density of planting trees provides high early and high yields. In this sense was generalized to use rootstocks M9 dwarfs, with the reduced vigour and the delivery of perform trees, with the nursery anticipates, grafting to 20 cm high above the root to increase the precocity of fructification. The trees bear fruits from the 1 year after the planting, in the second year the fruit production reaches 18-20 t / ha, in the south year it reaches the maximum level of 30-35 t / ha (A. Peşteanu, 2008).

Cutting to form the crown. Training cuts are applied differently depending on the physiological status of each in the way to obtain the desired crown form. In the first 2-3 years after the planting, in the case of high-density orchards, the vegetative growth predominates, the fructification being early or moderate. Therefore, the young trees cuts are limited, because the intensive more the vegetative growing and delayed the fructification.

In high density orchards regardless of how these are managed, the economic and early crops can be obtained, when the trees are left to grow freely with the minimum necessary cuts. (V. Babuc, 1985; N. Ghenea, et. al., 2004). They introduced leading freely forms as "Spindle bush, Slender spindle," "Spindle northern Netherlands", "Super spindle which allows, in the addition of 2500-3000 per ha density and well-illuminated crowns, moderate growth, harvesting and making cuts on the ground. This allows overgrown branches with early bearing formations and the achieving of high crop in the first years after planting (J.M. Lespinase, 1992, 1994; S. Sansavini, 1998; N. Braniste, 2004). The yields obtained moderate the vegetative growth that is dominant at that period.

It is important, in the formation of trees, the is reduced cuts to a minimum by replacing them with direction and enter the undergrowth or oblique angles to the horizontal for rapid differentiation of germ the fruit with immediate effect in the fructification of 2-3 year after planting. During the existence of the orchard, the cuts are limited to the interventions that have to ensure sustained fructification year by year.

Biological material. The density of trees and the specific exploitation techniques to each operating system of culture, determine differentiation about the moment of the entry of the fruiting, to the production in different periods of the plantation, the evolution of morphological and physiological status of trees etc.

The use of some rootstocks of the small force and very low vigour (M9, M26, M27), of a variety of early and productive, kind with some trees planted to anticipate high density (2500-3000 per ha) enables fructification of 1 year after planting. Duration of operation plantation is 10-12 years (N. Braniste, 2004).

CONCLUZION

The training systems in orchards depending on the desired objectives. Along with the parameters of biological, ecological and technological resources that govern the productivity, the orchard, to the extent possible to satisfy more envisaged objectives. Without doubt the scientific value of these objectives will mention their decisive character in the choice of culture. Thus, before choosing the biological material, the planting distances and the crown form, the first and more important step is to define precisely the envisaged objectives. These objectives are very important whereas they depend on the yield and quality of fruit production on the surface unity in the dynamics during the operation.

BIBLIOGRAPHY

1 Агафонов Н.В. Научные основы размещения и формирования плодовых деревьев. Москва, 1983, 173 с.
2 Бабук В.И. Формирование и обрезка деревьев в интенсивных насаждениях (Учебное пособие). Кишинев, 1985. 76 с.
3 Babuc V., Croitoru A. Caracteristicile fitometrice ale structurii plantaţiei superintensive de măr în funcţie de soi şi modul formării coroanei de fus zvelt. Lucrări ştiinţifice, vol. 16. Chişinău, 2008, p. 67-70.
4 Balan V. Metoda de stabilire a distanţei dintre rândurile de pomi fructiferi. Brevet de invenţie, RM nr. 361. Data publicării hotărârii de acordare a brevetului, 31.01.1996, BOPI, nr.1/96.
5 Balan V. Apple trees plantation structure. Notulae Botanicae Horti Agrobotanici Cluj-Napoca. Vol. XXXIII, 2005, p. 64-70.
6 Balan V. Apple trees planting distances concept conceptions de distances de la plantation de pommier. Bulletin of University of Agricultural Sciences and Vetirinary Medisine Cluj-Napoca. Horticulture. 2007, Vol. 64 (1-2), p. 202-206.
7 Branişte N. Cultura mărului. Bucureşti, 2004, 79 p.
8 Bucarciuc V. Precocitatea de rodire şi productivitatea soiurilor de măr. Cercetări în pomicultură, Vol. 6. Chişinău 2007, p. 190-207.
9 Cimpoieş Gh. Conducerea şi tăierea pomilor. Chişinău, 2000, 273 p.
10 Cimpoieş Gh., Boţan D. Creşterea şi fructificarea mărului în funcţie de soi şi structura plantaţiei. Ştiinţa agricolă, nr. 1, 2005, p 15-18.
11 Ghena N., Branişte N., Stănică F. Pomicultura generală. Bucureşti, 2004, 562 p.
12 Jackson J.E. Height density methods of planting rootstocks distances and trening systems. Riv. Ortoflorifrutt. Ital. 1978. Vol. 62, nr. 2, p. 191-204.
13 Jackson J. E., Theory of light interception by orchard and a modeling approach to optimizing orchard design. Acta horticulturae. 1980, nr. 114, p. 69-79.
14 Lespinase J. M., Delort F., Carboneau A. Conduite de `Roial gala`. Etude comparative de different systems. L`arboriculture, 1992, nr. 449, p. 30-36.
15 Lespinase J. M., Delort F. Le solen – verger's pieton. Rev. Fruits & Legumes, 1994, nr. 119.
16 Peşteanu A. Pretabilitatea soiurilor de perspectivă pentru sistemul superintensiv de cultivare a mărului. Lucrări ştiinţifice, Vol. 16. Chişinău, 2008, p. 77- 80.
17 Sansavini S. The fruit industry in Italy. In Italian Hort. Roma, 1998. p. 145-275.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

CULTURE SYSTEM OF TREES FRUIT PRODUCTION EFFICIENCY IN RELATION TO DENSITY OF PLANTING TREES

Valerian Balan[1]

KEY WORDS: varieties, rootstock, training system, period age of tree

ABSTRACT

The fruit-growing system is determined by the methods and technological tools by which is achieved using soil as a main source of production. The concept of fruit-growing system is used to integrate the relationships between the genetic characteristics of the soil with the technological and economic factors governing productivity. Before choosing the biological material, the planting distances and the crown form, the first and more important step is to define precisely the envisaged objectives. These objectives are very important whereas they depend on the yield and quality of fruit production on the surface unity in the dynamics during the operation. In this article we have studied the plant density and the productive potential of the plantation according to the geometric structure of the canopy. During the ontogenesis period the highest phytoproductivity was obtained at the distance of 4,5 - 5 m between row spacing and 2,5 - 3 m within row – spacing.

INTRODUCTION

The cultivation of fruit trees is based on the obtained results in the last decades of practical and theoretical researches carried out in major growing countries (Germany, Netherlands, Poland, Switzerland, France, and Italy) and in our country. Density of the trees evaluated from 400-600 trees 1970 years and has now reached around 1250-2500 per ha in our conditions and reaches the 3000-5000 tree per ha achieve and more in the Netherlands, Germany, Poland (J. W. Palmer, et al.,1989; A. Masseron, et al., 1990; V. Balan, 2007).

MATERIAL AND METHOD

In ontogenesis there were studied apples *cv Slava peremojtiam, Kalvili snow, Golden Delicious and Mantuaner* grafted on rootstock M4 and the utilization of the following apple tree spacing: 4,5 x 4,5 m, 5 x 4 m, 5,5 x 3,5 m, 5,5 x 3 m, 4 x 4 m, 4,5 x 3,5 m, 5 x 3 m, 4,5 x 3 m, 3,5 x 3,5 m, 4 x 3 m, 4,5 x 2,5 m. The rows were situated from north to south. The trees are formed on type of liberally rising fan-shaped espalier (palmetto). There were 24 apple trees in each variant. The experiences were repeated three times. At

[1] Faculty of Horticulture, the Agrarian State University of Moldova

the basis of the studies are methodological indications for the establishment of orchards with high productive structures, the evidence and the control of the main indices of photosynthetic productivity, the study of the biological rotation in phytocenosis. Top soil of the fruit plantation was presented by powerful chernozem on light loam and was cultivated permanent and maintained by till field.

The calculations showed that the value of the potential production of the canopy, calculated according to the coefficient of volumetric density of lateral surface of the crown (N. V. Agafonov, 1983), gradually increases with decreasing crown height.

RESULTS AND DISCUSSION

Valuing the land of orchards in time, achieved by planting density is a major indicator for the growing trees. Although a high density of trees per hectare is an important index that characterize the culture, with the value of his interest information about the entry of fruit trees, and worsening of thicken the light mechanization work establishing and maintaining orchards.

This information is necessary because a high density of trees per hectare not automatically defines system (intensive or superintensiv) culture, for example, assortment does not match these systems.

Theoretically it is possible to obtain similar yields at different planting distances (Ghena, Braniste and Stanica, 2004) recommended for each species (Tab.1).

Table 1

Yields at different planting densities.

Planting distance, m		Trees per ha	Yields, kg/ha			
			20000	30000	40000	50000
Between rows	On row		Harvest, kg/tree			
	2	1125	17,8	26,7	35,6	44,4
4	1,5	1500	13,3	20,0	26,7	33,3
3,5	1,25	2057	9,7	14,6	19,4	24,3
3	1	3000	6,7	10,0	13,3	16,7
3	0,75	4000	5,0	7,5	10,0	12,5
2,5	0,75	4800	4,2	6,3	8,3	10,4
2,5	0,5	7200	2,8	4,2	5,6	6,9

Basically contradictory data obtained with this statement (Tab. 2).

From research undertaken that resulted in cumulative production per hectare and tree until the 17th age planting of differences in production is very high. The highest cumulative production per tree (398.2 - 419.2 kg) in Golden Delicious variety was obtained in variants 4.5 x 4.5 m, 5 x 4 m and 5.5 x 3.5 m and the smallest (254.4 - 256, 9kg) - at distances of planting 3.5 x 3.5 m and 4 x 3 m. But calculated per hectare, the highest productivity was recorded at planting distances of 5 x 3 m, 4.5 x 3.5 m, 4.5 x3 m, 4.5 x 2.5 m as constituted 228.0 - 241.8 t/ha and less (196,3-209,6 t / ha) - with variations on longer distances planting.

Analysis of data submitted believe that in the early years of fruit-bearing tree on yields were close between all the tested variants, and later noted that at small distances were obtained with the lowest yields. In the first years of fructification they have obtained higher yields per hectare in variants with a greater number of trees to the surface, but later variants with a higher density of trees per hectare were exceeded by those who had a fewer trees per hectare. Given the development of varieties of trees in *Golden Delicious, Slava pobediteleam* and *Kalvili snow*, grafted on rootstock M4, after 16-17 years of growth and production as well as the possibilities for mechanization of the work can be emphasized that the geometric structure and internal a canopy distances optimized by planting 4.5 x 3.5 m, 5 x 3 m, 4.5 x 3 m is the more rational management and more productive.

Table 2

Influence of planting distance on the stage of the fructification age of the variety *Golden Delicious* apple, grafted on the M4.

Planting distance, m	Annual average on the stages by years of vegetation						Totalled production by 4 -17 years of vegetation		
	Growth and fruit-bearing		Fruit-bearing and growth		Fruit-bearing				
	kg/tree	t/ha	kg/tree	t/ha	kg/tree	t/ha	kg/tree	t/ha	Deferens to ha
4.5x4.5	17,9	8.8	38.2	18.8	35.9	17.7	398.2	196.3	-23.4
5x4	18.0	9.0	37.8	18.9	39.2	19.6	419.2	209.6	-10.1
5.5x3.5	18.3	9.5	36.9	19.1	36.4	18.9	402.3	208.8	-10.9
5.5x3	18.0	10.9	33.7	20.4	31.8	19.3	366.2	221.9	2.2
4x4	16.6	10.4	33.5	20.9	31.7	19.8	358.7	224.2	4.5
4.5x3.5	17.3	11.0	33.3	21.1	31.3	19.9	359.1	228.0	8.3
5x3	16.9	11.2	33.5	22.3	32.3	21.5	363.1	241.8	22.1
4.5x3	16.7	12.4	29.7	22.0	26.8	19.8	319.7	236.6	16.9
3.5x3.5	15.8	12.9	26.1	21.3	17.4	14.2	254.4	207.6	-12.1
4x3	15.1	12.7	25.3	21.1	18.8	15.7	256.1	213.3	-6.4
4.5x2.5	14.7	13.0	24.3	21.6	20.2	17.9	256.9	228.1	8.4
M	16.8	11.1	32.0	20.7	29.3	18.6	341.3	219.7	-

In general intensive plantations trees system include trees grafted on rootstocks of force middle, with the iron crown or small globule volume with 600-1250 per ha which will produce yields of 20-30 t / ha.

For superintensive plantations often used the simple planting in rows with 2500-3800 per ha. Typically, trees are driven into the globule forms with very low volume and

grafted onto rootstocks of weak force (V. Babuc, A. Croitoru, 2008; A. Peşteanu, 2008; V. Balan, R. Şaganian, 2008).

CONCLUZION

Apple tree due to a very large range of rootstocks and even different varieties of force enables the use of all of offers the possibility of the use of our systems of culture, allowing the adaptation of the orchard to soils less fertile or to different systems of management of tree crown.

For rising of the labour productivity systems they are chosen of simple management with a high degree of mechanization of work and culture of low stature of trees, which allow fully exploit the manual work (cut trees, and harvesting fruit space out). Such a system can be highlighted by the constantly relations between the species, rootstock, the management of crown, crown shape and distance of planting.

Modern fruit growing production involves the crown with simple lines in a vertical plane up to 2.5 m in height allowing the rationalization of work cutting, harvesting, maintenance of soil and orchard with lower costs.

Adaptation of some forms of crown less bulky, more systematized, with a structure as to increase production of fruit.

BIBLIOGRAPHY

1 Агафонов Н.В. Научные основы размещения и формирования плодовых деревьев. Москва, 1983, 173 с.
2 Babuc V., Croitoru A. Caracteristicile fitometrice ale structurii plantaţiei superintensive de măr în funcţie de soi şi modul formării coroanei de fus zvelt. Lucrări ştiinţifice, vol. 16. Chişinău, 2008, p. 67-70.
3 Balan V. Apple trees planting distances concept conceptions de distances de la plantation de pommier. Bulletin of University of Agricultural Sciences and Vetirinary Medisine Cluj-Napoca. Horticulture. 2007c, Vol. 64 (1-2), p. 202-206.
4 Balan V., Şaganian. Productivitatea pomilor de măr în funcţie de metoda de rărire a fructelor. Lucrări ştiinţifice. Volumul 16. Horticultură, viticultură, silvicultură şi protecţia plantelor. Chişinău, 2008b, p. 112-114.
5 Ghena N., Branişte N., Stănică F. Pomicultura generală. Bucureşti, 2004, 562 p.
6 Masseron A., Dalle E., Hutin C. Perspectives de nouveua aux systemes de conduite du verger. PT.2. Le programme ctifl. Infos, 1990, T. 60, p. 31-39.
7 Palmer J.W., Sansavini S., Winter F., Buneman G., Wagenmakers P.S. The international planting systems trial. Acta horticulturae. T. 243. The hagul., 1989, p. 231-241.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

INFLUENCE OF THE METEOROLOGICAL CONDITIONS ON FRUIT CRACKING IN TWO SWEET CHERRY CULTIVARS GRAFTED ON TEN (10) DIFFERENT ROOTSTOCKS

Valentin Lichev[1], Alexandros Papachatzis[2], Davood Bakhshi[3]

KEY WORDS: sweet cherry, Prunus avium, precipitation, rootstocks, fruit cracking

ABSTRACT

The studies were conducted in 2004-2006 in the 8-10-year-old plantation in the experimental field of the Agricultural University in the town of Plovdiv. On the basis of the concrete meteorological conditions during the time of the 20-day period before fruit-picking, the fruit cracking in the sweet cherry cultivars 'Bigarreau burlat' and 'Stella', grafted on 10 rootstocks, was studied. It was established that the precipitation in the last ten days before fruit-picking has the strongest influence on fruit cracking, whereas that of the preceding period(no matter that its quantity was greater)was of no significant importance. The influence of the rootstocks on cracking is not one way - i.e. a certain rootstock in some years induces heavier cracking than the remaining variants, and in other years – it is less heavy. This could be due to variations of the mean fruit mass of the trees on the examined rootstocks in the separate years, or to other factors.

INTRODUCTION

The cracking of the sweet cherry fruit inflicts serious losses on the producers in many of the regions where this crop is being cultivated (Balmer, 1996; Siegler, 1999). Taking into account the importance of this problem, the research workers from different countries have started their research work for its solving as early as the 30s of the 20th century (Sekse, 2008). Advancement in this activity has been registered after the introduction of the so called "cracking index" in the 50s of the previous century (Verner, 1957) and after the thorough studies of the different aspects of the sweet cherry fruit cracking, conducted in Denmark in the 70s (Christensen, 1972a, 1972b, 1973).

The main reason for the fruit cracking is connected with the frequent precipitation during the time of the fruit growth and ripening (Popatanasova et al., 2005; Greco et al., 2008; Vercammen et al., 2008). As a result of the purposeful scientific work it has been established that other factors, such as the biological characteristics of the cultivar – the thickness of the fruit skin, the size and density of the stomata on it (Georgiev, 2001; Sekse, 2008), the air temperature and humidity and the presence of wind (Georgiev, 2001; Sotirov, 2008), the maintenance system of the soil (Pansaers, 1976), the crown thickness etc., also influence fruit-cracking.

[1] Agricultural University, Plovdiv, Bulgaria
[2] Technological Education Institute Larissa, Greece
[3] Dep. of Horticultural Science, Faculty of Agriculture, University of Guilan, Rasht, Iran

There are very few studies in the literature available to us, referring to fruit-cracking depending on the rootstock. In this connection, some authors have observed the established influence of a certain rootstock (Granger and Frensham, 1991; Popatanasova and Sotirov, 2005; Simon et al., 2004), whereas in other studies no differences between the rootstocks have been proved (Vercammen et al., 2006).

Taking all this into consideration, we set the objective to study the influence of 10 rootstocks on the fruit-cracking of two cultivars under natural conditions (based on the concrete meteorological conditions).

MATERIALS AND METHODS

The studies were conducted during the period 2004 – 2006 in the experimental field of the Fruit-growing Department at the Agricultural University in the town of Plovdiv. The fruit of 8-10-year-old trees of the sweet cherry cultivars 'Bigarreau burlat' and 'Stella', grafted on the rootstocks P 1 (seedling of *P. mahaleb* L. selected in Bulgaria), Gisela 5, Gisela 4, Gisela 12, Gi 497/8, Weiroot 10, Weiroot 13, Weiroot 53, Weiroot 72 and Weiroot 158 were used, which were planted at distances of 6,0 – 4,5 m using a randomized block design. The trees (6 in number per variant) were trained as free-growing crowns; they were grown under the conditions of herbicide fallow and were gravity irrigated. The specific meteorological conditions (quantity of precipitation, mean 24-hour air temperature and relative air humidity) were registered during the time of the 20-day period preceding the crop-gathering. In the time of fruit-picking fruit were gathered (60 in number per tree for the cultivar-rootstock combinations, from the four cardinal points) and the percentage of cracking was calculated. The data obtained were statistically processed by the Anova method, using Student's test.

RESULTS AND DISCUSSION

During the 20-day period preceding the fruit-picking of 'Bigarreau Burlat' in the year 2004, the total precipitation of 32 mm was observed (Table 1). For the last 10 days of this period precipitation was low – 13,3 mm (Table 2), but as it was almost on a daily basis (Table 2 and Figure 1), it caused fruit-cracking. The fruit of the trees on Weiroot 53, Weiroot 158, Gi 497/8, P 1 and Gisela 12 suffered the most severe damages (between 12% and 15%), these on Gisela 4, Weiroot 10 and Weiroot 72 suffered the least severe damages (about 5% - 8%), whereas the remaining variants occupied an intermediate position (Table 3).

In the year 2005 during the 20-day period before picking the fruit of the cultivar 'Bigarreau burlat', a greater quantity of precipitation was observed (45 mm) in comparison with that form the same time in the previous year. Irrespective of this, fruit-cracking in the year 2005 in all variants decreases many times and was about 1% - 2% (Table 3). The reason for the lower fruit-cracking in the year 2005 is, according to us, probably due to the fact that the precipitation (nonetheless that it is great for the total 20-day period), fell mainly in the middle of this period, whereas in the last 8 days there was almost no precipitation (Figure 1). The weaker cracking in the year 2005 was positively influenced also by the higher mean 24-hour air temperature (Table 2), at which the rain drops fallen on the fruit evaporated more rapidly and didn't cause damages.

In the year 2006, in the time of the 20-day period preceding the harvesting of the cultivar 'Bigarreau Burlat', an insignificant quantity of precipitation fell (only 8,1 mm), which allowed to lower the fruit-cracking in all variants to under 1% (Table 3).

In the cultivar ‘Stella’ what makes an impression is that during the 20-day pre-harvesting period in the years 2004 and 2005 the precipitation is frequent (Table 1 and Figure 1), and its quantity in the two years is great and almost equal – 56,4 mm and 58,4 mm respectively (Table 1). This causes fruit-cracking which is especially clearly manifested in the year 2004 and in the separate variants it is between 25% and 45% (Table 3). The cracking is the highest (between 40% and 45%) in the trees on Gisela 5, Gisela 12 and P1, and it is the lowest (about 25% - 27%) in these on Gisela 4, Weiroot 53 and Weiroot 158. In the year 2005 the fruit-cracking is lower and in the separate variants it varies between 3% and 8, 62%. The cause for the different degree of cracking of the fruit of the cultivar ‘Stella’ in the years 2004 and 2005 (irrespective of the fact that in every one of these years the total precipitation for the 20-day pre-harvesting period was almost equal) can be explained, together with that for the cultivar ‘Bigarreau burlat’, with the precipitation quantity in the last ten-day period before harvesting. In this connection, for the last 10 days immediately before harvesting, for the year 2004 – 48,9 mm were reported, whereas for the year 2005 – it was only 13,1 mm (Table 2). The year 2006 is also indicative, when during the last 10 days before harvesting the precipitation fallen was 16,2 mm (approximately the same as that in the same term of the year 2005), and irrespective of the fact that the year 2006 was a lot dryer during the whole 20-day pre-harvesting period, cracking in both years was almost equal (Table 3). Based on the data obtained we can make the conclusion that the precipitation quantity in the last ten–day period before harvesting influences very significantly fruit-cracking. In this connection other authors (Granger, 2005; Popatanasova et al., 2005; Greco et al., 2008; Vercammen et al., 2008) also report that the precipitation in the time of growing in size and ripening of the fruit causes fruit-cracking, but they don’t specify the term in which precipitation causes the most severe damages. The conclusion drawn by us is logical, especially taking into consideration also the observations made under an electronic microscope, which register very thoroughly that the cracking on the cuticle occurs mainly in the third stage of fruit growing (Sekse, 2008).

As far as the rootstocks are concerned, their influence on fruit-cracking in our study is especially well outlined in the cultivar ‘Stella’ (in the three years), whereas in ‘Bigarreau Burlat’ – only in the year 2004 (Table 3). What makes an impression, however, is that this influence is not one-way – i.e. the separate rootstocks (for example Gisela 5) in some of the years induce higher fruit-cracking than the remaining variants, whereas in other years – considerably lower. This could be due to the variations in the mean fruit mass of the trees on the examined rootstocks in the separate years (data are not presented). In a given year, usually in the variants with larger fruit, higher cracking is also observed. It is possible, however, for other factors, such as fruit dry matter content, sugars etc., to influence cracking. According to us, additional, even more efficient studies are needed, including ones of the above-mentioned factors, in order to obtain more exact information about the influence of rootstocks on fruit-cracking (on the basis of the specific meteorological conditions). In this connection, according to Sekse’s (2008) topical opinion, it was observed that in the last years, although valuable contributions have been added to the issue of fruit-cracking in the sweet cherry, it still remains a complicated phenomenon.

CONCLUSIONS

Fruit-cracking in the sweet cherry cultivars ‘Bigarreau burlat’ and ‘Stella’ varies during the years of examining predominantly according to the quantity and density of the precipitation in the pre-harvesting period.

The precipitation in the last ten days or so before harvesting has the greatest influence on cracking, whereas that fallen before this time (no matter that its quantity is greater), is of no significant importance.

The influence of rootstocks on cracking is not one-way – i.e. a given rootstock in some years induces higher cracking than the remaining variants, whereas in other years - considerably lower. This could be due to the variations of the mean fruit mass during the separate years in the trees on the examined rootstocks or to other factors. In a given year, higher cracking is usually observed in the variants with larger fruit. However, it is possible for other factors to influence fruit-cracking too. In order to obtain more exact information about the influence of rootstocks on fruit-cracking (on the basis of the specific meteorological conditions), additional and even more detailed research is needed.

REFERENCES

1. Balmer M. Sűsskirschen – Prűfung einer neuen Intensitätsstufe. Obstbau, 7: 343-344, 1996.
2. Christensen J. V. Cracking in cherries. III. Determination of cracking susceptibility. Acta Agriculturae Scandinavica, 22: 128-136, 1972a.
3. Christensen J. V. Cracking in cherries. IV. Physiological studies of the mechanism of cracking. Acta Agriculturae Scandinavica, 22, 153-162, 1972b.
4. Christensen J. V. Cracking in cherries. VI. Cracking susceptibility in relation to the growth rhythm of the fruit. Acta Agriculturae Scandinavica, 23, 52-54, 1973.
5. Georgiev V. Ecological requirements. p. 64-70. In: V. Georgiev, M. Borovinova and A. Koleva, Cheresha (Sweet cherry) [Bul], Zemizdat, Sofia, 2001.
6. Granger A. R. The effect of three rootstocks on yield and fruiting of sweet cherry. Acta Hort., 667: 233-238, 2005.
7. Granger A. R., A. B. Frensham. Effect of three cherry rootstocks on the yield and fruiting of four sweet cherry (*Prunus avium* L.) varieties.
8. Australian Journal of Experimental Agriculture 31(4): 567-573, 1991.
9. Greco P., M. Palasciano, R. Mariani, A. Pacifico, A. Godini. Susceptibility to cracking of thirty sweet cherry cultivars. Acta Hort., 795: 379-382, 2008.
10. Pansaers L. L' eclatement des cerises. Le fruit belge, 44, 376: 267-271, 1976.
11. Popatanasova D., D. Sotirov. Investigations on the influence of the rootstock on cherry cracking of cultivar Van. Scientific works of the National Center of Agricultural Sciences, vol. 3: 208-211, 2005.
12. Popatanasova D., N. Hristov, M. Borovinova. Results of investigations on cracking and rot susceptibility of some sweet cherry cultivars. Scientific works of the National Center of Agricultural Sciences, vol. 3: 212-216, 2005.
13. Sekse, L. Fruit cracking in sweet cherries - some recent advances. Acta Hort., 795: 615- 624, 2008.
14. Siegler H. Regenschutz – im modernen Sűsskirschenanbau unerlässlich. Obstbau, 7: 391- 396, 1999.
15. Simon G., K Hrotkó, L. Magyar. Fruit quality of sweet cherry cultivars grafted on four different rootstocks. Acta Hort., 658: 365-370, 2004.
16. Sotirov D. Study of cultivar - rootstock combinations in sweet cherry (*Prunus avium* L.) in a plantation. Dissertation, Kyustendil, p. 170, 2008.
17. Vercammen J., G. van Daele, T. Vanrykel. Use of Gisela 5 for sweet cherries. Scientific works of the Lithuanian Institute of Horticulture and Lithuanian University of Agriculture, Sodininkyste ir Darzininkyste, 25(3): 218-223, 2006.

18. Vercammen, J., G. van Daele, T. Vanrykel. Cracking of sweet cherries: past tense? Acta Hort., 795: 463-468, 2008.
19. Verner L. Procedure for determining resistance of sweet cherry varieties to fruit cracking. Fruit varieties and horticultural digest, 12: 3-4, 1957.

Table 1.

Meteorological conditions during the time of the 20-day period before harvesting in two sweet cherry cultivars

	Quantity of precipitation, mm	Number of days with precipitation	Mean 24-hour air temperature, °C	Relative air humidity, %
'Bigarreau burlat'				
2004	32,0	11	16,1	70
2005	45,0	9	16,8	70
2006	8,1	6	15,2	65
'Stella'				
2004	56,4	11	17,2	77
2005	58,4	10	18,7	71
2006	18,8	9	19,1	63

Table 2.

Meteorological conditions during the time of the 10-day period before harvesting in two sweet cherry cultivars

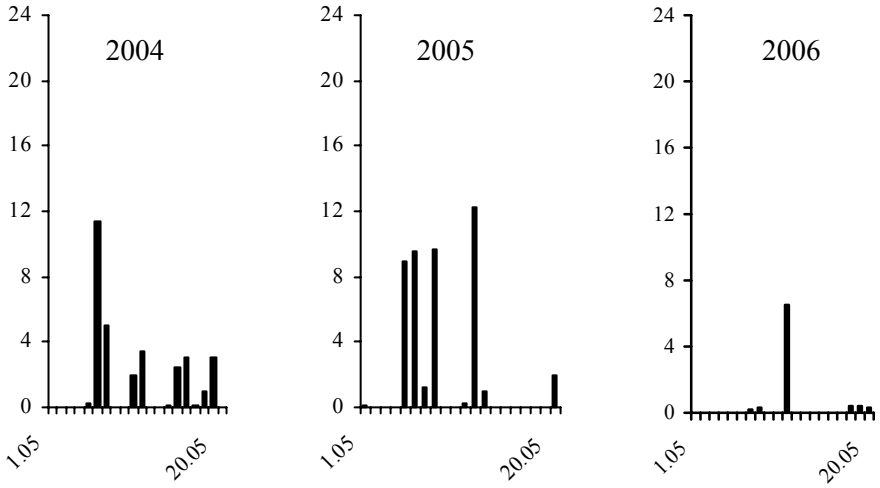
	Quantity of precipitation, mm	Number of days with precipitation	Mean 24-hour air temperature, °C	Relative air humidity, %
'Bigarreau burlat'				
2004	13,3	7	15,6	67
2005	15,4	4	17,1	73
2006	7,6	4	17,3	65
'Stella'				
2004	48,9	7	18,8	82
2005	13,1	4	17,1	74
2006	16,2	6	17,4	62

Table 3.

Fruit cracking in the cherry cultivars 'Bigarreau burlat' and 'Stella' depending on the rootstock

Rootstocks	'Bigarreau burlat'			'Stella'		
	2004	2005	2006	2004	2005	2006
P 1	12,73	1,69	0,53	39,52	3,07	6,06
Gisela 5	10,42	2,06	0,26	45,18	8,62	2,14
Gisela 4	5,19	1,52	0,28	25,10	3,40	2,97
Gisela 12	12,10	1,97	0,49	40,72	6,20	5,20
Gi 497/8	13,27	2,09	0,69	37,62	6,77	5,05
Weiroot 10	8,36	1,76	0,40	33,86	4,20	6,16
Weiroot 13	10,06	1,24	0,59	39,23	5,65	6,50
Weiroot 53	14,90	2,15	0,30	27,04	4,88	6,92
Weiroot 72	7,68	0,88	0,36	36,09	7,10	7,24
Weiroot158	13,56	1,50	0,48	26,78	4,07	6,70
LSD - 5%	4,09	NS	NS	13,20	4,31	3,19

'Bigarreau Burlat'



'Stella'

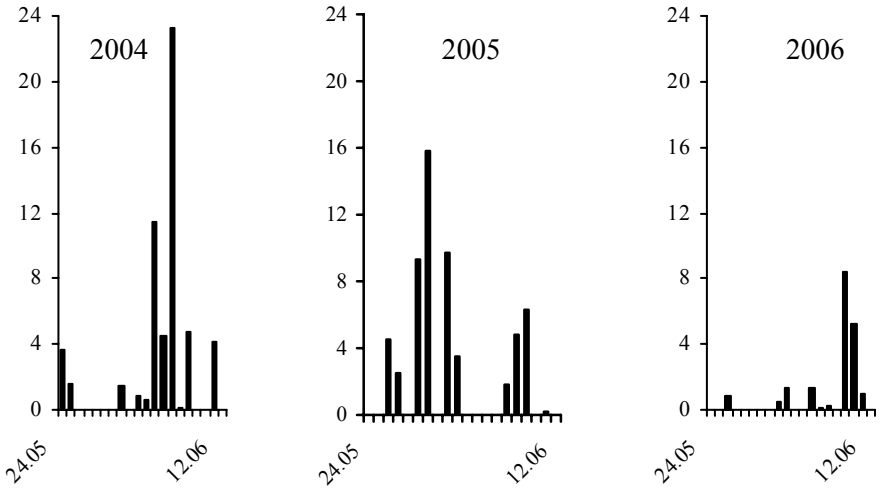


Figure 1. Quantity of precipitation (mm) during the time of the 20-day period before picking of the fruit of two sweet cherry cultivars

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

SELECTION AND EVALUATION OF AUTOHTONOUS POMEGRANATE (*PUNICA GRANATUM* L.) CLONES

Botu I. [1], A. Vicol[2], M. Botu[1], Gh. Achim[1], S. Preda[2], A. Papachatzis[3]

KEY WORDS: pomegranate, Punica granatum, selection

ABSTRACT

Punica granatum or pomegranate is a fruit crop that requires mild climate areas. Scattered shrubs and trees can be found in Romania, mainly in gardens. Most of these plants are grown for ornamental purpose. In the present paper a number of 7 pomegranate clones selected in Vâlcea area are presented. The clones were studied from 2002 from the point of view of their behavior in the growing and fruiting processes. 4 of the clones (VL 5.1.4, VL 4.2.3, VL H.D.1 and VL H.D.2) proved good adaptability to the temperate continental climate that has Mediterranean influences and exhibited superior ornamental potential. These clones are recommended for propagation and culture in the Oltenia gardens and parks. Selection of new genotypes of pomegranate from this region has to be continued.

INTRODUCTION

Punica granatum or pomegranate, known under the names *rodie* or *rodiu* (in România), *rinom* (in Iran), *ruman* (in Arab countries), is a fruit and ornamental small tree or shrub known in Persia from 3000 B.C. (Sonea, 1984).

Pomegranate tree is native from Iran to the Himalayas, in the northern India and has been cultivated since ancient times throughout the Mediterranean region of Asia, Africa and Europe. Later, it was spread to SE Asia, India, Indonesia and tropical Africa. In the 17th Century was introduced to Bermuda and then to Central and South America. In 1769 it was brought to California by the Spanish settlers (Morton, 1987).

In Europe, the northern limit of pomegranate growing is South of Bulgaria, Dalmatian Coast, Po Valley or Padan Plains in Italy and Southern France. As ornamentals, pomegranate shrubs can be grown (with covering during winter) up to Southern Carpathian Mountains in Romania, Croatia, Serbia, FYROM (Former Yugoslav Republic of Macedonia), Albania, Slovenia, etc (Mitchell, 1984).

The evolution and importance of this crop has lead to selection and breeding of a large number of valuable cultivars for quality fruit production. Some of the best known cultivars for fruits are: 'Wonderful', 'Spanish Ruby', 'Sweet Fruited', 'Malisi', 'Poona', 'Granada Agria', 'Kandahari', 'Muscat Red', etc.

[1] Universitatea din Craiova, Facultatea de Horticultură
[2] Staţiunea de Cercetare Dezvoltare pentru Pomicultură (SCDP) Vâlcea
[3] Technological Education Institute (TEI) of Larissas, Greece

Commercial pomegranate orchards are located in Northern Africa, Egypt, Israel, Syria, Lebanon, Turkey, Greece, Cyprus, Italy, France, Spain, Portugal, Iran, Iraq, India, China, Afghanistan, Bangladesh, Myanmar, Vietnam, Thailand, Kazakhstan, Turkmenistan, Tajikistan, Kirgizstan, Armenia, Georgia, U.S.A., Mexico, Argentina and Chile. World production of pomegranate fruits is estimated to be around 1.5 million tons annually. The most important producers are: Iran (600,000 t), India (500,000 t), China (260,000 t), U.S.A. (110,000 t) and Turkey (90,000 t). The largest planted areas are located in Iran (65,000 ha), India (54,750 ha), etc (Holland and Bar-Ya'akov, 2008).

Punica granatum species has important genetic variability (sweet or acid fruits, branches with or without thorns, different shapes and colors of flowers, etc).

Pomegranates are not specific to Romanian climatic conditions because temperatures below -12°C affect them drastically, fruits are ripening only very late in the autumn. Beside this, in the last 15-20 years ornamental pomegranate shrubs spread in the courtyards mainly in Oltenia region (in Vâlcea, Mehedinți, Gorj Counties), where protection during winter is rarely required.

Because pomegranates are used mainly for ornamental purposes in Oltenia in the courtyards and parks this paper has the aim to clarify some aspects regarding selection and culture of some genotypes in the Valcea area and to recommend a more sustained use not only for ornamental scope but also for fruit production.

MATERIALS AND METHODS

The research activity started in 2000 at SCDP Vâlcea. Initially, selections originated from Turkey were investigated, in the end they proved productive but vulnerable to low temperatures during winter. In the second stage, old pomegranate plants from Vâlcea area were selected. Once identified and tagged, selections were clonally propagated through suckers and then planted in the trial. The clones were planted in the trial in 2002 at 4 m by 3 m distances (833 shrubs/ha). Each clone is represented by 4-5 plants trained as trees. Growing and bearing fruits habits were observed and data was collected.

RESULTS AND DISCUSSIONS

Punica granatum shrubs that were used for clonal selection in Vâlcea were old (80-100 years), being in the 3rd or 4th growing generations. 7 clones were selected so far (Table 1). These clones have good adaptability to the specific environmental conditions from North Oltenia where were not affected by winter cold. With the exception of common traits like presence of numerous suckers, opposite leaves which are oblong, glossy and of dark green color, there is a large genetic variability that allows their discrimination. After 6 years of growth, the trees exhibit different vigor (low, medium or high) due to different elements (Table 1).

The Trunk Cross Sectional Area (T.C.S.A.) varies from 7.9 cm^2 (VL H.D.1) to 19.1 cm^2 (VL 4.2.3). Comparatively with control clone (VL 1.1.0) which has a T.C.S.A. of 9.2 cm^2, 4 clones have positive very significant values (VL 4.2.3; VL 5.1.4, VL 2.3.0 and VL H.D.2) and only VL H.D.1 clone has a negative very significant value of T.C.S.A.

The crown diameter and average height of trees have each one very close limit (102-200 cm and 147-195 cm respectively).

The crown volume is very important for pomegranate trees, larger it is more flowers and fruits are produced.

The largest crown volumes were recorded for VL H.D.2 (4.07 m^3) and VL 4.2.3. (2.84 m^3) clones, in the case of the others the differences are not significant. Out of the 7 clones which were studied, 4 do not have thorns on branches (VL 1.1.0; VL 5.1.4; VL 3.2.3. and VL 2.3.0), the rest of 3 clones have thorns.

Flowering period of pomegranate clones varies from 86 to 107 days, that means end of May and beginning of June till first 2 weeks of September. The clones which were studied showed differences of 2 to 10 days between them regarding beginning and end of flowering (Table 2).

The flower load during blooming is very important and specific. Number of flowers on trees varies from 80 (VL3.2.3) to 132.7 flowers in average (VL 5.1.4), each clone having its specificity. Another important trait is the flower structure, 6 clones have double flowers with numerous petals (59-95), and only VL 4.2.3 clone shows simple flowers with 6 petals (Table 3). Petal color is white-yellowish for 4 clones, orange for VL 4.2.3, orange and white for VL H.D.1 and dark red in the case of VL H.D.2. The sepals have same color like the petals for 6 of the clones, the exception being VL H.D.1. Sepal number is 5 for VL1.1.0, the rest of clones having 4 to 9 sepals.

Flowers size is relatively large (3.1 to 4.9 cm in diameter) and flower height oscillates from 3.7 to 4.5 cm, with the exception of VL 4.2.3. (3.1 and 3.8 cm).

The fruits are false berries, globose, large (up to 12 cm in diameter), of various colors and with persistent calyx (Table 4).

Fruit set varies from flower to flower; their formation is gradual, for this reason only 22 to 33% reach maturation. VL H.D.1 and VL H.D.2 did not set any fruits.

The fruit weight is between 165 to 202 g depending on the clone. Fruit color is green- yellowish, slightly red on the sunny side with the exception of VL 4.2.3 which has dark red fruits.

Fruit yield per hectare is relatively low (344-1542 kg/ha), fruits are acid and crack during rainy period at the end of September. The fruit yield is not economically efficient and the fruits have mainly ornamental use.

Out of the clones which were studied VL 5.1.4, VL 4.2.3, VL H.D.2 and VL H.D.1 can be recommended for propagation and growing in Oltenia in parks and gardens. These 4 clones are well adapted to the continental temperate climate from Oltenia which has sub-Mediterranean influences and have superior ornamental characteristics.

The selection and evaluation of *P. granatum* genotypes from the geographical area of Oltenia have to be carried on in the future too.

Table 1

Growth characteristics of *Punica granatum* clones at SCDP Vâlcea (5th-6th leaf)

No.	Clones	Trunk Cross Sectional Area (cm^2)			Crown diameter (cm)	Tree height (cm)	Crown volume (m^3)			Thorn presence	Tree vigor
		T.C.S.A. mean	±	Significance			Quantity	±	Significance		
1	VL 1.1.0 (Control)	9.2	-	-	128	147	1.90	-	-	no	low
2	VL 5.1.4	13.8	4.6	***	131	175	2.32	0.42	-	no	median
3	VL 4.2.3	19.1	9.9	***	176	195	4.74	2,84	***	no	high
4	VL 3.2.3	9.6	0.4	-	124	167	2.01	0.11	-	no	low
5	VL 2.3.0	10.7	1.5	***	126	159	1.98	0.08	-	no	median
6	VL H.D.1	7.9	-1.3	000	102	170	1.38	-0.52	-	no	low
7	VL H.D.2	11.6	2.4	***	200	190	5.97	4.07	***	no	high
	Mean	11.7	-	-	141	172	2.90	-	-	no	-

LSD 5% = 0.61 cm^2 LSD 1% = 0.83 LSD 0.01% = 1.14 LSD 5% = 0.92 m^3 LSD 1% = 1.26 LSD 0.01% = 1.72

Table 2

Timing and flowering capacity of *Punica granatum* clones at SCDP Vâlcea (5th-6th leaf)

No.	Clones	Flowering period (2008-2009)			Flower load on tree		
		Beginning of flowering	End of flowering	No. of days with flowers	25.06-05.07	25.08-05.09	No. flowers / Total no. of days
1	VL 1.1.0 (Control)	25-30.05	01.09-05.09	92-102	102.0	6.2	108.2
2	VL 5.1.4	20.05-25.05	01.09-05.09	97-107	112.2	20.5	132.7
3	VL 4.2.3	24.05-03.06	20.08-31.08	80-92	132.5	1.5	134.0
4	VL 3.2.3	24.05-04.06	27.08-08.09	84-106	72.5	7.3	80.0
5	VL 2.3.0	20.05-06.06	01.09-10.09	87-112	94.6	27.6	122.2
6	VL H.D.1	24.05-10.06	01.09-08.09	82-116	84.6	8.7	93.5
7	VL H.D.2	27.05-11.06	03.09-09.09	82-113	97.6	11.4	109.0
	Mean	-	-	86.0-107.0	99.6	11.8	111.4

Table 3

Flower characteristics of *Punica granatum* clones at SCDP Vâlcea (5^{th}-6^{th} leaf)

No.	Clones	Flower type	Petal color	Average no. of petals per flower	Sepal color	Average no. of sepals per flower	Corolla diameter (cm)	Flower height (cm)
1	VL 1.1.0	double	white-yellowish	95	white-yellowish	5	4,2	3,9
2	VL 5.1.4	double	white-yellowish	75	white-yellowish	4-9	3,8	4,1
3	VL 4.2.3	simple	orange	6	orange	4-9	3,1	3,8
4	VL 3.2.3	double	white-yellowish	71	white-yellowish	4-9	3,5	3,9
5	VL 2.3.0	double	white-yellowish	87	white-yellowish	4-9	3,7	3,7
6	VL H.D.1	double	orange and white	63	orange	4-9	4,2	4,4
7	VL H.D.2	double	dark red	59	light red	4-9	4,9	4,5

Table 4

Yield capacity and fruit characteristics of *Punica granatum* clones at SCDP Vâlcea (5^{th}-6^{th} leaf)

No.	Clones	Fruit yield			Fruit color	Fruit shape	Ratio of ripened fruits at 20.09-30.09 (%)
		No. of fruits /tree	Average fruit weight (g)	Quantity* (kg/ha)			
1	VL 1.1.0 (Control)	2.5	165	344	green-yellowish	globose	22
2	VL 5.1.4	6.3	180	945	green-yellowish	globose	28
3	VL 4.2.3	10.7	173	1542	dark red	globose	33
4	VL 3.2.3	4.0	202	673	green-yellowish	globose	27
5	VL 2.3.0	3.6	191	573	green-yellowish	globose	25
6	VL H.D.1	-	-	-	-	-	-
7	VL H.D.2	-	-	-	-	-	-

*Density = 833 trees/ha

LITERATURE CITED

1. Prodan I., Buia Al. 1958. Flora Mică ilustrată a R.P. România. Edit. Agro-Silvică. Bucureşti
2. Mitchell A. 1984. Le multiguide nature de tous les arbres de nos forets. Bordas, Liege – France.
3. Morton, J. 1987. Pomegranate. P. 352-355. In: Fruits of warm climates. Julia F. Morton, Miami, FL.
4. Sonea V. ş.a. 1984. Mică Enciclopedie de Horticultură. Edit. Ştiinţifică şi Enciclopedică, Bucureşti.
5. Holland D. and Bar-Ya'akov I. 2008. The Pomegranate: New Interest in an Ancient Fruit. *Chronica Horticulturae*, vol. 48, no. 3, I.S.H.S.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

RESEARCHES CONCERNING THE INFLUENCE OF MANUAL THINNING OF PIONEER APPLES IN CONDITIONS OF TIMIŞOARA

Olimpia Iordănescu, Isabela Szonyi (Rechițean), Roxana Micu, Alexandra Becherescu, Anca Drăgunescu[1]

KEY WORDS: *apple, Pioneer, manual thinning, fruits' weight, fruits' production*

Fruit rate-setting of apples is very necessary in those years when there are many mixed buds, in order to obtain an optimum determined production and to avoid the fruit alternation phenomenon. The research done during three years 2006, 2007 and 2008 at Pioneer variety consisted in doing manual thinning of apples after the physiological fall of fruits in June, each year, the variety having a pretty good reaction to thinning, in this way being reduced the alternation phenomenon and obtaining apples, which had a higher weight than those of the witness not thinned in all four thinning variants. Manual thinning had different intensities, the best results being obtained in the variants with 50% and 40% thinned apples. Considering the results obtained for this variety we can say that apple thinning has significant impact upon fruits' qualities and it does not influence too much the obtained apples production.

INTRODUCTION

In order to obtain the optimum determined production of apples and to reduce the alternation phenomenon of apple trees it is recommended to do the fruit thinning process to each tree. Apple thinning can be done by different methods such as: chemical, manual and mechanical thinning. It can also be done in different fruiting phenophases, such as: to mixed buds, to flowers (especially chemical) and to fruits (Drăgănescu E., 1998). Thinning done when fruits are larger only helps them to improve their size, colour and chemical qualities but it does not influence the alternation phenomenon that could appear (Cepoiu N., 1974, 1978). It is recommended to do the manual thinning of apples after the physiological fall in June, when the fruits are small and younger. While doing the manual thinning we eliminate the damaged, injured and attacked fruits, leaving only one healthy apple in the fruit group.

MATERIAL AND METHODS

The research was made during 2006-2008 in the Didactic Fruit Tree Plantation of our University, in the plot cultivated with different apple tree varieties, established in 1997, grafted on M106 and planted at the distance of 4x2 m.

[1] Banat's University of Agricultural Sciences and Veterinary Medicine Timisoara, Faculty of Horticulture and Forestry

The biological material consisted into one apple tree variety: Pioneer, a variety that used to have a very pronounced alternation period and that could be controlled by manual thinning.

The goal of this research was to determine the impact of manual thinning, done in different intensities, upon the apples' qualities and production and also upon the alternation phenomenon.

The experimental variants were:

- V1 – 50% thinned fruits
- V2 – 25% thinned fruits
- V3 – 30% thinned fruits
- V4 – 40% thinned fruits
- V5 – not thinned (witness)

The collected data was statistical calculated and interpreted by using the variance analyse method.

RESULTS AND DISCUSSIONS

In this paper work we will present the results obtained in the period 2006-2008 considering two parameters: apples' average weight (g) and average production (kg/tree).

Table 1

Average number of apples left on the trees

Variety	Variant	Year		
		2006	2007	2008
PIONEER	V_1 –50% thinned	50,00	84,60	90,00
	V_2 –25% thinned	76,00	118,00	123,00
	V_3 –30% thinned	70,00	98,70	105,00
	V_4 –40% thinned	62,50	91,50	96,00
	V_5 – not thinned	86,50	133,7	144,00

As we can see in table 1, Pioneer variety had the lowest average number of apples left on the trees in 2006. The witness variant (V5 – not thinned) had only 86.50 apples because of the alternation phenomenon that was present in that year and in 2007 and 2008 the average number of apples left on the trees increased. We can conclude that by doing the manual thinning the phenomenon of alternation was reduced because in 2008, when it should have happened again, Pioneer variety had a large average number of apples for each variant.

Table 2

Average weight (g) of Pioneer apples in 2006

Variant	Medium value (g)	Relative value (%)	Difference to the witness	Significance
V_1 –50% thinned	141,00	153,03	48,87	XXX
V_2 –25% thinned	110,00	119,39	17,87	XXX
V_3 –30% thinned	124,00	134,58	31,87	XXX
V_4 –40% thinned	132,00	143,27	39,87	XXX
V_5 – not thinned	92,10	100	0	Wt.

DL 5% = 1,33 DL 1% = 1,94 DL 0,1% = 2,92

In 2006, the average weight (g) of apples in 2006 in variant 5 (witness) was of only 92.10 g, while all the thinned variants had higher values. The biggest apples were obtained in the variants where the thinning was more severe V1 (50% thinned apples) and V4 (40% thinned apples), having 141.0 g (V1) and 132.0 g (V4). The other two variants V2 and V3 also had higher values, all of the variants registering very significant positive difference to the witness.

Table 3

Average weight (g) of Pioneer apples in 2007

Variant	Medium value (g)	Relative value (%)	Difference to the witness	Significance
V_1 –50% thinned	135,00	176,65	58,58	XXX
V_2 –25% thinned	108,50	141,76	31,91	XXX
V_3 –30% thinned	119,00	155,71	42,58	XXX
V_4 –40% thinned	128,00	167,49	51,58	XXX
V_5 – not thinned	76,42	100	0	Wt.

DL 5% = 5,67 DL 1% = 8,24 DL 0,1% = 12,37

The average weight of apples in 2007 was smaller than in 2006, the witness variant having 76.42 g average weight. All the thinned variants registered a very significant positive difference to the witness, but the highest of values was obtained in case of variant 1 – 135.0 g and variant 4 – 128.0 g.

Table 4

Average weight (g) of Pioneer apples in 2008

Variant	Medium value (g)	Relative value (%)	Difference to the witness	Significance
V_1 –50% thinned	96,00	154,83	34,00	XXX
V_2 –25% thinned	69,80	112,58	7,80	XXX
V_3 –30% thinned	74,50	119,89	12,33	XXX
V_4 –40% thinned	88,20	142,58	26,40	XXX
V_5 – not thinned	62,00	100	0	Wt.

DL 5% = 2,32 DL 1% = 3,38 DL 0,1% = 5,08

In 2008, the weight of fruits was smaller than all the other years for every variant and this might be explained by the high number of fruits that couldn't develop properly. The control variant had an average weight of apples of only 62.0 g, while variants 1 and 4 had only 96.0 g respectively 88.2 g. close to the value of the witness was the average weight of apples in variant 2 – 69.8 g, where the thinning was of 25%. However, all the thinned variants had a very significant positive difference to the witness.

Table 5

Average production (kg/tree) of Pioneer apples in 2006

Variant	Medium value (g)	Relative value (%)	Difference to the witness	Significance
V_1 –50% thinned	7,05	88,56	- 0,91	-
V_2 –25% thinned	8,36	105,02	0,40	-
V_3 –30% thinned	8,68	109,04	0,72	-
V_4 –40% thinned	8,25	103,64	0,29	-
V_5 – not thinned	7,96	100	0	Wt.

DL 5% = 3,52 DL 1% = 3,13 DL 0,1% = 7,79

Considering the average production, in 2006 none of the thinned variants registered a difference to the witness, the values being very similar. The lowest average production was obtained in variant 1, where the thinning was of 50%, having a value under the witness of 7.05 kg/tree. The other three thinned variants had a higher production than the witness of over 8.0 kg/tree, pointing out variant 3 (30% thinned apples), which had 8.68 kg/tree average production. The low productions can be explained by the small number of fruits that the variety had in 2006.

Table 6

Average production (kg/tree) of Pioneer apples in 2007

Variant	Medium value (g)	Relative value (%)	Difference to the witness	Significance
V_1 –50% thinned	11,42	111,85	1,21	-
V_2 –25% thinned	12,80	125,36	2,59	X
V_3 –30% thinned	11,74	114,98	1,53	-
V_4 –40% thinned	11,71	114,72	1,50	-
V_5 – not thinned	10,21	100	0	Wt.

DL 5% = 2.07 DL 1% = 3.01 DL 0,1% = 4.52

In 2007, the average production was higher, the witness variant having 10.21 kg/tree and all the other variants had higher values than it. The only variant that had significant positive difference to the witness was V2 (25% thinned apples) with the average production of 12.8 kg/tree. Close values had variants 3 and 4 of 11,74 kg/tree and 11,71 kg/tree average production.

Table 7

Average production (kg/tree) of Pioneer apples in 2008

Variant	Medium value (g)	Relative value (%)	Difference to the witness	Significance
V_1 –50% thinned	8,64	96,86	- 0,28	-
V_2 –25% thinned	8,58	96,18	- 0,34	-
V_3 –30% thinned	7,82	87,66	- 1,10	-
V_4 –40% thinned	8,46	94,84	- 0,46	-
V_5 – not thinned	8,92	100	0	Wt.

DL 5% = 3.09 DL 1% = 4.50 DL 0,1% = 6.76

The average production obtained in 2008 was lower than in 2007, but higher than in 2006. The values were lower because of the small weight of the fruits obtained in that year. The highest average production was obtained in the control variant (not thinned) of 8.92 kg/tree, while the lowest production was obtained in variant 3 (30% thinned apples) of 7.82 kg/tree. None of the thinned variants registered any difference to the witness.

CONCLUSIONS

Manual thinning of fruits had a good impact upon fruits' weight, but not on the production because even if they had higher weights there were left fewer apples on the trees, than in the witness variant not thinned.

In 2007 there were obtained the highest productions per tree, because of the high mixed buds differentiation degree.

We can conclude that the best productions were obtained in the variants where thinning was not that severe (V2 – 25% thinned apples; V3 – 30% thinned apples) or not thinned at all (witness V5 – not thinned).

BIBLIOGRAPHY

1. Baciu A., General Fruit Tree Culture, Universitaria PH, Craiova, 2005
2. Cepoiu N., Determining some Optimum Biological Index for Fruit Rate-Setting of Apple Tree, PhD Thesis, I.A.N.B., Bucharest, 1974
3. Cepoiu N., Modifying the Productive Potential of Some Apple Tree Varieties by Fruit Rate-Setting, Scientifical Works, I.A.N.B., Bucharest, 1978
4. Drăgănescu E., Fruit Tree Culture, Mirton PH, Timişoara, 1998
5. Iordănescu Olimpia, Fruit Tree Culture, Eurobit PH, Timişoara, 2008

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

'ROVERD' – PERSPECTIVE ORNAMENTAL HAZELNUT ELITE

Vicol A.[1], I. Botu[2], M. Botu[2]

KEY WORDS: hazelnut, ornamental, selection

ABSTRACT

During the 1988-2008 period at SCDP Vâlcea was selected and evaluated, a hazelnut elite named 'Roverd'. It was obtained by crossing and has the opportunity to be used as ornamental plant. The tree has a pleasant appearance which is caused by the red-purple leaves which keep their color until early summer, later, the leaves turn green. Over this background overlaps the intense red color of the involucre and the fruits which persists until fruit maturation. 'Roverd' cultivar can complete the aesthetics effect of parks and gardens.

INTRODUCTION

Hazelnut cultivars are grown especially for their food and economic value. Along with known varieties and cultivars of very different decorative appearance such as *Corylus maxima* var. *purpurea*, *Corylus avellana* var. *contorta*, *Corylus avellana* var. *pendula*, *Corylus avellana* var. *aurea*, *Corylus avellana* 'Red Lambert', *Corylus avellana* 'Red Dragon', etc. The cultivar 'Red Lambert', which has red-leaf till July and red-purple involucre, can be seen in many private gardens from Romania. Worldwide, there is a tendency to enrich the range of ornamental hazelnut varieties with various characteristics (different color of leaves and involucre, contorted branches, weeping habit, etc.). SCDP Vâlcea has developed a comprehensive breeding program from 1980 till now in order to obtain cultivars for fresh market and for industry or processing. Along with the main objectives different crosses produced hybrids with decorative traits and accordingly a selection for ornamental interest has been carried out.

MATERIALS AND METHODS

The biological material was obtained during 1988-2000 period, as result of hybrid crossing. Out of 'Red Lambert' x 'Daviana' cross a number of different hybrids resulted from which 'Roverd' (HR2P1) was selected in 1993.

The elite was clonally multiplied and planted into a trial in order to be further evaluated and characterized. The elite was planted into the trial at 5 m by 3 m distances and trained as trees (with single trunk). The evaluation into the trial was done from 2000 to 2009.

[1] Stațiunea de Cercetare Dezvoltare pentru Pomicultură (SCDP) Vâlcea
[2] Universitatea din Craiova, Facultatea de Horticultură

RESULTS AND DISCUSSIONS

Description of 'Roverd' elite:

The trees have medium to large vigor. After 16 years of growth, the trunk cross sectional area (TCSA) is 115 cm^2 and the habit is semi-spread. Crown diameter reached 3.65 m; the height was 4.6 m in average and the crown volume of 47.8 m^3. A few suckers with red leaves occurred by late summer, after that, the suckers' leaves turned green. The bud break occurs at the end of March. Leaves are red - purple until late May to early June, when they begin to turn slowly to green color. On the top of the shoots the leaves show more intense color than in rest. The process of leaves discoloration start with the leaves from the base of tree and from the middle of the edges of tree crown (Table 1 and Fig. 1 to 4). The catkins are long and of dark brown – reddish color. The catkins pollen shedding occurs at the end of February and female flowers bloom mid February (protogynous dichogamy). The fruits are brown and small (the size index is 14.8 mm and fruit weight is 1.4 g), of short sub cylindrical shape and having an index of roundness of 0.78. The kernel weights 0.8 g and the kernel ratio scores 57.1% (very high efficiency). The fruits are grouped in clusters (2-4) and the involucres are slightly longer than the nuts, with strong indentation and red-intense color until fruit ripening when turn to greenish-brown color. Since fruit clusters have intense colored involucres, they create an impressive ornamental effect due to the leaves color that turned to green.

The fruit ripening begins at the end of August. The fruits are clasping inside the involucre and because of this they do not fall easily on the ground. The fruit yields varied between 1.4 to 2.5 kg/tree and kept constant from one year to another.

Susceptibility to pests and diseases:

The 'Roverd' elite was not affected by bacterial blight (*Xanthomonas arboricola pv. corylina*) and gray mold (*Botrytis cinerea*). Fruits are rarely attacked by nut weevil (*Balaninus nucum*).

CONCLUSIONS

- The 'Roverd' (HR2P1) hazelnut elite has ornamental characteristics which recommend it for growing in family gardens and parks.
- The decorative effect of 'Roverd' is pleasant and visible from distance.
- The 'Roverd' hazelnut elite (syn. HR2P1) will be submitted for including into the Official Cultivar List in 2009.

LITERATURE CITED

1. Botu I., 1987. *Cultura intensiva a alunului.* Redacția de propaganda tehnică agricolă. Bucureşti.
2. Cociu V., Botu I., Botu M., Preda S., Achim G., Iancu M., 2007. *Nucul, alunul, castanul şi alte nucifere.* Ed. Conphys, Rm. Valcea, ISBN: 978-973-750-094-6.
3. Germain E., Sarraquigne J. P., 2000. *Le noisetier.* Editions CTIFL, Paris, France. ISBN 2-87911-159-5
4. Mehlenbacher S.A. 1991: *Hazelnuts*. In: Genetic resources in temperate fruit and nut crops, ed. J.N.Moore and J.R.Ballington. *Acta Horticulturae* no. 290.
5. Thompson M. M., 1979. *Filbert breeding -1979 update.* Proc. Nut Growers Soc. Oreg. and Wash. D.C., no. 64

Table 1

Characteristics of 'Roverd' hazelnut elite

No.	Specification	Evaluation of characteristics
1	Tree vigor	Medium - high
2	T.C.S.A. (cm^2)	115
3	Crown diameter (m)	3.65
4	Tree height (m)	4.60
5	Crown volume (m^3)	47.8
6	Tree growth habit	Semi-spread
7	Suckering (no.)	3-7
8	Tree trunk height (m)	Single trunk of 0,35 m height
9	Suckers color	Red in spring , then turn to green at the end of summer
10	Leaves color	Red in spring , then turn to green at the end of summer
11	Involucre	Longer then the nut, with indentation
12	Involucre color	Dark red, later it becomes brown-greenish
13	Cluster	2-4 fruits
14	Nut size index (mm)	14.8
15	Nut weight (g)	1.4
16	Nut shape	Short sub-cylindrical; Index of roundness = 0.78
17	Kernel size index (mm)	11.5
18	Kernel weight (g)	0.8
19	Kernel ratio (%)	57.1
20	Flowering time	Protogynous – female flowers bloom mid February and catkins shed pollen at the end of February
21	Fruit ripening period	End of August

Fig. 1 'Roverd' hazelnut tree in June

Fig. 2 'Roverd' hazelnut tree in July

Fig. 3. 'Roverd' hazelnut involucre

Fig. 4. Detail of 'Roverd' hazelnut nuts and involucre

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

IN VITRO REGENERATION CAPACITY OF APRICOT VARIETIES

Călinescu Mirela[1], Sina Cosmulescu[2], Plopa Catița[1]

KEY WORDS: regeneration, in vitro, culture media

REZUMAT

This paper reports in vitro regeneraton of some prunus armeniaca cultivars: 'Dacia', 'Harcot', 'Viorica', 'Carmela', 'Favorit', 'Rareş', 'Mamaia', 'Comandor', 'Olimp', 'Sulina', 'Litoral', 'CR 2/63', 'NJA19', 'Excelsio'r.

Explant material was axillary buds from one year old branches collected from mature plants in the field in February. Fourth basal media were compared: MS (Murashige and Skoog, 1962, LF (Lee Fossard), 1972, QL (Quoirin and Lepoivre, 1977) and Woody Plant Medium (1981) containing GA_3 (0.1g l^{-1}) IBA (0.01g l^{-1}) during initiation The best result regarding in vitro regeneration was recorded for 'Sulina', 'Carmela', 'NJA 19', 'Favorit' and 'Mamaia' cultivars (more 50 %) and for explant with size 0,3-0,5 mm.

INTRODUCTION

Prunus armeniaca L. is a species very appreciated for its fruits.

In vitro culture advantages represented one important reason to test some cultivars for propagation through this method. But, *"in vitro"* morphogenesis requires the inducing of some autoregulated phenomena that are autonomous and depend on new heterotrophic conditions that were created. In conformity with literature (Boxus and Druart, 1989) the explant has minim (limit) size for cells to manifest totipotentiality under *"in vitro*" conditions.

Other factor for *"in vitro"* culture success is represented by media compounds. This is typical for every species or cultivars, the requests are different even depending on the explants used (Isac, 1983). Together with basic culture media, the current methods used in *"in vitro"* culture, in order to induct and sustain of organogenesis, have as practical and theoretical base the hormonal balance concept. Dilley (1969) showed that the influence of hormones was manifested as their single action and through the change of ratio between stimulator hormones and inhibitor hormones.

Starting from this aspect, this work has had in view to determine some solutions for efficacious *"in vitro"* culture for some *Prunus armeniaca* cultivars through optimization of the parameters depending on the differentiation phase.

[1] Research Institute for Fruit Growing, Mărăcineni
[2] Craiova University

MATERIAL AND METHOD

Biological material: The biological material used to establish *„in vitro"* cultures was represented by meristems from axillary buds prelevated from one year old branches, from 9 apricot cultivars and elites: 'Dacia', 'Harcot', 'Viorica', 'Carmela', 'Favorit', 'Rareş', 'Mamaia', 'Comandor', 'Olimp', 'Sulina', 'Litoral', 'CR 2/63', 'NJA19', and 'Excelsior'.

The meristems used inoculation had three dimensions: 0,1 mm (meristematic domes), 0,1 – 0,3 mm (1 - 2 leaf primordia), 0,3 - ,05 mm (3 - 6 ; leaf primordia). The inoculations were effected in glass vials, under a sterile laminar air flux, 10 explants per variant.

Disinfection: The biological material disinfection consisted in its washing with: water + liquid detergent Tween 80 - 5 min; immersion in 96^0 alcohol - 15 min and immersion in sodium hypochlorite 10 min; rinses with sterile distillated water 3 x 10 min.

Growing media: used to initiate the culture were: Murashige&Skoog, (1962) Lepoivre, (1977**),** Fossard (1977) and Woody Plant Medium (1981), supplemented with: IBA = 0,1 ml / L, GA_3 = 1 ml / L and Na Fe EDTA (3,2 ml/L).

As source of organic carbon was used the sucrose 40 g /l and the agar 10 g/l as gelifiant agent.

The inoculations were effected in glass vials, under a sterile laminar air flux.

The growing conditions consisted in providing 22 - 23^0 C temperature, 16 hours photoperiod (light intensity of 2.000 - 2.500 lux) and 8 hours darkness.

The conditions provided to the cultures were 22 - 24^0 C temperature 16 hours photoperiod and 8 hours darkness.

RESULTS

Considering as main factor the growing media type, it was observed that growing media both by composition (macro- and microelements) and their hormonal balance responded in a different manner to the apricot needs in differentiation phase.

Because on Woody Plant Medium no satisfactory results were obtained, we renounced to this media use, and for the statistic interpretation the observation and records of the experiment data were carried out only on three variants:

V1 = Murashige&Skoog + IBA = 0,1 ml / L, GA_3 = 1 ml / L and Na Fe EDTA (3,2 ml/L).

V 2 = Lepoivre + IBA = 0,1 ml / L, GA_3 = 1 ml / L and Na Fe EDTA (3,2 ml/L).

V3 = Fossard + IBA = 0,1 ml / L, GA_3 = 1 ml / L and Na Fe EDTA (3,2 ml/L).

The data presented in the figure 1 shows that the studied cultivars and elites had an different response to the growing media composition, without relevant differences.

The greatest difference was noticed in the case of 'Harcot' cultivar grown on Lepoivre media had 60% differentiated explants, but on Lee-Fossard media had only 30%.

Over 50 % regeneration was achieved with the cultivars 'Sulina' in average with 54,4 %, 'Carmela' (52, 2 %), 'NJA 19' (51,1 %), 'Favorit' and 'Mamaia' 50,0% each of them.

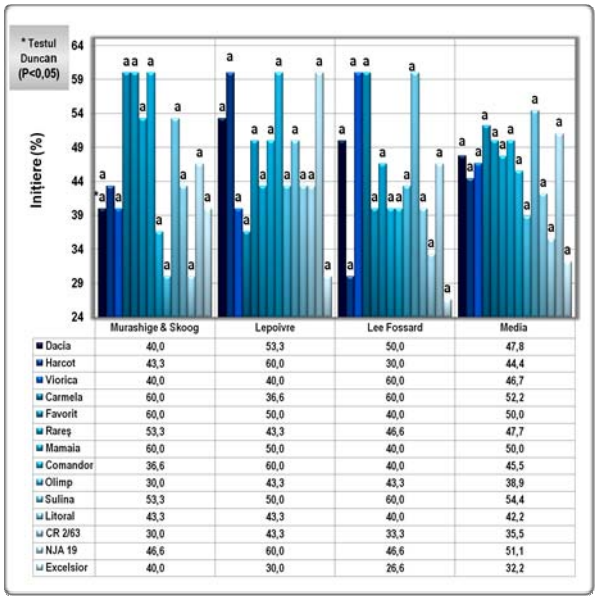
Average values of differentiated explants were obtained with the cultivars 'Dacia' (47,8 %), 'Rareş' (47,7 %), 'Viorica' (46,7 %), 'Comandor' (45,5 %), 'Harcot' (44,4 %) and 'Litoral' (42,2 %).

Regeneration capacity under 40% had the cultivars 'Olimp' (38,9 %), 'CR2/63' (35,5 %) and 'Excelsior' (32,2 %).

Other aspect studied was the regeneration power according with used explants types.

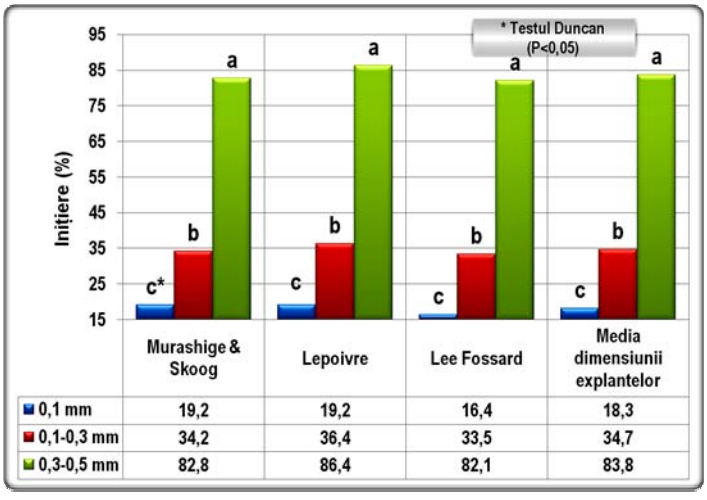
The results obtained on the three growing media, reveal the fact that the explants with the dimensions between 0,3-0,5 mm, after five weeks of cultivation, reached 83,8 % of the explants started.

The second category of explants, the ones measuring between 0,1 and 0,3 mm did not provided an satisfactory number of differentiated explants, no more than 34,7%.



	Murashige & Skoog	Lepoivre	Lee Fossard	Media
Dacia	40,0	53,3	50,0	47,8
Harcot	43,3	60,0	30,0	44,4
Viorica	40,0	40,0	60,0	46,7
Carmela	60,0	36,6	60,0	52,2
Favorit	60,0	50,0	40,0	50,0
Rareș	53,3	43,3	46,6	47,7
Mamaia	60,0	50,0	40,0	50,0
Comandor	36,6	60,0	40,0	45,5
Olimp	30,0	43,3	43,3	38,9
Sulina	53,3	50,0	60,0	54,4
Litoral	43,3	43,3	40,0	42,2
CR 2/63	30,0	43,3	33,3	35,5
NJA 19	46,6	60,0	46,6	51,1
Excelsior	40,0	30,0	26,6	32,2

Figure 1. Variation of the grown explants number (%) as relation between cultivar and different growing media



	Murashige & Skoog	Lepoivre	Lee Fossard	Media dimensiunii explantelor
0,1 mm	19,2	19,2	16,4	18,3
0,1-0,3 mm	34,2	36,4	33,5	34,7
0,3-0,5 mm	82,8	86,4	82,1	83,8

Figure 2 Variation of the grown explants number (%) according with different explants dimensions.

The smallest regeneration capacity occurred in the case of the explants with the dimensions at about 0,1 mm, in this case the average of the differentiated being only 18,3%.

No significant differences were noticed as regard the relation explant-growing media, were regardless the media type the values are very closed, 16,4% regenerated explants (Lee- Fossard) and 19,2 % (Murashige&Skoog and Lepoivre) at explants dimensions of 0,1mm; 33,5% differentiated explants (Lee-Fossard) and 36,4 % (Lepoivre) in the case of the explants with dimensions between 0,1and 0,3 mm.

The explants with the larger dimensions regenerated in rates between 82,1% (Lee-Fossard) and 86,4 % (Lepoivre).

CONCLUSIONS

1. The studied cultivars belonging to *Prunus armeniaca* species had no regeneration capacity on WMP growing media.

2. The Murashige&Skoog, Lepoivre and Lee-Fossard growing media registered not important differences as regard the regeneration capacity on the majority of cultivars.

4. The explants represented by meristematic domes together with 3 - 6 foliar primordia (0,3 – 0,5 mm) have superior regeneration capacity and evolution comparative with the ones represented by meristematic domes and 1-2 foliar primordial (0,1-0,3 mm), under the condition provided in the presented experiment.

REFERENCES

1. BOXUS PH., DRUART PH., - 1989 - The production of fruit and vegetable plant by *in vitro* culture. Actual possibilities and perspectives. 49 annèe – n 396 – 4 – trimestre.
2. DILLEY D.R. - 1969 - Hormonal control of fruit plant. Hort Sci: 4,11.
3. ISAC MARIA - 1983 - Comportarea unor soiuri de prun în procesul de microînmulțire. Lucrările celui de al II-lea Simpozion Național de culturi de țesuturi vegetale *„ in vitro*” , vol. II.
4. LINSMAIER, E.M., SKOOG, F. -1965- Organic growth factor requirements of tabacco tissue culture. Physiol Plant 18: 100 - 127.
5. MURASHIGE T., SKOOG F., -1962- A revised for rapid growth and bioassay with tabacco tissue cultures, Physiol Plant., 15: 473 - 497.
6. QUOIRIN M., LEPOIVRE P., -1977- Improved media for *in vitro* culture of *Prunus s*p. Acta Horticulturae 78: 437 – 442.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

THE INFLUENCE OF TECHNOLOGICAL FACTORS ON THE PEACH PHYSIOLOGY CULTIVATED ON SANDY SOILS

Anica Durau, Marieta Ploae[1]

KEY WORDS. Water, perspiration, the photosynthesis.

SUMMARY

The physiological process were influentate so the climatic factors from the period of how much vegetation the si of the factors agrotechnics apply. The watery amount in were contained between 70. 99 Off plantar of 2 m and 75, 29 off plantar of 3 m. The perspiration presented a variation a diurnal with maxims înregistrate at noon having the values contained between 12, 9g 10 g s. u.

In the month the maul off plantar of 3 m, and 17, 3g 10g s. P. In the month the all July off plantar of 3 m. Registered the erect values off plantar of 3m these be contained between 45, 0 -45, 9 mg su dm2 8h in the month the maul, between 49, 0-50, 2 mg su dm2 8 h a month a June, and 53, 0 mg su dm2 8 h in the month the July.

INTRODUCTION

In the zone of sabulous soils, through the researches efectuate urmarit the of a influences technological factors about the physiological process of the in the time of the period of vegetation to peach tree. The researches emphasized the great adaptability and the capacity of production of the species of an peach(Cociu V. 1990,1993 Antonia Ivascu 1993.2002. The species the peach tree turn to good account else efficient conditiile of the zone if entered the in the culture proof kinds the drought and with potential erect fotosintetic(Popescu M, 1982.) Aside from the conditions of average an important role in of the metabolism of fructiferous trees have it: The cultivated kind, the distances of plantar, the doses of fertilization and the forms of crown. Choosing new tolerant kinds to drought with strong coronament light is can enlarged the efficaciousness fotosintetic and default the quality of the fruits. Big the distances of plantar is maintained a favorable microclimates development of physiological process(perspiration, photosynthesis), due to supply with water of what trees explores the surfaces the big off-road maul through the radicular system. The distances among trees assures and a good illuminance of the crown and an what airing vehiculează the evaporation of the water through perspiration.

MATERIAL AND METHOD

The researches they accomplished to CCDCPN in a Dabuleni the orchard of peach tree with the kind Redhaven in experience he studied 3 forms of the crown on 3 distant of plant the trees on rind as follows.

[1] CCDCPN DABULENI

-4/ 2m- Vertical cordon, spindl-, bush, palmeta libera

-4/2, 5 m. Vertical cordon, spindle-bush, palmeta libera

-4/3 m- vertical cordon, spindle-bush, palmeta libera.

In the period of vegetation harvest proofs of leafs and they accomplished urmatoarele determinations.

The watery amount in leafs.

the amount of substance dried through drying to etuvala 105, c.

Concentratia the cellular juice foliar.

The intensity perspiration the balance torsional.

The intensity Of the photosynthesis Of the rondes Sachs

REZULTS

In the period of the years 2002-2004 prezented variation the diurnal and sezoniera of a physiological process to the kind of peach tree cultivated Redhaven on the sabulous soils(table 1). The watery amount in leafs(were) accessible to the distances of plantar and of the phases of vegetation ale the trees. In the month the maul the values were contained between 70, 99 off 2, 5 m and of 75, 29 off 3.

The amount of oscillated. Between 24, 9 and 29, 1. Concentrație the cellular juice registered the values contained between 9, 8 and 11, 5. At arms length reduced of 2 m, the values am else big because the density of the trees influences the watery what amount arrives at the level foliar and the osmotic forces breed to cellular level, oprindu miss inefficient ale of the water through perspiration.

In the month the June the watery slenderized all the variants be modificata of the accentuation of air drought of pedological si. The values were contained between 70, 1(2 m) and 72, 9 g 100 (3 m). Cantitatea of oscillated. Between 27, 1-29, 9 g 100 g s. P.. Concentration the cellular juice registered the values contained between 11, 2-12, 3. breed concentration of the juice foliar is considered a reaction of acclimation drought of fructiferous trees..

In the month the July the watery amount in oscillated between 69, 0-71, 3, and s. Between 28, 7-31. this is the phase of accumulations maxims to level foliar and the transport asimilatelor is in progress to the level of the fruits. The intensity of the perspiration foliare(the table 2) to were stricken so the climatic specific factors fiecarei phases of how much vegetation and of the factors agrotechnics(fertilization, irrigation.)

In all the phases he registered a variation a diurnal with big values to noon(the hour 12), contained between 9-12, 9 g 10 g. S p. In the month the maul, between 10, 7-15, 2 g 10 g s. P. In the month the June and between 10, 3-17, 3 g 10 g. S. P. In the month the July. Of reflection that the erect values are maintained and to the hour 16 be contained between 9, 9-13, 3 g 10. G 10 g s. P.

In the month the July. On sands by reason of lift of the temperature of the air to 35-38Oc (iulie_and diminish the humidity relateing to 30 is intensified the loss of the water of the deal of the evaporation. Off 3 m the intensity of the perspiration is elder what proves that the trees are better supply with water exploring an off-road elder surface the table2. The intensity of the photosynthesis to peach tree(the table 3) is easy accessible to the distances of plantar and of the phases of vegetation.

Off 2 m in the month the maul the values were contained between 30, 6-33, 8 mg dm2 8h, in the month the June between 39, 6-40, 5 mg s dm2 8h and in the month the July between 45, 0-45, 6 mg s. Dm2 8h.

Of reflection to the growth of the distance to 3 bred and the intensity of the photosynthesis registering the values between 45, 0-45, 9 mg s. Dm2 8h. In the month the

maul, between 49, 0-50, 2 mg s. Dm2 8h in the month the June and values of 53, 0-54, 0 mg s. Dm2 8h in the month the July. Fazial the intensity bred from the phase of intense growth of the fruits toward the phase of these. In the phase of asimilatele in chief glucidele deposited to the level of the fruits. The fructiferous trees had natural production and the main consumers have big the efficaciousness phptosyntetic.

CONCLUSIONS

The climatic factors from the zone of sabulous soils influences the speed and the rhythm of development of the physiological process to the cultivated peach tree on the sabulous soils. Aside from the conditions of average an important role in of the metabolism of fructiferous trees have it: The cultivated kind, the distances of plantar, the doses of fertilization and the forms of crown.

On sands by reason of lift of the temperature of the air to 35-38Oc (iulie-and diminish the humidity relateing to 30, is intensified the loss of the water of the deal of the evaporation.

BIBLIOGRAPHY

1. Antonia Ivascu. We orientations in the culture of the peach tree in România. The review Horticultura. 1993.
2. Antonia Ivascu. To rediscover the peach tree. The publishing house UNIVERSITAS COMPANY_ BUCURESTI. 2002
3. Cociu V. New kinds the factors of progress in the fruit growing. The publishing house Ceres. 1990.
4. Cociu V. The culture of the peach tree of the in of the house-keeping. The publishing house Ceres. 1993.
5. Popescu M and colab. The fruit growing generala and speciala. The publishing house didactica and pedagogica, Bucuresti. 1982.

Table 1

The of variation physiological indexes to the kind of peach tree Redhaven 2004

The distance of plantar the form of crown		Lunile								
		Else			Iunie			Iulie		
		Water%	s.u%	c.s.v%	Watter%	s.u%	c.s.v%	Water%	s.u%	c.s.v%
2m	Vertical cordonl	71,3	28,7	11,2	70,1	29,9	12,1	69,0	31,0	14,0
	Spindle-bush	71,2	28,8	11,4	70,3	29,7	12,3	69,3	30,7	14,1
	palmeta aplatizata	70,9	29,1	11,5	70,4	29,6	12,0	69,4	30,6	14,3
2,5m	Vertical cordon	74,0	26,0	10,4	71,0	29,0	11,9	70,1	29,9	13,9
	Spindle - bush	74,5	25,5	10,9	71,4	28,6	12,0	70,6	29,4	13,8
	Palmeta aplatizata	74,6	25,4	11,0	71,6	28,4	12,1	70,8	29,2	13,6
3m	Vertical cordon	75,0	25,0	10,1	72,o	28,0	11,2	71,0	29,0	13,0
	Spindle-bush	75,2	24,8	9,8	72,5	27,5	11,3	70,9	29,1	13,2
	Palmeta aplatizata	75,1	24,9	10,2	72,9	27,1	11,5	71,3	28,7	13,4

Table 2

The perspiration of the leafs to the kind of peach tree Redhaven

The distance of plantar the form of crown		*Lunile*								
		Else			*Iunie*			*Iulie*		
		Hour 8^{oo}	*Hour 12^{oo}*	*Hour 16^{oo}*	*Hour 8^{oo}*	*Hour 12^{oo}*	*Hour 16^{oo}*	*Hour 8^{oo}*	*Hour 12^{oo}*	*Hour 16^{oo}*
2m	Vertical cordon	2,1	9,0	6,7	3,2	10,7	9,3	3,9	10,6	9,0
	Spindle-bush	2,7	9,8	6,9	3,6	13,6	10,1	4,0	16,4	10,7
	palmeta aplatizata	3,0	10,1	7,0	4,0	13,9	10,7	4,7	16,3	10,9
2,5m	Vertical cordon	2,,9	10,0	8,1	4,7	14,0	9,8	4,9	16,5	11,0
	Spindle bush	3,0	11.2	7,9	4,9	14,2	10,4	5,0	16,9	12,3
	palmeta aplatizata	3,4	11,4	8,4	5,0	14,4	10,9	5,7	17,0	12,5
3m	Vertical cordon	3,0	12,0	8,9	5,4	14,9	11,0	5,9	17,1	12,9
	Spindle bush	3,2	12.7	8,7	5,1	15,0	11,2	5,9	17,3	13,0
	palmeta aplatizata	4,0	12,9	8,6	5,3	15,2	11,4	5,8	17,0	13.2

Table 3

The variation of the photosynthesis to the kind of peach tree Redhaven depending on the distance of plantar and form of crown(mg.Su.Dm2 8 a hours) - 2004-

The distance of plantar the form of crown.		Lunile			Production of fruits(t/tchick)
		Else	Iunie	Iulie	
2m	Vertical cordon	30,6	39,6	45,0	15,9
	Spindle-bush		40,0	45,2	13,7
	palmeta aplatizata	33,8	40,5	45,6	12,3
2,5m	Vertical cordon	40,9	45,0	47,5	10,3
	Spindle bush	41,0	45,7	48,0	9,0
	palmeta aplatizata	41,6	45,8	48,3	8,0
3m	Vertical cordon	45,0	49,0	53,4	7,9
	Spindle -bush	45,7	50,1	53,9	5,3
	palmeta aplatizata	45,9	50,2	54,0	4,5

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

FINAL RESEARCHES REGARDING THE COLLECTING AND USE OF GERMOPLASM FROM WALNUT TREES

Stăncioiu Eliane Teodora, Godeanu Ioan[1]

KEY WORDS: Juglans regia, nut tree, germoplasma, grafting

ABSTRACT

In Romania, due to the poor variety of the rootstock, the walnut tree is grafted by mixing different Junglas regia L. saplings. In the County of Gorj, 19 selections corresponding to the mains characteristics of the rootstock have been determinate. On these selections, various studies determinating their biological nature have been done; fruits have been gathered and used for the experimental reproductions in the sapling nursery.

According to the selection criteria, every year, on each biotype, the springing percentage have been counted, together with the medium diameter by package, the medium height, the percentage of STAS saplings obtained, and of thriving in the grafting process using the Jupîneşti type. The results of this analyse done in the sapling nursery have reached to the conclusion that the selection SL-10-TJ has obtained the highest springing percentage (86%).

INTRODUCTION

Although the research regarding the collecting and use of germoplasma from walnut tree is rather recent and continuously developing, no country has managed so far to define the most favorable methods for the developing of the nut tree and of its rootstock.

The multiplication of the nut tree has raised a series of technical and economic problems which have led until now to obtaining insufficient quantities of qualitative seeding material [4].

In our country, although the mother plants are confirmed as *Tîrgu Jiu 1, Secular* and *Portval,* because of lack of seed tree materials, at present, most of the varieties are being grafted on saplings proceeded from a mixture of genotypes belonging to the species of *Juglans regia L.*

MATERIALS AND METHODS

Research was carried out during the period 2003-2007 under the pedoclimatic conditions of the subcarpatian area of Oltenia, in the nearby of Targu Jiu, and the material used in the selection papers was proceeded from both the spontaneous and cultivated flora.

The selection phases hint to identify the initial material both the individual and mass selection as well as the study on saplings and mother trees schools.

[1] UNIVERSITY OF CRAIOVA, THE HORTICULTURE FACULTY

Using the individual selection on the existing biotypes in the County of Gorj, 19 biotypes, (*Juglans regia L.)* with adequate features have been chosen to be studied. The biotypes have been codified under the short name the SL (the selection), followed by a number of order and the street short name or the location where they have been identified, ex: SL-1-PT (Petreşti), SL-3-TJ (Tîrgu-Jiu).

Beside the research on the phonological, biological and agro - productive features, the selection have been studied also for its "behaviour" in the fields of formation of the sapling nursery.

The sapling nursery was set in autumn with 100 pieces of nut seeds for each selection at a 90 cm distance between each row and 10-12 cm between each nut tree, placed in rather deep ditches, in the fruit-growing research station in Rîmnicu -Vîlcea.

The *Jupîneşti* sort was used as biological material. Before beginning the proper grafting, the healthy, well developed mother plants between 1 and 2 years old, with an unharmed radicular system and a thickness at the grafting point of 8-20 mm, have been exposed to a process of performing for 10-15 days [1, 6].

At the same time, the grafting cuttings – one year old, healthy, of 50-80 cm length branches, with short (5-6 cm) internodes, round as section and with reduced marrow, underwent the same process of preforcing for only 3-4 days.

The preforcing was performed in a room covered with sawdust, at a temperature of 26-28 °C, with a relative moisture content of the air of 80-90% and aimed at reactivating the linking tissues.

The grafted material was bedded in boxes filled with sawdust and it was mantained at a temeprature of 26-28°C for 10-15 days until the grafting point transformed into a callus.

The stimulation of the callus-development was done by means of heat – only at the grafting point : hot callusing- due to a special instalation.

Subsequent to the forcing period, the grafted and callused material was kept in cool rooms, at the temeperature of 1-4°C until the risk of late white-frost passed and one could plant in Field I (C I) of the nurse.

RESULTS AND DISCUSSIONS

In the sapling nursery, based on a 3 years average and according to the results presented in Table 1, the medium springing percentage of the nut trees includes 19 % at SL-18-TJ and 86 % at SL-10-TJ.

The biometrical measurements showed, at the end of the first year of vegetation, the medium diameter of the saplings (measured above the collet: 3-5 cm) and more than 8 mm for all selections (table 2). In this situation the elites SL-3-TJ and SL-10-TJ distinguish themselves with a diameter of 11.9 mm, respectively 8.1 mm.

Table No. 1

The behaviour of certain nut tree elites selected as mother plants in the nut tree nursery (taken in 3 years time)

No	Selection (hybrid)	The number of sprung saplings			Aver age	The springing percentage (%)			Aver age
		1st year	2nd year	3rd year		1st year	2nd year	3rd year	
1	SL-1-PT	58	26	25	36	58	32	25	38
2	SL-2-PT	67	47	40	51	67	47	40	42
3	SL-3-TJ	37	77	53	56	17	77	53	49
4	SL-4-TJ	61	64	60	62	61	71	60	64
5	SL-5-TJ	53	83	61	66	53	83	61	66
6	SL-6-TJ	46	78	56	60	46	78	56	60
7	SL-7-TJ	53	67	71	66	53	67	71	66
8	SL-8-TJ	13	15	20	16	13	50	20	27
9	SL-9-TJ	48	45	41	46	48	64	41	51
10	SL-10-TJ	63	82	74	73	90	83	85	86
11	SL-11-TJ	20	53	43	36	20	73	43	45
12	SL-12-TJ	28	19	33	26	28	30	33	30
13	SL-13-TJ	35	27	38	33	35	54	38	42
14	SL-14-TJ	19	49	22	30	19	49	22	30
15	SL-15-TJ	29	59	49	46	29	59	49	46
16	SL-16-TJ	32	40	44	56	32	67	44	47
17	SL-17-TJ	35	75	54	56	35	75	54	56
18	SL-18-TJ	16	42	27	28	16	16	27	19
19	SL-19-TJ	52	55	60	56	52	61	60	57

By analysing the data in Table 3 the percentage of STAS saplings registers wide variations: SL-6-TJ, SL-8-TJ, SL-16-TJ, SL-9-TJ, SL-14-TJ, SL-5-TJ, SL-17-TJ distinguish tem selves with 78%, 76%, 74%, 68%, 64% respectively 62%, while for the elites SL-15-TJ, SL-13-TJ,SL-3-TJ and SL-18-TJ it is under 40%.

The *Jupîneşti* sort used for the grafting produced its first fruit (1-2 fruit /tree) right in Field II of the nursery.

By comparing the medium calculated data, we notice the highest amount of nut tree sapling at elites SL-2-PT, SL-5-TJ in the first and the second year and the lowest amount at elites SL-8-TJ, SL-12-TJ, SL-14-PT, in the first and the third year. The elite SL-4-TJ distinguishes itself for its constancy of the springing percentage- between 60 and 70 % each year (table 1).

The biometrical measurements showed, at the end of the first year of vegetation, the medium diameter of the saplings (measured above the collet: 3-5 cm) and more than 8 mm for all selections (table 2).

The height of the saplings also registered at the end of the vegetation period, is a studied element in the sapling nursery, oscillating between 18 cm at SL-8- TJ, SL-18-TJ and 10 at SL-5-TJ.

Table No 2

The growing features in thickness and length of the selected nut tree elites in the nursery

No.	Selection (hybrid)	The collets diameter (mm)		The height of the saplings (cm)		The medium diameter of the grafting (mm)	The medium length of the grafting (cm)
		1st year	2nd year	1st year	2nd year		
1	SL-1-PT	8.7	20.4	14	70	14.5	42.0
2	SL-2PT	10.5	20.6	14	101	15.5	57.5
3	SL-3-TJ	11.9	28.6	13	109	15.7	61.0
4	SL-4-TJ	8.7	21.9	15	91	15.3	53.0
5	SL-5-TJ	8.2	20.1	10	90	14.1	50.0
6	SL-6-TJ	9.0	24.1	14	104	15.5	59.0
7	SL-7-TJ	9.5	24.0	14	112	15.7	63.0
8	SL-8-TJ	10.4	23.4	18	86	14.9	52.0
9	SL-9-TJ	9.0	23.2	14	92	14.6	53.0
10	SL-10-TJ	8.1	21.7	12	92	14.9	52.0
11	SL-11-TJ	10.8	20.7	16	86	15.7	51.0
12	SL-12-TJ	10.6	23.0	14	93	15.8	53.5
13	SL-13-TJ	9.7	20.7	14	80	14.7	47.0
14	SL-14-TJ	9.7	20.3	13	84	14.0	55.0
15	SL-15-TJ	9.6	22.4	12	98	15.5	55.0
16	SL-16-TJ	8.7	21.5	13	95	15.1	54.0
17	SL-17-TJ	11.8	21.2	15	85	15.5	50.0
18	SL-18-TJ	10.5	23.5	18	82	16.5	50.0
19	SL-19-TJ	8.8	19.1	13	77	14.2	45.0

At the end of the second year of vegetation, by analysing the behaviour in the sapling nursery, one could register small coefficients of variation concerning the diameter of the plants (all over 19 mm) and the height varies from 70 cm (SL-1-PT) and 112 cm (SL-7-TJ).

The percentage concerning the grafting is only 55 % for elite SL-9-TG, the others with more than 80 %, the highest is to be registered for SL-5-TJ, SL-14-PT, SL-11-TJ, etc (table 3).

As a result of analyzing the information registered in Table 2, at the end of the vegetation period in Field I, we observe that the sapling dimensions are above the minimal limits of the STAS (in 8 mm in diameter and 10 cm high) for elites SL-17-TJ, SL-4-TJ, etc.

Table No. 3

The behaviour of the selected elites in the grafting process

No	Selection (hybrid)	No. of saplings	No. of STAS saplings for the grafting process	STAS sapling percentage (%)	No. of thriven Sapling after the engraftin g	Percentage (%) of thriving in the grafting process
1	SL-1-PT	58	32	55	25	78
2	SL-2-PT	67	29	43	22	76
3	SL-3-TJ	37	14	37	10	71
4	SL-4-TJ	61	36	59	24	67
5	SL-5-TJ	53	34	64	30	88
6	SL-6-TJ	46	36	78	33	92
7	SL-7-TJ	53	28	48	24	86
8	SL-8-TJ	13	10	76	9	90
9	SL-9-TJ	48	33	68	18	55
10	SL-10-TJ	63	32	50	26	81
11	SL-11-TJ	20	12	60	18	90
12	SL-12-TJ	28	14	50	13	93
13	SL-13-TJ	35	12	34	8	67
14	SL-14-TJ	19	13	68	11	84
15	SL-15-TJ	29	5	17	4	80
16	SL-16-TJ	32	26	74	24	85
17	SL-17-TJ	35	22	62	20	90
18	SL-18-TJ	16	5	31	4	80
19	SL-19-TJ	52	25	48	20	80

In other respects, the damages cause by the low temperatures in the winter time from the end of the vegetation untill its taking again were insignificant and appeared in the apical part of the grafting, its lower part remaining unaffected on a part of 10-12 cm.

Similar studies of using some after species of *Juglans* as rootstock have seen made in France on *Juglans nigra*, and in the U.S.A. on *Juglans hindsii* [5, 8]. In the U.S.A., out of the intrespecifical hybrids obtained on the nut tree we point out the *Paradox* and *Royal.* They present a good compatibility with the common nut tree *Juglans regia* L., but they have a bigger height.

Nut selections have been used in Greece as well, having as a results 7 of them valuable genotypes [7]. In Iran, also the first selection phase started in 1982 [2], when the identification collection and planting of the selected genotypes took places.

A serios selection activity took place in Rîmnicu Vâlcea, Romania in orden to obtain some valuable samples for both fruit and rootstock adjusted to the subcarpatian area.

A walnut cultivar study started in 1995 at Fruit Growing Research-Extension Station (SCDP Vîlcea) by M. Botu, Gh.Achim and I.Botu [3]. The aims of this study together with the breeding program are to introduce cultivars and valuable selections for walnut culture in the Oltenia region and even for the entire Romania. The observations referring to the flowering phenology, the growth behavior, occurrence of diseases and CLRV status, precocity of producing first fruits, etc.

CONCLUSIONS

Researches regarding the selection of some nut tree hybrids in order to obtain generative mother plants, proved that:

- in the sapling nursery, the highest springing percentage has been recorded for the selection SL-10-TJ (86%), and the lowest for the selection SL-18-TJ (19%); for the rest of the selections, only four have exceeded the admissible limit of 60% (table 1)

- the biometrics measurements of the height shown an important irregularity of the size growth which is situated between 42 cm (SL-1PT) and 63 cm (EL-7-TJ), (table 2). For the diameter of the package the figures are between 14-16 mm.

- at the end of the second year of vegetation, the saplings used for grafting have to have a diameter above 18 mm. All the selections reached this size, but analysing by comparison the data obtained (height and diameter) for the STAS saplings, the figures are between 17% for SL-15-TJ and 78% for SL-6-TJ (table 3).

- the percentage of thriving in the grafting process has high values for all the selections, except the SL-9-TJ (55%); the highest value being for the SL-12-TJ (93%) followed by SL-6-TJ with 92% and SL-17-TJ, SL-11-TJ and SL-8-TJ with 90% (table 3).

REFERENCES

1. Achim Gh. – Contributions in Establishing some New Procedures of Efficient Multiplication for the Nut Tree and Hazel Tree, University of Craiova, Master' degree Thesis, University of Craiova, (1998);
2. Akça Y., Sen S. Mehmet – A Study on the Genetic Variability and Selection of Superior Walnut (*Juglans Regia L.*) Trees Within Seedling Population of around Van Lake, IV International Walnut Symposium, Acta Horticulturae N. 544, Abstracts, (1999) www.actahort.org/books/544/, 65-112 pp;
3. Botu M., Achim Gh., Botu I.– Nut Selection in the District of Valcea Prone to be Omologated Current – Scientifical Papers – Current Problems of Modernizing the Nut Tree Crop, Craiova, (1995), 33-34 pp;
4. Botu M. & Collab. – Genetic Variability of the *Juglans Regia L.* Natural Population from Oltenia, Romania; IV International Walnut Symposium, Acta Horticulturae N. 544., (2001) Abstracts, www.actahort.org/books/544/ 149-154 pp;
5. Cociu V. & Collab. -Nut Tree Crop, Ceres Editing House, Bucarest, (2003), 15-115 pp;
6. Germain E. – Genetic Impovement of Persan Walnut (*Juglans Regia L.*) Acta Horticulture No 442 Proc III International Walnut Congress, (1993) 21-33 pp;
7. Godeanu I.– Contributions in Establishing some Agro Biological Indexes Concerning the Selection of Generative Mother Trees from Oltenia. University of Craiova, Master degree Thesis, University of Craiova, (1975).
8. Simonim, S., Le porte-greffes du voyer *Juglans regia* L., L' Arboriculture fruitiere. 563, (2002), 31-32 pp.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

RESEARCH REGERDING THE BEHAVIOUR OF CERTAIN SPECIES OF FRUIT BEARING TREES ON THE SLOPES OF ORADEA REGION

Bucurean Eva[1]

KEY WORDS: trees, slope, peach, apricot, apple

SUMMARY

Under soil, climate and orographic conditions of Oradea studies were carried out, concerning the trees comportment on various shapes of relief.

The biological material consisted of the species apple, apricot, peach trees, aged 3 – 10 years.

The data regarding the growth show that the hills in the perimeter of Oradea fruit – growing basin can be turned to account further on, by all the fruit – tree species of the temperate zone.

The tree planting on terraces managed gave poor results as compares to the zones with no terraces. The data concerning the growth are however contradictory as to the trees position on the terrace platform; the comportment of peach– trees is better when they are planed on the top side of the platform, whereas that of apple – trees is better on the bottom side of the terrace.

The trees death especially regarding the apricot – trees, is not influenced by their position on the plateau and on the slope with terraces.

INTRODUCTION

The soil, as the main environment factor, together with the climate conditions, influences the spreading of the species and varieties of trees, which, altogether with the level of the applied technology, establish the quality and quantity of the fruit production.

The relief is an element which indirectly influences the trees, positively and negatively changing the climate and soil conditions, these changes are sometimes so significant that they create unfavourable conditions to the fruit tree growing, especially when we take into consideration the level of the phreatic water, which should not be higher than 1,5 – 2 m.

In our country, where the rational use of the land reserves slopes or the trees on these types of ground becomes more and more up – to – date, pointing to the problem of solution – finding in order that these types of relief should be as good for the tree growth as possible.

[1] University of Oradea, The Faculty of Environment Protection

MATERIAL AND METHOD

Oradea is situated at the confluence of the Western Plain with the Western Sub - Carpathian Mountains, with the average multi – yearly temperature of 10,1°C and pluviometric conditions of 625 mm each year.

The orchards are placed on slope ground which needed earthwork, for many times, in order to be mechanized. The characteristic types of soil are brown or slightly podzol heavy with the content of clay up to 50% sometimes, these determining aero – hydric conditions less favourable for the trees, the presence of coast springs and places with slides when there are heavy rains.

The research studied the case of the peach – tree, 4 and 10 years old of the Jerseyland variety grafted on frank, the apricot – tree of The Best of Hungary variety, 10 years , the Golden Delicious and Starkrimson apple = trees, 6 years old, grafted on M 11.
The type of relief was the bottom of the slope with a slide of 3 – 5%; embankment made at the same time with the procedures of the soil of the level time and embankment made when the plantation were begun.

The fixing was only for the trunk girth measurement, for the height of the trees, thickness and length of the fence, being taken 8 trees in 3 repetitions, the results which were obtained being statistically processed and presented in tables.

RESULTS AND DISCUSSIONS

The peach tree growing, planted on slope soil, with no fixing, 10 years later, is shown in table no.1. This table shows that the bottom part of the slope with 2 – 5% sloping favourably influenced he tree growing on every researched aspect, compared to the trees situated on bigger slopes where the ground embanked because of the repetitive yearly work of the soil. In this case the tree girth was 6% less, the difference being not statistically assured. This fact is in favour of placing the peach tree on slopes up to 10 – 12%, with no embankment.

Table no.1

The behaviour of the peach –tree planted on a slope, not planned, anti – erosional, in the conditions of Oradea region

Type of relief	Tree girth			Tree height		
	cm	%	Difference	m	%	Difference
Bottom of slope	39,1	100	-	3,6	100	-
Slope embankment in time on the level line	36,9	94	- 2,2	3,5	97	- 0,1
	DL 5%		8,2		0,73	

As regarding the behaviour of the peach – tree on soil with no embankment, compared to the bottom of the slope, table no.2, the growth data show a good situation in the case of the trees planted on terraces downstream the platform with positive differences statistically secured and a bad behaviour of the trees situated upstream the platform terrace, which show trees with the girth 15,6% less than those at the bottom slope.

The situation is similar for the cases of the elements which characterize the growing of the top tree.

The cause of the differences between the two rows on the same embankment is, first of all, the heavier rains, which offered a good provision of water to the trees downstream and created an excess for those situated upstream the terrace.

The data of the growing of the breadth at the apricot – tree trunk are presented in table no.3. In this table we notice a better growth of the trees situated on the plateau with a slight slope and on embankment made gradually on the level line work, while the planting on the arranged embankment reduced the thickness of the trunk by 15%, the difference being statistically assured.

So, the stone fruit species are significantly influenced by the slope of the ground and the embankment work finished before planting.

Being aware of the lower demands of the seed species for the soil, it was generally researched their behaviour in similar conditions to those presented at stone fruit species.

Table no.4 shows the behaviour of the apple – tree as concerns the thickening of the trunk, for 3 orographic situations for 2 varieties grafted on m 11.

It can be noticed for the apple – tree, too, that the best – grown trees are those on the slightly not embankment slope, followed by those planted upstream the terrace with 82,7% of the first thickness; the trees planted downstream the terrace register the poorest growth results, at the level of 74,3% of the trees on the slightly not embankment slope.

The difference in behaviour for the apple – tree in the case of the embankment downstream and upstream compared to the peach – tree, apricot – tree and almond – tree can be explained by the fact that the apple – tree had a period with no heavy rain, so that the trees planted upstream had better conditions and it was drought for the trees planted downstream the platform of the terrace.

Out of the two varieties, the best behaviour is shown by Starkrimson, with very small differences between the trees situated on slight slope and those on the embankment as compared to the Golden delicious which presents bigger differences. For the Golden Delicious the gap percentage is higher: 10,3% downstream the embankment and 16,6% for the trees upstream the platform.

The apple – tree behaves the same when taking into account the growth in height of the trees, table no.5, with more differences at the Golden Delicious.

Table no.2

The influence of the certain types of relief upon the peach – tree growing in the conditions of Oradea region

Type of relief	Girth (cm)	%	Difference	Significance	% gaps	Height (m)	%	Difference	Significance	Width of the tree top	Length of the tree top
Ground slope	22,4	100	0	-	3,84	3,00	100	0	-	2,27	1,26
Embankment with upstream trees	23,1	103,12	0,7	xxx	19,04	3,03	101	+0,03	-	2,33	1,30
Embankment with downstream trees	18,9	84,37	-0,5	000	21,42	2,50	83,3	-0,50	00	1,97	1,07
DL 5%			0,19		0,18;						
DL 1%			0,32		0,29;						
DL 0,1%			0,59		0,55						

Table no.3

The influence of certain types of relief upon the thickness growth for the apricot – tree in the conditions of Oradea region

Variant	Trunk girth			%	Percentage of gaps
	average	difference	significance		
V1 – plateau with a slight slope	48,9	-	-	100	33,3
V2 – embankment made in time by soil work	48,2	- 0,7	-	98	20,8
V3 – terraced slope gradient height of 1,5-2 m, with trees planted downstream	41,8	- 7,1	-	85	33,3
DL 5%		7,14			
DL 1%		11,82			

Table no.4

The influence of certain types of relief upon the growing of thickness at the apple – tree trunk, in the conditions of Oradea region

Variety	Golden delicious				Starkrimson				Average, type of soil	
Type of relief	Trunk girth (cm)	Difference (cm)	%	% gaps	Trunk girth (cm)	Difference (cm)	%	% gaps	cm	%
Sleight slope	23,2	-	100	-	16,2	-	100	-	19,7	100
Embankment made initially (planted downstream)	16,3	-6,9	72	10,3	13,3	-2,9	83	6,6	14,8	74,3
Embankment made initially (planted upstream)	17,6	-5,6	76	16,6	15,0	-1,2	93	-	16,3	82,7
Variety average	19,0	-	-	8,9	14,8	-	-	2,2	-	-
DL 5%		3,11							2,10	

Table no.5

The influence of certain types of relief upon the height of the top of the apple – tree, in the conditions of Oradea region

Variety Table no.5	Golden delicious			Starkrimson			Average, type of relief	
Type of reliefl	Height of the top (m)	Difference (m)	%	Height of the slope (m)	Difference (m)	%	m	%
Slight slope	3,4	-	100	3,0	-	100	3,2	100
Embankment made initially (planting downstream)	2,6	-0,8	76	2,7	-0,3	90	2,6	81,3
Embankment made initially (planting upstream)	2,2	-1,2	64	2,5	-0,5	83	2,3	72,0
Variety average	2,4	-	-	2,4	-	-	-	-
DL 5%		0,268			0,102			

CONCLUSSIONS

The measurement made for two varieties of stone – fruit trees (peach – tree, apricot – tree) and one variety of seed- fruit trees (apple – tree,) planted on the Oradea fruit – growing area, regarding the behaviour concerning the growth depending on the orographic position of the land and of the trees on different types of relief, can bring same conclusions:

- the hills of the Oradea fruit – growing region are suited for the planting of fruit – bearing tree varieties characteristic to the climatic conditions of the region.
- trees grow better on lands with no embankment slight slope and on plateau with a slight slope
- good results, very similar to those from the slight slope and plateau are obtained in the case of planting the trees on no embankment slopes, up to 10 – 12%. On these level line, and, as time passes, these works produce terraces with trees on batter, which can be very well cultivated.
- the planting of the trees on terraces which have already been arranged before, brought poorer, contradictory results. In the case of the 4 years – old peach, the best growing results were obtained by planting the trees upstream whereas in the case of the 6 – 7 – years – old apple – tree, by placing the trees downstream the platform. These different situations are because of the better or worse pheviometric conditions during the trees, lives, so that it can be concluded that, in order to have a more uniform water supply of the embankment parts of Oradea heavy soil, the platform of the terrace should present a slight slope from upstream to downstream, slope which could diminish the danger of the sliding during the years with heavy rains.

BIBLIOGRAPHY

1. Baciu A. A., Pomicultură generală, Ed. Universitaria, Craiova, 2005;
2. Branişte N., Ghidra V., Ghidul pomicultorului, Ed. Agroprint Piteşti**,**1999 ;
3. Cociu V. şi colab., Cultura piersicului, Editura Ceres, Bucureşti, 1981;
4. Cosmulescu Sina Niculina, Protecția mediului în ecosistemele pomicole, Editura Sitech, Craiova, 2003;
5. Grădinaru G. şi colab., Pomicultura, Editura Moldova, Iaşi, 1998;
6. Hoza D., Pomologie, Editura Prahova, Ploieşti, 2000;

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

RESEARCH REGARDING THE CHEMICAL FERTILIZATION UPON THE GROWTH, FRUIT- BEARING AND PREMATURE DEATH OF THE APRICOT – TREE

Bucurean Eva[1]

KEY WORDS: apricot, fertilization, growth, fructification, destruction

SUMMARY

In the period 1999 – 2008 in Oradea, on a brown soil silty texture with 2,11 per cent humus and 36,5 – 42,5 per cent clay, there was organized an experiment with 8 variants, with chemical fertilizers NPK, in order to observes, as well as the growth and fruitage of the trees.

The results obtained show that niveau of phosphorous and potassium in soil is positively and at significant rate influenced by the doses of fertilizers applied.

The premature death is influenced by the doses of NPK and it is more frequent in the case of nitrogen applied in unilateral way or in double dose.

INTRODUCTION

The importance of the apricot – tree in our country fruit – growing is small, mainly because as a result a higher sensitivity of the species towards the climatic conditions.

Reduction of these negative influence can be obtained by the use of proper technological measures, among them being the fertilization.

Taking into account the role of a proper fertilization in order to produce a balance apricot – tree orchard in Oradea region there were carried out researches in order to study the tree reaction when chemical fertilizers are used. The apricot – tree plantation came into being in 1997, on brown soil with clay – texture, with an average content of clay of 40,2 % and 2,11% humus on the depth of the profile of 0 – 40 cm.

During the studied period of time, the pluviometric conditions were at 613,1 mm close to the normal, with the extremely lowest of 470,7 mm and highest of 799,7 mm.

From the point of view of the temperature, the values were lower than the normal ones, the average temperature was 10,0°C with an absolute minimum of -21,6°C.

MATERIAL AND METHOD

The plantation was made with the variety of The Best of Hungary engrafted on apricot – tree, the planting distance was 4x5 m and the top was freely flattened. Eight variants were taken into account, tables no.1, 2, and 3 placed in blocks at random, with 4 repetitions and 5 trees in a repetition.

[1] University of Oradea, The Faculty of Environment Protection

The maintenance system of the soil was cultivated field, with autumn ploughing and 3, 4 uses of the disk harrow during the vegetation period. The nitrogen, under the form of the ammonium nitrate was applied in spring, while the phosphorus and potassium were applied in autumn, by spreading it on the whole lot, except the variant no8, for which the phosphorus and potassium were applied once at every 5 years. Observations were made regarding the growing, fruit – bearing and premature death.

RESULTS AND DISCUSSIONS

The growing in thickness of the trunk is presented in table no.1. The data presented point out the fact that for all the fertilized variants there are increases compared to the most fertilized trees, increase between 2 and 18%. Analyzing the contribution of each element to the increase, and having the average data for 10 years, it can be noticed that the nitrogen in a dosing of 100 kg/ha s.a. brings a fertilization increase of 14%, when phosphorus (P_2O) is added the increase is 2% and when potassium (K_2O) is added to both of them, the increase is 65. The importance of the nitrogen is pointed out when it also is applied in doses of 200 kg/ha s.a. obtaining an overfulfilment of growing between 8 and 18%.

As concerns the phosphorus and the potassium, table no.1 does not imply that these would positively influence the thickening of the trunk. It can also be underlined the diminishing of the trees grow older, and during the 8^{th} – 10^{th} year of planting there could be noticed a strong recovery of the trees on the lots which were not fertilized, while the trees fertilized with NPK, the increase of the trunk thickening proves reduced values, situated below the level of the witness.

This observation can be also made in the case of the fruit production which is positively related to the trunk thickening.

Table no 2 shows that the trees started to bear fruit beginning with the third year from planting and, even if the level of the crop is low, the differences between the fertilized variant and the witness are obvious, with values statistically assured for the experiment.

Analyzing the production data on an average of 8 years, it can be noticed that the best results are obtained using the $N_{100}P_{80}K_{100}$ dosage of fertilizer, when the crop was 5,1 t/ha close results were obtained at the trees with a yearly application of the fertilization formula $N_{100}P_{80}$ or N200 yearly $P_{400}K_{500}$, applied every 5 years, which gave an average crop of 4,6 t/ha apricots per year.

It should also be mentioned that the nitrogen is a dosing of 100 kg increased the crop with 78 %, applied together with the phosphorus increased the growth to 113 % and all the three elements together ($N_{100}P_{80}K_{100}$) had an effect of production increase with 121 %.

In cases of using the phosphorus and potassium in larger doses and at larger periods of time (V_8) it should be noticed that this method proved to be better, raising the production with almost a ton of fruit per hectare compared to the V_5 variant which used the same dose of NPK but every year. The superiority of this variant is more obvious, if we take into account the easiness in fertilizing, work and fuel saving.

The premature death, a complex phenomenon which has partly been placed under control up to now, was present at all the variants of the experiment. Table no.3 shows that this phenomenon appears at the majority of them even during the first tree years from the planting, whereas after 12 years being registered dried trees from 16,6% to 50%.

Even the trees which were not fertilized present 20,8% dried trees this percentage appearing on the fifth year from the planting. Out of the three elements that were tried, the one which proves a favourable action is the phosphorus; for the combination $N_{100}P_{80}$ there are 16,6 % dead trees, while for the combination $N200P_{160}K_{100}$ there are up to 20,8% death

trees, the same percentage as the trees without fertilizers. The nitrogen doses (100 and 200 kg/ha) can encourage the drying of the apricot – tree with a higher percentage depending on the age, and it can be noticed that, during the first 6 years, the trees die at a yearly rate of 2,95%, while during the 6^{th} and 12^{th} year the rate drops to 1,56%.

CONCLUSIONS

Thickening of the trunk was influenced by the doses of NPK with increases between 2 and 18%, the highest values being registered for the variants which were given bigger doses of nitrogen. The fruit production was better at all the fertilized variants compared to the witness, increases being registered between 78 and 121%. It should be noticed that for the application of 100 kg of nitrogen, the production increased with 78%, when using $N_{100}P_{80}$ the production overfulflled the witness by 113% whereas the application of potassium $N_{100}P_{80}K_{100}$ the increase was of 121%.The best crops were obtained at the variants with the fertilizing levels of $N_{100}P_{80}K_{100}$ and $P_{400}K_{500}$ applied every 5 years. The premature death is influenced by the doses of NPK, being increased at the doses of nitrogen applied individually or in double dose.In order to diminish the effects of premature death and to spread the apricot – tree growing it is necessary that during the first 10 years the gaps should be completed at a percentage of 3%.

BIBLIOGRAPHY

1. Bunea A. şi colab., Unele aspecte ale pieirii premature a caisului în România, Revista „Horticultura" nr.6, 1981;
2. Cociu V. şi colab. , Caisul, Ed. Ceres, Bucureşti,1993;
3. Davidescu D., Davidescu Velicica, Agrochimie horticolă, Ed. Acad. Române, 1992;
4. Drăgănescu E., Pomicultură, Ed. Mirton Timişoara, 1998;
5. Popescu M. şi colab, Pomicultură generală şi specială, Editura Didactică şi Pedagogică, Bucureşti,1993;

Table no.1

The diameter growth of the trunk at the apricot – tree (mm) under the influence of certain doses of NPK

Variant	Years										Average	
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	mm	%
V_1- witness	10,4	9,9	7,7	5,1	6,0	5,8	1,8	7,5	7,1	5,1	6,64	100
V_2 - N_{100}	12,0	12,6	10,8	9,2	5,3	7,3	1,4	8,7	3,6	5,1	7,60	114
V_3 - $N_{100}P_{80}$	10,8	13,3	8,3	6,2	4,9	6,1	1,1	6,5	5,6	5,3	6,81	102
V_4 - $N_{100}P_{80}K_{100}$	11,2	11,8	11,0	9,0	5,5	6,1	1,7	6,3	3,6	4,1	7,03	106
V_5 - $N_{200}P_{80}K_{100}$	14,7	15,4	10,2	8,8	7,9	8,3	1,3	5,2	3,9	3,0	7,07	118
V_6 – $N_{200}P_{100}K_{100}$	12,5	12,9	8,3	9,1	7,7	6,1	2,3	5,8	5,5	4,0	7,42	112
V_7 – $N_{200}P_{160}K_{200}$	12,1	13,5	9,8	7,6	6,6	5,9	1,1	4,7	6,7	3,8	7,19	108
V_8 – $N_{200}P_{400}K_{500}$ once every 5 years	19,5	8,8	9,3	8,4	5,7	7,9	1,8	8,8	3,7	8,3	7,42	112
Average for years:	12,9	12,3	9,4	7,9	6,2	6,7	1,6	6,7	4,9	4,8	7,24	-

Table no.2

The influence of certain doses of NPK upon the fruit production
(Oradea 1999 – 2008)

Variant	Years																		Average (1999 - 2008)	
	1999		2000		2001		2002		2003		2004		2005		2006		2007		2008			
V_1- witness	1,2	100	0,8	100	0,4	100	2,5	100	0,9	100	0,3	100	0,4	100	1,7	100	4,6	100	6,7	100	2,3	100
V_2 - N_{100}	1,3	113	1,3	173	1,3	325	2,7	108	2,5	277	2,1	700	9,0	203	5,8	341	11,0	239	4,9	73	4,1	178
V_3 - $N_{100}P_{80}$	1,6	135	1,8	233	1,2	287	3,0	120	3,5	388	2,4	800	11,3	256	5,0	294	11,7	125	7,9	118	4,9	213
V_4 - $N_{100}P_{80}K_{100}$	1,5	130	2,6	346	2,0	487	3,3	132	2,4	266	2,4	800	10,2	231	6,6	388	14,4	313	5,5	82	5,1	221
V_5 - $N_{200}P_{80}K_{100}$	1,9	165	1,5	200	2,0	500	3,8	152	2,2	244	2,5	833	10,4	239	3,8	223	8,8	191	3,1	47	4,0	174
V_6– $N_{200}P_{100}K_{100}$	1,8	156	1,3	173	2,1	525	3,4	136	1,9	211	3,1	1033	8,5	193	8,4	494	7,6	165	3,9	100	4,2	182
V_7– $N_{200}P_{160}K_{200}$	1,4	117	2,5	326	2,1	512	2,5	100	3,0	333	1,7	566	8,5	193	5,5	323	11,9	258	5,2	58	4,8	208
V_8– $N_{200}P_{400}K_{500}$ every 5 years	1,9	161	2,0	266	1,7	412	3,3	132	3,4	377	2,6	866	10,9	245	2,8	164	13,7	298	6,7	100	4,9	213
Average for years:	1,5	-	1,7	-	1,6	-	3,0	-	2,4	-	2,1	-	9,2	-	5,0	-	10,5	-	5,5	-78	4,2	-
DL 5%	-		3,3		0,51		-		2,6		1,77		6,3		2,4		8,7		-		-	

Table no. 3

Premature death of the apricot – tree related to the chemical fertilization
Oradea (1999 – 2008)

	Years of experimenting									
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Variant V_1 - witness	4,16	12,5	16,66	20,8	20,8	20,8	20,8	20,8	20,8	20,8
V_2 - N_{100}	8,33	8,33	8,33	16,66	20,8	20,8	20,8	25,0	25,0	25,0
V_3 - $N_{100}P_{80}$	4,16	8,33	8,33	8,33	12,5	12,5	12,5	12,5	16,66	16,6
V_4 $N_{100}P_{80}K_{100}$	4,16	4,16	4,16	12,5	16,66	16,66	20,8	20,8	20,8	20,8
V_5 - $N_{200}P_{80}K_{100}$	-	-	4,16	8,3	16,66	16,66	16,66	20,8	20,8	29,2
V_6- $N_{200}P_{100}K_{100}$	4,16	8,33	12,50	12,5	16,66	16,66	20,8	20,8	20,8	20,8
V_7- $N_{200}P_{160}K_{200}$	4,16	8,33	8,33	8,33	8,3	8,33	16,66	16,66	16,66	20,8
V_8- $N_{200}P_{400}K_{500}$ once every 5 years	-	12,50	20,8	25,00	29,16	29,16	33,33	37,5	37,5	37,5
Average V x A cumulated	3,64	7,81	10,4	14,1	17,7	17,7	20,3	21,8	22,2	23,9
Average yearly rate	3,6	4,2	2,6	3,7	3,6	0,00	2,6	1,5	0,4	1,5
Age average rate					2,95	1,56				

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

THE CONTRIBUTION OF BIODIVERSITY OF GENETIC RESOURCES IN IMPROVEMENT OF GRAPEVINE ASSORTMENT IN REPUBLIC OF MOLDOVA - ACHIEVEMENTS AND PERSPECTIVES

Savin Gheorghe[1]

KEY WORDS: biodiversity, Vitis, genetic resources, breeding, resistance

ABSTRACT

In the Republic of Moldova was accumulated a wide grapevine genofond, divers by ecological, geographical origins and biological potential. Presented genotypes posed, separately or combine in different degree, the characteristics: high quality and productivity, earliness, seedless berry, resistance to winter conditions and diseases. Their utilization in breeding programs allowed during the last 40 years homologation of about 30 varieties for table and wine grapes, including seedless, with high resistance to abiotic and biotic unfavorable factors of environment.

Accumulation, evaluation, diversification of genetic resources, including the interchange of biological material, application of modern biotechnologies, is a continuous process.

Because of large biodiversity of vegetal genetic resources the productivity in agriculture increased significantly and during the last century this influence became determinative for their progress. In viticulture, with the foundation of Ampelographic collections, the process of mobilization, estimation, diversification and utilization of biodiversity of grapevine genetic resources acquires a scientific basis and well-directed orientation to solving the actual and perspective problems of viticulture.

The first Ampelographical collection in Basarabia was found in XIX century nearby the Cetatea Albă and contained more than 300 cultivars, inclusive 85 old autochthonous [1]. Late follows other collections, created near the divers didactic and research institutions. More important collections, with significant impact on development of viticulture in this region, are concerned to history and activity of all precursors of actual institute that began with the foundation in 1910 of Experimental and Model Horticultural Station in locality Costiujeni nearby the Chisinau. On the basis of collection of this station, during the century was accumulated significant diversity of genotypes that determined the development of viticulture and winemaking of republic.

In Ampelographic collection, found in 1956, was presented a significant amount of *V. vinifera* varieties, stocks varieties, European-American hybrids, representative of other species [2, 3]. On basis of these genotypes by 1980 were created some new cultivars, mainly with the late or very late ripening. But in the assortment was absent the wide diversity of varieties for table grapes with the various stage of full maturity, especially very early and early, as well as seedless varieties were practically absent. The future efforts were oriented to mobilization, evaluation and use of new grapevine resources for improvement this situation.

[1] Institutul Ştiinţifico-Practic de Horticultură şi Tehnologii Alimentare, Chişinău, Republica Moldova

In this article are presented some data concerning the contribution of these resources in amelioration of grapevine assortment in Republic of Moldova during the last 40 years.

MATERIAL AND METHODS

Grapevine Genofond, including Ampelographic collection and adjacent fields, is situated on experimental plots of Research-and-Practical Institute for Horticulture and Food technologies, situated on south part of Chisinau city on the area about 25 hectare. The areas have south-east exposition with the slowly slope. The soils are mainly typical chernozem. The texture of soils is sandy-argillaceous. Climacteric conditions correspond to viticulture zone Codru of republic and is characterized by duration of vegetative period of 170-175 days, the sum of active temperatures is 2900-3100°C, average annual air temperature is 9,0-9,6°C, annual sum of precipitation is 520-580 mm. The applied technological procedures on experimental plots correspond to traditional ones for republic.

Description, evaluation of genotypes is according the general accepted methodology [4, 5].

RESULTS AND DISCUTIONS

New Ampelographic collection was founded during 1981-1984 in basis of previous collection and introduction of new resources. The continuous process of identification and mobilization of genotypes, their diversification led to accumulation of actual biodiversity of grapevine [3, 6]. The principles formulated during the mobilization of new resources were oriented to localization of new sources of early and very early stage of full maturity of berry, resistance to winter conditions, pest and diseases.

Thus were introduced genotypes from diverse viticulture centers, mainly from Bulgaria, Romania, Hungary Germany, as well as from the republic of former USSR (in special from Middle Asia). The fragment of this diversity destined for amelioration of assortment for table grapes is presented in Table 1. Also the Genofond was completed with the varieties for wine, inclusive Aromat de Iaşi, Crâmpoşie selecţionată, Băbească gri, Mioriţa, Hibernal, Orion, Plevenska roza, Bianca, Cristal, Lakhedi mezeş, Kunliani, that correspond partially to formulated desire for quality, earliness, resistance. Analysis of data confirms the presence of more than 30 genotypes with the satisfactory lignifications of annual shoots at the beginning of September (about 50-70% from the length), that ensure a good preparation for winter conditions. Many of selected genotypes have a high appreciation at organoleptic degustations.

In general, during the last 30 years, were introduced about 900 genotypes, inclusive about 30 with early stage of full maturity of berry, about 50 with advanced resistance to winter conditions and diseases, as well as seedless genotypes, new clones of classical cultivars.

Also should be mentioned the contribution of presented grapevine genetic resources in foundation, completion of Ampelographic collections in other viticulture regions, particularly in Georgia (Tbilisi), Russia (Anapa, Novocherkask), Ukraine (Magarachi).

In basis of accumulated biodiversity were created and included in Register of plant varieties recommended in production process wide variety of cultivars for the majority of climacteric zones of Republic of Moldova [8]. Thus, the assortment for table grape was completed with new created local and introduced varieties: Augustovski, Codreanca, Prezentabil, Rannii Magaracia with early and medium stage of full maturity of berry; Frumoasa albă, Guzun, Leana, Zolotistîi ustoicivîi, Moldova, Muscat de Bugec with mid late and late stage of full maturity of berry.

Table 1

Introduced genotypes destined for amelioration of assortment for table grapes

Name of genotype	Country of origin	Note
Arcadia	Ukraine	early stage of full maturity of berry; large or very large, yellow berry with firm flesh; medium susceptibility to winter conditions and *Botrytis cinerea*
Kirghizchii rannii	Kirghizstan	early stage of full maturity of berry; large green-yellow berry with medium firm flesh; medium susceptibility to winter conditions and diseases
Muscat timpuriu de Bucureşti	Romania	early stage of full maturity of berry; medium green-yellow berry with firm flesh, muscat flavour
Napoca	Romania	medium stage of full maturity of berry; dark red-violet berry with firm flesh
V-25/20	Bulgaria	early stage of full maturity of berry; large green-yellow berry with firm flesh; low susceptibility to winter conditions and diseases
Suvenir cernăi	Ukraine	late stage of full maturity of berry; large blue-black berry with medium firm flesh, specific flavor; medium susceptibility to diseases
Timpuriu de Cluj	Romania	early stage of full maturity of berry; medium green-yellow berry with specific flavor
Xenia	Romania	late stage of full maturity of berry; medium – large green-yellow berry
Ukrainka	Ukraine	early stage of full maturity of berry; medium-large rose berry with medium firm flesh, muscat flavour; low susceptibility to winter conditions and *Botrytis cinerea*
Seedless varieties		
Călina	Romania	medium stage of full maturity of berry; small rose berry with medium firm flesh; medium susceptibility to winter conditions and diseases
Centennial seedless	USA	early stage of full maturity of berry; medium-large yellow berry with medium firm flesh, muscat flavour; medium susceptibility to winter conditions and *Botrytis cinerea*
Flame seedless	USA	early stage of full maturity of berry; medium dark-rose berry with medium firm flesh; medium susceptibility to winter conditions and diseases
Himrod	USA	very early or early stage of full maturity of berry; small yellow berry with medium firm flesh, specific flavor; low susceptibility to winter conditions and diseases
Interlaken	USA	early stage of full maturity of berry; small yellow berry with firm flesh, specific flavor; medium susceptibility to winter conditions and diseases
Mecita	Ukraine	early stage of full maturity of berry; small-medium rose berry with medium firm flesh; medium susceptibility to winter conditions and diseases

For the first time in republic were created and homologated seedless varieties, missed in autochthonous assortment. Traditional seedless varieties, introduced from other viticulture zone, are not efficient in our production conditions [8]. Newly created seedless varieties: Kişmiş lucistâi and Kişmiş moldovenesc (sensible to winter conditions), Apiren alb, Apiren roz, Apiren negru de Grozeşti (for fresh consumption and technological

processing, with advanced resistance to abiotic and biotic unfavorable conditions of environment) were included in assortment. All new created varieties need a reduced number of chemical treatments, so reducing the chemical pressure on environment, allows application of energy-saving technologies.

Future utilization of accumulated biodiversity, improvement of assortment is associated with the application of modern biotechnologies, inclusive application of embryo rescue from seedless berries [9]. According the researches [10], distance hybrids DRX-M_5 (with the participation of *V.rotundifolia*) have a very low susceptibility to *Phylloxera vastatrix* on roots. The morphological and anatomical studies [11] of one fragment from Genofond marked out some genotypes from Caucasus (Armenia, Severnîi Ararati, Rkaţiteli, Mţvivane ţiteli), Middle Asia (Guzali-Kara, Kişmiş ciornîi, Kişmiş krasnîi turkmenskii, Kîrmîzî kişmiş), as well as old autochthonous varieties (Coarnă neagră, Negru de Căuşani, Feteasc neagra, Ţâţa căprii, Galbena) with potential resistance to drought.

CONCLUSIONS

1. Utilization of biodiversity of accumulated in Republic of Moldova grapevine genetic resources allowed during the last 40 year creation and homologation of about 30 varieties for table and wine grapes, including seedless, with advanced resistance to abiotic and biotic unfavorable factors of environment. New varieties need a reduced number of chemical treatments, reduce the chemical pressure on environment, allows application of energy-saving technologies.

2. Recently introduced genotypes, in special with high quality and productivity, early stage of full maturity of berry, seedless, resistant to winter conditions, pests and diseases are an important potential for future modernization of grapevine assortment. The role of modern biotechnologies is decisive in acceleration and effectiveness of this process.

BIBLIOGRAPHY

1. Pelyakh M. Istoria vinogradarstva i vinodelia Moldavii. Kişinev, "Cartea Moldovenească", 1970.
2. Ivanova E.B. Katalog sortov vinograda. Kişinev, 1976.
3. Savin G.A. Ampelograficheskaia kolecţia MoldNIIViV. // Naucinîe dostijenia po vinogradarstvu i vinodeliu. Kişinev, 1980.
4. Constantinescu Gh. Ampelografia. Editura Agrosilvică de Stat. Bucureşti. 1958.
5. Descriptors for grapevines. (Vitis ssp.).– Rome, IPGRI, 1997.
6. Savin Gh. Genofondul viţei de vie – realizări şi rezerve. Institutul Naţional pentru Viticultură şi Vinificaţie 1910-2005, Lucrări ştiinţifice. Chişinău, 2005.
7. Registrul soiurilor de plante al Republicii Moldova. Chişinău, 2009.
8. Constantinescu Ghe., Indreaş A. Ampelologia soiurilor apirene. Bucureşti, Editura Academiei Republicii Socialiste România, 1976.
9. Chiriac Gh., Savin Gh., Smerea S. Embryo rescue in seedless genotypes.// Simpozionul ştiinţific anual cu participare internaţională „Horticultura – ştiinţă, calitate, diversitate şi armonie", Iaşi, 24-25 mai, 2007, p. 99-104.
10. Topală Şt. Kariologhia, poliplodia i otdalennaya ghibridizaţia vinograda. Chişinău, Combinatul Poligrafic, 2008.
11. Codreanu V. Anatomia comparată a viţei de vie (Vitis L.). Chişinău, Combinatul Poligrafic, 2006.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

ELABORATION OF INITIAL BIOLOGICAL MATERIAL WITH SEEDLESS PROPERTIES IN ORDER TO CREATE NEW GRAPEVINE VARIETIES IN REPUBLIC OF MOLDOVA

Savin Gheorghe[1], Cornea Vladimir, Tofan Svetlana, Nofit Daniela

KEY WORDS: seedless, grapevine, resistance to winter conditions, technological processing, Apiren alb, Apiren roz, Apiren negru de Grozeşti

ABSTRACT

Creation of seedless grapevine varieties for various utilization with high resistance to stressor represent a new program for viticulture of region. Were created, homologated, patented seedless varieties Apiren alb, Apiren roz and Apiren negru de Grozesti with grapes for fresh consumption and industrial processing. Other genotypes are in process of homologation. It was confirmed the presence of necessary characteristics for production of juice, compote, marinade, jam, raisins etc. The originality of produces, reduced number of chemical treatments represent some of advantages for including such genotypes as components of sustainable viticulture. The diversity of accumulated biological material with seedless properties allows realization of new breeding programs.

INTRODUCTION

According the Situation Report for the world vitivinicultural sector [1], during the last years the world production of fresh grapes is maintained at stable level and increased by 26% between the end of the 1990s and the beginning of the 2000s. Production of fresh grapes destined to consumption was estimated to 183,7 millions of quintals in 2005. At the same time word production of raisins reached in 2005 12,4 millions of quintals. Undoubtedly the contribution of seedless grapevine varieties in this production is decisive. Following the intention to improve assortment for table grapes in Republic of Moldova, large value is accorded to elaboration and diversification of seedless grape assortment. Especially as in new conditions of agriculture management the contribution of seedless varieties is important in diversification of products of technological processing of grapes, and resistant varieties can be included as component of sustainable viticulture.

Old autochthonous assortment in Republic of Moldova don't contain seedless varieties, and industrial cultivation of traditional varieties from Middle East and Central Asia, mainly adapted to warm region with long daylight hours, are not efficient in our climacteric region, situated at the northern extremity of industrial viticulture [2]. In 70's years of the past century a breeding program was initiated in order to create a seedless assortment adapted to our conditions. First created and homologated varieties Kişmiş lucistîi and Kişmiş moldovenesc have high quality, but are susceptible to unfavorable factors of environment, mainly to winter conditions. Complex interspecific hybrids and *V.*

[1] Institutul Ştiinţifico-Practic de Horticultură şi Tehnologii Alimentare, Chişinău, Republica Moldova

vinifera seedless varieties from Central Asia were used in breeding and created late hybrids of third and fourth generations, Apiren alb, Apiren roz and Apiren negru de Grozesti, posed relative or advanced resistance to winter conditions and disease and were homologated [3-5]. In addition, some of these varieties were tested for technological processing and were established the possibility for their utilization in production of must, juice, compotes, marinade, jam, raisins and wine [6].

At the same time is necessary continuation of creation of new seedless varieties for local assortment, especially with large bunch and berry, early stage of full maturity of berries, resistant to winter conditions. Presence in Institute's Collection of wide biodiversity of seedless genotypes from diverse viticulture zone of the world is the basis for this progress. Estimation of some of these genotypes are presented in the following.

MATERIAL AND METHODS

Were estimated seedless grapevine varieties growing on experimental plots of Research-and-Practical Institute for Horticulture and Food Technologies (Table 1).

Table 1

Seedless grapevine varieties included in study

Name of genotype	Country of origin	Year of homolo-gation	Berry skin colour	Berry particular flavor	Stage of full maturity of berry
Apiren alb*)	Moldova	2002	green-yellow	none	medium
Apiren negru de Grozeşti*)	Moldova	2005	blue-dark	none	medium
Apiren roz*)	Moldova	2002	rose	special	medium
Apiren roz Basarabean*)	Moldova		rose	none	medium
Apiren roz extratimpuriu*)	Moldova		rose	special	very early
Bessemeannii ghibrid V-6	Bulgaria		green-yellow	none	late
Calina	Romania		rose	none	medium
Centennial seedless	USA		green-yellow	muscat	medium
Flame seedless	USA		rose	none	early
Interlaken	USA		green-yellow	special	very early
Kişmiş lucistîi*) (m)	Moldova	1992	rose	muscat	early
Mecita	Ukraina		rose	none	medium
Perlette	USA		green-yellow	none	early
Ramdas	USA		green-yellow	special	medium
Romulus (m)	USA	2002	green-yellow	special	medium
VIII-1-24	Moldova		red-violet	none	mid late
XI-37-38	Moldova		red-violet	none	late

*) – varieties have Variety Patent

For new created varieties Apiren roz Basarabean and Apiren roz extratimpuriu files are prepared for homologation. Some of other varieties were introduced in collection during the last 10 years. As reference varieties were taken homologated varieties Romulus and Kismis lucistii. For studied genotypes were determined bunch and berry weight. Productivity is estimated by coefficient of absolute and relative fertility (CFA=total number of inflorescence / total number of fertile shoots; CFR= total number of inflorescence / total number of developed shoots). Resistance to winter conditions is estimated by number of lost buds after winter conditions. Also was determined sugar and total acid content in must, carried out organoleptic evaluation.

The applied technological procedures on experimental plots correspond to traditional ones for republic. Description, evaluation of genotypes was effectuated according the general accepted methodology [7]. Statistical treatment was performed with Statistica 6.0 software.

RESULTS AND DISCUTIONS

According the bunch weight (Table 2, Figure 1), can be distinguished two group: from low to medium (Apiren roz timpuriu, Ramdas, Interlaken, Apiren negru de Grozesti, Apiren roz Basarabean and Romulus) and from medium to high weight.

Table 2

Agrotechnologic characters of estimated seedless varieties
(Experimental lots of ISPHTA, 2006-2008)

Name of genotype	Bunch weight, g	Weight of 100 berries, g	Sugar content in must, g/dm^3	CFA	CFR
Apiren alb*)	430,7	209,1	205,5	1,12	0,53
Apiren negru de Grozeşti*)	213,9	150,9	183,0	1,49	1,12
Apiren roz*)	377,4	301,3	189,5	1,28	0,88
Apiren roz Basarabean*)	269,0	150,1	195,5	1,30	0,76
Apiren roz extratimpuriu*)	121,5	127,5	265,0	1,27	0,84
Bessemeannii ghibrid V-6	517,3	450,0	189,5	1,29	0,67
Calina	353,9	194,1	209,0	1,31	0,65
Centennial seedless	328,2	278,3	219,0	1,23	0,71
Flame seedless	382,2	203,2	224,0	1,16	0,62
Interlaken	159,6	159,4	240,5	1,40	0,81
Kişmiş lucistîi*) (m)	315,0	306,6	201,5	1,38	0,67
Mecita	347,4	214,2	198,0	1,30	0,59
Perlette	453,6	177,8	191,0	1,18	0,60
Ramdas	144,8	121,6	188,5	1,39	0,95
Romulus (m)	300,3	146,6	205,0	1,42	1,03
VIII-1-24	416,5	447,6	195,0	1,23	0,63
XI-37-38	811,7	454,9	172,5	1,40	0,98

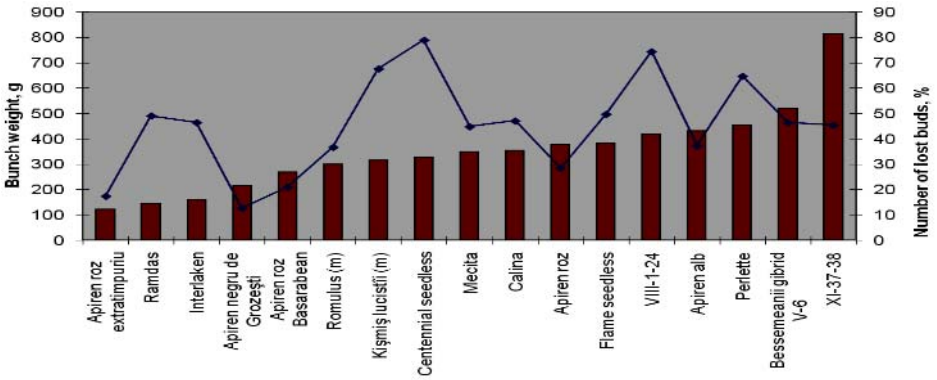


Figure 1. Distribution of genotypes by average bunch weight and number of lost buds

CFA and CFR value denotes presence for all varieties at least of one or more that one bunch on fertile shoot, as well as all shoots of Apiren negru de Grozesti and Romulus

are fertile. Concerning the percent of lost buds after winter conditions (average for 4 years), this value was less than 40% for all new created varieties. Smallest values was for Apiren negru de Groszesti (12,7%) and Apiren roz extratimpuriu (17,4%). There are some varieties with high accumulation of sugar, important for technological processing of berries: Centennial seedless – 219,0 g/dm^3, Interlaken – 240,5 g/dm^3 and Apiren roz extratimpuriu - 265,0 g/dm^3. Application of modern biotechnologies [8, 9] allowed creation, inclusive launch on market, of new seedless varieties with large bunch and berry, but sensible to our winter conditions: Down seedless, Summer royal, Summer muscat, White seedless, Monukka. The program of creation of initial biological material, i.e. pre-breeding program, based on these two groups: sensible with large bunch and berry and resistant with medium berry is in process of development [10].

CONCLUSIONS

1. The grapevine assortment in Republic of Moldova is completed with new seedless varieties with advanced resistance to unfavorable factors of environment.

2. Presence of seedless grapevine genotypes whit large diversity of characters: large, attractive bunch and berry, high quality, advanced resistance to winter conditions allow initiation of pre-breeding programs, as source and basis for future breeding programs.

BIBLIOGRAPHY

1. Report for the world vitivinicultural sector for 2005. http://news.reseau-concept.net/images/oiv_uk/client/Commentaire_Statistiques_2005_EN.pdf
2. Constantinescu Ghe., Indreaş A. Ampelologia soiurilor apirene. Bucureşti, Editura Academiei Republicii Socialiste România, 1976.
3. Savin Gh. Diversitatea resurselor genetice în ameliorarea soiurilor de viţă de vie cu diferit grad de apirenie rezistente la factorii stresogeni. Materialele sesiunii ştiinţifice "Probleme actuale ale geneticii, ameliorării, producerii seminţelor şi a materialului săditor", Chişinău, 27-28 iunie 2002. Buletinul Academiei de Ştiinţe a Moldovei. Ştiinţe biologice, chimice şi agricole. 3(288), 2002, 54-60
4. Savin Gh., Chiriac Gh., Cornea V. New seedless grapevine varieties with resistance to stressful factors of the environment: results and perspectives. Extended abstracts. Proceedings of the 5th International Table Grape Symposium, Somerset West, South Africa, 14 – 16 November 2007.
5. Registrul soiurilor de plante al Republicii Moldova. Chişinău, 2009.
6. Savin Gh., Cornea V., Şleagun Galina, Linda Ludmila, Fedorov S. Cercetări referitoare la utilizarea soiurilor noi de viţă de vie apirene în industria alimentară. Universitatea de ştiinţe agricole şi medicină veterinară „Ion Ionescu de la Brad", Lucrări ştiinţifice. Iaşi. Anul XLVIII – Vol. 1(48). Seria Horticultură. Iaşi, 2005, p. 265-270.
7. Descriptors for grapevines. (Vitis ssp.).– Rome, IPGRI, 1997.
8. Perl A. et al. Conventional and biotechnological approaches in breeding seedless table grapes. ISHS: Acta Horticulturae 528: VII International Symposium on Grapevine Genetics and Breeding. 2000.
9. Vivier M. Grapevine biotechnology: scope and value for viticulture and grape production development. Extended abstracts. Proceedings of the 5th International Table Grape Symposium, Somerset West, South Africa, 14 – 16 November 2007.
10. Chiriac Gh., Smerea S., Savin Gh. Embryo rescue in seedless genotypes. Simpozionul Ştiinţific internaţional „Horticultură: ştiinţă, calitate, diversitate şi armonie". Iaşi, Romania, 23-25 mai 2007, p.99-104

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

RESULTS OBTAINED REGARDING THE INFLUENCE OF INTERNAL SURFACE OF THE PRODUCT ON VITAL - METABOLIC PROCESSES OF GROWTH AND REPRODUCTION OF YEASTS

A. Popa[1]; Lidia Năstasie[2]

KEY WORDS: suspensions, decanting, stimulation, Diatomeae

ABSTRACT

Through the internal surface of the product, that is liable to effervescence, we understand the entire gamma of suspensions which determines the grape must disorder.

On these suspensions, we can put many levens and having the possibility to benefit by a mobile support, they will develop a powerful action of effervescence. On the basis of these finding, I explained why the dirty must fermentate with a higher speed than those that were liable to the decanting action.

INTRODUCTION

The internal surface of the product undergoing fermentation means the whole range of suspension determining the cloudiness of wine.

On these suspensions may be settled a large number of yeasts that having the opportunity to benefit from a mobile support will carry a strong fermentative action.

Based on this finding we could explain why cloudy musts ferment with a higher speed than those that have undergone clarification.

MATERIAL AND METHOD

In order to be able to study the action of the internal surface of the substratum subjected to fermentation on vital - metabolic processes of growth and reproduction of yeasts we used an Italian Riesling grape must with an initial sugar concentration of 196 g / l, which we monitored in five versions: V1 – unclarified; V2-V5- clarified using different methods such as: addition of bentonite and $SO_{2;}$ remain at a low temperature of 4° C for 8 hours; filtration through SKS plates or powder administration of diatoms.

[1] Universitatea din Craiova, Facultatea de Horticultură
[2] Doctorand Universitatea din Craiova

RESULTS OBTAINED

Following the experiments carried out regarding the internal surface of the product undergoing fermentation on vital - metabolic processes of growth and reproduction of yeasts we have observed the following (table 1) :

Table 1

Version	Starting in fermentation after....hours	Duration of fermentation	Obtained alcohol vol%	Sugar remained unfermented
V_1 – non-clarified must 60 mg SO_2/l	4	14	11,52	Traces
V_2 –must clarified after 8 hours, clarification 1 g/l bentonite and 200mg SO_2/l	24	20	11,23	5
V_3 – must clarified after 8 hours of remaining at 4^0C; 60 mg SO_2/l	36	25	11,23	5
V_4 – must clarified after 8 hours of remaining at 4^0C, then filtered through SKS plates; 60 mg SO_2/l	38	26	11,23	5
V_5 - must clarified after 8 hours of remaining at 4^0C, then filtered through SKS plates; administered 0,5 g/l diatoms, 60 mg SO_2/l	20	20	11,35	3

In the case of unclarified must (V1), the yeasts go rapidly in fermentation (after 4 hours), process that lasts only 14 days, the yeasts metabolize all the sugar available and the final alcoholic degree acquired by the must is good (11,52 vol%).

The only problem was the dosage of SO2 used; we chose a dose of 60 mg SO2 / L, so we frame into the dose allowed (50 – 200 mg/l).

We considered this evidence to be a witness and we have related all the other data obtained to the values obtained for V1 version.

In the case of V2 version we have applied to the must for clarification a dose of 200 mg SO2 / L and 1 g / l bentonite (compound responsible for the removal of protein residues). At this rate the yeasts needed 24 hours to enter the fermentation (due to the antiseptic action of SO2), and the process lasted for 20 days. Final alcoholic degree acquired was close to that evidence witness
11,23 vol% alcohol.

For V_3 version – we used for clarification 60 mg SO_2/l but also the effect of low temperatures (4° C). The yeasts entered the fermentation with difficulty (temperature of 4° C inhibits the multiplication process) and needed 25 days to metabolize the substratum. In this case also the final alcohol acquired was of 11,23 vol%.

For V_4 version – we used a procedure of cooling to 4° C followed by the energetic filtration through SKS plates after which we applied a dose of 60 mg SO_2/l. The yeasts entered the fermentation with difficulty only after 38 days and it took them 26 days to finish the fermentative process. Nevertheless, the final alcoholic degree acquired was in this case also of 11,23 vol%.

The last version (V_5) regarded the yeasts conduct when for clarification we used a combined method of cooling, filtering, additon of SO2, but also powder added diatoms. Data obtained in this case were significantly better, the yeasts entered into fermentation after 20 hours and it took them 200 days to finish fermentative process. Alcoholic degree was slightly higher (11.35 vol%) than previous versions.

CONCLUSIONS

- Clarification of musts leads to significant delays in starting the fermentation
- Internal surface of the substratum affects the period of time needed by the yeasts to metabolize the available sugar.
- Using the powder of diatoms in the process of clarification proved to be the best method because the results were similar to those of V_1 version (unclarified must).

BIBLIOGRAPHY

1. Amerine A. M. – 1973 – „Les leains en oenologie". Vignes et vins. Colloque intern. d'Oenol., 150 – anivers. de la naissance de Pasteur, 46 – 52;
2. Anghel I., Vassu T., Segal B., Berzescu P., Herlea V., Dan V., Oancea I. – 1989 – „ "Biology and technology of yeasts". – vol. I; Technical Publishing House, Bucharest ;
3. Anghel I., Vassu T., Segal B., Berzescu P., Herlea V., Dan V., Oancea I. – 1991 – "Biology and technology of yeasts". – vol. II; Technical Publishing House, Bucharest;
4. Belin J. N. – 1981 – „Biologie des levures liées à la vigne et au vin". Thèse Docteur en sciences naturelles, Université de Dijon;
5. Bouryan N. I., Kozlovsky U. V., Rzouvaev V. S. – 1975 – „Influence d!etanol sur la vitesse spécifique de la croissance des levures viniques". Vinodelia I. Vinogra – darstvo, U.R.S.S. nr. 3, 25 – 28, Bull. O. I. V. vol. 28, nr. 533 – 534, p. 698;
6. Castelli T., Rossi I. – 1973 – „L'écologie des levures". Vignes et vins. Nr. spec. 19 – 25, Colloque Intern. D'oenologie 150 anivers. de la naissance de Pasteur;
7. Cordonnier R. – 1980 – „La biochimie du vin". Pour la Science 36, 50 – 64;
8. Cotea D., Valeriu A. – 1985 – „Oenology Treaty" Ceres Publishing House, 261 – 360;
9. Galzy P. – 1973 – „Génétique des levures en oenologie". Vignes et vins. Colloque intern. d'Oenol., 150 – anivers. de la naissance de Pasteur, p. 11 – 18;
10. Kiefer W., Trouast G. – 1968 – „Condition nécessaires á l'obtention des vins de qualité. Influence des différents facteurs naturels et techniques". Raport Natinal de l'Allemagne XII Cong. Intern. de la Vigne et du Vin;

11. Pomohaci N. – 2000 – „Oenologie”. Vol. I, Ceres Publishing House, Bucharest;
12. Pomohaci N. – 2001 – „Oenologie”. Vol. II, Ceres Publishing House, Bucharest;
13. Popa A., Popa Daniela, Dragomir Felicia – 2002 – „ General Microbiology”. Universitaria Publishing House, Craiova;
14. Popa A., Popa Daniela, Dragomir Felicia – 2004 – „ Oenologica Microbiologyl”. Universitaria Publishing House, Craiova;
15. Popa A. – 2005 – „ The miracle of life microorganisms”. Universitaria Publishing House, Craiova;

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

THE NEED OF PROHIBITING CULTIVATION AND THEN LIQUIDATION OF DIRECT PRODUCER HYBRIDS CULTURE IN VITICULTURE

Aurel Popa[1], Elena (Păun) Genoiu, Cornel Dicu

KEY WORDS: direct producer hybrids, areas cultivated.

ABSTRACT

Direct producer hybrids are vine results from crossing and recrossing noble wines with different species of wild wines, usually American in order to achieve some types (varieties) that are producing, and in the same time, are resistant to phylloxera and cryptogrammic diseases.

Vine hybrids can be natural or artificial, as the crossing was made naturally or by human intervention.

Before phylloxera botanical forms in which global wine flora presents it, are mostly hybrid forms. Many vine varieties, especially those planted by human, as noble species, aren't usually pure botanic units, but products resulted from hybridization made by natural factors or variations born of total or partial eterogen.

INTRODUCTION

The instability of the microscopic characters and the frequency of gross mutations in our wines testify and this points that the chromosomal nature of most varieties of vine is constitutionally unstable, heterogeneous and unable to transmit to its descendents the complex characters through seed, in order to give us a pure line.

Natural hybrids have a past of hundreds and thousands of years, unlike there, artificial hybrids have a relatively recent origin.

Material and methods

We are interested in American producer hybrids especially French-American ones called direct hybrids because they can be grown on their own roots to phylloxera and they must be grafted onto rootstocks that meets the quality and grown as such.

Direct producer hybrids have come to the fore after the emergence of phylloxera in Europe, as a simple attempt to restore the wines that were destroyed with hybrids brought from America.

Since this goal was not possible, given the poor quality of the grape harvest and the lack of resistance of these hybrids to cryptogrammic diseases, we have consulted the data contained in the Record of wines from Romania and the Statistical data accumulated over time, reflecting that for our contntry the direct producer hybrids represent a true scourge for the Romanian winemaking, putting it in a very delicate situation to the world winemaking and this could weak the reputation it has earned over time. Romania is well

[1] University of Craiova

known as one of the countries that have the oldest wine making and with a strong reputation in producing white, aromatic and red wines.

RESULTS AND DISCUSSIONS

I. The factors that improve the spread of direct producer hybrids in the culture

The insertion of direct producer hybrids in the culture is difficult to suppose that could be conceived outside the framework of phylloxera problem, although in the fight with diseases and pests of the cultivated plants, primarily the highest hopes are directed to hybridization.

It is understandable that even if phylloxera had not occurred the hybridization system could remain untried for indirect combat of cryptogam diseases in vines. These hybridizations could remain exclusively rooted in noble. The panic produced among the momentary lack of certain solutions for the restoration of vineyards, unknowing the defects discovered later at the direct producer hybrids, the distrust in the effectiveness of combat, means with phylloxera, the growers year that they will not be able to apply those methods – is the complex of causes, which has forced the winemakers to take the first step in accepting direct producer hybrids culture instead direct producer hybrids, other types of factors have prompted their expansion such as:

1. The fight against the cryptogamic diseases:
2. The aggressive advertising, which was among direct producer hybrids by the nursery and the vine traders, in order to ensure a win as easily and as highly possible;
3. The possibility to prepare and to put in trade the red wines, that were so appreciated before disqualified by them;
4. Any innovations coming from abroad are easily accepted in our country;
5. Lower costs for setting up a holding of direct producer hybrids to that of noble vines grafted onto root stock;
6. The extension of the vineyards in the plain, where the lack of native and skilled winemakers in facilitating the propagation of direct producer hybrids;
7. The new appropriation tendency (the Agrarian Reform Law in 1921) of setting the received Cost (the stability of proprieties was more assured to us than the one agriculture properties);
8. The lack of refined tastes of consumers, which very often lead to price parity between noble wines and wines direct producer hybrids;
9. The lack of a strict control of the nursery and the wine traders;
10. The high price of grafted wines;
11. The forging of the wines, for which the products of direct producer hybrids have been searched by traders as low priced raw material, purchased and put to discoloration operations taste, etc, and then released for consumption, giving unexpected earnings;
12. The positive attitude and sometimes undecided or equivocal of our specialists towards direct producer hybrids;
13. The effects of the expansion into the culture of direct producer hybrids.

II. The expansion of direct producer hybrids in our country was made so fast, that for many specialists was a little alarming and partial phenomenon

On one side the rise of the vineyards on which were planted direct producer hybrids has had, as primarily effect, a reverse of numerical ratio between them and on the other side the vineyards planted with grafted vines. In 1929 from 29 major wine-growing

districts of the contry, only in 9 of them the surface of grafted wines is bigger than the ones of direct producer hybrids, and in the other 20 districts, the vines planted with direct producer hybrids beat the surface of grafted vines (46,03% Noble vines towards grafted vines, when it comes of young plantations. The farm that this rated multiplication of direct producer hybrids by a continues curse worsening of viticulture in Romania, however, registering a certain improvement in the period 1975-1999 (Tab. 1).

The report of the areas occupied with grafted plantations, on their own roots and direct producer hybrids in Romania (ha)
(After Statistical Year book of Romania and the Ministry of Agriculture)

Tab. 1

Year	Total vine area	Vines on own roots	Grafted vines	Direct producer hybrids wines
1880	137176	137176	-	-
1909	73977	63224	10753	-
1914	71467	39992	31475	-
1924	210034	105086	104948	-
1927	239865	38222	107892	93751
1933	273195	27254	105626	140315
1937	365429	26118	120590	218721
1948	220000	-	123200	96800
1955	228200	-	115400	112800
1965	207700	-	100300	107400
1975	295700	-	180500	115200
1980	259100	-	166300	92800
1990	223700	-	161100	62600
1995	212850	-	102800	110000
2001	244400	-	122300	122100
2007	189700	-	98100	91600

The beginning was made by totally compromising red wines that in a few years after the appearance of hybrids, they have last their centuries / old reputation from being almost impolitely removed from commerce. The will know species as: Rara neagra, Seina, Negru vartos, Feteasca neagra. Today are almost forgotten (G. Constantinescu, 1932).

It tack a long time (cca. 40 years) until consumers, have revalued red wines (not local varieties) and have given them a prominent place, where they were placed by the past through multimillenary assessments (Aurel Popa, 2008).

After the devaluation of wines it followed the degeneration of the consumer's tastes. The invasion of vines by direct producer hybrids through the places of consummation and even more, the fluctuation of those wines had the talent to confuse the public, because it didn't have anymore an orientation source.

Well qualified wines between 1930-1950 are sought less and less, their oldness is not any longer convenient, because the price differences towards the current wines are to law in order to cover all expenses that requires conservation.

The old situation when the wine was leading the consumers tastes and the skills gained in time is now dislocated, so that in this period even the mart skilled traders are had by the torrent of improper tastes and forced to follow them.

But the harm doesn't stop here. The overproduction came along with the most intensive wine falsification (1935-1948). Both are a results direct producer hybrids extension.

"The wave of red juice that flows in the felt below the fact of the plain peasant, from direct producer grapes on one side and the chemical tricks charged in tavern and restaurant cellars on the other hand, have made from Romanian the fourth vine country from the world and to be made unable to send abroad some wagons of wine or what is more sad, not to offer consumers an absolutely natural, hygienic and healthy country wine. And in the some time the native winemakers are groaning under the arises weight, was austerity is redoubled by the problem of direct producer hybrids and vineyards with famous historical existence is threatened (I.C.Teodorescu, 1928).

The determined intervention of the researchers (I.C.Teodorescu, 1930) sprang from the great care they had for the national vineyards, has made the Law for detaining the plantations of vines with direct producer hybrids to be vested by the Assembly of Deputies of the meeting of fume the 4th 1930, promulgated by the High Legal Decree no.2345 of June, the 26th 1930 and published in the Journal nr. 141, P.I. on 28th of June 1930.

It is estimated correctly that our country, particularly with its favorable climatic conditions for the culture of noble vines, with its urgent needs to fit among wine exporting states, it is shown to be the least hospitable to direct producer hybrids.

Only after the World War II, especially after 1970, the areas planted with direct producer hybrids have started to fail to prevail, as a result of state interventions to rehabilitate Romanian viticulture and to include Romania among the countries exporting quality wines.

We record a new explosion in areas under direct producer hybrids after 1990 (Tab.2), as a result of private property reconstruction also in viticulture.

The measures taken by the Romanian state for accession to the European Community, and particularly after the accession to this Community, led to radical changes in Romanian viticulture. Areas with direct producer hybrids are restricted (Tab.3) and modern holdings with high profitability appear.

There are still large areas occupied by the direct producer hybrids producers which, although it prohibited the sale, for consumption is consumed (it is the subject to domestic consumption and also to the free trade that doesn't subject to legal regulations). As a result, quality viticulture suffers, and its domestic consumption is reduced by at least 45-50% (Tab.2).

III. The prohibition and abolition necessity of the culture of direct producer hybrids in viticulture

Observations, systematic studies made over the last 100 years in all major viticultural countries, but also in Romania, led strongly to the conclusion that the direct producer hybrids should be limited in culture and even liquidated because they don't provide quality wines (including direct producer hybrids of the new generation).

The biggest shortcoming of the direct producer hybrids is the inferiority of their products in terms of quality. Foxed grassy taste, specific to all direct producer hybrids is even more pronounced as they have sufficient resistance to phylloxera and cryptogamic diseases.

The fox's taste of direct producer hybrids in our country is much more pronounced due to weather conditions. This taste is the affect of the malvinas content (diglicozidul de malvidina) that is high in the case of direct producer hybrids grapes.

The difference in quality between direct producer hybrids and noble vines is enormous, since in France nobody, until now, has dared to say a single word of plea for hybrids for the famous wine regions as: Burgundy, Champagne, and Bordeaux.

The French cult for the assortment of these vineyards stands as the Chinese wall against the hybrids (Nicolae Constantinov, 1932), Romania, where direct producer hybrids haven't reached the areas with great quality vocations, but remained in the lowland areas.

Another defect of direct producer hybrids refers to the degeneration of varieties, which was demonstrated by the most advocate and valuable hybridofils.

After only 8 years SEIBL 1020, considerate the king of direct producer hybrids ceases its intensity the immunity against cryptogamic diseases, the regular production.

Grapes of direct producer hybrids provide a small percentage of must; beans have a larger number of seeds the grains skin thickness is exaggerated, mature beans shook slightly from the stem.

As a consequence of the high percentage of grain skin, the wines have a high content of methyl alcohol product with negative influences on the optic nerve.

Acidity of must and wine from many direct producers, in particular the blood of Rupestris hybrids is very low, which makes the color maintenance and the wine aging very difficult.

Direct producer hybrids resistance to phylloxera is so weak that we can not cultivate them safely if they aren't grafted.

The resistance to cryptogamic diseases is sufficient to ordinary varieties, but totally insufficient to the better varieties.

The resistance to frost is also insufficient so creating direct producer hybrids in order to save the vines from phylloxera attack and cryptogamic diseases resulted in a notable failure.

CONCLUSIONS

1. After a century we are fully convinced that the direct producer hybrids remain in the history of Romanian and European viticulture as sad memory pages;
2. Now in the world is an overproduction of quality wines for the ones of domestic consumption is difficult to find a place on the market. Of course it's about the wines that are resulted from noble vines;
3. Keeping wine consumption at high rates, compared to other competing products (beer, distilled beverages, etc) can be achieved only with high quality wines;
4. For Romanian viticulture to earn the prominent place it deserves we have to forbid and then, to liquidate the direct producer hybrids from the culture;
5. Prohibition and then liquidation of direct producer hybrids from the culture, must be supported by state regulations and incentives for noble vines growers (different taxes, subsidies rooted planting material of noble and preparation of the soil for planting noble vines, establishing a strict control on direct producer hybrids wines transabilite.
6. Providing until liquidation a direct producer hybrids wine value through industrialization (vinegar, distillation, etc).
7. The producers of quality wines from noble varieties should provide, especially for domestic consumption, affordable wines.

BIBLIOGRAPHY

1. Constantinescu Gherasim, Problema hibrizilor producători direcți în România, 1932.
2. Popa Aurel, Secretul vinului bun, Editura Alma, Craiova, 2008.
3. Teodorescu I.C., Producția şi importul viţelor în România, Buletin Internațional D'Agriculture, Roma, 1928.

The areas and production development in viticulture 1990-2007

Tab. 2

No	Specification	UM	1990	1991	1992	1993	1994	1995	1996	1997
1	Vines per harvest	Mii ha	223.7	225.3	235.4	245	246.9	248.8	251.8	251.7
		Kg/ha	4266	37766	3846	5466	4183	5281	5685	4684
		Mii to	954	848.5	905.4	1339.2	1032.7	1313.9	1431.4	1179
2	Noble vines per harvest	Mii ha	161.1	159.3	161.5	158.9	149.7	146	141.8	137.7
		Kg/ha	4402	4012	3934	5735	3912	5766	6273	5074
		Mii to	709.1	639.2	635.4	911.3	585..7	841.8	889.5	698.7
3	Noble vines for wine	Mii ha	135.2	136.1	139	135.7	127.5	123.2	119.9	117.9
		Kg/ha	4282	3887	3829	5664	3919	5695	6169	4928
		Mii to	579	529	532.3	768.6	499.7	701.6	739.7	581
4	Vines for grape consumption	Mii ha	25.9	23.2	22.5	23.2	22.2	22.8	21.9	19.8
		Kg/ha	5023	4750	4582	6150	3963	6150	6840	5945
		Mii to	130.1	110.2	103.1	142.7	88	140.2	149.8	117.7
5	Hybride vines per harvest	Mii ha	62.6	66	73.9	86.1	97.2	102.8	110	114
		Kg/ha	3912	3171	3653	4970	4599	4592	4926	4213
		Mii to	244.9	209.3	270	427.9	447	472.1	541.9	480.3
6	Total wine production	Mii hl	5887	5925	6140	6231	6335	6721	7600	6690
No	**Specification**	**UM**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
1	Vines per harvest	Mii ha	247.5	244.4	233.1	223.1	191.8	190.5	189.7	188.6
		Kg/ha	5213	4568	4599	4802	5529	2530	5015	5954
		Mii to	1290.3	1116.5	1072	1071.2	1060.5	482.1	951.1	1122.9
2	Noble vines per harvest	Mii ha	128.5	122.3	116.6	111.9	102.8	98.1	98.1	96.2
		Kg/ha	5968	4991	5214	4876	6209	2762	5619	8102
		Mii to	766.9	610.3	608	545.4	638.3	271	551.3	779.4
3	Noble vines for wine	Mii ha	110.8	105.7	101.5	98.4	89.4	85.3	85.5	84.7
		Kg/ha	5857	4896	5074	4883	6050	2716	5664	8245
		Mii to	649	517.5	515	480.5	541	231.7	484.3	698.4
4	Vines for grape consumption	Mii ha	17.7	16.6	15.1	13.5	13.4	12.8	12.6	11.5
		Kg/ha	6661	5590	6159	4801	7260	3070	5317	7043

		Mii to	117.9	92.8	93	64.9	97.3	39.3	67	81
5	Hybride vines per harvest	Mii ha	119	122.1	116.5	111.2	89	92.4	91.6	92.4
		Kg/ha	4398	4147	3983	4727	4744	2284	4364	3717
		Mii to	523.4	506.2	464	525.8	4222.2	211.1	399.8	343.5
6	Total wine production	Mii hl	5453	5090	5461	5555	6166	2602	5014	5289

The hybride vine area per harvest and the grape production in 2007

Tab. 3

No.	Area	Hybrids vine area per harvest - ha	From which white	Interspecific hybrids	From which white	Vobidden HPD	From which white
1	Alba	528.00	368.00	0.00	0.00	528.00	368.00
2	Arad	223.00	173.00	223.00	173.00	0.00	0.00
3	Arges	255.18	133.00	23.44	23.44	231.00	110.00
4	Bacau	3450.00	2765.00	20.00	15.00	3430.00	2750.00
5	Bihor	1480	525.00	53.00	15.00	1427.00	510.00
6	Bistrita	272.00	272.00	252.00	252.00	20.00	20.00
7	Botosani	1608.003.00	1608.00	1070.00	1070.00	538.00	538.00
8	Brasov	3797.97	0.00	0.00	0.00	3.00	0.00
9	Braila	6183.00	133.19	3797.97	133.00	0.00	0.00
10	Buzau	206.00	340.00	6183.00	340.00	0.00	0.00
11	Caras Severin	3785.20	110.00	0.00	0.00	206.00	110.00
12	Calarasi	38.00	900.00	3785.20	900.00	0.00	0.00
13	Cluj Napoca	1219.00	10.00	38.00	10.00	0.00	0.00
14	Constanta	302.00	0.00	1219.00	0.00	0.00	0.00
15	Dambovita	8493.00	56.00	287.00	54.00	15.00	2.00
16	Dolj	6777.00	2488.00	8281.00	2325.00	212.00	163.00
17	Galati	3550.00	1807.00	5694.00	952.00	1083.00	882.00
18	Giurgiu	3856.00	0.00	3550.00	0.00	0.00	0.00
19	Gorj	35.00	2653.00	0.00	0.00	3856.00	2653.00
20	Harghita	7.00	25.00	7.00	7.00	28.00	18.00
21	Hunedoara	4114.00	0.00	7.00	0.00	0.00	0.00
22	Ialomita	4193.71	454.00	4114.00	454.00	0.00	0.00
23	Iasi	1486.00	3273.00	1550.00	1165.00	2643.00	2108.00
24	Ilfov	242.00	0.00	575.00	0.00	911.00	0.00
25	Maramures	3891.00	13.00	0.00	0.00	242.00	13.00
26	Mehedinti	273.00	707.00	3771.00	683.00	120.00	24.00
27	Mures	547.00	193.00	0.00	0.00	273.00	193.00
28	Neamt	5332.00	547.00	0.00	0.00	547.00	547.00
29	Olt	1058.00	1800.00	5332.00	1800.00	0.00	0.00
30	Prahova	3314.00	520.00	1058.00	520.00	0.00	0.00
31	Satu Mare	1695.00	2100.00	2500.00	1800.00	814.00	300.00
32	Salaj	325.00	892.00	174.00	174.00	1524.00	718.00
33	Sibiu	7183.00	325.00	0.00	0.00	325.00	325.00
34	Teleorman	140.00	0.00	7183.00	0.00	0.00	0.00
35	Timis	2231.00	60.00	140.00	60.00	0.00	0.00
36	Tulcea	6956.00	1090.00	2231.00	1090.00	0.00	0.00
37	Vaslui	1683.00	3329.00	164.00	15.00	6792.00	3314.00
38	Valcea	2756.00	0.00	0.00	0.00	1683.00	0.00
39	Vrancea	7.00	1024.00	2756.00	1024.00	0.00	0.00
40	Mun.Bucuresti		2.00	7.00	2.00	0.00	0.00
Total		93495.06	30695.63	66045.61	15029.63	27449.45	15666.00

No.	Area	Total products t	From which white	Interspecific hybrids	Interspecific hybrids	Vobidden HPD	From which white
1	Alba	1948.00	1358.00	0.00	0.00	1948.00	1358.00
2	Arad	1144.00	887.00	114.00	887.00	0.00	0.00
3	Arges	950.00	510.00	103.00	103.00	847.00	407.00
4	Bacau	16417.00	13396.00	95.00	78.00	16322.00	13318.00
5	Bihor	8140.00	2871.00	320.00	81.00	7820.00	2790.00
6	Bistrita	816.00	816.00	756.00	756.00	60.00	60.00
7	Botosani	7268.00	7268.00	4909.00	4909.00	2359.00	2359.00
8	Brasov	1.00	0.00	0.00	0.00	1.00	0.00
9	Braila	15192.00	533.00	15192.00	533.00	0.00	0.00
10	Buzau	21640.00	1190.00	21640.00	1190.00	0.00	0.00
11	Caras Severin	614.00	314.00	0.00	0.00	614.00	314.00
12	Calarasi	10345.00	2168.00	10345.00	2168.00	0.00	0.00
13	Cluj Napoca	134.00	35.00	134.00	35.00	0.00	0.00
14	Constanta	1852.00	0.00	1852.00	0.00	0.00	0.00
15	Dambovita	1669.00	309.00	1586.00	298.00	83.00	11.00
16	Dolj	30518.00	7517.00	29755.00	6932.00	763.00	585.00
17	Galati	28102.00	7686.00	23987.00	4864.00	4115.00	2822.00
18	Giurgiu	15017.00	0.00	15017.00	0.00	0.00	0.00
19	Gorj	14601.00	10045.00	0.00	0.00	14601.00	10045.00
20	Harghita	139.00	99.00	28.00	28.00	111.00	71.00
21	Hunedoara	60.00	0.00	60.00	0.00	0.00	0.00
22	Ialomita	9269.00	1020.00	9269.00	1020.00	0.00	0.00
23	Iasi	14526.00	11337.00	5368.00	4035.00	9157.00	7302.00
24	Ilfov	4432.00	0.00	1715.00	0.00	2717.00	0.00
25	Maramures	573.00	26.00	0.00	0.00	573.00	87.00
26	Mehedinti	13992.00	2545.00	13575.00	2458.00	417.00	780.00
27	Mures	1098.00	780.00	0.00	0.00	1098.00	3180.00
28	Neamt	3180.00	3180.00	0.00	0.00	3180.00	0.00
29	Olt	20824.00	7029.00	20824.00	7029.00	0.00	0.00
30	Prahova	4623.00	2272.00	4623.00	2272.00	0.00	360.00
31	Satu Mare	3976.00	2520.00	3000.00	2160.00	976.00	3446.00
32	Salaj	8119.00	4264.00	818.00	818.00	7301.00	1520.00
33	Sibiu	1520.00	1520.00	0.00	0.00	1520.00	0.00
34	Teleorman	9097.00	0.00	9097.00	0.00	0.00	0.00
35	Timis	336.00	144.00	336.00	144.00	0.00	0.00
36	Tulcea	7082.00	3283.00	7082.00	3283.00	0.00	17232.00
37	Vaslui	36315.00	17310.00	820.00	78.00	35495.00	0.00
38	Valcea	12768.00	0.00	0.00	0.00	12768.00	0.00
39	Vrancea	16536.00	6144.00	16536.00	6144.00	0.00	0.00
40	Mun.Bucuresti	17.00	4.00	17.00	4.00	0.00	0.00
Total		344850.00	120380.30	220003.80	52307.30	124846.20	68073.00

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✔*Biologie*
✔*Horticultură*
✔*Tehnologia prelucrării produselor agricole*
✔*Ingineria mediului*

Vol. XIV (XLX) - 2009

THE MICROBIOLOGICAL QUALITY OF WATER USED IN BAKERY INDUSTRY IN DOLJ COUNTY

Popa Aurel[1], Calutu Mirela[2]

KEY WORDS: water quality, microbiological parameters, HACCP system.

ABSTRACT

The quality of water used in the production of bread and bakery products must be drinking water quality. This property is ensured through compliance with quality parameters, which are microbiological and physical-chemical. To determine the microbiological quality of water from various sources, used by bakery units industry in Dolj County, have taken 50 samples of water from units located in rural and urban area. Analysis of the laboratory results indicated that the microbiological quality of water is not totally respected, 66.66 percentage of private water sources (wells) situated in rural areas had an improper microbiological quality. Unfortunately, it is used in food industry without an appropriate treatment. Water quality has an impact on food quality and safety, which is transferred on finished product. Also it can be concluded that water, in generally, suffers a deterioration of its quality, especially from the microbiological point of view.

INTRODUCTION

Food producers and processors require a framework based upon sound science that permits them to assess the potential for optimizing water use and to determine the potential impact of using different levels of water quality on their businesses. The availability of adequate freshwater resources, in both quantity and quality, is vital to food safety and production. It plays an important role in bakery industry as an ingredient and hygiene aid. The food industry must address the future trends relating to this resource and move towards increasing efficiency in water use. Improper use of water from the potability viewpoint may prejudice by chemical and/or microbiological contamination. Thus, regarding the water use by units of bakery, a distinction must be made between safety aspects and quality aspects. Water quality is situated at the crossing between the two features which equally contribute to the product's quality, but especially to its safety. The third edition of the WHO Guidelines for drinking water quality set microbial and chemical quality targets for potable water and which are updated annually.

MATERIALS AND METHOD

To determine the microbiological parameters of the water used in the bread and bakery industry in Dolj County, it was taken samples of water from the different water

[1] University of Craiova
[2] Sanitary Veterinary and Food Safety Direction

sources used by various bakeries from Dolj County. The water samples were taken from both, rural and urban area. These samples were monitored by the Department of Food Safety of Sanitary Veterinary and Food Safety Division, Dolj County, and executed at the corresponding laboratory. The Sanitary Veterinary Laboratory of Dolj County is in the full process of accreditation and uses to determine the microbiological parameters of water the specifications stipulated by Law no. 458/2002 of the quality of drinking water. Thus, for determinations of microbiological parameters, like the presence of E. coli in water (ISO 9308-1:2004) the method performed was membrane filtration, followed by anaerobic incubation on agar m-PC at $44^0C \pm 1^0C$, for 21 ± 3 hours. Colonies are opaque-yellow that turns in pink or red after exposure to fumes of ammonium hydroxide for 20-30 seconds. For the enumeration of culturable micro-organisms- colony count by inoculation in a nutrient agar culture medium, according with ISO 6222:2004. This European Standard specifies a method for the enumeration of culturable micro-organisms in water by counting the colonies formed in a nutrient agar culture medium after aerobic incubation al 36^0 C and 22^0 C. Inoculation was made by mixing with a specified medium in Petri dishes, measured volumes of the samples or dilutions of the sample. Incubation of one set of plates was made at 36^0 C for 44 h, and another set at 22 ^{0} C for 68 h. The plates were examined as soon as they are removed from incubators [3]. Calculation of the number of colony-forming units (cfu) per milliliter of the sample from the number of colonies formed in the medium. The method is intended to measure the operational efficiency of the treatment process of public drinking water supplies and for general application to all types of water. It is particularly applicable to the examination of water intended for human consumption.

Currently, water in the food industry is often classified as either potable or nonpotable, with most legislation simply requiring the use of potable water with little consideration of the application. It would seem logical to modify this classification to include a category that considers “suitability for intended use” to allow for the use of water of appropriate quality for a particular application. However, determining suitability for intended use needs to be based on accepted risk assessment criteria for chemical and microbiological hazards, and to be compatible with HACCP principles.

Table 1

Microbiological quality of water used in bakery industry

Nr. Crt.	Total number of water samples from different sources (50 samples)			
1.	Private supply – samples from rural area		Public supply – samples from urban area	
2.	18		32	
3.	Results:		Results:	
4.	Proper samples	Improper samples	Proper samples	Impropersamples
5.	6	12	31	1
Percentage	(33,33 %)	(66,66 %)	(96,8 %)	(3,125 %)

RESULTS AND DISCUSSION

The three main sources of water for the food industry are treated municipal supply, ground water and surface water. Two of the most significant microbiological safety hazards are contamination of source water and of supply systems subsequent to treatment, by sewage and animal manure. This is usually detected by the presence of E. coli, which is also used as a mean of checking the quality of the final water.

The amount of water used in the preparation of the dough depends on the dough consistency of leaven, a very important parameter. The leaven consistency has influence on the rate processes of the dough and, consequently, of the quality of bread. It is estimated that most defective bread consistency errors are due to the dough and its phases. The amount of water used in the preparation of the dough depends on the quality and moisture extraction flour and quality of the ingredients from dough

From the physical-chemical point of view, the hardness of water has an important role. Salts of calcium and magnesium form this hardness, which has a positive action in terms of weak gluten. It is preferable to use medium hardness water (5-10 degrees hardness) but also with high hardness (10-20 degrees hardness) (1). The very high hardness (above 20 degrees) has a negative impact for the quality of dough, in this case it is recommended the use of treated water, by decalcification.

In terms of microbiological quality, water should be devoid of microorganisms, parasites or substances which by number or its concentration may be a potential hazard to human health. Microbiological parameters are represented by the number of colonies at 37^0C (20 colonies/ml), enterococcus (Streptococcus faecali/100 ml) and Escherichia coli (0/1000 ml). Increasingly wide range of the assortments of bakery and bread improved the image of these kinds of products in the daily diet. Whatever would be the choice, bread manufacture involves the same raw materials: flour, water, yeast and salt. Determinations of raw and auxiliary materials are designed to obtain ownership of dough rheological optimal composition to the finished product. Water is a major component of bread dough, participating in their production by hydration of flour particles, especially the gluten proteins (1). According to the Law no. 458/2002 of the quality of drinking water, the water used in food processing for the manufacture, preservation or marketing of products for human consumption must have the quality of drinking water.

The "potability" of water, or requirement for drinking water quality, is normally encompassed in legislation covering critical chemical, physical and microbiological standards, although there can be significant variations in the number and levels of chemical parameters. Most do not have specific values associated with pathogens and rely on the principle of indicator organisms, particularly E. coli. It is also important to be aware of the basis for a particular standard, as not all standards are health-based and there may political or technical considerations. WHO has also introduced the concept of Water Safety Plans (WSPs), which are adapted from HACCP and require that the hazards are identified and the appropriate barriers are put in place to ameliorate the risks (4). In the case of microbial contaminants, the reliance on indicator organisms does not provide a mean of ensuring the safety of a water supply since pathogens, such as Cryptosporidium, may still be present in the absence of indicators if the final barrier, often chlorine, is insufficient to kill the oocysts (2).

CONCLUSIONS

Water resources, particularly those in groundwater aquiferous present a greater risk of pollution. This risk is converted into direct consequence of only being used as sources of drinking water. Phreatic pollution is an acute phenomenon, which is continuous and irreversible. The data presented reveal a worsening trend of the quality of the water sources, especially those located in rural areas. It may be noted that in rural areas we can find the most intense depreciation of the quality of water sources.

Results of laboratory analysis indicate that the microbiological quality of water is not totally accomplished, 66.66% of water sources from own sources (wells) in rural areas

have the quality microbiological improper. The microbiological quality of water from public supply was comply with the requirements in 96,8 % from cases (31 proper samples from 32 determinated samples) (Table 1). Also, it can be concluded that water suffers a deterioration of its quality, especially from the microbiological point of view. Unfortunately, it is used in food without an appropriate treatment. This has an impact on food quality and safety of its finished product.

This implies that an adequate monitoring and verification system must be in place to demonstrate that control of the quality of water coming into the process, whether it is from the public water supply or a private water supply, has been achieved at all times. It would be stressing, however, that all requirements for microbiological monitoring and verification must be derived from the HACCP study. Ideally, monitoring should not be based solely on microbiological testing, as this is frequently retrospective, but should also include the measurement of physical/chemical parameters.

REFERENCES

1. Banu C., coord. Manualul inginerului de industria alimentară. Editura Tehnică, Bucureşti, 2002;
2. Fawell, J., Nieuwenhuijsen, M. J. – Contaminants in drinking water, British medical Bulletin 68:199-208, Oxford University Press., 2003;
3. SR EN ISO 6222:2004 – Water Quality –. Enumeration of culturable micro-organisms-Colony count by inoculation in a nutrient agar culture medium;
4. World Health Organization, Guidelines for Drinking-Water Quality, Third Edition, Volume 1, Recommendations, WHO, Geneva.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✔*Biologie*
✔*Horticultură*
✔*Tehnologia prelucrării produselor agricole*
✔*Ingineria mediului*

Vol. XIV (XLX) - 2009

STUDY CONCERNING CLIMATIC FACTORS AND GRAPE PRODUCTION IN THE HILLY AREA OF BUJORU VINEYARD

Agatha Popescu[1], Viorica Enache[2], Cristina Simion[2], Alina Donici[2], Gabriel Tabăranu[2]

KEY WORDS: climatic factors , grape production, Bujoru hills

ABSTRACT

The paper aimed to evaluate the level of 22 major climatic factors , grape yield and grape production of 11 vine types both for red and white wine grapes and table grapes (White Feteasca, Royal Feteasca, Aligote , Sarba, Cabernet Sauvignon , Merlot , Black Babeasca, Black Feteasca , Chasselas Dore, Hamburg Muscat and Black selected Coarna) at Bujoru Vineyard in the years 2007 and 2008 . The change of climatic factors and grape production level from a year to another was estimated based on Index Method,Gain Method, Share Method and Comparison Method and also Point Method was used in order to establish the vine type hierarchization.The year 2008 registered lower rainfalls but relatively higher temperatures with a deep influence on grape yield which has recorded a higher level compared to the year 2007.

INTRODUCTION

Climate change has a deep impact upon production and agroecosystems. Growing areas , grape yield , grape quality and efficiency in viticulture vary from a year to another according to the level of the climatic factors. In the coming 30 years , it is expected as the average temperature in Europe to increase by 2.04 – 4.5 ºC in summer season and by 3.5 ºC - 6 ºC in winter season with a strong influence upon the traditional limits of Vine growing , phenological phases, grape yield and quality and costs .Researchers are looking for solutions to monitorize viticulture so that grape and wine market not to be affected too deeply. In this context, the aim of this paper is to analyze the evolution of the climatic factors and grape production in the year 2008 compared to the level registerd in the year 2007 at the well known Bujoru Research and Development Station, Galatzi County, Romania. This research work was run within a partneship project destined to evaluate the impact of global climate change upon the viticultural ecosystems from the hilly areas.

MATERIAL AND METHOD

The experiments were carried out at the Bujoru Research and Development Station, Galatzi County , which is situated in the Eastern part of Romania in a well known hilly area suitable for vine growing. A number of 11 vine types, cultivated on 148 ha surface have been used as follows: White Feteasca 49 ha, Royal Feteasca 12 ha, Aligote 17

[1] University of Agricultural Sciences and Veterinary Medicine Bucharest, Romania
[2] Bujoru Research And Development Station for Viticulture and Vinification, Galatzi County , Romania

ha, Sarba 11 ha for white wine grapes, Cabernet Sauvignon 5 ha, Merlot 14 ha, Black Babeasca 12 ha, Black Feteasca 1 ha for red wine grapes, Chasselas Dore: 17 ha for white table grapes, Hamburg Muscat 6 ha and Black selected Coarna 4 ha for red table grapes. The soil characteristics are: specific weight 2.65 g/cubic cm, total porosity 54.8 %, air porosity 28.5 %, hygroscopic coefficient 3.43 %, whithering coefficient 611 m^3/ha, field capacity 2,615 m^3/ha, total capacity 6,083 m^3/ha, volumetric weight 1.19 g /cm^3.

The following 22 climatic factors were analyzed: global, active and useful thermic balance, annual rainfalls and also during the vegetation period , annual average temperature and also average temperature in July, August and September, air minimum temperature, maximum average in August, average temperature in the 1st and 2nd decade of June , wind speed, air moisture, nebulousness, the number of days with maximum temperatures, the length of bioactive period, the real heliothermic index, hydrothermic index, the bioclimate index of vine and oenoclimatic index.

The level of climatic factors as well as grape yield and grape production were compared in the years 2008 and 2007. The levels registered in the year 2007 were considered the Control variant (C) and the levels recorded in the year 2008 were considered the Experimental variant (E).

The modern methodology was used as follows: ***Index Method***, in order to calculate the individual indices of 22 climate factors, according to the formula: $R_i = XC_i/XB_i$, where: i=1,…,22; if $R_i > 1$, i factor is increasing ; if $R_i < 1$, i factor is decreasing and if $R_i = 1$, the i factor is constant; ***Gain Method*** , based on the formula: $S_i = R_i - 1$, where S_i = the gain of the i climate factor and R_i as mentioned above; if $S_i > 1$, i factor is increasing; if $S_i < 1$, i factor is decreasing and if $S_i = 1$, the i factor is constant ; ***Share Method***, based on the formula : $P_i = |S_i| * 100 / \Sigma |S_i|$, where P_i = the weight of the climate factor and S_i as mentioned above; ***Point Method*** for ranking the vine types and ***Comparison Method*** for setting up the economical analysis in grape production and identifying the change from a year to another.

RESULTS AND DISCUSSIONS

Climatic Factors. In general, in the year 2008, less rainfals and relatively higher temperatures have been noticed . More exactely, the thermic balance, average annual temperature and also temperature in the month of August, the air minimum temperature and the average maximum temperature in August, wind speed, air relative humidity and the bioclimatic index have increased in 2008 compared to 2007. The hierarchy of the climate factors in the decreasing order of their 2008 level has been the following one: annual rainfalls, wind speed, the number of days with temperatures higher than 30 °C, average temperature in July and the 1st and 2nd decades of June, hydrothermic index, rainfalls during the vegetation period and heliothermic index. In 2008, the rainfalls registered 285.7 mm by 50 % less than in 2007. The sunstroke counted for 1,332.7 hours compared to 1,477.4 hours in 2007. The average temperature in July was 24 °C compared to 28.1 °C in 2007. The averages temperature was 25.9 °C in August and 17.1 °C in September . The minimum temperature was – 14.5 °C in 2008 compared to 13 °C in 2007. The number of days with temperatures higher than 30 °C was 52 compared to 66 in 2007. The bioactive period has ranged between 177-178 days. The heliothermic index was 250 compared to 275 in 2007. The hydrothermic index was 0.6 compared to 0.6 in 2007. The bioclimatic coefficient was 11.8 to 11.5 in 2007 and the oenoclimatic coefficient was 2

Table 1

Climatic factors in the years 2007 and 2008 in the Bujoru Hilly area

	C 2007	E 2008	E - C	Individual Index	Gain S_i	Share P_i
Global thermic balance (Σt°g)	3,671.5	3,694.9	+23.4	1.006	0.64	0.303
Active thermic balance (Σt°a)	3,618.3	3,645.3	+27	1.007	0.75	0.355
Useful thermic balance (Σt°u)	1,858.3	1,875.3	+17	1.009	0.91	0.431
Σ annual rainfalls (mm)	554.4	285.7	- 268.7	0.515	-48.47	22.948
Σ rainfalls during the vegetation period(mm)	254.5	224.8	-29.7	0.883	11.47	5.525
Σ sunstroke hours during the vegetation period	1,477.4	1,332.7	-144.7	0.902	9.79	4.635
Average annual temperature, °C	13.5	13.4	-0.1	1.037	3.70	1.752
Average temperature in July, °C	28.1	24.0	- 4.1	0.854	-14.59	6.907
Average temperature in August, °C	25.5	25.9	+0.4	1.015	1.57	0.743
Average temperature in September, °C	17.4	17.1	-0.3	0.982	-1.72	0.814
Air Minimum temperature, °C	-13.0	-14.5	+1.5	1.110	7.41	3.508
Maximum average temperature in August,°C	30.6	32.0	+1.4	1.045	4.58	2.168
Average temperature in the 1st and 2n decades of June	25.2	21.9	-3.3	0.869	-13.10	6.020
Wind speed (km/hours)	2.3	-	-	1.304	30.43	14.407
Air relative humidity (%)	57	-	-	1.052	5.26	2.490
Nebulousness	5.6		-	1.071	7.14	3.380
Number of days with maximum temperatures > 30 °C	66	52	-14	0.787	-21.21	10.042
The length of bioactive period, days	178	177	-1	0.994	-0.56	0.265
The real heliothermic index	2.75	2.50	-0.25	0.909	-9.09	4.304
Hydrothermic coefficient	0.7	0.6	-0.1	0.857	-14.29	67.65
Bioclimatic index	11.5	11.8	+0.3	1.026	2.61	1.236
Oenoclimatic index	5,091.2	5,003.2	-88	0.982	-1.73	0.819
					$\Sigma \mid S_i \mid =$ 211,22	100.00

Grape Yield was higher in the year 2008 compared to the year 2007 for all the vine types, varying between 13,188 kg/ha for Royal Feteasca and 7,547 kg/ha for Black Babeasca, reflecting a favorable influence of the climatic factors. In order, the vine type ranking in 2008 was the following one : Royal Feteasca, Chasselas Dore, Hamburg Muscat, Black selected Coarna, Merlot, White Feteasca, Aligote, Black Feteasca, Cabernet Sauvignon and Black Babeasca (Fig .1).

Grape Production was influenced by grape yield, but also by cultivated area for each vine type. Grape production was higher in 2008 compared to 2007 and varied between 406,700 kg for White Feteasca and 8,000 kg for Black Feteasca. Related to this aspect, the decreasing order of the vine types was White Feteasca , Chasselas Dore, Royal Feteasca , Aligote, Sarba, Merlot, Black Babeasca, Hamburg Muscat, Cabernet Sauvignon, Black Coarna and Black Feteasca (Fig.2).

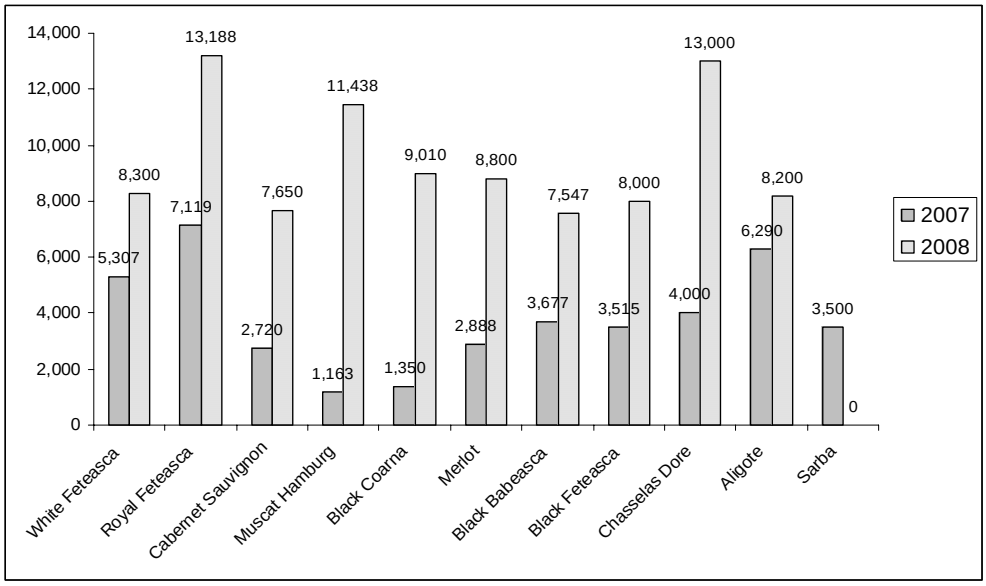


Fig 1 . Grape Yield by Vine Type and Year at Bujoru Vineyard

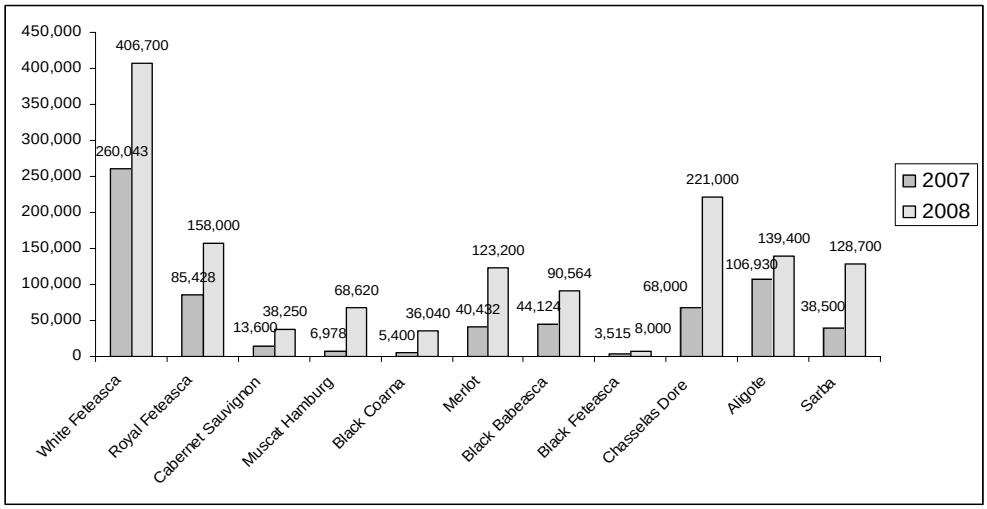


Fig .2. Grape Production by Vine Type and Year at Bujoru Vineyard

The Hyerarchization of Vine types based on grape yield and grape production is presented in Table 2 based on the Point Method which allows to rate each vine type according to its grape output.

Taking into account, the first criterium, grape yield, some vine types such as: White Feteasca, Cabernet Sauvignon, Black Babeasca, Black Feteasca , Aligote have come on higher positions in the year 2008 compared to the year 2007, refecting that the climate change has had a favorable influence upon grape yield. Other vine types such as Muscat Hamburg, Selected Black Coarna, Merlot, Chasselas Dore and Sarba registered lower positions in the year 2008 compared to the ones occupied in the year 2007 . But the Royal Feteasca vine type did not show any variation of grape yield, keeping its first position in the vine type hyerarchy, meaning that in this case no matter climate change .

Table 2

The Hierarchization of Vine type based on Grape Yield and Production in the years 2007 and 2008

Vine Type	Vine Type Position			
	Grape Yield		Grape Production	
	2007	2008	2007	2008
White Feteasca	3	7	1	1
Royal Feteasca	1	1	3	3
Cabernet Sauvignon	9	10	8	9
Muscat Hamburg	11	4	9	8
Selected Black Coarna	10	5	10	10
Merlot	8	6	6	6
Black Babeasca	5	11	5	7
Black Feteasca	6	9	11	11
Chasselas Dore	4	2	4	2
Aligote	2	8	2	4
Sarba	7	3	7	5

Concerning grape production, the position of vine types did not vary too much in the most of cases .

CONCLUSIONS

1. In the year 2008, the importance of climate factors based on their decreasing order is the following one: average annual rainfalls, wind speed, number of days with maximum temperatures higher than 30 °C, average temperature of July, the hydrotermic coefficient, the average temperature in the 1st and 2nd decades of June, rainfalls during the vegetation period, sunstroke hours, real heliothermic index, air minimum temperature, nebulousness, air relative humidity, average temperature in August, annual average temperature, bioclimatic index .

2. In the year 2008, in general , the grape yield was higher than in 2007 , varying between 7,547 kg/ha for Black Babeasca and 13,188 kg/ha for Royal Feteasca .Total grape production has also increased , the production gain varying between 883 % for Hamburg Muscat and 30 % for Aligote.

3. The vine type decreasing order based on grape yield registered in the year 2008 was the following one : Royal Feteasca, Chasselas Dore, Hamburg Muscat, Black selected Coarna, Merlot, White Feteasca, Aligote, Black Feteasca, Cabernet Sauvignon and Black Babeasca.

4. The increased grape yield in the year 2008 has allowed to some vine types such as White Feteasca, Cabernet Sauvignon, Black Babeasca, Black Feteasca , Aligote to come on higher positions compared to the year 2007, refecting that the climate change has had a favorable influence upon grape yield .

5. The grape yield of Muscat Hamburg, Selected Black Coarna, Merlot, Chasselas Dore and Sarba vine types has been affected by the lower rainfalls and higher temperatues registered in the year 2008 .

6. The Royal Feteasca vine type looks to be resitant to the variation of climate conditions because it has maintained its first position in the hyerarchy of vine types based on grape yield.

7. Climate change is an important environment factor which has to be taken into consideration, analyzed and monitorized in close relationship to vine types and other technological aspects in order to sustain grape production.

BIBLIOGRAPHY

1. Anderson Kim, Chistopher C. Findley, Sigfredo Fuentes , Stephen Tyerman, Viticulture, Wine and Climate Change, in "*Garnaut Climate Change Review",* www.garnautreview.org.au, 2008
2. Chiriac Cristina, Influence of climate change upon environment in the Cotnari Vineyard, Annals of Stephan the Great University, Romania, XVI, http:// www.atlas.usv.ro/www/anale/datagrid, 2007
3. Enache Viorica, Simion Cristina, Donici Alina, Tabaranu Gabriel, Popescu Agatha, Research concerning the global climatic changes and their influence on viticultural ecosystem in Dealu Bujorului vineyard, *The Journal of Environmental Protection and Ecology (JEPE)*, 2009, www.gen.teithe.gr/-bena
4. Enache Viorica, Simion Cristina, Donici Alina, Popescu Agatha **,** Aspects of the Desertification risk in the South of Moldova, Romania, Conference on Desertification, University of Ghent, Belgium, 23 January 2008
5. Hayes Peter, The Climate as a Factor for Wine Valorisation, International Congress of Climate and Viticulture , Zaragoza, Aragon, Spain, 10-1 april , 2007
6. Jones Gregory, Climate Change: Observations, Projections and General Implications for Viticulture and Wine Production, Whitman College, Working Paper 7, http://dspace.lasrworks.org/bitstream, 2007
7. Popescu Agatha, Simion Cristina, Tabaran Gabriel, Simion Ion, A comparative study concerning the economic efficiency in the producing of high quality grafted vines , Annals of Craiova University, Vol. XIII (XLIX) , 2008
8. Schultz H., Climate Change and Viticulture: A European perspective on climatology, carbon dioxide and UV-B effects. *Journal of Grape and Wine Research* , 6(1):2-12 , 2008
9. Simion Cristina, Enache Viorica, Donici Alina, Popescu Agatha, Research concerning the world climate change upon the vegetative evolution of vine in Dealu Bujorului Vineyard, Romania, 31st World Congress of Vine and Wine, June 15-20, 2008, Verona, Italia, segreteria.scientifica@oiv2008.it
10. Research upon the Impact of World Climate Change on the Viticultural Ecosystem from the hilly areas. PN II Partnership Project, Globalclim 51075/2007, www.usab.ro, www.cnmp.ro

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✔*Biologie*
✔*Horticultură*
✔*Tehnologia prelucrării produselor agricole*
✔*Ingineria mediului*

Vol. XIV (XLX) - 2009

STUDY CONCERNING THE FORECAST OF GRAPE YIELD UNDER THE CONDITION OF CLIMATE CHANGE IN THE HILLY AREA OF BUJORU VINEYARD

Agatha Popescu[1], Viorica Enache[2], Cristina Simion[2], Alina Donici[2], Gabriel Tabăranu[2]

KEY WORDS: grape yield, forecast , climate change , Bujoru Hills

ABSTRACT

The paper aimed to present the grape yield forecast for the year 2009 for 11 vine types (White Feteasca, Royal Feteasca, Aligote, Sarba, Cabernet Sauvignon, Merlot, Black Babeasca, Black Feteasca, Chasselas Dore, Hamburg Muscat and Black selected Coarna) based on the evolution of 7 climatic factors and average grape production in the year 2007 and 2008 at Bujoru Vineyard , Galatzi County, Romania. The Forecast Matrix inlcuding the values of grape yield shows that it varies not only from a vine type to another, but also from a climatic factor to another according to its importance. A higher average grape production is favorised mainly by the average temperature in September, but also by the total annual rainfalls, the average temperatures in the 1 st and 2 nd decades of June, the avergae temperatures in July and in August . The rainfalls during the period of vegetation have a deep impact upon grape production.

INTRODUCTION

Climate variation from year to another could deeply influence vine growing. Many aspects could be taken into account such as: the evolution of phenological phases, the appearance of vine diseases and pests, the level of grape yield, grape quality and efficiency in viticultural farms. Under these conditions, business planning requires to take into account not only the production performance recorded in the previous years but also the variability of climatic factors .

Ther is no doubt that, under the global climate change , the future of viticulture belongs to the so called „expert systems„ destined to monitorize the change of climatic factors in close relationship to environment itsms, vine growing technologies, plant protection and economic performances in the vineyards situated in the hilly areas (Johns Gregory, 2007). Various models have been used in order to predict the future global climate change as well as to forecast the evolution of grape production (Anderson Kim and col, 2008, Heyes Peter, 2007).

In this context , the present paper aims to establish the forecast of grape yield in the hilly area of Bujoru Vineyard, Galatzi County , Eastern Romania taking into account the evolution of climatic factors .

[1] University of Agricultural Sciences and Veterinary Medicine Bucharest, Romania
[2] Bujoru Research And Development Station for Viticulture and Vinification, Galatzi County , Romania

MATERIAL AND METHOD

The forecast of the average grape production has been carried out for the year 2009, based on the yield records achieved in close connection with the climate conditions in the years 2007 and 2008 at the Bujoru Research and Development Station, Galatzi County, which is situated in the Eastern part of Romania in a well known hilly area suitable for vine growing.

The grape yield has been planned for a number of 11 vine types as follows: White Feteasca , Royal Feteasca, Aligote, Sarba for white wine grapes, Cabernet Sauvignon, Merlot, Black Babeasca, Black Feteasca for red wine grapes, Chasselas Dore for white table grapes, Hamburg Muscat and Black selected Coarna for red table grapes.

Based on the previous experiments run in the years 2007 and 2008 when 22 climatic factors have been analyzed , a number of 5 climatic factors have been considered to have a major impact upon grape production as follows: annual rainfalls, rainfalls during the vegetation period, annual average temperature, average temperature in the 1^{st} and 2^{nd} decade of June, average temperature in July, in August and in September.

The grape yield forecast was determined using the following mathematical formula:

$$Y= A_0+A_1*P*X/100,$$

where Y= grape yield, $A_0 = YB - A_1*P*XB/100$, $A_1 = 100*(YC-YB)/ (P*(XC-XB))$, P = the share of climatic factor , X = climatic factor, B – the year 2007 considered the Control variant and C – the year 2008, considered the experimental variant. The term P , meaning the share of the climatic factor was determined by the formula : $P_i = |S_i|*100 / \Sigma |S_i|$, where P_i = the weight of the climate factor and S_i = the gain of the climate factor, where $S_i = R_i - 1$ and $R_i= XC_i/XB_i$, and finally i=1,…,22 climatic factors.

The data concerning the level of the climatic factors in the years 2007 and 2008 have been collected from the Meteo Forecast Galatzi Station.

The experiments have been carried out within a partnership research project destined to study the impact of World Climate Change on the Viticultural Ecosystems from the hilly areas.

RESULTS AND DISCUSSIONS

The level of climatic factors in the years 2007 and 2008. In general , in the year 2008, less rainfalls and relatively higher temperatures have been noticed .

The rainfalls during the vegetation period were 224.8 mm in the year 2008 compared to 254.5 mm in the year 2007.

The average annual rainfalls have been almost 50 % less in 2008 compared to 2007 , that is 285.7 mm compared to 554.4 mm.

The average annual temperature was 14 Celsius degrees in the year 2008 compared to 13.5 Celsius degrees in the year 2007.

The average temperatures in the 1^{st} and 2^{nd} decades of Junewas 21.9 Celsius degrees in the year 2008 compared to 25.2 Celsius degrees in the year 2007 .

The average temperature in Julywas 24 Celsius degrees in 2008 in comparison with 28 Cesius degrees in the year 2007.

The average temperature in August was 25.9 Celsius degrees in the year 2008 compared to 25.5 Celsius degrees in the year 2007.

The average temperature in September was 17.1 Celsius degrees in the year 2008 compared to 17.4 Celsius degrees in the year 2007.

The share of the climatic factors was different from a climate factor to another showing their importance. However, the shares of all these 7 climatic factors totalize 44.709 % , representing an important part of the all 22 climatic factors studied within the research project. This was the main reason , they have been considered the most important climate factors with a deep impact upon grape yield . The most important share belongs to the total annual rainfalls (22.948 %), then the average temperatures in the 1st and 2nd decades of June and in July come on the second position (over 6 %), the rainfalls during the vegetation period come on the 3rd postion (over 5 %) and finally the average temperatures in the month of August and September (less than 1 %) .

The forecast for the Climatic Factors. Taking into account the level of the climatic factors registered in the years 2007 and 2008, for the year 2009 the forecast figures have been calculated as an average value of the previous records as presented in Table 1.

Table 1

The evolution of climatic factors in the year 2007 and 2008 and the forecast for the year 2009

Climatic factor	MU	2007	2008	Differences 2008-2007	Share P(%)	2009 Forecast
Rainfalls during the vegetation period	mm	254.5	224.8	- 29.7	5.525	240
Total annual rainfalls	mm	554.4	285.7	- 268.7	22.948	420
Average annual temperature	ºC	13.5	14.0	+ 0.5	1.752	13.7
Average temperatures in the 1st and 2nd decades of June	ºC	25.2	21.9	- 3.3	6.020	23.5
Average temperature in July	ºC	28.1	24.0	- 4.1	6.907	26
Average temperature in August	ºC	25.5	25.9	+0.4	0.743	25.7
Average temperature in September	ºC	17.4	17.1	- 0.3	0.814	17.2

The Grape Yield recorded in the years 2007 and 2008 . In the year 2007 , the grape yield varied between 1,163 kg/ha for Hamburg Muscat and 7,119 kg/ha for Royal Feteasca vine type. In the year 2008, the grape yield was higher compared to the year 2007 for all the vine types, varying between 13,188 kg/ha for Royal Feteasca and 7,547 kg/ha for Black Babeasca, reflecting a favorable influence of the climatic factors. In order, the vine type decreasing ranking in the year 2008 was the following one: Royal Feteasca, Chasselas Dore, Hamburg Muscat, Black selected Coarna, Merlot, White Feteasca, Aligote, Black Feteasca , Cabernet Sauvignon and Black Babeasca (Table 2).

The forecast of grape yield for the year 2009. The values of the average grape production are presented in Table 3. They have been determined taking into account both the levels of grape yield but also of climatic factors in the previous years , 2007 and 2008, using the mathemetical formulas presented above. The matrix presented in Table 3 shows the future values of the grape yield at the crossroads of the columns, representing the studied vine types with the rows, representing the climatic factors taken into consideration.

Table 2

Ranking of Grape Yield by vine type in 2007 and 2008 at Bujoru Vineyard

Vine Type	Grape Yield / Position in 2007	Grape Yield / Position in 2008	Yield Gain – kg 2008-2007	Differences % 2008-2007
White Feteasca	5,307	8,300	2,993	156.39
Royal Feteasca	7,119	13,188	+6,069	185.25
Cabernet Sauvignon	2,720	7,650	+4,930	281.25
Muscat Hamburg	1,163	11,438	+10,267	983.49
Black Coarna	1,350	9,010	+7,660	667.40
Merlot	2,888	8,800	+5,912	304.70
Black Babeasca	3,677	7,547	+3,870	205.24
Black Feteasca	3,515	8,000	+4, 485	227.59
Chasselas Dore	4,000	13,000	+9,000	325.00
Aligote	6,290	8,200	+1,910	130.36
Sarba	3,500	11,700	+8,200	334.28

As we can see from the Forecast Matrix, the values of grape yield varies not only from a vine type to another , but also from a climatic factor to another according to its importance among other climate determinants. For instance, a higher average grape production is favorised mainly by the average temperature in September, but also by the total annual rainfalls, the average temperatures in the 1 st and 2 nd decades of June, the avergae temperatures in July and in August. The rainfalls during the period of vegetation have a deep impact upon grape production.

CONCLUSIONS

1. The grape yield has been planned for a number of 11 vine types as follows : White Feteasca, Royal Feteasca, Aligote, Sarba for white wine grapes, Cabernet Sauvignon, Merlot, Black Babeasca, Black Feteasca for red wine grapes, Chasselas Dore for white table grapes, Hamburg Muscat and Black selected Coarna for red table grapes.

2. In general, in the year 2008, less rainfalls and relatively higher temperatures have been noticed.

3.The share of the climatic factors was different from a climate factor to another showing their importance. However, the shares of all these 7 climatic factors totalize 44.709 %, representing an important part of the all 22 climatic factors studied within the research project.

4. In the year 2007, the grape yield varied between 1,163 kg/ha for Hamburg Muscat and 7,119 kg/ha for Royal Feteasca vine type. In the year 2008, the grape yield was higher compared to the year 2007 for all the vine types, varying between 13,188 kg/ha for Royal Feteasca and 7,547 kg/ha for Black Babeasca, reflecting a favorable influence of the climatic factors.

5.The vine type decreasing ranking in the year 2008 was the following one: Royal Feteasca, Chasselas Dore, Hamburg Muscat, Black selected Coarna, Merlot, White Feteasca, Aligote, Black Feteasca , Cabernet Sauvignon and Black Babeasca.

6. The Forecast Matrix inlcuding the values of grape yield shows that it varies not only from a vine type to another , but also from a climatic factor to another according to its importance .

7. A higher average grape production is favorised mainly by the average temperature in September, but also by the total annual rainfalls, the average temperatures in the 1 st and 2 nd decades of June, the avergae temperatures in July and in August. The rainfalls during the period of vegetation have a deep impact upon grape production.

BIBLIOGRAPHY

1. Anderson Kim, Chistopher C. Findley, Sigfredo Fuentes, Stephen Tyerman, Viticulture, Wine and Climate Change, in "*Garnaut Climate Change Review",* www.garnautreview.org.au, 2008
2. Chiriac Cristina, Influence of climate change upon environment in the Cotnari Vineyard, Annals of Stephan the Great University, Romania, XVI, http:// www.atlas.usv.ro/www/anale/datagrid, 2007
3. Enache Viorica, Simion Cristina, Donici Alina, Tabaranu Gabriel, Popescu Agatha, Research concerning the global climatic changes and their influence on viticultural ecosystem in Dealu Bujorului vineyard, *The Journal of Environmental Protection and Ecology (JEPE)*, 2009, www.gen.teithe.gr/-bena
4. Enache Viorica, Simion Cristina, Donici Alina, Popescu Agatha**,** Aspects of the Desertification risk in the South of Moldova, Romania, Conference on Desertification, University of Ghent, Belgium, 23 January 2008
5. Hayes Peter , The Climate as a Factor for Wine Valorisation , International Congress of Climate and Viticulture, Zaragoza, Aragon, Spain, 10-1 april , 2007
6. Jones Gregory, Climate Change: Observations, Projections and General Implications for Viticulture and Wine Production, Whitman College, Working Paper 7, http://dspace.lasrworks.org/bitstream, 2007
7. Popescu Agatha, Simion Cristina, Tabaran Gabriel, Simion Ion, A comparative study concerning the economic efficiency in the producing of high quality grafted vines , Annals of Craiova University , Vol.XIII (XLIX), 2008
8. Schultz H., Climate Change and Viticulture: A European perspective on climatology, carbon dioxide and UV-B effects. *Journal of Grape and Wine Research* , 6(1):2-12 , 2008
9. Simion Cristina, Enache Viorica, Donici Alina, Popescu Agatha, Research concerning the world climate change upon the vegetative evolution of vine in Dealu Bujorului Vineyard , Romania , 31st World Congress of Vine and Wine, June 15-20, 2008, Verona , Italia, segreteria.scientifica@oiv2008.it
10. Research upon the Impact of World Climate Change on the Viticultural Ecosystem from the hilly areas. PN II Partnership Project, Globalclim 51075/2007, www.usab.ro, www.cnmp.ro

Table 3

Grape Yield Forecast in the year 2009 based on the average grape production and climatic factors in the years 2007 and 2008

	White Feteasca	Royal Feteasca	Cabernet Sauvignon	Hamburg Muscat	Merlot	Back Coarna	Black Babeasca	Black Feteasca	Chasselas Dore	Aligote	Sarba
Rainfalls during the period of vegetation	5,308	7,191	2,722	1,334	2,891	1,478	3,677	3,511	4,150	6,291	3,637
Total annual rainfalls	6,608	7,140	5,188	1,200	5,845	1,378	5,631	5,759	4,033	6,359	3,530
Average annual temperature	6,504	9,547	4,692	5,270	5,253	4,454	5,225	5,309	7,600	7,054	6,780
Average temperature in the 1st and 2nd decades of June	6,849	10,245	5,260	6,452	5,934	5,296	5,671	6,795	5,328	7,274	7,724
Average temperature in July	6,840	10,228	5,245	6,422	5,916	5,273	5,659	5,812	8,610	7,268	7,700
Average temperature in August	6,804	10,154	5,185	6,297	5,844	5,180	5,612	3,739	8,500	7,245	7,600
Average temperature in September	7,302	11,165	6,007	8,008	6,829	6,457	6,257	6,505	6,000	7,563	4,047
AVERAGE	6,527	8,259	4,897	3,099	5,498	2,796	5,385	5,592	5,179	6,678	4,961

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

ÉTUDE SUR LES PRÉFÉRENCES DES CONSOMMATEURS ROUMAINS CONCERNANT LES VINS DE QUALITÉ DANS L'ANNÉE 2008

Constantin Băducă[1], Dan Boboc[2], Georgeta Beleniuc[1],
Amancio Calcerrada Martinez[3], M. Năstase[2]

MOTS CLE: vin, consommation, ventes, préférences, bouteilles

RESUMÉ

Une équipe de chercheurs de l'Université des Études Economiques de Bucarest, l'Université de Craiova et l'Association des Dégustateurs Autorisés de Roumanie a réalisé une étude sur les préférences des consommateurs roumains concernant les vins de qualité, à partir des ventes du vin en 2008 dans le plus grand réseau de magasins en Roumanie. L'analyse des ventes montre que sur première place dans les préférences des consommateurs roumains dans l'année 2008, il a été le vin Grasa de Cotnari, vendus en 1.071876 bouteilles, celui-ci étant le seul vin vendu en plus d'un million des bouteilles. Dans la classification des meilleurs vins de qualité vendus sur le marché roumain, sur les places 2 - 6 ont été des vins issus du vignoble Murfatlar, sur la 7-ème place il a été un autre vin de Cotnari, Tămâioasă românească et sur la 8-ème place il a été toujours un vin de Murfatlar. De 37 vins, 36 étaient des vins roumains et seulement un vin était importé.

INTRODUCTION

Le contexte culturel et social de la production vinicole et de la consommation regarde le rapport entre la production vinicole et le marketing, se focalisant dans le comportement du consommateur et les attitudes culturelles (Charters S., 2006). Évidemment, le monde du vin change. La filière, en pleine mutation, doit faire face à un marché domestique en recherche de valeur plus que de volume (Mora P., 2007).

En Roumanie, la consommation de vin est abaissée de 27 litres par habitant à 21 litres par habitant entre 1990 et 2006 mais la consommation de vins de qualité est en augmentation (Boboc D. et. al., 2008). Sur le marché roumain du vin, les ventes par super ou hypermarchés sont de plus en plus importantes et depuis 2007 ils sont passé de 70 % et la tendance est toujours d'augmentation (David I., 2008). C'est le contexte qui a imposé d'étudier les préférences des consommateurs roumains pour les vins de qualité, notamment en qui concerne les types des vins, les cépages et les vignobles d'origine.

MATERIEL ET MÉTHODE

Ce travail a été réalisé à partir de l'analyse des ventes de des vins de qualité dans l'année 2008 par le plus grand réseau de magasins de type hypermarché en Roumanie.

[1] Université de Craiova, Faculté d'Horticulture, chaire d'Oenologie
[2] Université des Etudes Economiques de Bucarest
[3] Association des Degustateurs Autorisés de Roumanie

L'étude a été réalisée d'une equipe de chercheurs de l' Université de Craiova, l'Université des Études Economiques de Bucarest et l'Association des Dégustateurs Autorisés de Roumanie et elle a été portée seulement sur les vins mises en bouteilles de 0,7 l, c'est-à-dire le type de bouteille spécifique pour les vins de qualité.

L'étude a montré que dans l'anée 2008 ils sont vendus, par ce réseau de magasins, plus de 300 vins de qualité, de la production interne et de l'import, beaucoup d'entre eux en petites quantités, de quelques milliers de bouteilles ou moins. C'est le raison que nous avons pris en compte uniquement les vins vendus en plus de 10.000 bouteilles, pour avoir des résultats concluants. Pour une meilleure réprésentation des préférences des consommateurs, nous avons partagé ces vins en deux groupes: une groupe comprenant les vins vendus en plus de 100.000 bouteilles et la groupe des vins vendus entre 10.000 et 100.000 bouteilles.

RESULTATS ET DISCUSSIONS

L'analyse des ventes montre que dans l'année 2008 ils sont vendus, par ce réseau de magasins, 16.449.144 bouteilles, si on prend en compte seulement les vins vendus au-sessus de 10.000 bouteilles. Ces sont les vins blancs le mieux vendus (7.118.088 bouteilles, c'est-à-dire 43,3%), suivis des vins rouges (5.971.596 bouteilles, c'est-à-dire 36,3%), les muscats (2.600.892 bouteilles, c'est-à-dire 15,8%), les vins liquoreux (459.204 bouteilles, c'est-à-dire 2,8%) et les vins rosés (299.364, c'est-à-dire 1,8%) (tableau 1). Les données du même tableau montrent des grosses différences concernant la structure des ventes entre les deux grouppes. Ainsi, pour trois de cinq types de vins, les ventes au-dessus de 100.000 bouteilles ont été nettement suppérieurs que les ventes de 10.000 à 100.000 bouteilles. Ces vins sont: les blancs, avec 4.510.512 bouteilles (63,4%) au-dessus de 100.000 et 2.607.576 bouteilles (36,7%) au-dessous de 100.000 bouteilles, les muscats, avec 2.020.248 bouteilles (77,7%) contre 580.644 bouteilles (22,3%) et, surtout, les liquoreux, avec 431.916 bouteilles (94,1%) au-dessus de 100.000 contre uniquement 27.288 bouteilles (5,9%) au-dessous de 100.000 bouteilles. Par contre, pour les vins rouges et les rosée, les ventes sont plus importantes au-dessous de 100.000 bouteilles. Les rouges sont vendus en 3.059.052 bouteilles (51,2%) entre 10.000 et 100.000 bouteilles, tandis que les rosés sont vendus entièrement au-dessous de 100.000 bouteilles, donc aucun vin rosé n'est vendu au-dessus de 100.000 bouteilles.

Tableau 1

Les ventes des vins, bouteilles et %, sur types de vins

Vins	10.000 – 100.000 bouteilles	Plus de 100.000 bouteilles	Total
Blancs	2.607.576 36,6%	4.510.512 63,4%	7.118.088
Rouges	3.059.052 51,2%	2.912.544 48,8%	5.971.596
Muscats	580.644 22,3%	2.020.248 77,7%	2.600.892
Rosés	299.364 100%	0 0%	299.364
Liquoreux	27.288 5,9%	431.916 94,1%	459.204

Tableau 2

La structure des ventes après les types des vins - %

Vins	10.000 – 100.000 bouteilles	Plus de 100.000 bouteilles	Total
Blancs	38,8	45,7	43,3
Rouges	46,5	29,5	36,3
Muscats	8,8	20,4	15,8
Rosés	4,5	0	1,8
Liquoreux	0,4	4,4	2,8

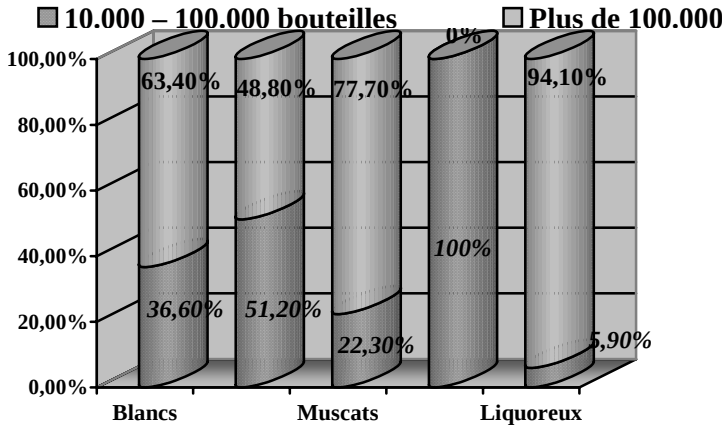


Figure 1 – Structure des ventes

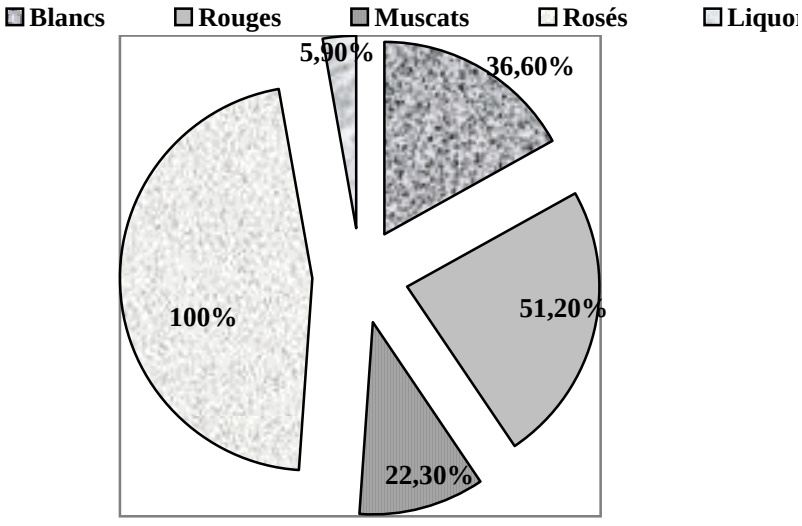


Figure 2 – Structure des ventes pour le niveau 10.000 – 100.000 bouteilles

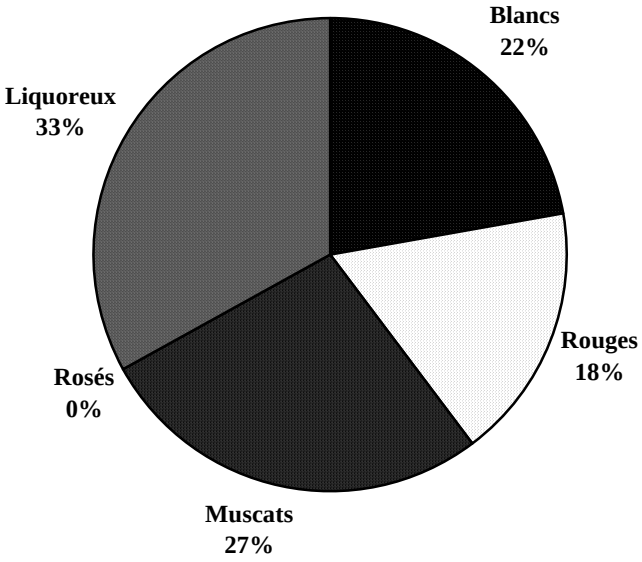


Figure 3 – Structure des ventes pour le niveau plus de 100.000 bouteilles

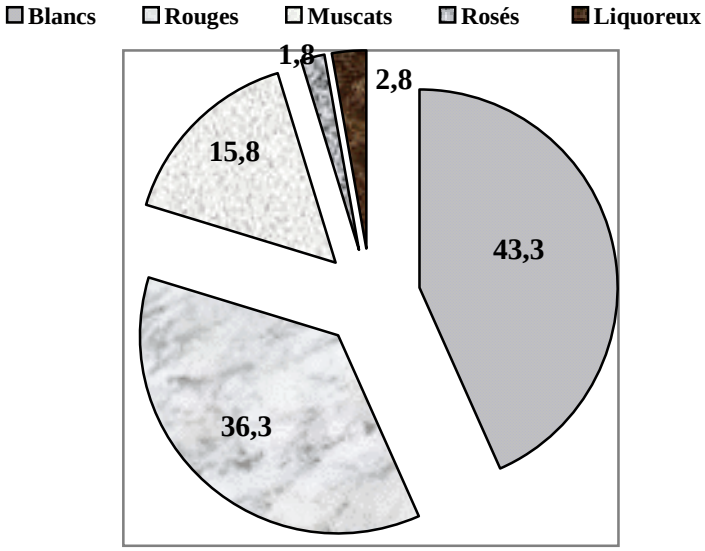


Figure 4 – Structure des ventes totales

L'analyse des ventes montre aussi que les vins blancs (43,3%) et les rouges (36,3%) touchent 80% des ventes totales tandis que les autres trois types de vin ont un taux beaucoup plus bas, environ 20%. C'est une situation bien différente d'autres pays de l'Union Européenne n'importe pas qu'ils sont pays viticole ou pas, où les vins rouges, à coté des rosés se trouvent à la première place dans la consommation. En Roumanie, les vins rosés présentent un taux assez faible dans la consommation totale.

Les mieux vendus vins dans l'année 2008 sont présentés dans le tableau 3. Les données du tableau montrent qu'ils sont 37 vins vendus en plus de 100.000 bouteilles, dans un nombre total de 9.875.220 bouteilles. Parmi les 37 vins, ils sont 36 vins roumains et uniquement un vin provenant de l'import mais il se trouve sur la 35-ème place dans le classement des ventes.

C'est *Grasa de Cotnari* le premier vin dans les préférences des consommateurs roumains dans l'année 2008, avec 1.071.876 bouteilles vendues. Il faut encore remarquer qu'il est le seul vin vendu en plus d'un million de bouteilles. Sur les suivantes cinq places (2–6) dans le classement, ils sont des vins obtenus dans le plus renommé vignoble roumain – Murfatlar. Sur la 7-ème place il a été un autre vin de Cotnari, *Tămâioasă românească* et sur la 8-ème place il a été toujours un vin de Murfatlar. Les places 9 et 10 revients à deux vins produits d'autres deux grands producteurs roumains – Vinia et Jidvei.

Tableau 3

Le classement des vins après les ventes

Nr. crt.	Le vin	Bouteilles
1.	Grasă de Cotnari	1.071.876
2.	Dry Riesling Premium Murfatlar	651.036
3.	Pinot & Merlot Vinotecă Murfatlar	642.636
4.	Lacrima lui Ovidiu Murfatlar	431.916
5.	Cabernet Sauvignon Vinotecă Murfatlar	422.352
6.	Muscat Ottonel Vinotecă Murfatlar	352.020
7.	Tămâioasă românească Cotnari	297.744
8.	Merlot Vinotecă Murfatlar	290.004
9.	Busuioacă de Bohotin Vinia	286.716
10	Dry Muscat Gal. Rom. Jidvei	279.456

En qui concerne l'origine des vins, c'est Murfatlar, le premier vignoble dans les préférences des consommateurs roumains de vins de qualité dans l'année 2008. Le plus renommé vignoble roumain produit touts les 4 types de vins qui sont entrés dans notre classement. Ainsi, dans cette étude, les vins de Murfatlar sont vendus en 3.198.492 bouteilles, c'est-à-dire 32,4%. Sur la deuxième place il est le vignoble de Cotnari, avec 1.759.392 bouteilles (17,8%) mais il faut préciser qu'il est un vignoble producteur uniquement de vins blancs, y compris les muscats. Les deux vignobles, Murfatlar et Cotnari, sont à l'origine de moitié des vins de qualité vendus en plus de 100.00 bouteilles. Ils sont suivis, a grande différence, d'autres deux connus vignobles roumains – Recaş (8,6%) et Jidvei (7,5%, mais non-producteur de vins rouges).

L'analyse de l'origine des vins montre que les cépages roumains (cv. *Grasă de Cotnari, Fetească regală, Fetească albă, Galbenă de Odobeşti, Frîncuşă* – blancs, *Fetească neagră* – rouges, *Tămâioasă românească, Busuioacă de Bohotin* – muscats) sont bien préférés des consommateurs roumains de vins de qualité.

CONCLUSIONS

L'étude portée sur ventes des vins dans le plus grand réseau de magasins de Roumanie dans l'année 2008 a mis en évidence les préférences des consommateurs roumains pour les cépages et également pour les vignobles producteurs de vins de qualité. La consommation des vins de qualité n'est pas le même chose avec la consommation totale de vin, où ils sont d'autres taux de consommation pour différents types de vins.

Les vins de qualité sont consommés principalement à domicile, au cours des repas en famille et avec les amis, notamment à l'occasions spéciales, parce que la plus grande partie de la population roumaine garde l'habitude de célébrer ainsi la majorité des fêtes. Également, les vins de qualité sont toujours bons pour cadeaux.

La structure des ventes, résulté de l'étude, prouve que les consommateurs roumains aiment plus les vins fruités que les boisés, qui sont préférés d'un nombre plus petit de consommateurs, les vrais connaisseurs, pouvant bien apprécier la complexité aromatique du vin et surtout le bouquet. C'est l'une des explications que parmi les meilleurs vendus vins les blancs et les muscats dominent. Il est surprenant le taux réduit de des ventes des vins rouges mais il faut préciser que cette situation est valable seulement pour les vins vendus en grandes quantités parce-que si on prend en compte encore les ventes en moins de 100.000 bouteilles, le taux des rouges arrive à 40 %.

BIBLIOGRAPHIE

1. Boboc D., Manole V., Istudor N. – The Place of Wine Chain in Romanian Economy. *Dans: Enometrics XV VDQS,* Collioure, 29-31 may, 2008.
2. Charters S. – Wine and Society: The Cultural and Social Context of a Drink. *Édition Butterworth-Heinemann, USA*, 2006.
3. David I. – Schimbarea obiceiurilor de consum mută vînzările de vin din restaurante în supermarketuri. *Ziarul financiar,* 8.04.2008, pag. 3., 2008.
4. Mora P. – Le commerce du vin: Panorama – Perspectives. *Éditure Dunod, Paris,* 2007.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

RECHERCHES CONCERNANT L'OPTIMISATION DE LA TECHNOLOGIE D'ÉLABORATION DES VINS ROUGES DE QUALITÉ DU CÉPAGE NOVAC

Constantin Băducă[1], Justin Urucu, Mihai Cocoş, Veronica Gheorghiu, Nicolae Gheorghiu, Gheorghe Cimpoeru

MOTS CLE: vin, macération, couleur, arôme, goût

RESUMÉ

Les recherches en vue d'optimiser la technologie d'élaboration des vins de Novac, nouveau cépage roumain pour vins rouges, de grande production mais avec un potentiel qualitatif remarquable, ont montré l'importance de maîtriser l'extraction fractionnée des composants du marc agissant sur certains facteurs technologiques, comme la date optimale de la vendange, la durée de macération, le nombre, le moment et la durée des remontages et, également, la nécessité de maîtriser la macération et fermentation alcoolique par aditions de d'enzymes pectolytiques, de levures sélectionnées et d'activateurs de fermentation.

INTRODUCTION

Élaborés à partir de jus des raisins noirs, les vins rouges sont plus corsés que les vins blancs. Leur couleur est obtenue par une macération plus ou moins longue des parties solides de la grappe du raisin pendant la fermentation (PRIEWE J., 2001). Le vin rouge est un vin de macération. Selon la nature des raisins, selon le type de vin recherché, cette macération peut être plus ou moins poussée; il s'agit d'un moyen simple, à la disposition du vinificateur pour apporter une personnalisation du vin produit. Des vins de "style primeur", à consommer jeunes, doivent posséder un arôme et un fruité qui sont des fonctions inverses du taux des composés phénoliques. Par contre, le bon développement au vieillissement des vins de garde suppose une richesse suffisante en tanin (RIBEREAU-GAYON P. et al. , 1998). La vinification en rouge moderne donne toute l'attention à la qualité du produit, même si cette notion n'est pas trop rigoureuse. Une définition simple pourrait être celle-ci: "La qualité d'un vin est l'ensemble de ses qualités, c'est-à-dire de ses propriétés que le rendent acceptable ou désirable". La qualité est le résultat d'une rencontre entre le vin, avec ses caractéristiques, et le consommateur, avec ses préférences, sa culture, ses conditionnements du moment (PEYNAUD E. et BLOUIN J., 2006). Le bon raisin rouge est mûr, débarrassé de ses composés à caractères herbacés, enrichi de ses arômes variétaux, assez riche en sucre et sans dégâts de pourriture (BLOUIN J. et PEYNAUD E., 2006).

Quantité et qualité des tanins sont notion importantes qui conditionnent la constitution d'un vin et plus ou moins grande aptitude au vieillissement. (BĂDUCĂ CÎMPEANU C., 2008). Pour une même matière première, la quantité et la qualité des tanins sont fonction des modes et techniques de vinification: température de fermentation,

[1] Université de Craiova, Faculté d'horticulture, chaire d'Oenologie

durée de macération, contact marc-jus favorisé par le nombre et la durée des remontages, concentration en éthanol et tout phénomène facilitant plus ou moins l'extraction des tanins. (TAILLANDIER P. et BONNET P., 2005).

Parmi les principaux facteurs d'influence sur la qualité des raisins est toujours le cépage. Novac c'est un nouveau cépage roumain pour vins rouges, obtenus à Drăgăşani, depuis une vingtaine d'années. Il s'agit d'un cépage de grande production mais avec un potentiel qualitatif assez remarquable, qui permet d'obtenir, selon les millésimes et les terroirs, souvent des vins de qualité (CICHI D. et COSTEA D.C., 2008).

MATERIEL ET MÉTHODE

L'objectif de notre travail a été de trouver les meilleures solutions pour conduire les différentes séquences technologiques de vinification en rouge conduisant aux vins avec des propriétés physico-chimiques et sensorielles en mesure de valoriser au mieux le potentiel qualitatif du cépage Novac. Ainsi, nous avons évalué l'incidence de quelques facteurs technologiques et microbiologiques de vinification primaire sur la composition et la qualité des vins de Novac. Nos recherches sont déroulées pendant plusieurs années (2005 – 2008) sur vendanges de Novac provenant de différents terroirs de la zone collinaire d'Olténie – Drăgăşani, Stârmina, Oprişor. Les facteurs étudiés sont: le niveau de maturité et l'état sanitaire des raisins, macération, fermentation alcoolique. Les vins obtenus en conditions de microvinification et dans la cave, ont été analysés physico-chimique et organoleptique.

RESULTATS ET DISCUSSIONS

Les conditions climatiques des années viticoles ont beaucoup varié pendant les recherches. Il s'agit d'une mauvaise année viticole (2005), très humide et peu ensoleillée, d'une année viticole normale (2006) et deux grandes années viticoles (2007 et 2008), avec beaucoup chaleur et lumière. Nous avons constaté ainsi la forte influence des conditions climatiques sur la maturation et la qualité des raisins de Novac. Il faut dire aussi qu'il est un cépage avec grand potentiel de production, pouvant arriver jusqu'à 200 q/ha, mais au-dessus de 150 – 160 q/ha la qualité est très faible, la maturité reste déficitaire (tableau 1). C'est la raison que certains producteurs, pour privilégier la qualité prennent souvent la décision de limiter production, environ de 110 – 130 q/ha. À ces niveaux de production, le cépage a une remarquable aptitude d'accumuler sucres mais il a des difficultés de garder l'acidité. En qui concerne l'état sanitaire de raisins, elle a été bonne même dans les automnes pluvieux, le cépage ayant une bonne résistance.

Tableau 1

Relation entre la production et qualité des raisins de Novac

Rendement, q/ha	Maturité	Qualité
100 – 120	Très bonne maturation, teneurs en sucres au-dessus de 220 g/l, mais faible acidité (3 – 3,8 g/l H_2SO_4)	Bonne synthèse et extraction des anthocyannes, vins de qualité, colorés, corsés, charnus, prétables à garder
120 – 150	Bonne maturation, teneurs en sucres de 200 à 230 g/l, acidité 3,5 – 4 g/l H_2SO_4	Vins de qualité, colorés, souples, fruités, souvent à consommer jeuns
Plus 150	Mauvaise maturation, sucres moins de 200 g/l, souvent de 150 à 170 g/l, acidité 4 – 5 g/l H_2SO_4	Vins de faible qualité, peu colorés, minces, communes

À partir de la vérité que la macération c'est la principale séquence technologique de la vinification en rouge, nous avons étudié l'influence des différents facteurs technologiques sur l'extraction des composés phénoliques pendant la macération pour obtenir des vins avec caractéristiques de composition et sensorielles en mesure de valorise le potentiel qualitatif du cépage Novac. Dans toutes les expérimentations, en microvinifications ou dans la cave, nous avons utilisé des procédés statiques de macération, en récipients de différents volumes, de 10 l à 300 hl, en verre ou acier. Nous avons suivi l'influence de deux procédés d'assurer le contact jus-marc, c'est-à-dire le remontage et l'enforcement du chapeau de marc en moût pour accroître la macération et pour protéger contre le développement des bactéries acétiques. À la suite des essayes, nous pouvons dire que, pour le cépage Novac, le remontage est le meilleur moyen d'homogénéiser les phases de la vendange et d'améliorer l'extraction des composés phénoliques. De la figure 1 on voit que pour la même vendange, le remontage permet d'obtenir un vin plus plus gras, plus structuré et moelleux mais moins végétal, avec moins d'amertume, d'astringence et de la dureté que le vin obtenu par l'enforcement du chapeau de marc en moût. Également, nous avons constaté que le nombre, le moment et la durée des remontages sont des points d'intervention pour régler l'extraction des constituants du marc et, par cette voie, la tenue et le caractère du vin.

Comment le Novac présente plus d'aptitude à la production des vins à consommer jeunes que des vins de garde, les remontages en debout de cuvaison sont plus importants que les remontages en fin de macération. Ainsi, pour les vins de Novac, la composition polyphénolique est donnée essentiellement par les anthocyannes et les tanins des pellicules et très peu par les tanins des pépins. Ils sont obtenus très bons résultats avec le schéma suivant: pour les premiers deux jours de macération 5 remontages fermés/jour, de 15 minutes chacun et, pour les suivants deux jours, 2 remontages fermés plus un remontage ouvert/jour, de 20 minutes chacun.

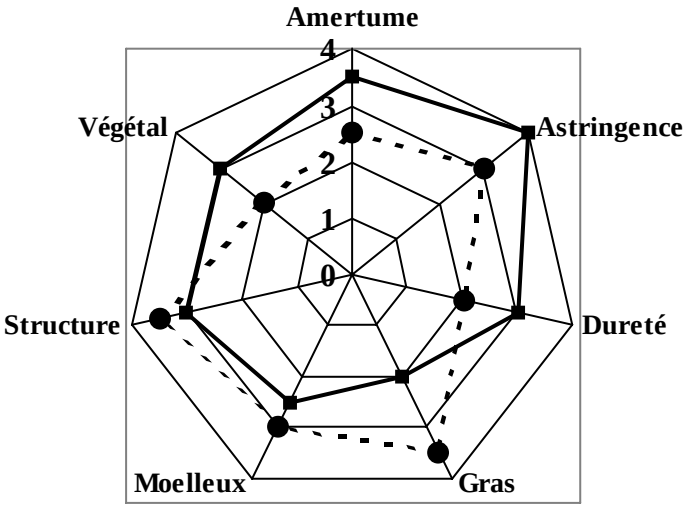


Figure 1 - Influence du remontage sur les principaux caractères gustatifs des vins de Novac

En qui concerne la durée de macération, nos recherches ont montré que pour le Novac, généralement, ils sont suffisants 4 – 5 jours de macération et les cuvaisons plus

longues ne sont pas justifiées toujours parce que l'extraction des anthocyannes et des tanins des pellicules est assez facile des premiers jours de macération, notamment si s'utilise des enzymes pectolytiques et la température de macération est supérieure de 25^0C. Parmi les nombreux essayes concernant la durée de macération, la figure 2 montre l'extraction des composés phénoliques pendant la macération et on voit que les teneurs en anthocyannes augmentent dans les premiers jours de macération, avec un maximum vers le 5-ème jour, et baissent ensuite ainsi que un vin avec 3 jours de macération a plus d'anthocyannes que le vin avec 10 jours de macération. Par contre, les teneurs en tanins augmentent au long de toute la durée de macération.

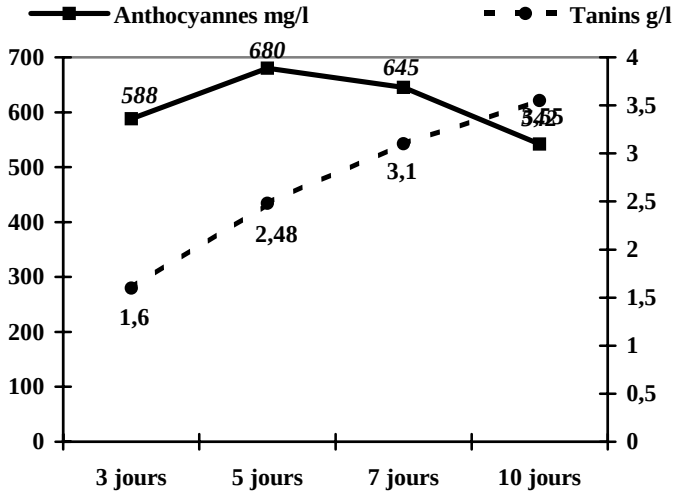


Figure 2 – L'extraction des tannins et anthocyannes de la vendange de Novac

Parmi les meilleures possibilités d'améliorer l'extraction des composés phénoliques s'est prouvé l'utilisation des enzymes pectolytiques. Nous avons réalisé beaucoup d'expérimentation concernant l'action des différentes préparations enzymatiques sur l'extraction des composés phénoliques et touts les essais nous ont conduit vers la conclusion qu'il y a une forte amélioration de la composition polyphénolique et des caractères organoleptiques des vins issus des macérations avec des enzymes pectolytiques. Les vins obtenus par macérations conduites avec des enzymes d'extraction sont plus colorés, plus charnus, plus fruité, moins amers, moins astringents, moins végétaux grâce aux enzymes riches molécule dégradant la paroi des cellules du raisin, qui facilitent la libération des tanins contenus dans vacuoles (figure 3).

Dans l'évolution du vin, la fermentation alcoolique représente la phase de naissance et il est particulièrement important de maîtriser la fermentation alcoolique pour éviter touts les arrêtes qui peuvent mettre en danger l'équilibre, la qualité et la stabilité du vin. Nos recherches montrent que l'addition des levures sélectionnées, sous la forme des levures sèches actives, permet non seulement un bon déroulement de la fermentation alcoolique avec la transformation complète des sucres, mais aussi il y a une forte influence des levures sur l'arôme des vins, notamment sur le fruité et l'arôme secondaire (de fermentation), qui fait les vins très agréables et aptes à la consommation rapide. Pour stimuler l'activité des levures, notamment en conditions de teneur élevée en sucre, s'impose l'addition des activateurs de fermentation.

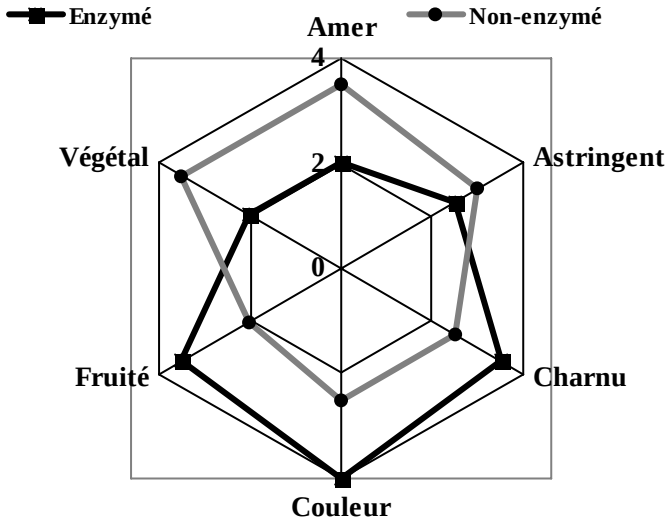


Figure 3 – Influence des enzymes pectolytiques sur les caractères gustatifs des vins de Novac

CONCLUSIONS

Novac, nouveau cépage roumain pour vins rouges, permet d'élargir la gamme des vins produits dans la zone collinaire d'Olténie. Ils sont des vins souples, assez colorés, fruités, d'un bon équilibre olfacto-gustatif mais ils sont encore d'établir certains aspects concernant l'optimisation des différentes séquences technologiques de vinification. Il faut d'abord établir quel niveau de maturité permet d'avoir une vendange optimale pour le type de vin recherché et parce qu'il s'agit d'un cépage de grande production, souvent s'impose de limiter le rendement au maximum 150 q/ha, avec un optimum environ de 110 – 130 q/ha.

En qui concerne la vinification, il faut bien maîtriser l'extraction des constituants du marc parce qu'on sait que dans un même organe, à coté des composés phénoliques favorables à la qualité il y a aussi d'autres substances moins favorables de point de vue olfacto-gustatif. C'est la raison qu'il faut rechercher d'avoir une extraction fractionnée visant exclusivement les constituant de bonne saveur.

Les recherches déroulées sur une période de 4 ans (2004 – 2008) en conditions de microvinification et de la cave ont montré l'efficacité de l'addition des enzymes pectolytiques pour favoriser la macération, des levures sèches actives et des activateurs de fermentation pour maîtriser la fermentation alcoolique. Parmi les facteurs technologiques, il faut faire attention sur la durée de macération (qui n'est pas nécessaire de dépasser 4 – jours de raison de l'aptitude du cépage plutôt pour vins de style primeur que pour vins de garde) et au remontage, qui s'est prouvé le meilleur moyen d'assurer le contact jus-marc. Nous avons constaté qu'ils sont particulièrement importants les remontages des premiers jours de macération, notamment les premiers deux jours, quand touts les remontages sont fermés. Pour les suivants deux jours de macération, il est conseillé de faire deux remontages fermés et un remontage ouvert.

BIBLIOGRAPHIE

1. BĂDUCĂ CÎMPEANU C., - Degustarea vinului. Bazele ştiinţifice ale degustării. *Editura Sitech, Craiova, 2008.*
2. BLOUIN J., PEYNAUD. E. – Connaissance et travail du vin. 4e édition. *Éditure Dunod, Paris*, 2006.
3. CICHI Daniela, COSTEA D.C. – Soiuri de viţă-de-vie cultivate şi cultivabile în România. *Editura Arves, Craiova, 2008.*
4. PEYNAUD. E., BLOUIN J. – Le goût du vin. Le grand livre de la dégustation. 4e édition. *Éditure Dunod, Paris*, 2006.
5. PRIEWE J. – Tout sur le vin. Le guide practique de la dégustation. *Éditions Solar, Paris,* 2001.
6. RIBÉREAU GAYON P., DUBOURDIEU D., DONÈCHE B., LONVAUD A. – Traité d'œnologie. Tome I. Microbiologie du vin. Vinifications. *Éditure Dunod, Paris*, 1998.
7. TAILLANDIER P., BONNET J. – Le vin. Composition et transformations chimiques. *Éditions TEC & DOC, Lavoisier, Paris,* 2005.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✔*Biologie*
✔*Horticultură*
✔*Tehnologia prelucrării produselor agricole*
✔*Ingineria mediului*

Vol. XIV (XLX) - 2009

APPLICATION DU SYSTÈME D'ANALYSE DANGERS ET POINTS DE CONTRÔLE CRITIQUE (APPCC) DANS LA LIGNE D'ÉLABORATION DE VIN BLANC

A. Calcerrada[1], J.E. Pardo[1], C. Baduca[2], Daniela Popa[2]

MOTS CLÉ: système, dangers, contrôle, vin, qualité

RESUMÉ

L'Analyse Dangers et Points de Contrôle Critique (APPCC) est un système préventif qui essaye de garantir la sécurité et l'innocuité alimentaire, et qui permet la protection du produit et la correction de jugements, en améliorant les coûts de qualité par des défauts et en économisant presque le super contrôle final. Dans ce travail on décrit les dangers propres qui peuvent être trouvés dans la ligne d'élaboration de vin blanc, les mesures préventives qui peuvent être appliquées dans l'usine et les systèmes de surveillance à implanter, ainsi que les mesures correctrices prévues, en étant nécessaires, et les registres de contrôle qui devront rester dans l'industrie. La mise en pratique de ces connaissances permettra, à toute industrie d'élaboration de vin blanc, un auto-contrôle de ses productions basé le système APPCC

INTRODUCTION

La Directive Générale d'Hygiène des Aliments 43/93/CEE (transposée à l'ordre juridique espagnol à travers l'arrêté royal 2207/1995, de du 28 décembre), établit que les entreprises du secteur alimentaire, dans lesquelles on inclut, évidemment, les industries du vin blanc, elles doivent mettre en marche un système d'autocontrôle de leurs productions, basé le système d'Analyse Dangers et Points de Contrôle Critique (APPCC) (DOUZE, 1993). L'APPCC, défini comme un système préventif de contrôle des aliments dont l'objectif principal est la sécurité ou l'innocuité alimentaire (ICMSF, 1991), il introduit comme première nouveauté le fait qui la responsabilité de la sécurité du consommateur est transférée depuis l'inspection officielle jusqu'au cadre du producteur, qui doit garantir cette sécurité avec la prévention (NOVOTEC, 1999). L'objectif principal de ce travail consistera l'implantation du système APPCC dans la ligne d'élaboration de vin blanc.

MATERIEL ET METHODE

Pour la réalisation de ce travail il a été nécessaire de visiter différentes industries productrices de vin blanc qui avaient prévu l'implantation du système APPCC. Dans une première étape nous compilons une information sur les caractéristiques physique - chimies

[1] ÉCOLE TECHNIQUE SUPÉRIEURE D'INGÉNIEURS AGRONOMES (ETSIA). UNIVERSITÉ DE CASTILLA-LA MANCHA (UCLM). TERRAIN UNIVERSITAIRE, S/N. 02071 ALBACETE
[2] UNIVERSITÉ DE CRAIOVA, FACULTÉ D'HORTICULTURE

et microbiologiques des vins et les matières premières auxiliaires. Postérieurement, nous élaborons le diagramme de flux du processus productif complet. Une fois révisée ce diagramme, nous révisons chacune des étapes à la recherche des possibles dangers (biologiques, physiques ou chimiques) pour le consommateur. Une fois identifié un danger, nous cherchons un ou plusieurs mesures préventives qui pourraient le diminuer ou l'annuler. Quand les mesures préventives ne seront pas suffisantes ou adéquates pour réduire un danger, on dépassera la limite critique établie, ce qui sera détecté grâce au système de surveillance établi. On appliquera alors une série de mesures correctrices qui, aussi, devront être prévues précédemment, dans le but d'éliminer, dans la mesure du possible, les causes des dangers détectés. Tous les pas donnés pour définir le système APPCC seront documentés et enregistrés.

RESULTAS ET DISCUSSIONS

Dans ce paragraphe on décrit le processus ou le diagramme de flux (Figure 1), depuis la réception des matières premières jusqu'au stockage du vin, en accord avec le cadre d'étude et toujours en nous basant ce qui est observé dans les différentes industries visitées. On inclut aussi un synoptique d'application (Tableau 1) où, pour chaque phase, on décrit les principaux dangers qui peuvent être prévus, ainsi que les mesures préventives à tenir compte pour diminuer ou éliminer ce danger. Ce qui est synoptique reflète la limite critique pour chaque mesure préventive et la surveillance nécessaire pour démontrer qu'un point critique est sous contrôle. Afin de corriger les déviations qui pourraient superficiellement se produire ou sous les limites critiques marquées, nous avons formulé toutes les mesures correctrices spécifiques pour chaque PCC du système.

BIBLIOGRAPHIE

1. DOCE – Directive 93/43 relative a la hygiène de los productos alimenticios. Diario Oficial de las Comunidades Europeas, número 175, de 19 de julio de 1993.
2. ICMSF – El sistema de análisis de riesgos y puntos críticos. Su aplicación a las industrias de los alimentos. *Ed. Acribia, Zaragoza, España, 1991.*
3. NOVOTEC – Guía de aplicación del Análisis de Riesgos y Control de Puntos Críticos (ARCPC) en almazaras. Ed. Caja Rural de Jaén, Jaén, España, 1999.

DIAGRAMME DE FLUX LIGNE D'ÉLABORATION DE VIN BLANC

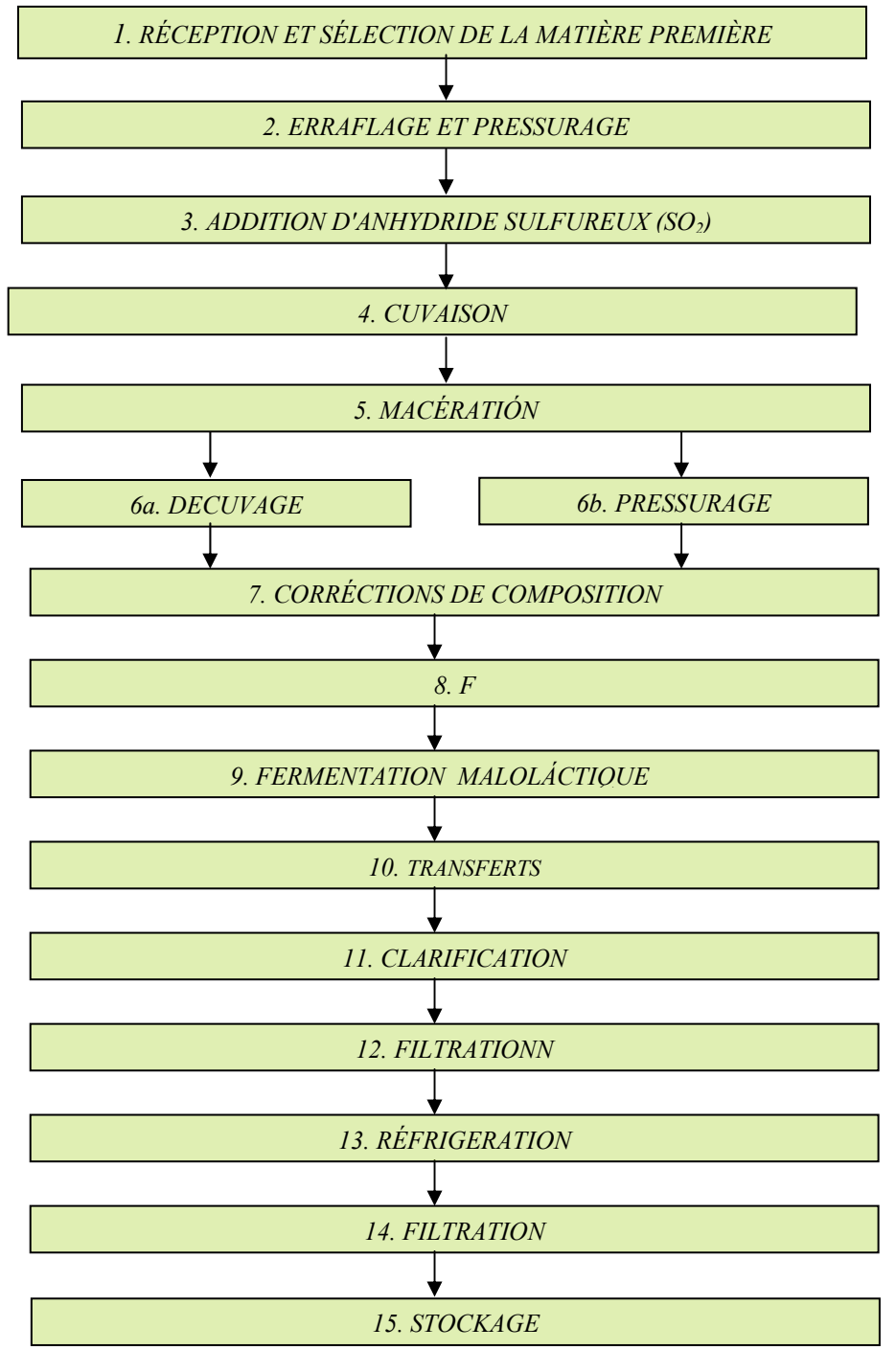


Tableau 1

Synoptique d'application de la ligne d'élaboration de vin blanc

PHASE	DANGERS	MESURES PRÉVENTIVES	LIMITE CRITIQUE	SURVEILLANCE	MESURES CORRECTRICES	REGISTRES
1. Réception et sélection de la matière première. Approvisionnement d'eau.	• Déficient état de maturation ou sanitaire. • Restes produits phyto-sanitaires ou herbicides. • Pollution microbiologique des milieux de transport et des trémies de réception. • Aplatissement prématuré des raisins. • Eau non potable.	• Fixer le moment optimal de vendange. • Éviter l'utilisation produits phyto-sanitaires ou herbicides non autorisés, hors de délai ou en doses supérieures à à celles permises. • Former aux agriculteurs. • Conditions hygiéniques des remorques et les trémies de réception. • Transfert adéquat du raisin au chai. • Approvisionnement d'eau potable.	• État de maturation et sanitaire fixé par l'entreprise. • Doses permises et délais de sécurité les produits phyto-sanitaires et les herbicides. • Bonnes pratiques d'hygiène dans des remorques et des trémies de réception. • Ne pas dépasser de limites de charge. • Accomplir R.D. 140/2003	• Contrôle visuel la charge et la prise d'échantillons pour analyse. • Analyse de résidus dans les raisins. • Contrôle hygiénique des moyens transport et trémies de réception. • Moût libre dans la remorque. • Analyse physico-chimique et microbiologique de l'eau.	• Rejet de la matière première non apte. • Favoriser les bonnes pratiques agricoles. • Correction du programme propreté et désinfection du moyen de transport et des trémies. • Corriger des pratiques de transport. • Chloration l'eau et le changement du point d'approvisionnement. • Entrée de départs.	• Analyse des raisins et de l'eau. • Dossier le maintien et le réglage du matériel de pulvérisation. • Programme propreté et désinfection. • Conditions de transport autorisées. • Mesures correctrices
2. Eraflage et pressurage	• Rupture du raspón et des pépites du raisin. • Pressé très énergique. • Pollution microbiologique du moût.	• Maintien préventif d'équipements. • Propreté et désinfection adéquates.	• Bon fonctionnement des équipements. • Bonnes conditions hygiéniques.	• Application correcte des programmes de maintien préventif d'équipements et de propreté et de désinfection.	• Corriger les deux programmes, quand se nécessaire.	• Programme de maintien préventif d'équipements. • Programme propreté et désinfection. • Mesures correctrices

3. Addition d'anhydride sulfureux (SO_2).	• Doses incorrectes de sulfureux.	• Être rigoureux avec le niveau d'hygiène. • Ajouter la plus petite quantité possible de SO_2 avant la fermentation. • Suivre des instructions de l'oenologue. • Calcul de la dose avant l'addition. • Maintien préventif d'équipements.	• Dosage correct (≤ 160 mg/L).	• Analyse du moût. • Processus d'addition. • Exécution du maintien préventif d'équipements.	• Mélange avec des moûts devant addition excessive. • Corriger des instructions de travail. • Corriger le programme de maintien préventif d'équipements.	• Instructions données par l'oenologue (dose, manière d'emploi, etc.). • Résultat des analyses. • Programme de maintien préventif d'équipements. • Mesures correctrices
4. Cuvaison.	• Pollution microbiologique. • Dose incorrecte ou mal été les enzymes et des levures. • Montée de la température	• Programme propreté et désinfection adéquat. • Bonnes conditions stockage et conservation des levures. • Maintien préventif des équipements de froid.	• Conditions hygiéniques satisfaisantes. • Conditions adéquates stockage et bonne utilisation des levures. •Fonctionnement correct de l'équipement de froid.	• Inspection visuelle et contrôle analytique des réservoirs. • Contrôle des conditions stockage et date de caducité des levures. •Fonctionnement correct de l'équipement de froid.	• Corriger programme propreté et désinfection. • Rejeter les levures en mauvais état et corriger les conditions de stockage. • Refroidir le réservoir dans le plus petit temps possible. • Correction du programme de maintien préventif d'équipements	• Programme propreté et désinfection et résultats des analyses pratiquées aux réservoirs. • Conditions de stockage. • Programme de maintien préventif d'équipements. •Registre graphique quotidien de la température. • Moyennes correctrices.
5. Macération.	• Temps de macération inadéquat.	• Temps de macération fixé par l'oenologue.	• Temps optimal de macération entre 2 et 8 heures.	• Analyse de moûts.	• Répéter une opération. • Traiter le moût séparément et chercher une sortie adéquate au futur vin.	• Ordres dictées par l'oenologue. • Registre graphique quotidien de température. • Analyses physico-chimiques et organoleptiques pratiquées. • Mesures correctrices.
6a. Decuvage.	• Pollution microbienne. • Danger d'oxydations.	• Déterminer moment optimal de descube. • Propreté de réservoirs après son moulage. •Éviter contact entre le moût et l'air.	• Résultats adéquats des analyses pratiquées. •Propreté adéquate des réservoirs. •Bonnes pratiques de manipulation.	• Analyse. • Bonnes pratiques de manipulation. • Propreté des réservoirs.	• Addition d'anhydride sulfureux. • Corriger le programme propreté et désinfection. • Modifier les pratiques de manipulation.	• Analyses pratiquées. •Programme propreté et désinfection. •Mesures correctrices.

6b. Pressurage.	• Pressurage incorrect. • Pollution microbienne du moût presse.	• Maintien préventif des presses. • Conditions hygiéniques adéquates.	• Bon fonctionnement des presses. • Propreté adéquate des presses.	•Fonctionnement les presses et du pressage. • Exécution correcte du programme propreté et désinfection.	• Corriger les instructions de travail. • Corriger les programmes de maintien préventif et de propreté et de désinfection des presses.	• Instructions données aux ouvriers. • Programmes de maintien préventif et de propreté et de désinfection de presses. • Mesures correctrices.
7. Correction des moûts.	• Pollution microbiologique. • Doses inadéquates produits oenologiques ou mal été de de ces derniers.	•Fonctionnement correct du programme propreté et désinfection. • Doses adéquates et bon état de stockage de l'acide tartrique.	• Conditions hygiéniques satisfaisantes. •Doses d'acide tartrique indiquées par l'oenologue (> ; 4 g/L). • Bonnes conditions de stockage.	• Propreté et désinfection de réservoirs correcte. •Analyse de laboratoire. •Confirmer dose à utiliser. •Conditions stockage (température, humidité, etc).	• Répéter l'opération de correction de moûts. •Correction du programme propreté et désinfection. •Rejeter les produits en mauvais état. •Modifier les conditions de stockage.	• Programme propreté et désinfection. •Contrôles analytiques effectués. •Caractéristiques des lots d'acide tartrique reçus. •Conditions de stockage. •Mesures correctrices.
8. Fermentation alcoolique.	• Parada fermentativa. • Pérdida de viabilidad de las lavaduras secas activas (LSA) • Contaminación microbiológica.	• Mantenimiento preventivo del equipo de frío. • Detección previa de residuos. • Adición de activantes. • Calentamiento del mosto. • Respetar instrucciones del fabricante de LSA. • Condiciones higiénicas adecuadas.	• Funcionamiento correcto del equipo de frío • Tª óptima de fermentación: 15-18ºC. • Dosis de LSA recomendadas por el fabricante. • Buenas condiciones higiénicas.	• Correcto funcionamiento del equipo de frío. • Seguimiento del proceso fermentativo (Tª, densidad, acidez volátil, etc.). • Buenas prácticas de dosificación de LSA. • Correcta aplicación del programa de limpieza y desinfección.	• Enfriar el depósito en el menor tiempo posible. • Adición de LSA. • Corrección del programa de mantenimiento preventivo de equipos. • Adición de nutrientes. • Reestablecer pautas correctas de limpieza y desinfección.	• Programa de mantenimiento preventivo de equipos. • Registro gráfico diario de temperatura. • Análisis físico-químicos y microbiológicos. • Características de las LSA. • Programa de limpieza y desinfección. • Medidas correctoras.
9. Fermentation malolactique.	• Arrêts de fermentation. • Doses inadéquates ou perte de viabilité	• Maintien adéquat de l'équipement de froid. •Garantir de bas contenus de SO_2.	•Fonctionnement correct de l'équipement de froid.	•Fonctionement de l'équipement de froid. •Analyse physico-	• Augmenter ou diminuer la température du vin. • Inoculer des bactéries	• Programme de maintien préventif d'équipements. • Registre graphique quotidien de température.

	des ferments lactiques.	•Addition du pied de cuve. • Suivre des instructions du fabricant du pied de cuve.	• Doses adéquates et bon état du pied de cuve.	chimique, sensorielle et microbiologique des vins. •Bonnes pratiques de dosage.	lactiques. • Corriger le programme de maintien préventif d'équipements. • Ajouter acide tartrique.	• Contrôles analytiques. • Dose de ferments lactiques utilisés. • Mesures correctrices
10. Transferts.	• Pollution microbiologique. • Retard dans le transfert. • Risque oxidasique.	• Suivre des instructions de de l'oenologue. •Accomplir le programme propreté et désinfection. •Dosage correct de SO_2.	•Date établie par l'oenologue. •Conditions hygiéniques satisfaisantes des instruments. •Dose optimale de SO_2.	• Inspection visuelle des conditions travail et hygiène. •Doses de SO_2 ajoutées. •Compte du nombre micro-organismes et concentration d'acide lactique. •Dégustation.	• Rejet de départs dans de mauvaises conditions. •Correction du plan de travail. •Correction du programme propreté et désinfection. •Addition de SO_2.	• Instructions de travail. • Programme propreté et désinfection. • Doses de SO_2 ajoutées. • Résultats des analyses. • Mesures correctrices.
11. Clarification.	• Clarification défectueuse. • Dosage inadéquat de produits. • Incorporation de produits toxiques ou certain clarificante non autorisé. •Pollution microbienne.	• Contrôle de la température. •Suivre des instructions de de l'oenologue. •Bon état et identification correcte des clarifiantes. •Conditions hygiéniques adéquates.	• Température environ de 14ºC. • Ajouter des doses adéquates (50 g/hL). • Bon état de conservation des clarifiantes. • Ne pas incorporer de produits toxiques ou clarifiantes non autorisés. •Équipements et instruments hygiéniques.	•Température. •Dosage et état des clarifiantes. •Accomplir le programme propreté et désinfection.	• Nouveau clarifié du vin. •Correction des conditions de stockage des clarifiantes. • Retrait de lots en mauvais état. •Rétablir des règles de propreté.	• Température. •Dose de de clarifiantes. •Dossier de clarifiantes autorisés. • Conditions de stockage. • Programme propreté et désinfection. • Mesures correctrices.

12. Filtration.	• Filtration défectueuse. •Pollution microbienne.	• Réviser les filtres. • Analyse microbiologique du vin filtré. • Conditions hygiéniques appropriées.	• Bon état des filtres. • Conditions hygiéniques satisfaisantes.	• État des filtres. • Limpidité du vin après la filtration. •Propreté du filtre.	• Nouveau filtrat. • Changer ou nettoyer le filtre. • Correction du programme de propreté des filtres.	• Volume vin filtré, état des filtres et résultat des analyses. • Programme de propreté des filtres. • Mesures correctrices.
13. Réfrigération.	•Rupture de la chaîne de froid. •Binôme temps-température inadéquate.	• Accomplir le programme de maintien préventif d'équipements. •Suivi exhaustif de la température.	• Bon fonctionnement des équipements. •Accomplir du temps et des températures choisies par l'oenologue.	•Fonctionement de l'équipement de froid. •Contrôle quotidien de la température. •Contrôle du matériel précipité.	• Mise sur le point de l'équipement. • Rétablir la chaîne de froid. • Nouvelle stabilisation du vin.	• Binôme temps-température. • Plan de maintien préventif d'équipements. • Mesures correctrices.
14. Filtration.	• Filtration défectueuse. •Pollution microbienne.	• Réviser les filtres. • Analyse microbiologique du vin filtré. • Conditions hygiéniques appropriées.	• Bon état des filtres. • Conditions hygiéniques satisfaisantes.	• État des filtres. • Limpidité du vin après la filtration. •Propreté du filtre.	• Nouveau filtrat. • Changer ou nettoyer le filtre. • Correction du programme de propreté des filtres.	• Volume vin filtré, état des filtres et résultat des analyses. • Programme de propreté des filtres. • Mesures correctrices.
15. Stockage.	•Éviter les oxydations. •Modifications microbiologiques	• Bonnes pratiques de manipulation. • Réviser l'état propreté et désinfection des réservoirs. • Analyses physico-chimiques et organoleptiques.	• Bonnes conditions de travail. • Propreté et désinfection adéquates des réservoirs. • Valeurs positives des paramètres analysés.	• Pratiques de manipulation. • État propreté et désinfection des réservoirs. • Interprétation des analyses.	• Suivre des instructions de l'oenologue. • Rejet de départs non aptes. • Correction des programmes de bonnes pratiques de manipulation et de propreté et de désinfection des réservoirs.	• Résultat des analyses. •Programmes de bonnes pratiques de manipulation et de propreté et de désinfection des réservoirs. • Mesures correctrices.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

IMPLEMENTATION OF THE HAZARD ANALYSIS AND CRITICAL CONTROL POINTS (HACCP) IN THE LINE OF MAKING SWEET RED WINE

A. Calcerrada[1], J.E. Pardo[1], C. Baduca[2], Daniela Popa[2]

KEY WORDS: wine, self-manage, preventive measures, food safety

ABSTRACT

The Hazard Analysis and Critical Control Points (HACCP) is a preventive system, which seeks to ensure the security and food safety, and allows product protection and correction of errors, improving quality costs for defects and saving nearly over control final. This paper describes the perils that can be found in the processing line of sweet red wine, preventive measures that can be applied in the factory and to establish monitoring systems and remedial measures provided, if be required, and control registers that must be in the industry. The implementation of this knowledge will allow to any industry of red sweet wine to self-manage their products based on HACCP.

INTRODUCTION

The General Directorate of Food Hygiene 43/93/CEE (transposed into Spanish law by Royal Decree 2207/1995 of 28 December), states that food businesses, among which are included, obviously, white wine industries, must implement a quality assurance system of its productions, the system based on Hazard Analysis and Critical Control Points (HACCP) (DOCE, 1993). HACCP, defined as a preventive system of food control systems whose main goal is safety or food safety (ICMSF, 1991), introduced as the first novelty of the fact that responsibility for consumer safety inspection is carried from official until field producer, which must ensure that safety prevention (NOVOTEC, 1999). The main objective of this work will consist in the implementation of HACCP in the processing line of sweet red wine.

MATERIAL AND METHOD

For the realization of this work has been necessary to visit various processing industries sweet red wine that had planned the implementation of HACCP. As a first step we gather information about the physical - chemical and microbiological characteristics of wines and auxiliary raw materials. Subsequently, we developed the flow chart of the entire production process. Once you review this chart, we reviewed each of the stages in search of potential hazards (biological, physical or chemical) to the consumer. Having identified a

[1] TECHNICAL SCHOOL SUPERIOR OF ENGINEER AGRONOMISTS (ETSIA). UNIVERSITY DE CASTILLA-LA MANCHA (UCLM). UNIVERSITY CAMPUS, S/N. 02071 ALBACETE
[2] UNIVERSITY OF CRAIOVA, FACULTY OF HORTICULTURE

hazard, we seek one or more preventive measures that could prevent or decrease. When preventive measures are not sufficient or adequate to reduce a danger, exceed the critical limit set, which will be detected through the monitoring system. Then apply a series of corrective measures, too, must be provided in advance in order to eliminate, as far as possible the causes of identified hazards. All steps taken to define the HACCP system shall be documented and recorded.

RESULTS AND DISCUSSIONS

This section describes the process or flow chart (Figure 1), from receipt of raw materials to storage of wine, according to their field of study and always based on the findings of the various industries visited. Also included is an overview of application (Table 1) where for each phase, describes the main hazards that can be anticipated and preventive measures to consider minimizing or eliminating that danger. The summary reflects the critical limit for each preventive measure and monitoring necessary to show that a critical point is under control. In order to correct the deviations that may occur above or below critical limits marked, we have identified specific corrective actions for each CCP in the system.

REFERENCES

1. DOCE – Directive 93/43 on the hygiene of foodstuffs. *Official Journal of the European Community, No. 175 of 19 July 1993*.
2. ICMSF – El sistema de análisis de riesgos y puntos críticos. Su aplicación a las industrias de los alimentos. *Ed. Acribia, Zaragoza, España*, 1991.
3. NOVOTEC – Guía de aplicación del Análisis de Riesgos y Control de Puntos Críticos (ARCPC) en almazaras. *Ed. Caja Rural de Jaén, Jaén, España*, 1999.

Figure 1.

IMPLEMENTATION OF THE HAZARD ANALYSIS AND CRITICAL CONTROL POINT

FLOW CHART OF THE LINE MAKING SWEET RED WINE

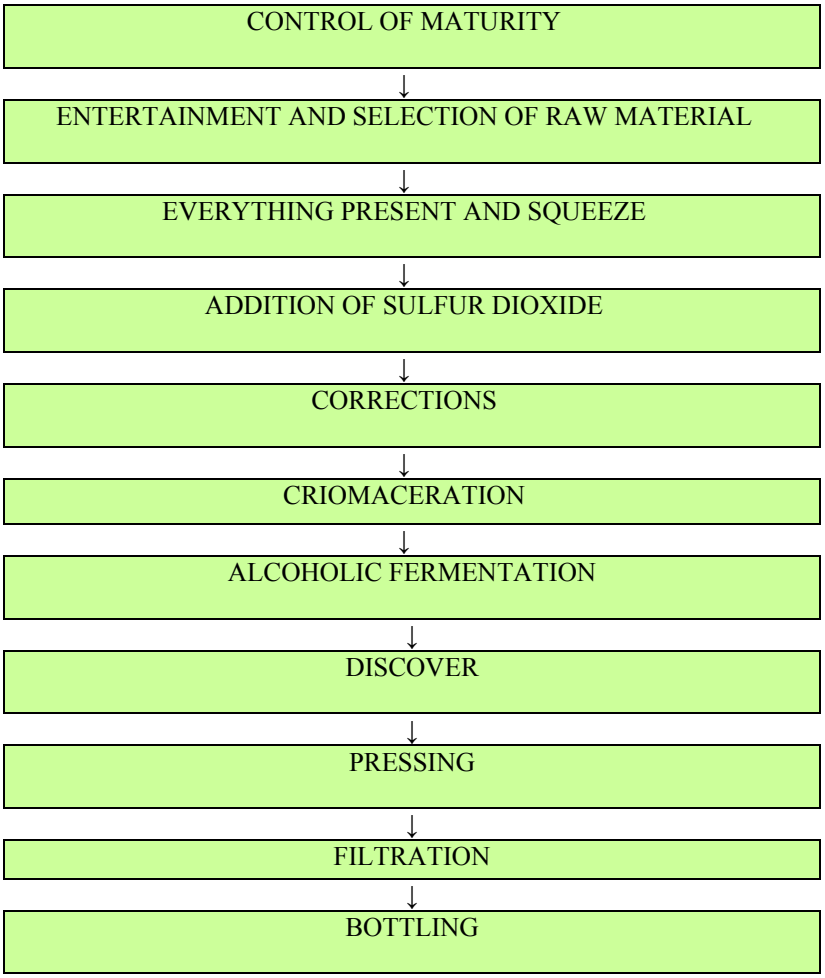


Table 1.

Synoptic application of the processing line of sweet red wine

PHASE	MEASURES	HAZARD PREVENTIVE	CRITICAL LIMIT	SURVEILLANCE	CORRECTIVE MEASURES	RECORDS
1. Control of maturation	•Inadequate monitoring	• Winemaker's instructions. Proper maintenance of measuring instruments.	• Harvest between 17-19 º Baume.	• Control maturation by the winemaker.	• New samples in fields to harvest. • Review of the status of the measuring apparatus	• Obtained data from the conducted tests.
2 Reception and selection of raw materials.	• Poor health status. • Raw materials contaminated by fungicides • Crushing grapes and premature initiation of fermentation •Wrong Baume Grade • Microbiological contamination of transportation. • Non-drinking water.	•Establish the optimum time of harvest • Monitoring the health status of the grape • Appropriate transfer to the cellar • Hygienic conditions of the hoppers.	• Do not exceed loadlimits. .•Good hygiene practices. • Good transport practices. • GHPs.	• Visual inspection of the grapes. • Chemical determinations in grapes. • Terms of means of transport. • Control hygienic means of transport. • Cleaning and disinfection of the hopper.	• Rejection of unsuitable material. • Correct transport practices. • Clean adequate means of transport and hoppers.	• Input items. • Analysis grapes. • Corrective measures. • Cleaning program.
3. Everything present and squeezed.	• Rupture and scrape the seeds • Crushing very energetic . • Microbiological contamination	• Appropriate maintenance of equipment. • Cleaning and disinfection.	• Effective functioning of equipment. • Good hygienic conditions.	• Proper implementation of preventive maintenance programs for equipment, cleaning and disinfection.	• Correct both programs when necessary	• Program cleaning • Maintenance of equipment, disinfection. • Corrective measures.
4. Adding sulfur anhydrid	• Incorrect doses of sulfur	• Being strict with hygiene standards • Add the least amount of SO2 before fermentation. • dose calculation before addition. • Preventive maintenance of equipment. • Follow directions to the winemaker.	• Effective functioning of equipment. • correct dosage (≤ 160 mg / l).	• Control of the maintenance program. • Analysis of the must. • Control Laboratory.	• Mixture musts before adding excessive. • Correct work instructions. • Correct preventive maintenance program of equipment.	• Instructions given by the winemaker (dose, mode of employment, etc.).. • Analysis results • Control of maintenance. • Control doses of sulfur. • Corrective measures.

5. Corrections.	• Microbiological contamination. • Inadequate dose or poor enological products thereof.	•Correct operation of cleaning and disinfections program. • Appropriate dose and condition of storage of tartaric acid	• Satisfactory sanitary conditions. • Dose of tartaric acid as indicated by the winemaker (> 4 g / l). • Good storage conditions.	• Control of storage conditions • Confirm dose used. • Cleaning and disinfections of tanks correctly	• Correct storage conditions. • Discard bad products. • Repeat correction must. • Correction cleaning and disinfections program.	• Control of storage. • Corrective measures • Program cleaning and disinfections. • Analytical controls made. • Characteristics received lots of tartaric acid.
6. Criomaceration.	• Added excessive temperature. • |Microbiological contamination.	• Program adequate cleaning and disinfections. • Preventive maintenance of equipment.	• Sanitary condition. • Satisfactory operation of the cold.	• Visual inspection of the tanks. • Temperature control.	• Correct cleaning and disinfections program. • Correct the cooling conditions.	• Program cleaning and disinfections. • Corrective measures.
7. Alcoholic fermentation.	• Taking too sweet wine • Ski wrong •Microbiological contamination.	• Control of pumping. • Inoculation of yeast sensitive low of 17 ° C. • Appropriate maintenance of equipment. • Cleaning and disinfections.	• Preventive maintenance of proper equipment • Temperature control • Hygienic conditions.	• Monitoring of fermentation process (T [a], density, volatile acidity, etc.) • Control equipment maintenance. • Temperature control • Traced and hygiene programs.	• Correction maintenance program. • Frequently lift, aerate and restore hygiene program.	• Preventive maintenance program of equipment • Daily chart record of temperature and density • Conventional microbiological analysis • Corrective measures.
8. Devoting.	•Microbiological contamination. • Risk of oxidation. • Production of H2S and aromas and flavors.	• Determine optimal time devatting • Follow directions to the winemaker.	• Good handling practices. • Good organoleptic quality of wine.	• Controls physicochemical and sensory. • High number of microorganisms.	• Adding sulfur dioxide dosage, when necessary.	• Laboratory controls • Corrective measures. • Practical analysis.
9. Pressed.	• Wrong pressed • Oxidations of wines • Microbiological contamination.	• Correctly adjust the pressing force. • Program adequate cleaning and disinfections. • Preventive maintenance program of equipment. • Instructions winemaker.	• Apply appropriate pressures. • Satisfactory sanitary conditions • Good functioning of the press.	• Intensity of the pressing force. • Preventive maintenance of equipment. • Visual control of the pressing process	• Correction of working conditions. • Correction of cleaning and disinfections programs and equipment maintenance.	• Daily extraction of worth • Pressure used • Laboratory controls • Program cleaning and disinfections. • Corrective measures

10. Filtration	• Stop fermentation. • Inadequate dose or loss of viability of lactic ferments. • Acetic acid production.	• Proper maintenance of cooling equipment. • Maintain a warm, if necessary. • Analytical controls. • Addition of starter cultures.	• Good handling practices • Operation of the equipment from the cold. • Satisfactory sanitary conditions	• Temperature control. • Physical-chemical, sensory and microbiological analysis of wines. • Control equipment maintenance program.	• Wine mixture and addition of starter cultures. • Correction equipment maintenance program. • Addition of tartaric acid	• Equipment maintenance program. • Analytical controls and corrective measures implemented. • Record chart. • Dose of starter cultures used.
11. Filling	• Incorrect filling of the bottles. • Contaminated corks. •Physicochemical alterations. • The presence of crystals or other foreign bodies. • Incorrect wash water decalcification. • Microbial contamination.	• Adjust the fill level. • Preventive maintenance of equipment • Good condition of the corks and bottles. • Cleaning. • Right decalcification process	• Proper rinsing. • Proper maintenance of equipment and supplies. • Good cleaning practices.	• Visual inspection of the operation. • Implementing correct programs for cleaning, disinfecting and preventive maintenance of equipment.	• Reject unsuitable items • Correction program for cleaning, Disinfecting and preventive maintenance of equipment.	• Receiving lots • Cleaning and disinfections program • Maintenance program of equipment and utensils. • General Incidents. • Corrective measures.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

RESEARCHES REGARDING UTILISATION OF NATURAL ORGANIC COMPOUNDS OF BORON AT HORTICULTURAL PLANTS ON PSAMOSOILS

I. Ratoi[1], V. Toma[1],
Mihaela Croitoru[1], Anica Durău[1]

KEY WORDS: horticol plants, fertilizers, boron, psamosoil

ABSTRACT

Foliar fertilization with natural organic compounds of boron contributes to increasing the strength and productivity of plants.

At watermelons culture the using of boron fertilizers determined the increasing of fruits mean weight and increasing of production. The greatest fruits (4,660 Kg), were obtained when used the compound Bor complex. In this variant the production of fruits was 45,3 t/ha.

At peach tree, the strenght of trees, expressed throughtthe length of offshoots, registered the values between 25,37 m/tree in variant with Acid boric, 0,15% and 32,90 m/tree in variant with Bor complex, 5 l/ha, comparative with 17,80 m/tree in witness variant, foliar unfertilized. The production spores in variants foliar fertilized were between 6 and 48% comparative with witness variant, foliar unfertilized.

At vine, the spores of production, function of different types of fertilizers, comparative with witness variant, foliar unfertilized, were between 13 and 50%. It was emphasized the variant fertilized with Bor complex, 5 l/ha, where grapes production was of 6750 Kg/ha.

INTRODUCTION

Vegetable growing, fruit growing and viticulture, considered specialized agrosystems, represent a large frame for man`s interventions, for example ensurance with mineral elements necessary for the plants nutrition.

The boron has a great fisiological importance for plants because it encourages the blossom, fecundation and development of seeds, stimulates the increasing of root, intensifies some ensime as saccharose, pectase, tirosinase, dehydrogenase, operates indirectly upon the photosynthesis through intensification of glucides transport, especially, saccharose from leaves (Davidescu D., 1974, Davidescu Velicica, Davidescu D., 1999, Scorei R.şi colab.).

The agricultural soils from Romania contain, in mean, about 15-68 ppm boron, and the boron mobil quantity is between 0,1-0,8 ppm (Băjescu Irina, Chiriac Aurelia, 1984). The sandy soils contain the smallest quantity of microelements, and boron, too.

The watermelons, tree and bush fruits and vine manifest temperat necessity for boron. The insufficiency of boron in plants nutrition determine the deficiency phenomenon

[1] Research – Development Station for Agricultural Plants on Sands Dabuleni

(Davidescu D., 1974). The correction of deficiency phenomenon of boron in plants nutrition is made through the administration in soil of boron salts but also through the application on leaves of some products on base of boron (Gartel W., 1974).

MATERIAL AND METHODS

For emphasizing the role of boron for the horticole plants were used the products on base of boron, of the type Acid boric, 0,15%, Folibor standard, 5 l/ha, Folibor B, 5 l/ha, Cupribor, 5 l/ha, Bor complex, 5 l/ha, at watermelons culture, peach tree and vine in 2005-2006 period.

Two foliar treatments were applied:

- the treatment I, at before of the increasing of offshuts at watermelons culture, before the start of blossom at vine, and at the start of intense increasing of offshuts at peach tree;
- the treatment II, at 10 days for the first at watermelons culture, after the end of blossom at vine, and at 14 days after the first.

The solution quantity for one treatment was 300 l/ha at watermelons culture, 600 l/ha at vine and 1000 l/ha at peach tree.

In witness variant, foliar unfertilized, the agrofound was N150 P_2O_5 100 K_2O 100.

RESULTS AND DISCUSSION

At watermelons culture the rezults, regarding the level of production, obtained through fertilization with the boron from natural organic compounds, show the importance of boron in their nutrition, on the sandy soils.

The mean of two experimentation years emphasize the treatments with Acid boric (production spore of 5,2 t/ha) and Bor complex (production spore of 4,9 t/ha), (table 1). The production differences between variants, are evidently but are not statistical provided, this because of sandy soils ununiformity from the point of view of natural fertility, and the reduce relative spores of 0,4-5,2 t/ha were obtained because of the rich agrofound relative and of reduce number of foliar treatments.

The importance of boron is very relevant compared to the production obtained through fertilization with Folibor standard, which was of 44,4 t/ha, and fertilizing with Bor complex, were obtained 45,3 t/ha, because of the chemical composition of the two products. Although, the product Bor complex has in its composition a great number of macro and microelements, the product Folibor standard, which has in its composition only boron and calcium, achives almost the same the production spore.

The importance of boron in plants nutrition of watermelons on psamosoils is, also, emphasized through the production spore obtained in variant treated with Acid boric, which has not these elements in their composition.

Utilisation of boron fertilizers determined the increasing of fruit mean weight of watermelons. The fruits with the mean weight too greatest (4,660 Kg), were obtained when the fertilization was made with Bor complex (table 1). The mean of two years showed a increasing of fruit weight with 3-13%, the greatest increasing were registered through foliar fertilization with Bor complex (spore of weight of 561 g) and Acid boric (spore of weight of 496 g).

Table 1

The influence of fertilization with natural organic compounds of boron upon of watermelons production

Variant	Mean weight of fruits		Yield			
	Kg	%	t/ha	%	Difference t/ha	Signification
Witness, foliar unfertilized	4.099	100	40.4	100	Mt.	-
Acid boric, 0,15%	4.595	112	45.6	113	+5.2	-
Folibor standard, 5 l/ha	4.412	107	44.4	110	+4.0	-
Folibor B, 5 l/ha	4.375	106	40.8	101	+0.4	-
Cupribor, 5 l/ha	4.246	103	43.5	108	+3.1	-
Bor complex, 5 l/ha	4.660	113	45.3	112	+4.9	-
DL 5%	5.3		8.7		7.0	
DL 1%	7.1		12.1		9.6	
DL 0,1%	9.4		16.7		13.0	

At peach tree culture, the trees strength was expressed by the length of offshoots, height of tree, diameter of tree crown and the volum of the crown. The foliar fertilizing with natural organic compounds of boron contributed to obtaining some superior values in all fertilzed variants and at all the studied elements (table 2).

The sum of vegetative increasing registered values between 25,37 m/tree in variant treated with Acid boric, 0,15% and 32,90 m/tree in foliar treated variant with Bor complex, 5 l/ha, comparative with 17,80 m/tree in witness variant, foliar unfertilized.

The height of the tree is an important indicator, for establishing the strength of fruit trees, with condition without man intervention. In this case the differences comparative to the witness variant were small, 2,13 m in witness variant, foliar unfertilized and from 2,23 m to 2,31 m in fertilized variants with Folibor standard, 5 l/ha and respectively Bor complex, 5 l/ha.

The crown volum of trees, registered superior values in foliar treated variants, with nutrients, respectively from 1,63 m^3/tree in variant treated with Cupribor, 5 l//ha to 1,80 m^3/tree in fertilzed variant with Bor complex, 5l/ha, comparative with witness variant, foliar unfertilized where registered a value of 1,07 m^3/tree.

Table 2

The influence of fertilization with natural organic compounds of oron upon some elements of strength at peach tree

Variant	Sum of vegetative increasing (m/tree)	Heith of tree (m)	Diameter of tree crown (m)		Volum of tree crown (m^3)
			between rows	on row	
Witness, foliar unfertilized	17.80	2.13	1.77	1.66	1.07
Acid boric 0,15%	25.37	2.30	1.80	1.68	1.65
Folibor standard, 5 l/ha	29.60	2.31	2.31	1.88	1.77
Folibor B, 5 l/ha	26.70	2.23	1.80	1.56	1.70
Cupribor 5 l//ha	27.37	2.23	1.91	1.70	1.63
Bor complex 5 l/ha	32.90	2.3 1	2.21	1.71	1.80

From the point of view of the influence of foliar fertilzers on base of boron upon fruits production it was established that comparative to the witness variant, foliar unfertilized, was obtained a mean production of 8,3 t/ha, in all foliar fertilized variants were obtained very big productions, the spores of production were between 6 şi 48% (table 3).

Table 3

The influence of fertilization with natural organic compounds of boron upon production of peach tree

Variant	Fruit mean weight (g)	Yield		Differences t/ha	Signification
		t/ha	%		
Witness, foliar unfertilized	71	8.3	100	-	Mt.
Acid boric 0,15%	83	8.9	106	+0.55	-
Folibor standard, 5 l/ha	92	12.4	148	+4.05	***
Folibor B, 5 l/ha	86	10.4	125	+2.10	*
Cupribor 5 l//ha	87	11.2	135	+2.90	**
Bor complex 5 l/ha	90	12.4	148	+4.02	***
DL5%				1.65	
DL1%				2.29	
DL0,1%				3.16	

The greatest production of fruits was obtained in fertilized variants with Folibor standard, 5 l/ha and Bor complex, 5 l/ha, 12,4 t/ha. The mean weight of fruits was influenced by the foliar fertilization but also by the fruits number on tree. Comparative with the witness, foliar unfertilized where the fruits mean weight was of 71 g the greatest values were obtained in fertilized variants with Folibor standard, 5 l/ha (92g) and Bor complex, 5 l/ha (90g).

The production spores were statistically provided in four from five variants very significantly, in fertilized variants with Folibor standard, 5 l/ha and Bor complex, 5 l/ha, significantly distinct in treated variant with Cupribor, 5 l//ha and significantly in fertilized variant with Folibor B, 5 l/ha.

At vine culture, the foliar fertilization, with natural organic compounds of boron, contributed to obtaining spores of production in all variants which it was used (table 4). The production spores, function of different types of fertilizers, comparative to the witness variant, foliar unfertilized, although were between 13 and 50%, are not statistically provided. It was emphasized the fertilized variant with Bor complex, 5 l/ha, where the grapes production was of 6750 Kg/ha, with a production spore of 50% comparative with the witness, foliar unfertilized. This variant was followed by variants which used Folibor standard, 5 l/ha and Cupribor, 5 l/ha with production spore of 22%.

The grapes production quality depend on the biological potential on variety, of culture factor but also on the climatical conditions as well as grapes production quantity (table 4).

Concerning the influence of different types of fertilizers on boron base, showed that through their utilisation were obtained grapes with a big weight comparative with the witness, foliar unfertilized. The mean weight of 100 grapes was between 188 and 198 g in all foliar treated variants comparative with the witness, foliar unfertilized where it was

registered a value of 172 g. The greatest value was registered in the variant which used Bor complex, 5 l/ha, 198 g/100 grapes.

The values of total sugar content were between 160 şi 162 g/l in foliar treated variants comparative to 166 g/l in the witness, foliar unfertilized. The greatest value was registerred in treated variant with Folibor B, 5 l/ha, 162 g/l.

Table 4

Grapes production function of foliar fertilization with natural organic compounds of boron at vine

Variant	Grapes production		Difference Kg/ha	Mean of 100 grapes (g)	Total sugar (g/l)	Total acidity (g/l H_2SO_4)
	Kg/ha	%				
Witness, foliar unfertilized	4500	100	172	166	2.42	Mt.
Acid boric, 0,15%	5250	116	188	161	2.41	+750
Folibor standard, 5 l/ha	5500	122	192	160	2.56	+1000
Folibor B, 5 l/ha	5125	113	191	162	2.60	+575
Cupribor, 5 l/ha	5500	122	193	160	2.71	+1000
Bor complex, 5 l/ha	6750	150	198	160	2.73	+2250

DL 5% = 3070 DL 1% = 4260 DL 0,5% = 5880

In witness variant, foliar unfertilized, the value of total titrable acidity was of 2,42 g/l H_2SO_4 and in treated variants with products on boron base this registered the greatest values, with one exception. This was between 2,56 g/l H_2SO_4 in treated variant with Folibor standard, 5 l/ha, and 2,73 g/l H_2SO_4 in treated variant with Bor complex, 5 l/ha.

CONCLUSIONS

1. The foliar fertilization with different types of fertilizers on boron contributes to obtaining some superior values concerning the plants strength and productivity.

2. At watermelons culture, the utilisation of fertilizers with boron determined the increasing of fruits mean weight and, finally, the increasing of production. The fruits with the greatest mean weight too greatest (4,660 Kg), were obtained when the fertilization was made with Bor complex.

3. At peach tree culture, the trees strength expressed through the vegetative increasing sum registered values between 25,37 m/tree in treated variant with Acid boric, 0,15% and 32,90 m/tree in treated variant with Bor complex, 5 l/ha, comparative with 17,80 m/tree in witness variant, foliar unfertilized.

4. At vine culture, the foliar fertilization, with natural organic compounds of boron, contributed to obtaining grapes with a big weight of spores of production between 13 and 50%.

REFERENCES

1. *Băjescu Irina, Chiriac Aurelia*. - Distribuţia microelementelor în solurile din România. Editura Ceres, Bucureşti, 1984.

2. *Davidescu D*. - Chimizarea agriculturii. Editura didactică şi pedagogică, Bucureşti, 1974.
3. *Davidescu Velicica, Davidescu D*. - Compendium Agrochimic. Editura Academiei Române, Bucureşti, 1999.
4. *Gartel W*. - The microelemnts – their importance for the nutrition of grapes with particular regard to deficiency and toxicity symptoms. Weinberg u. Keller, 21, 1974.
5. *Scorei R., Lascu N., Giorgota N., Toma V., Ploae Marieta, Croitoru Mihaela, Mitruţ Mihaela.* - The influence of fertilization in the vegetation using Folibor and Cupribor on the quantitative level of watermelon production. Bulletin of University of Agriculture Sciense and Veterinary Medicine, Culj-Napoca, 2005.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

PHYSIC-CHEMICAL PROCESSES THAT OCCUR DURING THE AGING OF WINE DISTILLATES UN CAKE BARRELS OF DIFFERENT CAPACITIES

Rădulescu Paula, Călugăru Laura, Popa Aurel

KEY WORDS: Wine distillates, aging, cake barrels.

ABSTRACT

To achieve drinks of spirit brandy type (Cognac), raw distillations of wine are subject to the processes of aging, for a long time, in cake barrels, where take place profound physical, chemical and biochemical transformations that lead to the enrichment of chemical composition and the enablement of olfactory-gustative characteristics of distillates.

The classical aging of wine distillates remained also in this days as a traditional practice, slow and delicate, based a winemaker kills and experience. During the aging of distillate wine occurs a concentration of some of its components and occurs the achievement of other new components, bath sets of changes contributing decisively to the improvement of organoleptic characteristics (Popa A., 1992, 2002).

INTRODUCTION

As for Romania, the wine distillations represent an important way of recover the wine-raw material, from many vineyard areas and one of these areas is the vineyard center Banu-Maracine, Craiova, so we proposed to surprise the physical-chemical processes during 2004-2009, that occurs during the aging of wine distillates in barrels of different capacities.

MATERIAL AND METHODS

To achieve the experiments were used cak with a capacity of 500 liters and 200 liters, where was passed to aging the wine distillate, from the Cramposie wine, 1990 harvest. Composition and organoleptic characteristics of raw wine distillate from the Cramposie wine, harvest in 1990 are present in Tab. 1.

Oak barrils (500 l and 200l) with raw distillate of wine, were passed in the warehave of againg, where temperature varied between 15-25ºC. Periodically, from six to six months were analyzed the chemical characteristics of distillate subjected to aging, turning to analysis adapted by O.I.V, and the organoleptic assessment was done by the calling to the assessment system of compensation points from 1 to 20.

We mention that our experiences are part of a larger/broader research program conducted at the Department of Viticulture-Oenology of the Horticulture Faculty of Craiova.

Tab.1

Compositional characteristics of raw distillate of wine

	I. The physico-chemical properties	Content	Content improved by the quality standard
1.	Alchoolic concentration at 20ºC vol.%	68,82	62-72
2.	Total acidity (acetic acid) mg/l	450	600
3.	Aldehydes (acetaldehida) mg/l	94	150
4.	Superior alchools, mg/l	1800	700-3000
5.	Metyl alchool, g/l	0,8	2,60
6.	Esters, mg/l	1900	500-2200
7.	Furfural, mg/l	9,3	14,5
8.	Iron, mg/l	0,7	1
9.	Copper, mg/l	1,02	3
10.	Lead, mg/l	0,03	0,3
11.	Arsenic, mg/l	-	0,05
II. Sensors features			
Clear liquid without suspended particles or slurry and without sediment. Colorless liquid			

RESULTS AND DISCUSSION

The evolution of the distillate wine characteristics during the aging of raw distillate wine in cak barrels (500 l in full) are presented in Tab.2. Distillate obtained from Cramposie wine, the harvest of 1990.

The evolution of the same characteristics of raw distillate of wine found during aging, but in cak barrels of smaller capacity (200 l in full) is given in Tab.3

During aging of wine distillates in barrels of different capacities located in warehause of aging with temperature, relatively high, between 15-25ºC, occur distillate losses. The results obtained by us are presented in Tab.4.

CONCLUSIONS

Analytical results obtained during 5 years of research, concerning on physico-chemical processes that occur during aging of wine distillates in cak barrels of different capacities allow us to draw next conclusions:

1. The most important chemical reactions that occur during aging can be divided into two main categories:
   a) hydrolysis reaction
   b) oxidation reaction
2. Hydrolysis reactions have influence mainly on the taste characteristics of distillate, while the oxidation of the fragrance;
3. Volatile components of the distillate from wine by distilation during aging
4. Nonvolatile components, mainly from, cak and dry extract from of distillate at a rate of 0,5-2 g/l after 4 to 8 years of aging. The extract contains a complex of substances: acids, tannins, lignin, lignon, colorants, sugars, esters, aldehydes and aromatic ketones, lactones;
5. In barrels of larger capacity (500 liters), the aging of distillate wine is heavy because of larg volumes, the staves barrel is very big and the contact with the oxigen from oxigen becomes insuficient;

6. In vassels of smaller capacity (200 liters), wine distillate obsolescent quieker, as a result of a favorable report between the surface and the volume and the lower thiekness, which eases the oxidation processes. At the sametime, low-capacity vassuls, the proportin of distilate that is lost by evaporation is higher.

BIBLIOGRAPHY

1. Lafon, J. – Introduction sur etude theoretique sur la Cognac, sa composition et son vieillissement naturel en fruits de Cherie-"Revue francaise d'oenologie", nr.57,p.6-7, 1975
2. Popa A., - Producerea si învechirea distilatelor de vin. Editura Scrisul Românesc,Craiova, 1985;
3. Popa A., Popa D., - Modification of chemical composition and organoleptic assets in wine distillations under the action of aging procedures - Bull. USAMV Cluj Napoca, vol 57,p. 229-233, 2002.

The evolution of the distillate wine characteristics during the aging of raw distillate wine in cak barrels (500 l in full).
Distillate obtained from Cramposie wine, the harvest of 1990

Tab.2

Analyses phase (ages)	Alco-holic titre vol% to 15ºC	pH	În mg/l distilled			În mg per 100 ml anhydrous alcoohol						Esters + Higher alcohools	Higher alcoohols + esters	Organoleptic assessment 0-20 pct.
			Extract	Ash	Total nitrogen	Total acidity (acetic acid)	Aldehide (acetaldehyde)	Esters (etil acetat)	Furfural	Higher alchools	Nonalchoolic coefficient [8]			
Initial	68,82	3,56	114	25	1,1	36,4	6,8	76,8	0,00	152	272	228,8	1,97	8
1	68,70	3,61	482	55	-	65,00	6,9	89,10	0,20	174	335,2	263,1	1,95	9,5
1,5	68,68	3,72	592	54	-	77,14	7,5	96,40	0,60	182	357,6	278,4	1,88	12
2	68,50	3,85	610	62	-	80,4	8,6	114,0	0,80	188	391,8	302,0	1,64	16
2,5	68,42	3,80	742	69	-	87,6	9,8	130,4	0,90	194	422,7	324,4	1,48	17
3	68,10	3,83	870	69	-	89,0	10,4	146,0	1,20	204	450,6	350,0	1,39	18
3,5	67,90	3,71	890	71	-	91,1	11,3	172,4	1,30	210	486,1	382,4	1,21	18
4	67,51	3,50	899	73	2,29	92,4	12,6	180,1	1,50	215	501,6	395,1	1,19	18
4,5	67,43	3,49	946	74	2,35	94,4	15,4	184,3	1,50	220	515,6	404,3	1,19	19
5	67,14	3,45	1144	75	2,40	95,2	18,2	189,0	1,60	232	536,4	421,0	1,22	19

* Nonalcohoolic coefficient = Σ acids, aldehydes, esters, furfural and higher alcohools

Tab 3.

The evolution of the distillate wine characteristics during the aging of raw distillate wine in cak barrels (200 l in full).

Analyses phase (ages)	Alco-holic titre vol% to 15ºC	pH	În mg/l distilled			În mg per 100 ml anhydrous alcoohol						Esters + Higher alcohools	Higher alcoohols + esters	Organoleptic assessment 0-20 pct.
			Extract	Ash	Total nitrogen	Total acidity (acetic acid)	Aldehide (acetaldehyde)	Esters (etil acetat)	Furfural	Higher alchools	Nonalchoolic coefficient [8]			
Initial	68,82	3,56	114	25	1,1	36,4	6,8	76,8	0,00	152	272	228,8	1,97	8
1	68,73	3,51	942	27	2,3	37,0	7,6	84,8	1,14	166	296,5	250,8	1,95	10
1,5	68,50	3,47	1156	31	2,9	89,4	8,5	95	1,27	169	363,1	264	1,77	12
2	68,01	3,46	1404	34	3,6	105	10	143	2,14	186	446,1	329	1,30	17
2,5	67,80	3,45	1686	34	4,8	109	17	164	2,64	198	490,6	362	1,20	19
3	67,53	3,46	1743	35	5,7	134	20	189	3,50	214	560,5	403	1,13	19
3,5	67,32	3,43	1794	35	6,9	166	26	210	4,80	292	638,8	442	1,10	19
4	66,80	3,42	2742	35	7,5	195	28	236	6,44	247	712,4	483	1,04	19
4,5	66,56	3,42	2896	35	8,4	210	33	241	7,30	253	744,3	494	1,04	19
5	66,50	3,42	2886	36	9,0	230	34	256	8,50	286	814,5	542	1,11	20

Distillate obtained from Cramposie wine, the harvest of 1990

Tab.4

The oscillation limits and the loss average of distillate wine, occuring during aging, in relation to the size of barrels (kg/100Kg).

Barrels in full in a local with ambiental temperature between 15-25ºC

Analysis phase (ages)	Barrels capacity (l)	
	500	200
1	1,4 - 2,9 1,84	3,3 - 7,2 4,9
1,5	3,6 - 5,7 4,0	8 - 13,2 10,2
2	3,7 - 5,2 4,8	8,6 - 9,4 10,9
2,5	5,8 - 6,4 5,8	9,9 - 14,6 12,2
3	5,3 - 8,4 6,8	11,2 - 17,9 14,0
3,5	7,3 - 10,6 8,4	13,7 - 19,6 16,4
4	7,5 - 10,9 8,8	14,6 - 22,0 17,9
4,5	8,4 - 13,0 11,4	16,4 - 24,8 19,80
5	9,2 - 13,6 11,40	17,2 - 2,70 23,0

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

THE ORIGIN AND EVOLUTION OF DISTILATE EXTRACT OF AGED IN OAK BARRELS OF VARIOUS SIZES

Rădulescu Paula, Călugăru Laura, Popa Aurel

KEY WORDS: Distillate extract, oak barrels, aging.

ABSTRACT

The main chemical processes that conducted to the improve of wine distillates composition and of their olfactory-gustative characteristics are related with ethanolissis and other wood lignin of oak transformations. During the process of lignin oak ethanol's happen two opposite phenomena, one refers to decomposition by the simplest combination of lignin monomers and the other to condensation of monomers with the formation of dense products, which ultimately precipitates. Also, during aging of wine distillates some of the lignin ethanolisse products, and some of the simplest combination of wood extracted cycle enzymes are subject to oxidative degradation, resulting aromatic aldehydes, such as vanillin. It should be emphasized the fact that the most condensed non-volatile products of lignin ethanolisse increase the distillate of wine extract, and the fact that they have color, it participate in reaching the aged distillate's color (Popa A., 1985, 2002, Gavrilescu I., 1998, Teodorescu and all, 1958).

INTRODUCTION

In a research program developed at the Department of Viticulture and Oenology of the Faculty of Horticulture in Craiova, in connection with the production and aging of wine distillates we decided to catch the wine distillate extract evolution during aging and to determine the main origin components thereof.

Material and methods

The experiments were conducted in the wine technological laboratory Banu Maracine resort Craiova, following which is the origin and evolution of the main components of wine distillate extract old to 15 years, in oak barrels of different capacity (500 liters and 200 liters), located in a place for aging, whose ambient temperature was between 15ºC and 25ºC. for chemical determinations, there were used methods recommended by the International Organization of Vine and Wine (OIV).

RESULTS AND DISCUSSIONS

The main obtained results of the extract's content evolution of aged wine distillate in oak barrels with a capacity of 500 liters, are presented in Tab.1.

Extract's content evolution of aged wine distillate in oak barrels with a capacity of 500 l (in full). Distillate obtained from Cramposie wine, made from de harvest of 1990

Tab.1

Compo-nent	Maturation period (years)										
	1	1,5	2	2,5	3	3,5	4	4.5	5	After 10 years	After 15 years
Tanning substances %	20	23	25	29	33	34	35	36	36	37	14
Lguin %	27	29	31	32	34	36	36	37	37	19	18
Reducing sugars %	16	19	21	23	24	24	25	25	25	36	47

It was found that tanning substances are extracted from oak wood in the first 3 to 5 years, after which their content is reduced on account of condensation process, that takes place. Lignin content increases in distillate u to 5 years of aging, then decreases significantly as a result of chemical transformations with the formation of reducing sugars, that face important proportions as the aging period increases.

Aging of distillates in oak barrels with smaller capacity lead to the same evolutionary effect of tanning substances, lignin and sugars, but their proportions are more considerable. The obtained results are presented in Tab.2.

Extract's content evolution of aged wine distillate in oak barrels of smaller capacity (200 l, in full). Distillate obtained from the Cramposie wine made from the harvest of 1990

Tab. 2

Compo-nent	Maturation period (years)										
	1	1,5	2	2,5	3	3,5	4	4.5	5	After 10 years	After 15 years
Tanning substances %	20	23	25	29	33	34	35	36	36	37	14
Lguin %	27	29	31	32	34	36	36	37	37	19	18
Reducing sugars %	16	19	21	23	24	24	25	25	25	36	47

To capture the component's source of aged wine distillate's extract, we have made absolute alcoholic aqueous extracts in the inner layer of oak staves that came in direct contact with the distillate subjected to aging up to 2 mm thick.

The results obtained from aged distillates in oak barrels with a capacity of 500 liters are presented in Tab.3.

The chemical composition of the imner and outer layers of staves' oak barrels (500 liter capacity), in which wine distillate got aged for 15 years. The extract was made from the 2 mm resulted talaj of two layers

Tab. 3

The area where the extract was made	The chemical composition of the a queos and alcoholic extract (mg/l)			
	Dry residue	Tanning substances	Reducing substances	Lignin
From the inner layer (that came direct contact with the distillate) up to 2 mm thick	1,84	0,85	0,05	0,89
From outer layer (that came in direct contact with the at mosphere) up to 2 mm thick	4,05	3,10	0,09	1,17

Inner layer's depletion is easily found into the main components of the wine distillate extract, as a result of the hydrolysis and oxidation reactions process.

We meet the same phenomenon in the case wine distillate aging in vassals of smaller capacity (200 liters), the depletion of the immer layer being more severe and therefore, a more rapid aging and quality distillate. The obtained results are given in Tab. 4.

The chemical composition of the inner and outer layers of stares oak barrels (capacity 200 liters) in which wine distillate got aged for 15 years. The extract was made from the first 2 mm resulted talas of the two layers

Tab.4

From outer layer (that came in direct contact with the at mosphere) up to 2 mm thick	The chemical composition of the a queos and alcoholic extract (mg/l)			
	Dry residue	Tanning substances	Reducing substances	Lignin
From the inner layer (that came direct contact with the distillate) up to 2 mm thick	1,52	0,42	0,01	0,39
From outer layer (that came in direct contact with the at mosphere) up to 2 mm thick	4,00	3,12	0,08	1,14

CONCLUSIONS

1. Our research confirms researches carried out in other major wine countries of the world, demonstrating that in the aging technology of wine distillates, the oak barrel is not only a container for wine distillate, but mostly it provides wood extractive substances to the distillates that are necessary in the aging process and in the same time it accomplishes the physical and chemical conditions that conduct to the transformations that occur between wine distillate and wood. Without the wood presence the organoleptic qualities of the wine distillate would not form, whatever the length of aging.
2. The extraction and then oxidation of tanning substances from the oak barrel stave leads to an improvement in the wine distillate's taste, printing a pleasant taste. In the raw wine distillates, the tanning substances are absent and they increase gradually as aging, reaching the maximum level after 3-5 years, and then due to the oxidation processes they begin to decrease;
3. The lignin is a nucleosides substance, whose constitution is little known; it contributes with the cellulose to vegetable cells walls constructions. A part of the lignin is soluble in alcohol in the presence of acetic acid. Therefore it can be soluble by the distillate and decays in time in aromatic compounds, such as vanillin. The consequence of this process is that, as aging, absolute lignin content of the distillate decreases, as a result of oxidative damage and, further, as a result of condensation with tanning substances:
4. Hemicelluloses are hydrolysis substances by dilute acids and soluble in time, during the monosaccharide formation, that result in improving the distillate taste;
5. During the wine distillate's aging period from 5 to 10 years, the extraction of tanning substances decreases due to the tannin depletion of the superficial layers of the oak staves layers. At this age, the distillates are moved in barrels that were used before. Now, a slow oxidation of the dissolved tannins takes place, the color intensifies, and the bitter taste disappears. The acidity continues to slightly increase, mainly due to non-volatile acids that were extracted from oak wood. The lignin ethanolisse and the hemicelluloses hydrolysis intensifies, the esters alcoholize continues. As a result of ethanolissis and lignin oxidation, aromatic aldehydes occur, such as vanilla.

BIBLIOGRAPHY

1. Gavrilescu Ion – Teză de doctorat,Universitatea de Stiinte Agricole si Medicină Veterinară „Ion Ionescu de la Brad" - Iasi, 1998
2. Popa A., – Producerea si învechirea distilatelor de vin - Editura Scrisul Românesc, Craiova, 1985;
3. Popa A., Popa D.,– Modification of chemical composition and organoleptic assets in wine distillations under the action of aging procedures - Bull. USAMV Cluj Napoca, vol 57,p. 229-233, 2002;
4. Teodorescu Stefan, Iliescu Lucia, Ionescu I. Al- Evolutia compozitiei chimice a distilatelor de vin în cursul învechirii - Analele ICAR , 1958, vol. XXVI, P.115-138, 1958.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

RESEARCHES ON PRACTICING THE DIFFERENTIATED PRUNING IN CONJUNCTION WITH THE AGROBIOLOGIC FEATURES OF THE VARIETY AND THE ECOLOGICAL RESOURCES OF THE AREA OF CULTURE

Mălăescu Mihaela, Dobrei Alin, Ghiță Alina, Cristea Teodor[1]

KEY WORDS: the vigor, fertility, productivity, differentiated pruning

ABSTRACT

The obtaining of superior yields, typical for varieties and area of culture depends on knowing the technological and agrobiologic characteristics of varieties, but also on the application of some technologies which are specific to each variety.

In order to obtain high-quality wines is very important for the production to be balanced in terms of quality and quantity. This paper regards the vigor, fertility and productivity of the Fetească regală, Fetească albă, Muscat Ottonel and Burgund varieties in terms of applying of differentiated pruning.

The experimental variants consist in applying fructification pruning differentiated under the form of equal fruit loads but applied on different elements of fructification: short canes and long canes.

INTRODUCTION

The fructification pruning is one of the most important works in the grapevine technology of culture and, at the same time, the most difficult to apply, with a high labor consumption.

The pruning methods and the training forms of the grapevine have evolved a lot in the recent years; the viticulturists are trying to adopt the simplest solutions in order to facilitate the other works.

When applying these pruning, the genetic characteristics of the variety and the climatic conditions during the bud differentiation should be taken into account.

MATERIAL AND METHODS

The study was conducted during 2007-2008 in the vineyard of the Timisoara Didactic Resort from U.S.A.M.V.B.T. The studied varieties: Fetească regală, Fetească albă, Muscat Ottonel and Burgund are aged over 15 years, are grafted onto the Berlandieri x Riparia Kober 5BB rootstock and the planting distances are 2 x 1.2 m, the density being 4166 logs/ha .

[1] Banat University of Agricultural Sciences and Veterinary Medicine, Timişoara

Because the training form specific to vineyards of the Timişoara Didactic Resort is the semi-tall, the following pruning types, were applied on the varieties:

V 1-30 buds assigned to short canes
V 2-30 buds assigned to long canes
V 3 - 40 buds assigned to short canes
V 4 - 40 buds assigned to long canes
V5 - 50 buds assigned to short canes
V6 - 50 buds assigned to long canes

During the researches we conducted observations and measurements on logs vigor, fertility and productivity, the quantity and quality of yields. The annual growths were measured; the shoots and inflorescences were counted. The foliar surface calculation was done by weighting using the round-pieces method. Sugar determination was made by refractometry.

RESULTS AND DISCUSSIONS

The estimation of logs' vigor was done by measuring the annual growths and determining the foliar surface.

The foliar surface and obtained production are closely related, because the accumulation of organic substances in the grape-berries is based on photosynthesis. Foliar surface is specific to each variety, but is influenced by both the pedoclimatic conditions and the technology of culture.

Foliar surface grew along with the fruit load. At equal fruit loads, foliar surface is greater if at the pruning long elements of fructification are left on the log (long canes).

After measuring annual growths, we have observed that at the Fetească regală variety, the V3 variant had the highest percentage of maturated growths of 94.95%, while the V2 variant had the lowest percentage of 88.98%.

At the Fetească albă variety, we observed the lowest percentage of maturated wood of 83.65% at the V2 variant and the highest percentage at the V6 variant of 95.75%.

Muscat Ottonel variety has the highest matured wood percentage between 88.82% (V2) and 93.44 (V6).

82.97% at the V3 variant is the lesser value of maturated wood at Burgund variety, and the highest value was obtained at V1 variant, 93.46%.

At the Fetească regală variety as compared to the V1 variant – the control variant, the V6 variant after analyzing the variance had a very significant positive significance.

At the Fetească albă variety the V6 variant had recorded as compared to V1 – control variant a very significant positive value.

The Muscat Ottonel variety had recorded significantly positive values next to the control at the V4, V5, V6 variants.

Positive significations were also obtained at the Burgund variety at V5 and V6 variants.

In order to determine the logs' fertility and productivity, the fertility and productivity coefficients and indexes were calculated.

Comparing the studied varieties we observed that the best fertility was registered at the Muscat Ottonel variety and the lowest at the Fetească albă variety.

The best percentage of fertile shoots was at: the Fetească regală, V5 variant - 82.2%; Fetească albă, V2 variant - 73.6%; Muscat Ottonel, V3 variant - 93.4% and Burgund, V5 variant - 83.6% .

Absolute productivity index had the highest values at the variants: V5 - Fetească regală - 253.4; V4 - Fetească albă - 232.5; V3 - Muscat Ottonel - 180; V4 - Burgund - 300.8

Table 1

Logs' vigor (2007-2008 average)

Variety	Variant	Total annual growths (m/log)	Maturated growths		Foliar surface (m^2/log)	Difference to the control (m^2/log)	Significance
			m/log	% from total			
Fetească regală	V1(ct)	16,40	15,02	91,58	4,25	-	-
	V 2	16,97	15,10	88,98	4,40	+0,15	-
	V 3	17,06	16,20	94,95	4,48	+0,23	*
	V 4	17,30	16,15	93,35	4,60	+0,35	*
	V 5	17,50	16,30	93,14	4,62	+0,37	*
	V 6	18,02	16,94	94,00	4,88	+0,63	**
DL5%=0,23 DL1%=0,41 DL0,1%= 0,97							
Fetească albă	V1(ct)	21,02	18,70	88,96	7,40	-	-
	V 2	20,62	17,25	83,65	7,56	+0,16	-
	V 3	20,11	18,16	90,30	8,35	+0,95	**
	V 4	20,17	17,80	85,99	8,52	+1,12	**
	V 5	19,89	17,55	88,23	8,78	+1,38	**
	V 6	19,30	18,48	95,75	8,96	+1,56	***
DL5%= 0,37 DL1%= 0,79 DL0,1%=1,55							
Muscat Ottonel	V1(ct)	14,30	13,09	91,53	3,40	-	-
	V 2	14,95	13,28	88,82	3,68	+0,28	-
	V 3	14,80	13,35	90,20	3,65	+0,25	-
	V 4	15,15	14,02	92,54	3,74	+0,34	*
	V 5	15,30	14,10	92,15	3,78	+0,38	*
	V 6	16,03	14,98	93,44	3,96	+0,56	*
DL5%= 0,31 DL1%=0,72 DL0,1%= 1,43							
Burgund	V1(ct)	19,27	18,01	93,46	5,15	-	-
	V 2	18,49	15,90	85,99	5,20	+0,05	-
	V 3	18,21	15,11	82,97	5,32	+0,17	-
	V 4	18,14	16,89	93,10	5,34	+0,19	-
	V 5	18,00	15,40	85,55	5,48	+0,33	*
	V 6	17,80	16,38	92,02	6,02	+0,87	**
DL5%=0,28 DL1%= 0,58 DL0,1%= 1,23							

Finally we present data on the quantity and quality of grape production. At the Fetească regală variety, V5 variant has the highest production, having as compared to the control variant a very significant positive value.

The Fetească albă variety recorded at the V4 variant a distinctly significant positive production from the control.

At Muscat Ottonel, V3 variant has a distinctly significant positive value next to the control's production and the V6 variant has a negative significance.

At the Burgund variety, significant positive yields experienced the V4, V5 and V6 variants.

We estimated the quality of production on the sugar and acidity content. We noticed as very qualitative the varieties Burgund and Muscat Ottonel, which have sugar values over 190 g/l at all tested variants.

Table 2

Logs' fertility and productivity (2007-2008 average)

Variety	Variant	Fertile shoots (%)	Fertility coefficients		Medium weight of a grape (g)	Productivity index	
			relative	absolute		relative	absolute
Fetească regală	V 1	75,1	1,15	1,29	142	163,30	183,18
	V 2	76,2	1,22	1,40	145	176,90	203,00
	V 3	75,9	1,26	1,36	134	168,84	182,24
	V 4	77,1	1,29	1,47	137	176,73	201,39
	V 5	82,2	1,44	1,81	140	201,60	253,40
	V 6	80,8	1,38	1,72	138	190,44	237,36
Fetească albă	V 1	71,2	1,12	1,32	118	132,16	155,76
	V 2	73,6	1,24	1,46	104	128,96	151,84
	V 3	70,9	1,54	1,62	120	184,80	194,40
	V 4	70,2	1,61	1,86	125	201,25	232,50
	V 5	68,5	1,55	1,78	112	173,60	199,36
	V 6	66,8	1,58	1,80	110	173,80	198,00
Muscat Ottonel	V 1	90,2	1,39	1,45	98	136,22	142,10
	V 2	93,0	1,48	1,53	96	142,08	146,88
	V 3	93,4	1,72	1,80	100	172,00	180,00
	V 4	92,1	1,64	1,71	95	155,80	162,45
	V 5	88,8	1,25	1,32	88	110,00	116,16
	V 6	88,0	1,18	1,24	90	106,20	111,60
Burgund	V 1	76,8	1,20	1,35	120	144,00	162,00
	V 2	78,6	1,29	1,43	147	189,60	210,21
	V 3	81,0	1,70	1,74	151	256,70	262,74
	V 4	82,4	1,76	1,88	160	281,60	300,80
	V 5	83,6	1,67	1,75	158	263,86	276,50
	V 6	83,0	1,71	1,80	155	265,05	279,00

At the Fetească albă variety we noticed a larger quantity of sugar in the case of variants with a smaller load of fructification, but V3 and V4 variants have a balance between production and quality. 2007 and 2008 being favorable for the cultivation of vines, also determined the obtaining of superior qualitative productions at the Fetească regală variety.

Table 3

Quantitative and qualitative production (2007-2008 average)

Variety	Variant	Production (kg/ha)	Sugar (g/l)	Acidity (g/l H_2SO_4)	Alcoholic degree (% vol.)	Difference to the control (kg/ha)	Signifi cance
Fetească regală	V 1(ct)	7545	185	5,4	10,8	-	-
	V 2	8998	186	5,5	10,9	+1453	-
	V 3	10207	182	5,3	10,7	+2662	*
	V 4	10869	184	5,4	10,8	+3324	**
	V 5	13582	183	5,2	10,7	+6037	***
	V 6	11491	180	5,2	10,5	+3946	**
DL5%=1667 DL1%=3125 DL0,1%= 5749							
Fetească albă	V 1(ct)	6458	197	4,8	11,5	-	-
	V 2	7583	202	4,9	11,8	+1125	-
	V 3	8124	199	4,7	11,7	+1666	*
	V 4	9166	195	4,8	11,4	+2708	**
	V 5	8749	191	5,0	11,2	+2291	*
	V 6	8624	188	5,1	11,0	+2166	*
DL5%=1333 DL1%=2708 DL0,1%= 5498							
Muscat Ottonel	V 1(ct)	9571	200	3,8	11,7	-	-
	V 2	10100	198	3,8	11,6	+529	-
	V 3	13200	192	3,6	11,2	+3629	**
	V 4	11030	196	3,6	11,5	+1459	-
	V 5	8126	195	4,0	11,4	-1445	-
	V 6	7290	196	4,1	11,5	-2281	0
DL5%=1665 DL1%= 3541 DL0,1%=6905							
Burgund	V 1(ct)	10800	200	4,5	11,7	-	-
	V 2	11120	202	4,4	11,8	+320	-
	V 3	11400	197	4,3	11,5	+600	-
	V 4	12300	198	4,4	11,6	+1500	*
	V 5	12044	198	4,6	11,6	+1244	*
	V 6	11980	196	4,3	11,5	+1180	*
DL5%=1124 DL1%=2207 DL0,1%= 4499							

CONCLUSIONS

Foliar surface at the studied varieties ranged within the normal limits, the highest values were recorded at the variants with big fruit loads.

At Fetească regală and Burgund varieties the optimal fertility and productivity have been observed at the variants with the fruit load of 50 buds, distributed on short canes.

Muscat Ottonel variety presents a good fertility at a fruit load of 40 buds distributed on short canes, and the Fetească albă variety prefers a moderate fruit load, distributed on long fructification elements (long canes).

Between fertility, productivity and actual production there isn't always a direct correlation.

In all the years of research, production quality was good on all varieties.

The differences recorded between varieties reflect their genetic potential.

The researches which formed the basis of obtaining these results were funded by CNCSIS Bucharest project: Development of some models of advanced viticultural technologies in accordance with the pedoclimatic conditions, the varietal assortments and sustainable viticulture principles, ID-1128, 2007-2010.

REFERENCES

1. A. Dobrei, L. Rotaru, S. Morelli, Ampelografie, Ed, Solness, Timişoara, 2008
2. A. Dobrei, Mihaela Mălăescu, Rodica Dărăbuş, Alina Ghiță, T. Cristea, Ampelografie- Lucrări pratice, Ed. Waldpress, Timişoara, 2007
3. A. Dobrei, L. Rotaru, M Mustea, Cultura viței de vie, Ed. Solness Timişoara, 2005
4. Dobrei A., Iova Gh., Dărăbuş Rodica, Mălăescu Mihaela, Les recherches concernand la fertilite et la productivite de quelque cepages de vigne cultive dans la Station Didactique du Timisoara, Cercetări ştiințifice seria a VI-a, Facultatea de Horticultură, Ed. Agroprint, Timisoara, 2002
5. Iova GH., Dobrei A., Kolcsar Kiss Katalin, Cercetări privind influența repartizării sarcinii de rodire asupra creşterii şi fructificării la soiul Fetească regală, Cercetări ştiințifice seria a III-a, Facultatea de Horticultură, Ed. Agroprint, Timisoara, 1999

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✔*Biologie*
✔*Horticultură*
✔*Tehnologia prelucrării produselor agricole*
✔*Ingineria mediului*

Vol. XIV (XLX) - 2009

RESEARCHES ON APPLICATION OF PHITOSANITARY TREATMENTS TO CONTROL PLANT DISEASES AND PESTS AT THE TABLE GRAPE VARIETY - SILVANIA

Mălăescu Mihaela, Dobrei Alin, Ghiță Alina, Cristea Teodor[1]

KEY WORDS: phitosanitary treatments, pests and diseases

ABSTRACT

Diseases and pests control at the grapevine in the context of sustainable viticulture is an important technological link that directly affects the quantity and quality of grape production and the economic efficiency of grapevine cultivation. In the vineyards of Timisoarea Didactic Resort in U.S.A.M.V. Timisoara, we applied 2 different schemes of phitosanitary treatments with products that are available on the market, on the table grape variety Silvania. Researches were focused on the damaging symptoms represented by the frequency, intensity and attack degree of pests and diseases and the effect of the applied treatments. We observed that the application of the first treatments which have a preventive role is very important and the use of expensive phitosanitary products is not always justified.

INTRODUCTION

The grapevine pathogens that induce the greatest losses are downy mildew, powdery mildew and gray mold, and the most harmful pests are mites and moths. One of the most expensive technological sequences at the grapevine is the control of diseases and pests. Treatments of diseases and pests at the grapevine should be primarily made as preventive; in this respect rigorous observations are being necessary in order to signal the risk of infection in terms of diseases or the exceeding of the pest thresholds at the pests. As required by modern viticulture, we must develop effective and less polluting treatment plans that take account of the ecologic and economic conditions of the area of culture. The application of the most appropriate technological measures which would result in phytosanitary protection of the vineyards has direct influence on the quantity and quality of grape production and also a greater economic efficiency.

MATERIAL AND METHODS

The experience was conducted in the vineyard of the Didactic Resort from the U.S.A.M.V.B. Timişoara in 2008, on an area of 1 ha planted with table grape variety Silvania. We choose a table grape variety because they are more susceptible to attack by diseases and pests as compared to wine grapes, in addition Silvania variety has a good resistance to downy mildew, medium to powdery mildew and low to gray mold. We divided the area of 1ha in 2 parcels of 0.5 hectares on which we applied different treatment

[1] Banat University of Agricultural Sciences and Veterinary Medicine, Timişoara

plans, with the most representative products that are currently found on the market. Plan 1 for phytosanitary treatments that we applied in the parcel I includes products that on the market have a higher cost, and plan 2 contains products with a more affordable price. 8 treatments were carried out; they were performed in both parcels during the same phenophases and at the same dates. We studied 20 logs in each parcel in which we examined leaves and bunches, observing the pest symptoms represented by the frequency, intensity and degree of attack of pests and diseases. These indicators were analyzed before the first treatment and after the first treatment corresponding to diseases / pests. After applying the 8 treatments, we analyzed by comparing yields from the 2 parcels.

As follows we present the treatment plans that we used.

Table 1

Plan 1 for phytosanitary treatments against pests and diseases from vineyards used in parcel I

Nr. crt.	Date	Phenophase	Pest or disease	Commercial product and dose
1	20-30 IV	Bud break	Mites , Powdery mildew	Neoron 500 EC 0,1%; Decis 25WG 0,03%; Karathane Gold 0,05%
2	10-20 V	10-15 cm shoots	Mites , Moths, Powdery mildew	Envidor 240 SC 0,04% 0,4 l/ha; Calypso 480 SC 100 mi/ha; Flint max 0,16 kg/ha
3	20-30 V	25-30 cm shoots, bunches release	Downy mildew, Powdery mildew	Ridomil Plus Gold 42,5WP 3kg/ha, Talendo 0,225l/ha
4	30 V – 10 VI	Before flowering	Downy mildew, Powdery mildew, Moths (gen. I)	Melody Duo 2kg/ha, Flint max 0,16 kg/ha Decis 25WG 0,03%, 30 g/ha
5	10-20 VI	After flowering	Downy mildew, Powdery mildew, Gray mold	Ridomil Plus Gold 42,5WP 3kg/ha, Talendo 0,225l/ha Teldor 500 SC 1 l/ha
6	20 – 30 VI	Growth of the berries	Downy mildew, Powdery mildew	Melody Duo 2kg/ha, Flint max 0,16 kg/ha
7	1-20VII	Compacting of the bunches	Downy mildew, Powdery mildew, Gray mold, Moths	Ridomil Plus Gold 42,5WP 3kg/ha, Talendo 0,225l/ha Teldor 500 SC 1 l/ha Envidor 240 SC 0,04% 0,4 l/ha
8	20 VII – 10 VIII	Beginning of the ripening	Downy mildew, Powdery mildew, Gray mold, Mites, Moths (gen. II)	Melody Duo 2kg/ha, Flint max 0,16 kg/ha Mythos 3 l/ha, Neoron 500 EC 0,1%; Calypso 480 SC 100 mi/ha

Approximate cost of the plan 1 for the phytosanitary treatments - 3467 RON/ha

Table 2

Plan 2 for phytosanitary treatments against pests and diseases from vineyards used in parcel II

Nr. crt.	Data	Phenophase	Pest or disease	Commercial product and dose
1	20-30 IV	Bud break	Mites , Powdery mildew	Nissorun 0,05%; Decis 2,5 EC 0,03%, 0,3l/ha; Kumulus DF 0,3%

2	10-20 V	10-15 cm shoots	Mites , Moths, Powdery mildew	Apollo 50 SC 0,04%, Karate Zeon 0,02%, Falcon 460 EC 0,3l/Ha
3	20-30 V	25-30 cm shoots, bunches release	Downy mildew, Powdery mildew	Mikal Flash 3kg/ha, Folicur Solo 250EW 0,4l/ha
4	30 V – 10 VI	Before flowering	Downy mildew, Powdery mildew, Moths (gen. I)	Curzate F 2,5kg/ha, Falcon 460 EC 0,3l/Ha Decis 2,5 EC 0,03%, 0,3l/ha
5	10-20 VI	After flowering	Downy mildew, Powdery mildew, Gray mold	Mikal Flash 3kg/ha, Folicur Solo 250EW 0,4l/ha Topsin 70PU 0,1%
6	20 – 30 VI	Growth of the berries	Downy mildew, Powdery mildew	Curzate F 2,5kg/ha, Falcon 460 EC 0,3l/Ha
7	1-20VII	Compacting of the bunches	Downy mildew, Powdery mildew, Gray mold, Moths	Mikal Flash 3kg/ha, Folicur Solo 250EW 0,4l/ha Topsin 70PU 0,1% Apollo 50 SC 0,04%
8	20 VII – 10 VIII	Beginning of the ripening	Downy mildew, Powdery mildew, Gray mold, Mites, Moths (gen. II)	Curzate F 2,5kg/ha, Falcon 460 EC 0,3l/Ha Shavit 25EC 0,02% Nissorun 0,05%; Karate Zeon 0,02%

Approximate cost of the plan 2 for the phytosanitary treatments – 2031RON/ha.

RESULTS AND DISCUSSIONS

Silvania variety has a good resistance to downy mildew, so that the frequency of the pathogen Plasmopara viticola attack is relatively low. After applying the first treatment against downy mildew (phenophase : 25-30 cm shoots) is observed that the frequency, intensity and degree of attack have decreased a lot. Plan 1 (Ridomil Plus Gold, Melody Duo 2kg/ha) of treatment recorded a slight qualitative surplus next to the plan 2(Mikal flash , Curzate F).

Table 3

The effectiveness of treatment plans on downy mildew attack

Variant	Nr. of analyzed leaves	F%	I%	GA%
Before the first treatment	70	13,20	15,88	2,09
After the first treatment from plan 1		6,55	5,02	0,32
After the first treatment from plan 2		7,30	5,96	0,43

The degree of attack of the pathogen Uncinula necator is higher as compared to downy mildew attack. After the first treatment (at bud break) we observed that the application of the product Karathane Gold is more effective in controlling the powdery mildew than the application of a concentration of 0.3% of Kumulus DF which contains 800g/kg sulfur.

Table 4

The effectiveness of treatment plans on powdery mildew attack

Variant	Nr. of analyzed leaves	F%	I%	GA%
Before the first treatment	86	24,60	20,13	4,95
After the first treatment from plan 1		10,12	7,24	0,73
After the first treatment from plan 2		12,38	8,01	0,99

This table grape variety is sensitive to Botrytis cinerea, which explains the high values recorded by the pest symptoms. The treatment with Teldor SC 500 gave spectacular results, after the first treatment the frequency and intensity of attack were reduced by half. The treatment with Topsin 70 PU also gave good results, reducing the degree of attack at 2.39.

Table 5

The effectiveness of treatment plans on gray mold attack

Variant	Nr. of analyzed inflorescence	F%	I%	GA%
Before the first treatment	60	30,43	20,75	6,31
After the first treatment from plan 1		15,10	10,96	1,65
After the first treatment from plan 2		18,22	13,15	2,39

The products used to control mites and insects (Neoron, Nissorun, Decis, Envidor, Apollo) have given good results in both treatment plans, without significant differences and were applied generally. The products for the control of the moths at the grapevine (Calypso, Karate Zeon) were locally applied because the attack has not covered the entire area on which we conducted the experience.

In order to carry out the research we have chosen for each treatment plan 2 products which we used alternative. After applying the 8 treatments we concluded that the production from the parcel I was 4560 kg / 0.5 ha, being superior to the production obtained in parcel II, 4112 kg / 0.5 ha.

CONCLUSIONS

2008 was favorable to grapevine culture in terms of climate, the high frequency and intensity of disease and pest attacks from this year is a consequence of poor phytosanitary degree of the vineyard from the previous year. We found that the first treatments-that are preventive-are very important but we also noted that it is not always necessary the application of 5-6 treatments for controlling a disease as occurred in our case at downy mildew, if weather conditions aren't favorable for the development of the disease.

At Silvania variety we appreciate that the treatments against gray mold must be applied in time to avoid damage, the more justified in terms of production surpluses was the third treatment. We believe that both treatment plans can be successfully chosen. We mention that in favorable years for the vine culture, with no serious attacks by diseases and pests, it is not economically efficient to use expensive phytosanitary products, the difference in production being not very significant. We recommend the alternative application of phytosanitary products in order not to create resistant breeds and reducing the consumption of expensive products by using them at a smaller number of treatments, especially at critical moments; at the remaining treatments at the phenophases with a lower risk use phytosanitary products less expensive. We cannot develop treatment plans that are universally valid, they shall be establish differently depending on the phitosanitary condition of the vineyard, soil and climate conditions of the area and of each year, financial resources of the exploitation, etc..

REFERENCES

1. Dobrei A., L. Rotaru, M Mustea , Cultura viței de vie, Ed. Solness Timişoara, 2005
2. Dobrei A., Mihaela Mălăescu, Rodica Dărăbuş, Alina Ghiță, T. Cristea, Ampelografie - Lucrări pratice, Ed. Waldpress, Timişoara, 2007
3. Dobrei A., L. Rotaru, S. Morelli, Ampelografie, Ed, Solness, Timişoara, 2008.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

RESULTS CONCERNING THE TEMPERATURE INFLUENCE ON THE VITAL-METABOLIC PROCESSES OF GROWTH AND REPRODUCTION OF YEASTS

Nastasie Lidia[1]

KEY WORDS: yeasts, effervescence, stimulation, inhibition.

ABSTRACT

The temperature has a great influence upon a series of parameters: the multiplication of yeasts, the speed of the substratum effervescence, the accumulation of the alcohol and the breathing intensity of the yeasts.

The yeasts have wide limits of development regarding the temperature at which they can display the vital processes, between 0 degrees Celsius and 45 degrees Celsius and this is the reason why they are framed in the group of eurythermal organisms.

The temperature acts synergically with other factors: the hydration degree, the alcohol, the ph, the acetic acid, the light in different stages of the effervescence process, often inhibiting this process.

INTRODUCTION

Temperature influences upon a series of parameters: multiplication of yeasts, the rate of fermentation, the cumulation of alcohol and intensity of breathing

The yeasts have large edges of development concerning the temperature where they can display the vital processes, between 0-45°C, and for this reason they are situated in the group of the eurythermal organisms. To these organisms we can`t talk of minimum temperatures, optimal or maximal of growth and development. Temperature varies a lot in accordance with variety and species, but also in accordance with the type of wine production (white and red).

Temperature, along with other factors: the degree of aeration, concentration of acetic acid, the internal surface of a substratum, the degree of hydration, light, operate synergistically in different steps of the fermentation process, inhibiting the most often this process.

For this reason the oenologue is obliged to know the action of these factors in order to guide them in the desired direction so as the wine to present high quality of the bouquet and flavor.

MATERIAL AND METHODS OF RESEARCH

In order to study the temperature influence over the yeast metabolism it was used must that derives from white grapes italian Riesling red grapes, Merlot variety.

[1] Doctorand Facultatea de Horticultură Craiova

The experiments concerned the influence of temperature on rate of fermentation of sugar and the growth rhythm of yeasts, after 2-15 days from the onset of fermentation, as well as the limit of fermentation of the yeasts. The same experiment was monitored and the final amount of alcohol acquired depending on temperature of fermentation.

The alcoholic fermentation was caught at different temperatures: 6°C, 20°C, 25°C, 30°C and 35°C.

THE RESULTS OBTAINED

The influence on the temperature of fermentation upon the metabolic processes proved to be very complex. The decrease or increase in temperature in the limits followed of 6-35°C affected the vital-metabolic processes of yeasts, but they did not induce their death when when the environment may have accumulated toxic products.

At low temperatures of fermentation (6°C), the rate of fermentation of sugar and the rhythm of multiplication of yeasts are minor. Only after 4 days from the must seeding the number of yeasts doubled in the case of italian Riesling must and tripled in the case of Merlot must.

As for the italian Riesling must, after 7 days from the beginning of fermentation only 20 g of sugar were metabolized, as for the italian Riesling must 40 g of sugar (the higher values for the Merlot must being explained by the influence of the internal surface of the substratum).

As for the italian Riesling must we observe that the process of multiplication of yeasts, it decreased after the 7th day, sign that low temperatures strongly inhibit the process of multiplication.

In the last day (the 15th), the metabolized quantity of sugar was of 25 g for the italian Riesling must and 56 g for the Merlot must, so we can conclude that at a temperature of 6° the yeasts metabolize slowly the available substratum. (fig 1)

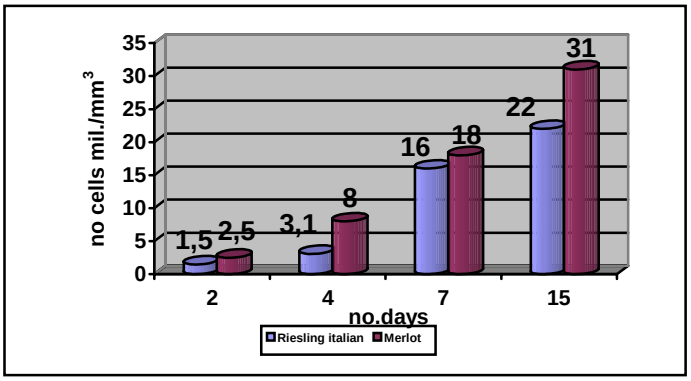


Fig 1 The influence of temperature of 6°C on the rate of multiplication of yeasts in two types of must, italian Riesling (196g./l sugar) and Merlot (210g/l sugar)

Once the growth of the temperature of fermentation (at 200°C) strongly increased the rhythm of metabolizing the sugar on account of the better and obvious multiplication of yeasts. For this only after 2 days there are metabolized 23 g of sugar in the case of italian

Riesling must and 30 g for the Merlot must, the number of yeasts strongly increased, especially in the first days, after which the rate of multiplication decreased (fig 2). At a temperature of 20°C in the last day of determinations (the 15th day) there were metabolized 156 g of sugar in case of the italian Riesling must and 175g sugar for the Merlot must.

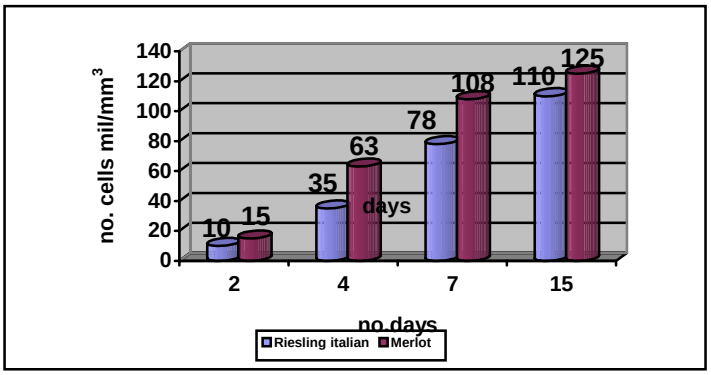


Fig.2 Influence of temperature of 20°C upon the rhythm of multiplication of yeasts for two types of must, italian Riesling (196g/l sugar) and Merlot (210g/l sugar)

At a temperature of 25°C, the yeasts invaded the substratum, that they metabolized at a high rate, in day two from the beginning there have already been fermented 41 g of sugar for the italian Riesling must and 80 g of sugar the Merlot must, only to realize in the last day a registration for the italian Riesling must of 180 g of metabolized sugar and 192 g of metabolized sugar for the Merlot must. The rate of multiplication of yeasts at this temperature increased in the first two days and afterwards temperated. (fig 3).

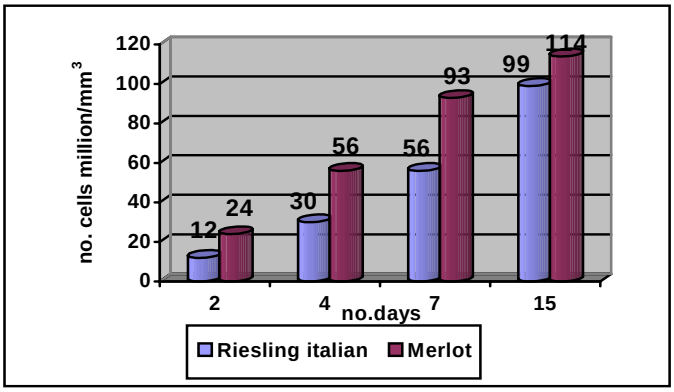


Fig. 3 The influence of temperature of 25°C upon the rhythm of multiplication of yeasts for two types of must of italian Riesling (196g/l sugar) and Merlot (210 g/l sugar)

At 30°C and 35°C, even if the yeasts invaded the substratum, after 2 days, for the italian Riesling must 68 g of sugar were metabolized (at a temperature of 30°C), respectively 74 g (at a temperature of 35°C) and for the Merlot must 78 g of sugar metabolized (at a temperature of 30°C), respectively 79 g (at a temperature of 35°C), although it was registered a decrease in the rate of muliplication of yeasts after the 4th day, all this being explained that the primary and secondary products of the fermentation inhibit the activity of yeasts. (fig.4 and 5).

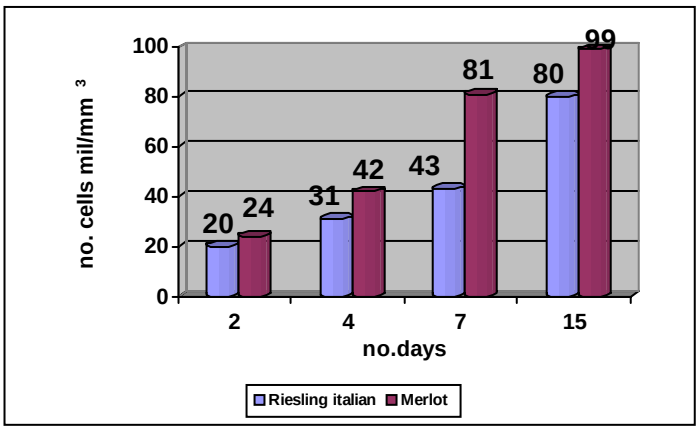


Fig.4 Influence of temperature of 30°C upon the rhythm of multiplication of yeasts for two types of must, italian Riesling(196g/l sugar) and Merlot (210 g/l sugar)

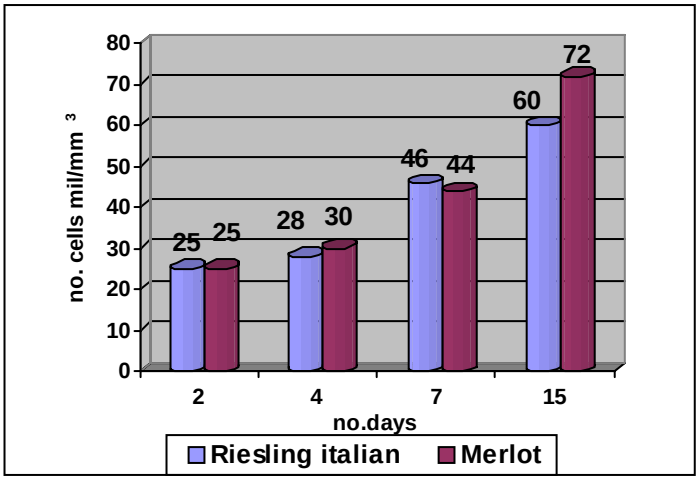


Fig.5 Influence of temperature of 35°C upon the rhythm of multiplication of yeasts for two types of must, italian Riesling (196g/l sugar) and Merlot (210 g/l sugar)

In all the cases that we researched (6°C, 20°C, 25°C, 30°C, 35°C), the rate of metabolizing of sugar decreases during the final 7 days, which is just by the difficulties that yeasts encounter because of the cumulation of stress factors in the environment, but also the diminuation of nourishing substances.

The parallel interpretation for the two types of must reached to the conclusion that if the Merlot must, the phenomena registered are faster and display at a higher rate in comparison with those from the italian Riesling must, a fact that is easily explained by the musts fermentation that derive from the black grapes is made in presence of solid parts of the grape (peel of grapes, seeds, pulp) that provide additional favourable conditions to the development of metabolic processes.

The biggest proportions of alcohol issued registered after 15 days from the start of the fermentation at a temperature between 25°C-30°C. At a temperature of 20°C respectively of 35°C the alcohol degree was lower, because there remained foxy sugar in the environment. At a temperature of 20°C the fermentation could continue but at 35°C it blocked, in the environment the quantity of foxy sugar being so high, it resorts to other means of transformation than the normal ones, and that`s why the wine which was obtained does not present organoleptic and chimical normal qualities.

COCLUSIONS

Following the experiments carried out regarding the influence of temperature on metabolism of yeasts we arrived to the following conclusions:

- assessing the fermentative activity of a population of yeasts is based on the speed and efficiency that the substratum can ferment at;
- low temperatures of fermentation (6°C) are ineffective for the yeasts metabolism, number of viable cells is small, onset of fermentation is delayed and large amounts of unfermented sugar remain in the environment;
- it was observed that at a temperature of 200C the multiplication of yeasts is good, fermentation rate was good, final alcohol acquired is small and large amounts of unfermented sugar remain15 days later in the environment;
- temperatures of 25 - 300C proved to be optimal for both the multiplication rate and the rate of metabolism, small amounts of sugar remain in the environment and final alcohol acquired registered the highest value;
- high fermentation temperatures (350C) obviously slow down yeasts metabolism, stopping the fermentation process, the yeasts die, even though large amounts of sugar remain in the environment;
- effect of temperature should be studied by linking the influence of other factors that inhibit the action of yeasts

BIBLIOGRAPHY

1. Amerine A. M. – 1973 – „Les leains en oenologie”. Vignes et vins. Colloque intern. d'Oenol., 150 – anivers. de la naissance de Pasteur, 46 – 52;
2. Anghel I., Vassu T., Segal B., Berzescu P., Herlea V., Dan V., Oancea I. – 1989 – „ “Biology and technology of yeasts”. – vol. I; Technical Publishing House, Bucharest ;
3. Anghel I., Vassu T., Segal B., Berzescu P., Herlea V., Dan V., Oancea I. – 1991 – “Biology and technology of yeasts”. – vol. II; Technical Publishing House, Bucharest;

4. Belin J. N. – 1981 – „Biologie des levures liées à la vigne et au vin”. Thèse Docteur en sciences naturelles, Université de Dijon;
5. Bouryan N. I., Kozlovsky U. V., Rzouvaev V. S. – 1975 – „Influence d!etanol sur la vitesse spécifique de la croissance des levures viniques”. Vinodelia I. Vinogra – darstvo, U.R.S.S. nr. 3, 25 – 28, Bull. O. I. V. vol. 28, nr. 533 – 534, p. 698;
6. Cordonnier R. – 1980 – „La biochimie du vin”. Pour la Science 36, 50 – 64;
7. Cotea D., Valeriu A. – 1985 – „Oenology Treaty” Ceres Publishing House, 261 – 360;
8. Kiefer W., Trouast G. – 1968 – „Condition nécessaires á l'obtention des vins de qualité. Influence des différents facteurs naturels et techniques”. Raport Natinal de l'Allemagne XII Cong. Intern. de la Vigne et du Vin;
9. Pomohaci N. – 2000 – „Oenologie”. Vol. I, Ceres Publishing House, Bucharest;
10. Pomohaci N. – 2001 – „Oenologie”. Vol. II, Ceres Publishing House, Bucharest;
11. Popa A., Popa Daniela, Dragomir Felicia – 2002 – „ General Microbiology”. Universitaria Publishing House, Craiova;
12. Popa A., Popa Daniela, Dragomir Felicia – 2004 – „ Oenologica Microbiologyl”. Universitaria Publishing House, Craiova;
13. Popa A. – 2005 – „ The miracle of life microorganisms”. Universitaria Publishing House, Craiova;

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

STUDY CONCERNING THE INFLUENCE OF SUGAR CONCENTRATION OF GRAPE MUST ON VITAL-METABOLIC PROCESSES OF GROWTH AND YEAST REPRODUCTION

Nastasie Lidia[1]

KEY WORDS: effervescence rhythm, inhibition, sugar concentration

ABSTRACT

The normal metabolic activity of the leavens is permanently inhibited by a lot of physique, chemical and biological factors.

The inhibitory action of these factors comes from: the exaggerated content of some normal components of the grape must (sugar, phenols), the accumulation in big size of some secondary products of effervescence (carbonic anhydride, acetic acid) or the intervention of some antagonism and izoantagonism phenomena.

INTRODUCTION

The normal metabolic activity of yeasts is permanently inhibited by multiple physical, chemical and biological factors.

The inhibitory action of those issues from: the grape must excessive content of some normal components (sugar, phenol), the accumulation of larger proportion of some secondary products of fermentation (alcohol, carbon dioxide, acetic acid) or the intervention of some antagonism and izoantagonism phenomena.

MATERIAL AND RESEARCH METHOD

Among factors that inhibit the metabolic activity of yeasts, in this paper we treated the action of initial concentration of sugar on grape must.

To watch embarrassing sugar we used the yeast flora of yeast spontaneous, where prevailed Saccharomyces ellipsoideus.

For the experiment we used Italian Riesling grape must with different initial sugar concentrations and we followed the time requeired from the processing time till the perfection of must fermentation. The rate of fermentation expresssed in grams sugar fermentation/24hours, the final acohol acquiered and the must rate of fermentation.

To highlight the best the influence of the sugar concentration on the activity of yeast, we used grape musts with an initial sugar concentration of : 136; 160; 180; 200; 220; 240; 280; 300; 320; 340; 360 g/l.

[1] Doctorand Facultatea de Horticultură Craiova

RESULTS OBTAINED

Following tests carried out on the reaction of yeasts we got to the following data (table 1):

Table 1

Rate of fermentation of musts (g zahar/24 hours) depending on their initial concentration in sugar

Sugar concentration (g / l)	Nr. days required for shaping the fermentation	Unfermented sugars	The rate of fermentation (g sugar/24 hours)
136	5	traces	27,2
160	10	traces	16
180	10	traces	18
200	15	traces	12,3
220	15	traces	14,6
240	20	traces	12
280	30	38	8,06
300	30	57	8,10
320	30	63	8,56
340	30	110	7,66
360	30	112	8,26

At a grape must with reduced initial concentration of sugar(136g/l), fermentation yeasts triggered after three hours of sowing, metabolized relatively quickly available substrate, but finally acquiered degree alcohol was small(7.8 vol % alcohol).

At a grape must with initial concentration of sugar (160g/l), fermentation yeasts triggered after four hours of sowing, metabolized the entire available substrate, permitting also the obtaining of a good finally acquiered degree alcohol, 9.2 vol %.

In the case of must with initial concentration of sugar of 180g/l, there are already „embarrassed yeasts" translated by delaying the fermentative beginning (six hours). Still, they manage to metabolize the entire sugar available (after 24 hours) and the wine has a good finally acquiered degree alcohol(10.5 vol%).

With increasing initial concentration of sugar in the must, delaied fermentative commencent is recorded: 6.5 hours at the initial concentration of 200g/l and 7 hours for that of 220g/l. These yeasts metabolize hard sugar concentrations available, 360 hours being requiered to complete the process. The quantity of final acquiered alcohol is good, 11.7 vol% alcohol, respectively 12 vol% alcohol. However, it is clear that the yeasts are feeling the environmental hiperosmotic inhibitory action together with the alcohol accumulated.

The maximum amount of sugar that could be metabolized by yeasts, we recorded it at a must with 240g/l sugar. In this case, although fermentation lasted 480 hours, yeasts were able to metabolize the subtrate and the wine obtained had a high degree of alcohol (14 vol% alcohol).

Above this value, pursued in all cases, we observed that yeasts can not work in hiperosmotic environments, they cease any activity fementative, although the amount of sugar is high. At high concentrations, large delaies of fermentation beginning of 14 hours at 320g/l sugar are recorded; 20 hours at the initial concentration of 340g/l and 26 hours at 360g/l sugar. At high concentrations, yeasts lost water in external environment, loss that led to lysis by plasmolization.

CONCLUSIONS

1. Yeasts multiply easily in small and moderate sugar levels initially and hard with its growth.
2. The largest quantity of final acquired alcohol was recorded in wines that came from musts with an initial concentraion of sugar of 160, 180 and 200g/l.
3. Yeasts are unable to metabolize all the sugar available in case of musts whose initial concentration was at least 280g/l.
4. The destructive action of a large concentration of sugar was potentiated also by other fermentation products, by alcohol in particular.
5. The rate of fermentation of sugars by yeasts was good in the musts having an initial concentration of sugar starting with 160 till 240 g/l, then with the increasing of sugar concentration, the rate of fermentation was highly unbalanced.

BIBLIOGRAPHY

1. Amerine A. M. – 1973 – „Les leains en oenologie". Vignes et vins. Colloque intern. d'Oenol., 150 – anivers. de la naissance de Pasteur, 46 – 52;
2. Anghel I., Vassu T., Segal B., Berzescu P., Herlea V., Dan V., Oancea I. – 1989 – "Biology and technology of yeasts". – vol. I; Technical Publishing House, Bucharest;
3. Anghel I., Vassu T., Segal B., Berzescu P., Herlea V., Dan V., Oancea I. – 1991 – "Biology and technology of yeasts". – vol. II; Technical Publishing House, Bucharest;
4. Belin J. N. – 1981 – „Biologie des levures liées à la vigne et au vin". Thèse Docteur en sciences naturelles, Université de Dijon;
5. Bouryan N. I., Kozlovsky U. V., Rzouvaev V. S. – 1975 – „Influence d!etanol sur la vitesse spécifique de la croissance des levures viniques". Vinodelia I. Vinogra – darstvo, U.R.S.S. nr. 3, 25 – 28, Bull. O. I. V. vol. 28, nr. 533 – 534, p. 698;
6. Castelli T., Rossi I. – 1973 – „L'écologie des levures". Vignes et vins. Nr. spec. 19 – 25, Colloque Intern. D'oenologie 150 anivers. de la naissance de Pasteur;
7. Cordonnier R. – 1980 – „La biochimie du vin". Pour la Science 36, 50 – 64;
8. Cotea D., Valeriu A. – 1985 – „Oenology Treaty" Ceres Publishing House, 261 – 360;
9. Galzy P. – 1973 – „Génétique des levures en oenologie". Vignes et vins. Colloque intern. d'Oenol., 150 – anivers. de la naissance de Pasteur, p. 11 – 18;
10. Kiefer W., Trouast G. – 1968 – „Condition nécessaires á l'obtention des vins de qualité. Influence des différents facteurs naturels et techniques". Raport Natinal de l'Allemagne XII Cong. Intern. de la Vigne et du Vin;
11. Pomohaci N. – 2000 – „Oenologie". Vol. I, Ceres Publishing House, Bucharest;

12. Pomohaci N. – 2001 – „Oenologie”. Vol. II, Ceres Publishing House, Bucharest;
13. Popa A., Popa Daniela, Dragomir Felicia – 2002 – „General Microbiology”. Universitaria Publishing House, Craiova;
14. Popa A., Popa Daniela, Dragomir Felicia – 2004 – „ Oenologica Microbiologyl”. Universitaria Publishing House, Craiova;
15. Popa A. – 2005 – „ The miracle of life microorganisms”. Universitaria Publishing House, Craiova;

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✔*Biologie*
✔*Horticultură*
✔*Tehnologia prelucrării produselor agricole*
✔*Ingineria mediului*

Vol. XIV (XLX) - 2009

RESEARCHES ON THE BEHAVIOR OF SOME OLD GRAPEVINE VARIETIES AND BIOTYPES FROM MINIŞ-MĂDERAT AREA GROWN IN BIOLOGICAL SYSTEM

Ghiță Alina, Dobrei Alin, Mălăescu Mihaela, Cristea Teodor[1]

KEY WORDS: local varieties and biotypes, qualitative and quantitative production

ABSTRACT

Researches were conducted in 2008 and concerned the evolving of vegetation phenophases, the total and maturated annual growth, and the quantitative and qualitative production of the varieties, in order to highlight the biological and technological characteristics of some grapevine varieties from the wine-growing area of Ineu, varieties cultivated in a biological system. 11 grape varieties were studied –out of which 2 have technological characteristics of table grape varieties (Pârgav, Ochiul Boului), 6 have the characteristics of wine grape varieties (Rujă Albă, Rujă Roşie, Negru Dulce, Galbenă, Rară Albă, Risling – biotype of the Riesling Italian variety), 2 varieties have mixed characteristics (Tămâios, Ceaslă Mare – biotype of the Chasselas Dore variety), and one is the variety Chasselas Dore, a cosmopolitan variety which is very popular and has mixed technological characteristics and was selected as witness variety .

INTRODUCTION

Viticulture has been over time a main occupation of many populations. Taking into account the specificity of grapevine culture, we consider that there is a close interdependence between the continuity of the viticultural activity and the settling of a population. The vineyard, source of wealth and charm, is one of the benefits offered by the generosity of nature. Vineyards steal and imprison feelings and sights, as this wonderful scenery of nature, represent an attraction hard to resist. The Miniş – Măderat vineyard has a temperate continental climate with Mediterranean influences, under the specific influences of Central European climate. The values of the climatic elements registered at the Meteorological Station of the Miniş Viticultural Research Resort exceed the restrictive limits of the grapevine.

MATERIAL AND METHODS

The studied materials are 11 grape varieties, out of which 2 have technological characteristics of table grape varieties (Pârgav, Ochiul Boului), 6 have characteristics of wine grape varieties (Rujă Albă, Rujă Roşie, Negru Dulce, Galbenă, Rară Albă, Risling – biotype of the Riesling Italian variety), 2 varieties have mixed characteristic (both for table and wine) (Tămâios, Ceaslă Mare – biotype of the Chasselas Dore variety), and one is the variety Chasselas Dore, a cosmopolitan variety which is very popular and has mixed technological characteristics and was selected as witness varieties.

[1] Banat University of Agricultural Sciences and Veterinary Medicine, Timişoara

Researches were conducted in 2008 and concerned the evolving of vegetation phenophases, the total and maturated annual growth, and the quantitative and qualitative production of the varieties, in order to highlight the biological and technological characteristics of some grapevine varieties from the wine-growing area of Ineu, varieties cultivated in a biological system. Although these varieties have good or very good qualities, both in terms of quantity and quality of production, they haven't extended in the viticultural practice. Some of these varieties are practically local biotypes of some worldwide well-known varieties, but because of their age in cultivation in this area and also due to the selection of populations they have developed some unique characteristics as compared to the original varieties.

The vineyard in which the enumerated varieties may be found has about 120 years and is a family holding, having as planting distances 1m between rows and 1m between the logs on a row and the number of logs is approximately 2000. The used pruning system is multiple Guyot without trunk, and the fructification elements are represented by fruit links of 4-5/log.

RESULTS AND DISCUSSIONS

The begining of vegetation phases in 2008.

Table 1

Nr.	Variety	Vegetation phases					
		Bleeding	Bud break	Flowering	Ripening	Grape maturation	Leaf falling
1.	Pârgav	5.IV	9.IV	27.V	20.VII	14.VIII	10.X
2.	Ochiul Bouluı	7.IV	11.IV	2.VI	12.VIII	2.X	24.X
3.	Rujă Albă	6.IV	10.IV	29.V	4.VIII	14.IX	19.X
4.	Rujă Roşie	5.IV	9.IV	28.V	1.VIII	10.IX	17.X
5.	Negru Dulce	3.IV	8.IV	27.V	23.VII	7.IX	11.X
6.	Galbenă	9.IV	12.IV	4.VI	14.VIII	28.IX	23.X
7.	Rară Albă	8.IV	10.IV	3.VI	10.VIII	27.IX	20.X
8.	Risling	8.IV	11.IV	3.VI	12.VIII	23.IX	22.X
9.	Tămâios	6.IV	11.IV	2.VI	13.VIII	20.IX	19.X
10.	Ceaslă Mare	7.IV	11.IV	30.V	3.VIII	11.IX	18.X
11.	Ch. Doré	7.IV	10.IV	29.V	1.VIII	9.IX	15.X

Annual growth (total and maturated) in 2008.

Nr.	Variety	Log 1		Log 2		Log 3		Log 4		Log 5		*Average*		
		Shoot Nr.	Shoot lenght. (cm)	Shoot Nr.	Shoot lenght. (cm)	Shoot Nr.	Shoot lenght. (cm)	Shoot Nr.	Shoot lenght. (cm)	Shoot Nr.	Shoot lenght. (cm)	The nr of shoots/log	*Total growths* (m/log)	Maturated growths (m/log
1.	Pârgav	18	936	23	1125	12	598	18	952	20	1082	18.2	9.38	7.84
2.	Ochiul Boului	23	2814	22	2632	25	3012	24	2958	21	2646	23	28.12	24.72
3.	Rujă Albă	19	1885	20	1998	22	2063	17	1740	19	1921	19.4	19.21	17.18
4.	Rujă Rosie	21	1982	22	2021	23	2079	18	1815	20	1932	20.8	19.65	17.32
5.	Negru Dulce	19	1312	18	1225	17	1154	20	1421	21	1462	19	13.14	11.05
6.	Galbenă	23	2794	24	2898	25	3054	20	2012	21	2114	22.6	25.74	22.14
7.	Rară Albă	24	2896	25	2994	27	3258	21	1998	23	2328	24	26.94	23.81
8.	Risling	24	2798	26	3011	21	1871	28	3214	23	2285	24.4	26.35	23.12
9.	Tămâios	16	1782	13	1597	15	1698	19	1912	17	1869	16	17.71	15.08
10.	Ceaslă Mare	23	2274	19	1878	25	2371	21	2076	22	2175	22	21.54	18.29
11.	*Ch. Doré*	17	1652	16	1554	19	1846	15	1452	16	1512	16.6	16.03	14.12

Table 2

The studied grapevine varieties belong to(in terms of grape maturation), different ages, so we have: a 2nd age variety (Pârgav), 5 varieties of 4th age (Rujă Albă, Rujă Roşie, Negru Dulce, Ceaslă Mare, Chasselas Dore), 4 varieties of 5th age (Galbenă, Rară Albă, Risling, Tămâios), a 6th age variety (Ochiul Boului).

Regarding the leaf falling, this phenophase starts first at the Pârgav variety, and the variety that keeps its leaves on the log the longest is the Ochiul Boului variety.

The vigor of a grapevine is generally given by the annual vegetative growth. This vigor is synthetically expressed by a number of indicators, out of which the most important are total and maturated annual growth. Their value is shown in Table 2. The largest total growths were observed at the Ochiul Boului variety, while the smallest are observed at the Pârgav variety.

The production of the studied varieties is presented in quantitative terms in Table 3 and in terms of quality in Table 4.

Quantitatively, production is outlined in the above mentioned tables through the following indicators: total number of grape bunches, total weight of the grape bunches, the average weight of a grape bunch and the average weight of a grape berry. The variety with the largest number of bunches/log is the Risling variety, which has a 24,4 average of bunches /log. The smallest number of bunches per log is in the Ochiul Boului variety.

This indicator (number of bunches per log) is not sufficient to express the production's quantitative level of a variety, because a variety may have as main feature the presence of a large number of bunches on the log, but the bunches taken individually may have a reduced weight and thus the total weight of the bunches is small.

Regarding the average weight of a bunch is notable the Ochiul Boului variety with a weight of approximately 600 g.

The most important indicator for determining the productive capacity of a variety is the total weight of bunches on the log. Given this fact and considering the data in the table below you can observe that the Rară Albă variety is the most productive, this variety can produce, in some favorable years, a bucket of grapes per log (10-11kg of grapes).

Out of all the substances that are contained in the chemical composition of the grape berries, the greatest importance for the formation of taste qualities of the grapes and their technical processing is given by sugars and organic acids. Therefore, the quality of grapes is frequently assessed by the content in sugars and organic acids, however narrow and unilateral this scaling may be.

From a viticultural point of view 2008 was a favorable year for the accumulation of sugars in grape berries. The sugar content in the must (g/l) of the studied varieties was between 236 g/l at Negru Dulce variety and 168 g/l at Ochiul Boului variety.

According to the must acidity content (expressed in g/l H_2SO_4), the Rară Albă variety is on the first place with a value of approximately 5,3 g/l, and on the last place is Negru Dulce variety with a value of approximately 3, 2 g / l.

The weight of bunches and berries in 2008

Nr.	Variety	Log 1		Log 2		Log 3		Log 4		Log 5		Total number of bunches	Bunches total weight (kg)	Bunches average weight (g)	Berries average weight (g)
		Nr. of bunches	Bunches weight(g)	Nr. of bunches	Bunches weight(g)	Nr. of bunches	Bunches weight(g)	Nr. of bunches	Bunches weight (g)	Nr. of bunches	Bunches weight(g)				
1.	Pârgav	17	2605	18	2862	15	2385	16	2544	17	2801	83	13,19	159	1,7
2.	Ochiul boului	8	4752	7	4358	10	6214	9	5547	7	4158	41	25,02	610	6,2
3.	Rujă albă	15	4020	16	4288	17	4556	14	3698	14	3752	76	20,31	267	1,5
4.	Rujă roşie	16	4240	17	4505	17	4521	14	3710	15	3975	79	20,95	265	1,4
5.	Negru dulce	16	2448	15	2295	14	2142	20	3065	18	2754	83	12,70	153	1,2
6.	Galbenă	16	4496	17	4777	18	5058	15	4215	16	4489	82	23,03	281	3,1
7.	Rară albă	21	7985	23	8855	24	8920	20	7589	20	7365	108	40,71	377	3,4
8.	Risling	24	3624	25	3775	23	3281	27	4077	23	3665	122	18,42	151	1,2
9.	Tămâios	15	3210	13	2782	14	2996	16	3549	16	3299	74	15,83	214	2,8
10.	Ceaslă mare	21	5523	18	4734	22	5785	19	4997	20	5261	100	26,30	263	2,7
11.	Ch.dore	21	3309	20	3220	21	3453	18	2898	19	3059	99	15,93	161	2,1

Table 3

Table 4

Sugar and acidity content of grape must in 2008

Nr.	Variety	Sugar content of the must (g/l)	Acidity content of the must (g/l H_2SO_4)
1.	Pârgav	172	3,7
2.	Ochiul Boului	168	4,3
3.	Rujă Albă	178	4,5
4.	Rujă Roşie	181	4,3
5.	Negru Dulce	236	3,2
6.	Galbenă	179	4,8
7.	Rară Albă	188	5,3
8.	Risling	210	4,4
9.	Tămâios	229	3,4
10.	Ceaslă Mare	183	4,1
11.	Chasselas Dore	187	3,9

CONCLUSIONS

Analyzing the obtained results from researches on the varieties we can draw the following conclusions:

- Pârgav, Ceaslă mare and Ochiul Boului variety have technological characteristics of table grape varieties. Pârgav variety is notable by precocity and a balanced taste similar to Chasselas Dore variety, and Ochiul Boului variety is a late grape variety with very appealing bunches , with large berries and very pleasant taste. The grapes of this variety are very well preserved over the winter. The taste of the Ceaslă mare variety grapes is similar to the variety from which it originates, but the appearance of its bunches is clearly superior to the Chasselas Dore variety.

- Rujă Albă, Rujă Roşie and Galbenă varieties have features that are characteristic to varieties cultivated to produce table wines,

- Negru Dulce, Risling and Tămâios varieties can be successfully used to obtain superior wines. Tămâios variety can also be used to obtain table grapes, the berries being semi-crunchy and having excellent taste,

- Rară Albă variety has very good features to obtain quality sparkling wines. Given the above mentioned features, the presented varieties deserve to be studied in detail in the context of comparative cultures, and if they prove to be suitable, widespread in production.

The researches which formed the basis of obtaining these results were funded by CNCSIS Bucharest project: Development of some models of advanced viticultural technologies in accordance with the pedoclimatic conditions, the varietal assortments and sustainable viticulture principles, ID-1128, 2007-2010.

REFERENCES

1. Dobrei A.,Soiurile de struguri pentru masă, Editura Waldpress, Timişoara, 2003;
2. Dobrei A.,si col.,The behaviour of some local grape varieties under Minis-Maderat vineyard conditions, Buletin USAMV Cluj-Napoca, vol 63/2006, Horticulture, 2006;
3. Oşlobeanu M. şi col., *„Zonarea soiurilor de viţă de vie în România”*, Editura Ceres, Bucureşti, 1991.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

RESEARCHES ON THE INFLUENCE OF BIO-STIMULATORS ON LOGS' VIGOR, QUANTITATIVE AND QUALITATIVE PRODUCTION AT THE MUSCAT OTTONEL VARIETY

Ghiță Alina, Dobrei Alin, Mălăescu Mihaela, Drăgunescu Anca[1]

KEY WORDS: table grape, bio-stimulators, aromatic wines

ABSTRACT

Researches concerned the behavior of the Muscat Ottonel variety when applying treatments with Pro-Gibb and Berelex bio-stimulators. Researches have been conducted in 2008, in the vineyard of the Timisoara Didactic Resort, a plantation of more than 15 years old, with planting distances of 2 m between rows and 1,2 m between vines per row.

The pruning type is Cazenave Cordon. Observations and measurements on the influence of these bio-stimulators on the foliar surface, maturated and total annual growths, grape maturation evolution, the quantity and quality of production, were carried out.

Bio-stimulators were applied after flowering and shoots fastening in accordance with concentrations in the prospect.

INTRODUCTION

Muscat Ottonel variety is a grape variety for aromatic wines, but is also used for fresh consumption due to its specific "Muscat" flavor. In the Timişoara Didactic Resort the growth conditions of this variety are weak, being a variety with early ripening, the process of wood maturation takes place in good conditions, which assures a relatively good resistance to frost.

The degree of milleting and beading is very low, usually the grapes of the Muscat Ottonel variety do not millet and do not bead.

MATERIAL AND METHODS

Researches have been conducted on the Muscat Ottonel variety, variety of grapes for aromatic wines and targeted the action of bio-stimulators on growth and fructification. Pro-Gibb and Berelex bio-stimulators were applied after flowering and shoot fastening, the foliar surface, total and maturated annual growths, grape maturation evolution, the quantity and quality of production being observed.

Foliar surface was determined by the round-pieces method, in early July, when it reached the maximum; total annual growths were determined by direct measurement, after the leaf fall, and the maturated growths after the first frosts.

[1] Banat University Of Agricultural Sciences And Veterinary Medicine Timisoara

The evolution of grape maturation was monitored by determining the sugar content and acidity, by analyzing samples of grapes harvested from 5 to 5 days, from August 15 until September 30.

RESULTS AND DISCUSSION

In Table 1 we have presented the influence of bio-stimulators on foliar surface in 2008, its average on the log was 6,06 m2. Untreated control variant has registered a minimum value of 4,5 m^2, the maximum value was recorded in the case of the variant treated with Berelex, 8,5 m^2.

Both at the experimental variant with Pro-Gibb and at the variant of treatment with Berelex were recorded differences next to the Untreated control variant, which are statistically reliable.

Analyzing the results it is found that after treatments with bio-stimulators foliar surface increases were observed, pointing out that Berelex influences foliar growths much better as compared to Pro-Gibb's, both being superior to Untreated control variant.

Table 1

The bio-stimulators influence on foliar surface in 2008

Variant	Leaf medium surface (cm^2)	Foliar surface (m^2/log)	Foliar surface (m^2/ha)	Difference to control (m^2/log)	Significance
Untreated(CT)	135	4,5	18747	-	-
Pro-Gibb	208,2	5,2	21663,2	+0,7	*
Berelex	186,3	8,5	35411	+4,0	***

DL 5% - 0,5 DL 1% - 1,2 DL 0,1% - 3,1

Table 2

The bio-stimulators influence on total and maturated annual growths in 2008

Variant	Total annual growths			Maturated annual growths			Difference to the CT (maturated growths /log-%)	Signifi-cance
	Pe but. (m)	La HA (m)	%	Pe but. (m)	La HA (m)	%		
Untreated (CT)	15,0	62490	100	12,6	52491	84	-	-
Pro-Gibb	19,09	79528	127	14,7	61240	77	-7,0	-
Berelex	18,3	76237	122	14,06	58574	76,8	-7,2	-
Average	17,4	72751	116	13,7	57435	79,2	-4,8	-

DL 5%= 7,38 DL1%= 13,21 DL 0,1%= 21,2

In 2008 the average of total annual growths was 17,4 m/log slightly superior to the control, which had growths of 15,0 m/log, and inferior to the variants treated with bio-stimulators. Between the 2 treated variants we observed a slightly higher growth at Pro-Gibb, of 19,09 m/log versus 18,3 m/log at Berelex.

Analyzing maturated annual growths we found higher values of the percentage at the Untreated control (84%) than at the treated variants.

Regarding the influence of the bio-stimulators on total and maturated annual growths, the differences recorded as compared to Untreated control are not statistically reliable. At this indicator we can conclude that, by applying bio-stimulators, higher annual growths as compared to the Untreated control were recorded, while maturated growths in percentage were superior to the control.

The application of bio-stimulators did not endanger wood maturation, on the contrary, annual growths (in absolute values) were net superior to the control. Muscat Ottonel variety is a variety that is noticed in particular by the production's quality and not quantity.

At this variety, the obtained productions are much lower than at other varieties such as Fetească Regală, Creață, Cadarcă, Riesling, etc..

In 2008, we observed superior productions at the variants treated with Pro-Gibb and Berelex of 7964 kg/ha and 8312 kg/ha, as compared to the Untreated control variant who produced a lower yield (7325 kg/ha).

The surplus of production at the variants treated with bio-stimulators as compared to the Untreated control variant were 639 kg/ha at Pro-Gibb and 987 Kg/ha at Berelex, the differences being statistically reliable.

In pursuance of the results we can affirm that at the Muscat Ottonel variety the application of the bio-stimulators gave production surpluses as compared to the Untreated control variant, which are statistically reliable.

Analyzed in absolute values, as compared to the results obtained in the case of table grape varieties, these surpluses are not very spectacular but in the case of the Muscat Ottonel variety, they are very important.

Table 3

The bio-stimulators influence on production in 2008

Variant	Average production/log (g)	Average production/ha (Kg)	Difference to the control	Signification
Control	1,75	7325	-	-
Pro-Gibb	1,91	7964	+639	*
Berelex	1,99	8312	+987	**
Average	1,88	7867	+813	-

DL 5% - 531,6 DL 1% - 972,2 DL 0,1% - 1712,1

Table 4

The bio-stimulators influence on the production's quality in 2008

Variant	Sugar (g/l)	Acidity (g/l sulfuric acid)	Glucose-acidimetric index
Control	218	3,5	62,28
Pro-Gibb	194	3,8	51,05
Berelex	210	3,7	56,75
Average	207,3	3,6	56,6

The production obtained in 2008 had a superior quality expressed through sugar content, acidity and glucose-acidimetric index.

This year's sugar content was 218 g/l at the control variant, 194 g/l at the variant treated with Pro-Gibb and 210 g/l at the variant treated with Berelex, giving an average of 207,3 g/l. Acidity expressed in g/l H_2SO_4 was 3,5 at the control variant, 3,8 at the variant treated with Pro-Gibb and 3,7 at the variant treated with Berelex.

Table 5

The influence of the bio-stimulators on the grape maturation evolution in 2008

Variant	Index	Date									
		15.VIII	20.VIII	25.VIII	31.VIII	5.IX	10.IX	15.IX	20.IX	25.IX	30.IX
Untreated (CT)	Sugar (g/l)	120,2	129,4	140,1	159,2	179,1	189,3	197,2	210,6	216,1	218,0
	Acidity	8,1	7,8	7,3	6,1	5,0	4,2	3,91	3,7	3,6	3,5
Pro-Gibb	Sugar (g/l)	109,0	118,8	130,1	148,6	169,1	177,4	186,0	190,2	192,5	194,0
	Acidity	8,7	8,3	7,7	6,8	5,4	4,9	4,7	4,1	3,9	3,8
Berelex	Sugar (g/l)	115,0	124,8	133,6	151,8	170,9	182,1	196,3	201,5	208,2	210,0
	Acidity	8,2	7,8	7,4	6,2	5,2	4,7	4,2	3,9	3,8	3,7
Average	Sugar (g/l)	114,7	124,3	134,6	153,2	173,0	182,9	193,1	200,7	205,6	207,3
	Acidity	8,3	7,9	7,4	6,3	5,2	4,6	4,27	3,9	3,79	3,6

In 2008, due to heliothermal and agro-technical conditions, sugar accumulation in berries had a very good evolution, reaching optimum values for obtaining quality wines. Thus, at the Untreated control, on August 15, the sugar content was 120,2 g/l, this value had increased spectacularly between August 31and September 15, after which the accumulation of sugar evolved more slowly, reaching at September 30, the value of 218 g / l.

Out of the two variants treated with bio-stimulators, a better progress had the variant treated with Berelex, which finally reached the value of 210 g/l, than the variant treated with Pro-Gibb who presented at the end of the period (September 30) a sugar content of 194 g/l.

On average, the sugar content of the grapes increased during the studied period, from 114,7 g/l (August 15) to 207,3 g/l (September 30), and the acidity decreased from 8,3 g/l sulfuric acid (August 15) at 3,6 g/l sulfuric acid (30 September).

In what regards the production, the Muscat Ottonel variety is a variety that is particularly distinguished by the production quality and not by quantity.

In 2008, we observed superior productions at the variants treated with Pro-Gibb and Berelex of 7964 kg/ha and 8312 kg/ha, as compared to the Untreated control who gave a lower production of 7325 kg/ha.

The production surpluses at the variants treated with bio-stimulators as compared to the Untreated control variant were 639 kg/ha (Pro-Gibb) and 987 kg/ha (Berlex), being statistically reliable.

Regarding the bio-stimulators influence on production quality, we can conclude that at the Muscat Ottonel variety the application of bio-stimulators gave significant production surpluses, without significantly affecting the quality.

Out of the two used bio-stimulators, the most appropriate for this variety, in the Timişoara Didactic Resort conditions, is Berelex which gave the largest surpluses of production and affected the least production's quality.

CONCLUSIONS

Muscat Ottonel is a very appreciated variety by consumers, due to the wine quality and especially because of the special flavor it has.

Analyzing the results, we found that after the application of bio-stimulators treatments resulted increases of the foliar surface.

The Muscat Ottonel is a variety of medium vigor, with a good maturation of the wood, being known the fact that bio-stimulators positively influence the production of grapes, but at the same time intensifying the growths and delaying wood maturation.

The application of bio-stimulators did not endanger wood maturation, on the contrary, the maturated growths (in absolute values) were net superior to the control.

Out of the two variants treated with bio-stimulators, a good evolution in terms of sugar content had the variant treated with Berelex.

The researches which formed the basis of obtaining these results were funded by CNCSIS Bucharest project: Development of some models of advanced viticultural technologies in accordance with the pedoclimatic conditions, the varietal assortments and sustainable viticulture principles, ID-1128, 2007-2010.

REFERENCES

1. Dobrei A. Şi col., Ampelografie-Lucrări practice, Ed. Waldpress, Timişoara, 2007;
2. Dobrei A., Cercetări privind influența îngrăşămintelor chimice şi organice asupra cantității şi calității producției de struguri pentru masă, în condițiile centrului viticol Recaş, USAMVB Timişoara, 2000;
3. Dobrei A. Şi col., Cercetări privind comportarea unor soiuri de struguri pentru masă şi vin în condițiile S.D. Timişoara, Cercetări ştiințifice, seria a V-a, Timişoara, 2001;
4. Rotariu L. Şi col., Tehnici speciale de creştere a calității în viticultură, Ed. Prahova - Ploieşti, 2004.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

THE STUDY OF FERTILITY ON NOVAC, NEGRU DE DRAGASANI AND CABERNET SAUVIGNON CL 7 DRAGASANI IN DRAGASANI VINEYARD

Dinu Daniel – Grigorie, Gorjan Sergiu Stefan, Farcas Cornel Emil[1]

KEY WORDS: fertility

ABSTRACT

There were taken into study the grapes varieties: Negru de Dragasani, Novac and the clone Cabernet Sauvignon cl 7 Dragasani. The grape varieties are for red superior wine.

The researches were made at the Dealu Olt plantation belonging to SCDVV Dragasani and part of Dragasani vineyard, in 2007, 2008 and 2009 and there were studied the fertility values of these grapes.

INTRODUCTION

The grapes varieties and the clone that were taken into study were created at SCDVV Dragasani: Novac by M. Marculescu in 1987 (Oprea Stefan, Sergiu Dan Moldovan), Negru de Dragasani by M. Marculescu and M. Vladasel in1993(Oprea Stefan, Sergiu Dan Moldovan) and the clone Cabernet Sauvignon cl 7 Dragasani by M. Neagu, P. Banita, Daria Basamac and M. Marculescu, in 1976 (Statiunea de Cercetare si Productie Viti-vinicola Dragasani).

MATERIALS AND METHODS

The researches were taken place in the Comparison Field of SCDVV Dragasani, between 2007 and 2009. The system of culture is non-protected, semi stem and the vines are planted at the distance of 2 meters between the rows and 1,1 meters between the vines of a row. There were studied five vines from each grape variety and noticed total buds, total dead buds, total viable buds, total copse, fertile copse, sterile copse, total inflorescences and fertile copse percentage.

Also, we made a synoptic table of fertility with the fertility coefficient (relative and absolute).

RESULTS AND DISCUSSIONS

Situated in the great geomorphological unit called Getic Piemont, the Dragasani vineyard covers the Oltet Platform.Situated at 44˚30'nordic latitude and 23˚27'eastern latitude, at 182 meteres altitude,the Dragasani vineyard belongs to A3 oenoclimatic zone

[1] SCDVV Dragasani

which includes regions and lawns that produces, specially red, white and flavoured superior qualitywines, with name of controlled denomination.

The characters studied are:

Tb = Total number of buds / vine;
Tx = Total dead buds / vine;
Tv = Total viable buds / vine;
Tc = Total number of copse / vine;
Fc = Number of fertile copse / vine;
Sc = Number of sterile copse / vine;
Tinf = Total number of inflorescences / vine.

The fertile copse percentage is obtained by divideing the fertile copse at total copse (Tc) and multiply with 100.

$$Fc\% = Fc / Tc \times 100$$

The relativ fertility coefficient (r.f.c.) its obtain by divideing the number of the inflorescences at the number of fertile copse (Fc).

$$r.f.c. = Tinf / Tc$$

The absolute fertility coefficient (a.f.c.) is obtained by divideing the number of the inflorescences at the number of fertile copse.

$$a.f.c. = Tinf / Fc$$

The maximum fertile copse percentage is 90% (Cabernet Sauvignon cl 7 Dragasani, in 2007) and the minimum is 64,8 (Novac, in 2009)

The best year regarding the average of fertile buds/vine is 2008 at Novac (22,6%) and Cabernet Sauvignon cl 7 Dragasani (23%) and 2009 at Negru de Dragasani (19,6%).

The maximum relative fertile coefficient is at Negru de Dragasani (1,64, in 2007) and the worst at Novac (0,95, in 2008).

The maximum absolute fertile coefficient is at Negru de Dragasani (1,87, in 2007) and the smallest at Novac (1,49, in 2008).

Table no 1

The fertility of grapes

Studied characteristics	**2007**			**2008**			**2009**		
	Novac	**Negru Dragasani**	**Cabernet cl.7**	**Novac**	**Negru Dragasani**	**Cabernet cl.7**	**Novac**	**Negru Dragasani**	**Cabernet cl.7**
Tb	26,8	25,8	25,4	26,8	29,8	29,2	23,2	25,8	22,4
Tx	8,6	7,8	6	4,6	10,6	6,2	5,2	6,2	2,4
Tv	18,2	18	19,4	22,2	19,2	23	18	19,6	20
Tc	20,4	18	20	22,6	19,4	24,2	18,2	20,6	20
Fc	15,8	15,8	18	15,2	15	19,4	11,8	16,2	15,6
Sc	4,6	2,2	2	7,4	4,4	4,8	6,4	4,4	4,4
Tinf	25,8	29,6	29,2	21,6	24,2	34,6	18,4	26	23,2
Fertile copse (%)	77,4	87,7	90	67,3	77,3	80,2	64,8	78,6	78

Table no 2

The synoptic table of fertility

Studied characteristics			2007			2008			2009		
			Novac	Negru Dragasani	Cabernet cl.7	Novac	Negru Dragasani	Cabernet cl.7	Novac	Negru Dragasani	Cabernet cl.7
Statistic data/vine	Tc		20,4	18	20	22,6	19,4	24,2	18,2	20,6	20
	Fertile copse	Nr.	15,8	15,8	18	15,2	15	19,4	11,8	16,2	15,6
		%	77,4	87,7	90	67,3	77,3	80,2	64,8	78,6	78
	Sc		4,6	2,2	2	7,4	4,4	4,8	6,4	4,4	4,4
	Tinf		25,8	29,6	29,2	21,6	24,2	34,6	18,4	26	23,2
Fertility coefficient	Rel		1,26	1,64	1,46	0,95	1,24	1,42	1,01	1,26	1,16
	Abs		1,63	1,87	1,62	1,42	1,61	1,78	1,56	1,60	1,49

We can observe that in the year 2007 the maximum fertile copse percentage is 90% at Cabernet Sauvignon cl 7 Dragasani and the minimum is at Novac, with 77,4%. The average of total viable buds/vine is also superior to Cabernet Sauvignon cl 7 Dragasani and inferior to Negru de Dragasani.

The year 2008 is the worst year for Negru de Dragasani, with a maximum fertile copse percentage of 80,2% at Cabernet Sauvignon cl 7 Dragasani , and the smallest percentage at Novac, with 67,3%. Also, the average of total viable buds/vine is superior to Cabernet Sauvignon cl 7 Dragasani and inferior to Negru de Dragasani.

The best year regarding fertile copse percentage is 2007 with a maximum of 90% and a minimum of 77,4%. The worst year for Novac and Cabernet Sauvignon cl 7 Dragasani was the year 2009, with values of 64,8% and 78% and the worst year for Negru de Dragasani was 2008, with a value of 77,3%. (table 1)

In 2007, the highest relative fertile coefficient is at Negru de Dragasani (1,64) and the smallest is at Novac (1,26). The maximum absolute coefficient is, also, at Negru de Dragasani (1,87) and the smallest at Cabernet Sauvignon cl 7 Dragasani(1,62).

Negru de Dragasani have the greatest fertile coefficient (1,64/1,87) and the smallest coefficient is at Novac (1,26/1,62).

The fertility coefficient at all the grape varieties is middle, with values between 1,1 – 2,0.

In 2008 the highest fertile coefficient is at Cabernet Sauvignon cl 7 Dragasani (1,42/1,78) and the smallest at Novac (0,95/1,42) The fertile coefficient is middle at all grape varieties except the relative at Novac which is small.

In 2009, the fertile coefficient reaches 1,26/1,60 at Negru de Dragasani and the minimum relative fertile coefficient is 1,01 (Novac) and the minimum absolute fertile coefficient is 1,49 (Cabernet Sauvignon cl 7 Dragasani).

In 2009 the fertile coefficient is middle at all grape varieties.

The best year of the fertile coefficient at Novac and Negru de Dragasani is 2007 and for Cabernet Sauvignon cl 7 Dragasani is 2008. (table 2)

CONCLUSIONS

From the point of view of the fertile copse percentage the best year was 2007, with a maximum of 90% (Cabernet Sauvignon cl 7 Dragasani) and a minimum of 64,8 % (Novac). The worst year was 2009 (for Novac and Cabernet Sauvignon cl 7 Dragasani with values of 64,8 % and 78 %) and for Negru de Dragasani was the year 2008 (with 77,3 %).

As an average of these three years, the file copse percentage for Novac is 69,8 %, for Negru de Dragasani is 81,2 % and for Cabernet Sauvignon cl 7 Dragasani is 82,7 %.

From the point of view of the fertile coefficient, the maximum relative fertile coefficient is at Negru de Dragasani (1,64, in 2007) and the worst at Novac (0,95, in 2008). The maximum absolute fertile coefficient is at Negru de Dragasani (1,87, in 2007) and the smallest at Novac (1,49, in 2008).

In all three years, the fertile coefficient is middle at all the grape varieties, except the relative fertility coefficient at Novac, in 2008,which is small to middle.

REFERENCES

1. Oprea Stefan, Sergiu Dan Moldovan - Ameliorarea vitei de vie in Romania. Editura Polirom, Cluj Napoca, 2007.
2. ***Statiunea de Cercetare si Productie Viti-vinicola Dragasani - La 50 de ani de activitate stiintifica: 1936-1986. Dragasani, 1986.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

THE PHENOLOGICAL RESEARCH (BUD BREAK AND BLOOMING) ON NATIVE GRAPE VARIETIES IN THE CLIMATIC CONDITIONS OF DRĂGĂŞANI VINEYARD

Gorjan Sergiu Stefan, Dinu Daniel Grigorie, Farcas Emil Cornel[1]

KEY WORDS: *bud break, blooming, grape varieties*

ABSTRACT

The research was made at Drăgăşani Vineyard, Dealu-Olt wine growing plantation within S.C.D.V.V. Drăgăşani on the grape varieties: Novac, Negru de Drăgăşani, Crampoşie selectionata, Alutus, Vilarom, Călina, Victoria, Azur between 2006 – 2008.

The research focused on the bud break and blooming of these varieties in order to make a comparison between these years, on the basis of the climatic conditions and the conclusion was that there was a faster start of the vegetating process in 2007 as compared to 2006 and 2008.

INTRODUCTION

These grape varieties were created along time at S.C.D.V.V. Drăgăşani by the researchers colective of the unit.

The grape varieties Victoria, Azur were created by Condei Gh.and Lepadatu Victoria; Novac, Alutus, Vilarom and Calina by Marculescu M.; Negru de Dragasani by Marculescu M. and Vladasel M.; Cramposie selectionata by Popescu Emilian, Neagu Marin and Banita Petre (Statiunea de Cercetare si Productie Viti-Vinicola Dragasani,1986; Stefan Oprea, Sergiu Dan Moldovan, 2007)

The climatic dates were taken from Meteorological Station of I.N.M.H. Dragasani on the period 2006 – 2008.

MATERIALS AND METHODS

The grape varieties taken into study are located on the research fields Camp Colecție (The Collection Field) and Camp Comparativ (The Comparison Field). In order to emphasize these phenophases (bud break and blooming) as well as the recorded temperatures, during the research period, careful and precise observations were made.

The system of culture is non-protected, semi stem and the vines are planted at the distance of 2 meters between the rows and 1,1 meters between the wines of a row.

[1] S.C.D.V.V. Dragasani

RESULTS AND DISCUSSIONS

Situated in the great geomorphologic unit called Getic Piemont, the Dragasani vineyard covers the Oltet Platform. Situated at 44˚30' nordic latitude and 23˚27' eastern latitude, at 182 meteres altitude.

In 2006, the bud break of these grapes varieties started on April and blooming on May and June.

Temperatures recorded during the period of these phenophases of the above mentioned grapes varieties took place and after that, show that there weren't low temperatures in January and February and temperature between March and June was normal for this period.

In 2007, bud break began earlier, at the beginning of April, because of the fact that temperatures were not lower than 0^0C.

Thus, we can observe an increase of the temperature as related to 2006. Due to the increasing temperature, blooming began earlier too than in 2006.

In 2008, bud break began in April, a little bit later than in 2007, but earlier than in 2006, with a temperature lower than 0^0C in January (-2,9^{0}C) and a normal temperature during the rest of the year.

The blooming period was the end of May and the beginning of June.

Table no. 1

PHENOLOGY

Grapes varieties	2006		2007		2008	
	Bud break	Blooming	Bud break	Blooming	Bud break	Blooming
Novac	13.04	03.06	03.04	21.05	07.04	26.05
Negru de Drăgăşani	19.04	01.06	06.04	19.05	10.04	29.05
Crampoşie selectionată	13.04	31.05	07.04	23.05	10.04	28.05
Alutus	19.04	01.06	10.04	22.05	13.04	26.05
Vilarom	21.04	05.06	11.04	23.05	12.04	29.05
Călina	21.04	09.06	07.04	24.05	12.04	04.06
Victoria	19.04	09.06	16.04	22.05	14.04	03.06
Azur	14.04	31.05	04.04	23.05	02.04	29.05

We can observe that in the year 2006, the bud break started on 13.04 at Novac and Cramposie selectionata, on 14.04 at Azur, on 19.04 at Alutus, Victoria, Negru de Dragasani, on 21.04 at Vilarom and Calina.

The blooming begun on started on 31.05 at Cramposie selectionata, Azur, on 01.06 at Negru de Dragasani and Alutus, on 03.06 at Novac, on 05.06 at Vilarom and on 09.06 at Calina and Victoria.

In 2007 the bud break begun on 03.04 at Novac, 04.04 at Azur, on 06.04 at Negru de Dragasani, on 07.04 at Cramposie selectionata and Calina, on 10.04 at Alutus, on 11.04 at Vilarom and on 16.04 at Victoria.

The blooming was in May: on 19 at Negru de Dragasani, on 21 at Novac, on 22 at Alutus and Victoria, on 23 at Cramposie selectionata, Vilarom and Azur, and on 24 at Calina.

We can observe that in 2008, the bud break begun on 02.04 at Azur, on 07.04 at Novac, on 10.04 at Negru de Dragasani and Cramposie selectionata, on 12.04 at Vilarom and Calina, on 13.04 at Alutus and on 14.04 at Victoria.

The blooming begun on 26.05 at Novac and Alutus, on 28.05 at Cramposie selectionata, on 29.05 at Negru de Dragasani, Vilarom and Azur, on 03.06 at Victoria and on 04.06 at Calina

We can observe that in the years 2007 and 2008 the temperatures are increasing, compared to 2006

CLIMATIC DATES

Month	Temperature ^{0}C					
	2006		2007		2008	
	Average	Max.	Average	Max.	Average	Max.
January	-3,8	7,7	5,8	17,0	-2,9	12,6
February	-0,4	14,5	3,9	16,9	3,3	19,6
March	5,1	21,7	7,8	20,1	8,3	20,0
April	12,1	22,0	12,9	25,0	12,3	24,3
May	16,3	30,5	18,7	30,2	16,5	32,4
June	19,3	32,6	22,6	37,1	21,3	33,3

The average of temperatures, in 2006, were -3,8˚C in January, -0,4˚C in February, 5,1˚C in March, 12,1˚C in April, 16,3˚C in May and 19,3˚C in June.

The maximum temperatures were 7,7˚C in January, 14,5˚C in February, 21,7˚C in March, 22,0˚C in April, 30,5˚C in May and 32,6˚C in June.

In the year 2007, the average of temperatures is: 5,8˚C in January, 3,9˚C in February, 7,8˚C in March, 12,9˚C in April, 18,6˚C in May and 22,6˚Cin June.

The maximum temperatures were: 17˚C in January, 16,9˚ in February, 20,1˚C in March, 25,0˚C in April, 30,2˚C in May and 37,1˚C in June.

In the year 2008, the average of temperatures was: -2,9˚C in January, 3,3˚C in February, 8,3˚C in March, 12,3˚C in April, 16,5˚C in May and 21,3˚C in June.

The maximum of temperatures was: 12,6˚C in January, 19,6˚C in February, 20,0˚C in March, 24,3˚C in April, 32,4˚C in May and 33,3˚C in June.

CONCLUSIONS

On the basis of these observations it was established that the bud break and the blooming of the mentioned grape varieties began earlier in 2007 than in 2006 and 2008, due to the fact that during the months precursory to bud break and blooming, the average temperatures were higher than in the other years, except for the month of March 2007, when temperature was lower than in 2008.

We can observe that in the last two years 2007 and 2008, temperatures are increasing, leading to a faster beginning of the vegetating process.

The average and maximum temperatures were increasing than 2006.

These very good temperatures from the last two years will come to a very good production of grapes, both quantitatively and quality.

REFERENCES

1. ***Statiunea de Cercetare si Productie Viti-Vinicola Dragasani - La 50 de ani de activitate stiintifica 1936-1986. Dragasani, 1986.
2. Stefan Oprea, Sergiu Dan Moldovan – Ameliorarea vitei de vie in Romania, Editura Poliam Cluj – Napoca, 2007

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✔*Biologie*
✔*Horticultură*
✔*Tehnologia prelucrării produselor agricole*
✔*Ingineria mediului*

Vol. XIV (XLX) - 2009

THE CONTENT OF LETTUCE LEAVES (*LACTUCA SATIVA*) AND SPINACH (*SPINACEA OLERACEA*) OF NITRITES AND NITRATES DEPENDING ON THE GROWING SYSTEM

Chilom Pelaghia [1], Anica Sufan[2]

KEY WORDS: *lettuce, spinach, nitrites, sampling*

SUMMARY

Under normal technology conditions there have been taken samples of lettuce (Mona) and spinach (Matador), determining the content of nitrites and nitrates. There haven't been identified detectable nitrite ions, and the nitrate ions values have been within optimal limits, well below the permitted maximum levels.

In terms of protection, the values are lower and the younger leaves (spinach) or etiolate leaves (salad) record lower values.

INTRODUCTION

Providing food for people is the most important issue to achieve, being always in the attention of those who are concerned with maintaining human health.

Food production will have to increase according to the requirements, increasing the efficiency per area unit but also their quality by maintaining the plant's health (M. Berca. 2000, A. Butaru. 2005 Pelaghia Chilom. 2007).

METHOD AND MATERIAL

In order to fit into our objectives to resolve, it was resorted to the method of "sampling" of lettuce and spinach from the field and greenhouses, in the same area, in our case Almaj – Dolj Township. The Township is located in the influence area of Craiova Chemical Plant, only 4 km away, and the samplings were performed by the practiced methods, and there were grown and analyzed Mona breed for the lettuce and Matador breed for the spinach, in terms of 2007.

In terms of growing, both species were grown on soil fertilized with a well-decomposed organic material in the fall, in quantity of 2.5 kilograms/square meters area, the ground being prepared in both cases for early crops of cabbage, the two species representing early cultures.

[1] University of Craiova
[2] Drd. D.A.D.R. DOLJ – Dolj Phytosanitary Unit

For the lettuce, the first determination was made when forming the bulb – sampling a medium sample by superimposing the rosette leaves, and the second determination in the sampling phase with samples of leaves from two levels.

The content of nitrites and nitrates in accordance with the order of the Ministry of Agriculture, also for spinach the determinations were made in the first harvest every 10 days.

It was determined the Forests and Rural Development no. 1145/2005 regarding the approval of sanitary and veterinary health standard – the data in table 1 showing the maximum permitted levels.

Maximum limits of nitrites and nitrates in lettuce and spinach

Table no. 1

Crt. No.	**BREED**	**Content in mg/kg fresh product depending on the stage of harvest and area of (mg NO3/kg)**	
1	Fresh spinach (Spinacea oleracea L)	Harvested between the 1st of November and 31st of March	3000 mg/kg
		Harvested between the 1st of April and 31st of October	2500 mg/kg
2	Fresh lettuce (Lactuca sativa L) (lettuce grown in covered areas and raised in the open field)	Harvested between the 1st of October and 31st of March - Greenhouses - Solariums - Field	 2000 mg/kg 2500 mg/kg 2500 mg/kg

For the two species there have been taken samples in relation to specific of table no. 2.

The specific of variants

Table no. 2

Growing in	**Variants**	**Time of performing the samplings**	**Sampling**
The field	V1	- The well formed rosette stage	V1-1 of the entire rosette
	V2	- The havesting stage of bulbs	V2-1 of the outer leaves
			V2-2 of the inner leaves (etiolated)
The solariums	V3	- The well formed rosette stage	V3-1 of the entire rosette
	V4	- The havesting stage of bulbs	V4-1 of the outer leaves
			V4-2 of the inner leaves (etiolated)

For lettuce, the interval between the two harvesting moments was of 21 days and for spinach of 10 days.

RESULTS AND DISCUSSIONS

In plants of both species there were made specific technology works for the two species.

The values of the features analyzed within "The Central Laboratory for the Determination of Residues in Plants and Vegetal Products - Bucharest "are presented in the tables no. 3 (for salad) and no. 4 (for spinach).

The content of nitrites and nitrates in lettuce and spinach mg/depending on the growing conditions

Table no. 3

Growing in	Variants	Subvariants	NO2 * mg/kg	NO3 mg/kg 5(probe)	Average I ** Mg/kg	Average II***
The field	V1	V1-1	Nd*	589,74 587,92 590,24 590.04 591,06	589,80	589,80
	V2	V2-1	Nd*	624,22 629,12 614,14 602,00 616,84	617,26	584,13
		V2-2	Nd*	564,14 552,12 548,10 538,20552,40	550,99	
The solariums	V3	V3-1	Nd*	568,10 567,72 568,92 568,51 569,42	568,33	568,33
	V4	V4-1	Nd*	572,12 578,14 600,20 584,40 596,20	586,17	566,045
		V4-2	Nd*	528,40 536,36 514,12 522,12 528,60	545,92	566,045

Nd* = non detectable

** The average of the 5 determinations *** The average of the determinations in the bulb stage

The data in the table show that were detected nitrite ions which represent the products of the metabolization of nitrates under such conditions of technology.

In spinach, of the data no. 4 there are highlighted the differences between the variants in relation to the growing area and the time of the determination.

The content of nitrites and nitrates in spinach depending on the growing conditions

Table no. 4

Growing in	Variantele	NO2 * mg/kg	NO3 mg/kg 5(probe)	Media mg/kg	Specific of variants
The field	V1	Nd*	601,65 601,06 600,06 602,11 600,30	601,06	Determinations at the beginning of the harvest
	V2	Nd*	628,40 632,20 622,40 640,20 642,20	633.08	Every 10 days determinations
	V3	Nd*	530,01 528,54 529,41 530,62 530,41	529,11	Determinations at the beginning of the harvest
The solariums	V4	Nd*	542,00 538,80 546,20 550,20 550,20 562,30	547,9	Every 10 days determinations

Nd* = non detectable

Under general aspect, the values of the plants' contents from greenhouses are lower compared to the ones in the field, and the ones in the second phase are somehow higher than those of the first phase. The differences are visible in the chart no. 2.

All values are much reduced from their permitted highs.

The nitrate content from one area to another, with slightly higher values for the field crops compared to those of greenhouses, the plants in the field are more exposed to adverse factors and likely they have an influence upon these components.

But the differences are however small and insignificant. Regarding the time of harvest, respectively the rosette stage, there are slight differences from the field to the solarium as a phenological stage when the determinations were performed in the well-formed rosette stage, but the tests were reported to an average sample value, the values were different from the tests of two samples, with outer leaves and respectively inner – separate leaves. The inner leaves less exposed to light have lower levels of nitrates - 550.99 mg / kg in the inner leaf, with an average of 584.13 mg / kg.

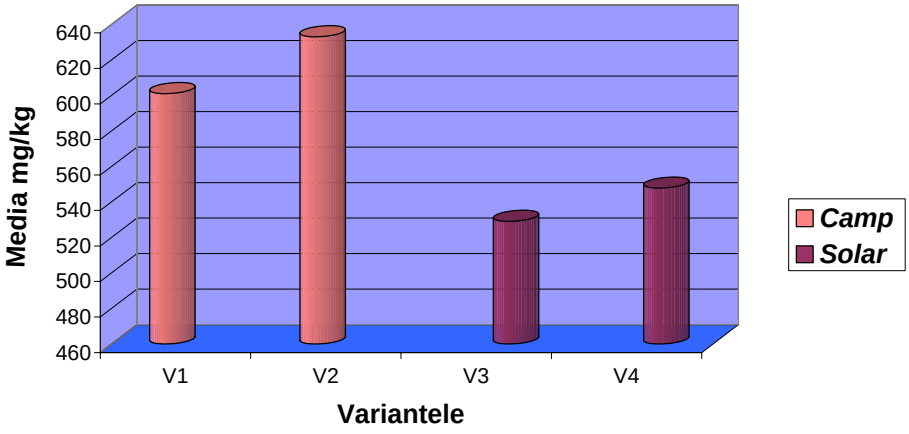


Chart no. 1
The content of nitrites and nitrates in spinach depending on the growing conditions

The average sample is very close to that of the leaves analyzed in the rosette stage.

In the solarium, the values are slightly lower for similar variants in the field, but meet the same rule.

The differences between variants also stand out in **Chart no. 1.**

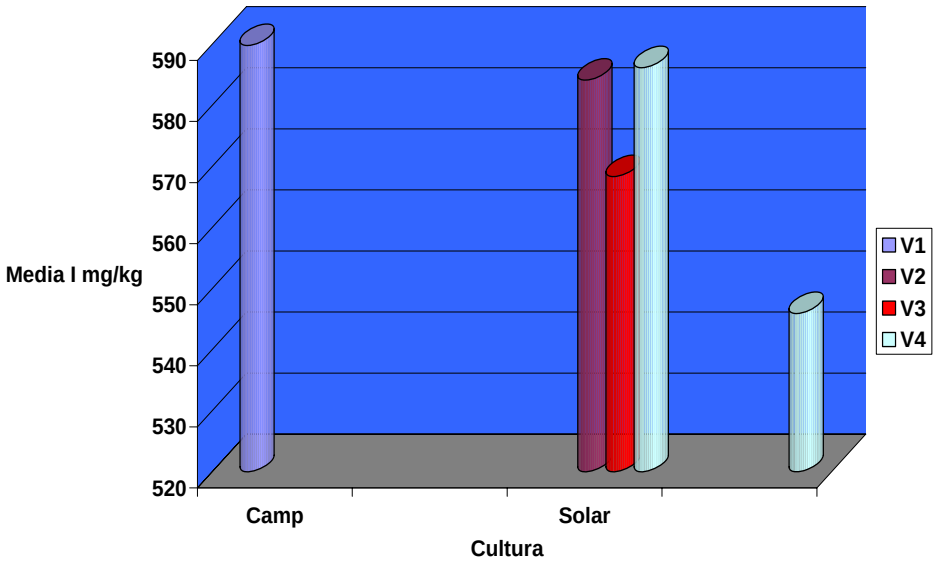


Chart no. 2
The content of nitrates in lettuce, depending on the growing conditions

CONCLUSIONS

- Under the area conditions, during the research year there haven't been recorded detectable values of nitrites;
- The contents of nitrates have been well below the maximum permitted levels;
- Under protected conditions, the values are lower than those in the field;
- In spinach, as it advances in growing, the nitrate contents increase slightly;
- In lettuce, the values of the nitrate content are lower in the leaves inside the bulb, compared to the outer ones;
- The growing and technology conditions influence the contents in some measure.

BIBLIOGRAPHY

1. M. Berca – General ecology and environmental protection. Ceres Publishing House. Bucharest. 2000.
2. Mihaela Georgeta Jianu – Doctoral Dissertation. Bucharest. 2005.
3. Pelaghia Chilom; Anica Şufan.L' influence de la fertilization foliare sur certains modifications morphologique et du contenu en nitrates de la salade. . 2007.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✔*Biologie*
✔*Horticultură*
✔*Tehnologia prelucrării produselor agricole*
✔*Ingineria mediului*

Vol. XIV (XLX) - 2009

STUDY OF THE PRODUCTIVE AND QUALITATIVE POTENTIAL OF SOME SWEET MELON HYBRIDS UNDER THE INFLUENCE OF SOME MODERN FIELD CROP TECHNOLOGIES

Becherescu Alexandra [1], A. Horgoş[1], Lavinia Ciucuriță[2], O.Țâru[1]

KEY WORDS: crop technology, modernization, foil, tunnel, mulch

ABSTRACT

Crop technology has evolved, implying the improvement and modernization of the technological steps, so that we may speak about a modernized field technology of sweet melons at the moment. Crops are initiated with the application of arrangement methods in open field with direct seeding and planting of seedlings – there ones representing classic cultivation methods. The method of crop arrangement through planting of seedling in open field was improved with the replacement of the traditional irrigation methods with the newest and actual irrigation method, namely the drip irrigation method, and with seedling protection with down tunnels of polyethylene foil.

This work presents the influence exerted by the arrangement methods and by the modernized crop technology on yield.

INTRODUCTION

Species of cucurbitaceous vegetable plant known for about 2000 years, the sweet melon was introduced in our country at the beginning of the 17th century, being cultivated in the South, South-East and South-West of the country on larger areas in field, but with tendency of extension in the protected environments, too.

The crop technology applied has evolved along time, the technological steps being improved and modernized so that at the moment we may speak about a modernized field crop technology, very similar with the one of the watermelons.

According to size and form, sweet melons are divided into two groups, namely: cantaloupes, with a globe-shaped fruit and deeply striped, and the properly melons, with an oval-elongated fruit and husky cover, more or less smooth or finely reticulated.

In greenhouses, sweet melon cultivation may be carried out during spring, the profitableness of this crop being a very high one.

Plant conduction and „in green" cuttings aim at the favouring of fructification and the achievement of an early big yield. The cuttings take place in concordance with the cultivar used, plant vigour and luminosity, etc. So, Focşăneanu (1978) shows that plants may be conducted in three systems, namely:

[1] U.S.A.M.V.B.Timişoara
[2] Asociație Familială Com.Păuliş, Sat Sâmbăteni, Jud. Arad

1. The conducting system of the main stem, without top pinching. The advantages of this system are represented by a very early production, but the fruits are a bit smaller than in the second system.

2. Plant (seedling) pinching system at 3-4 leaves and the conduction of one sprout as main stem. The advantages are: achievement of uniform fruits, but the production is a bit late.

3. Seedling pinching system at 3-4 leaves and the conduction of two sprouts in „V" (conduction on two stems). The fruits are smaller than in the two systems. It is adequate for the variety Galia. The fertile lateral sprouts are pinched at 1-2 leaves and one fruit, and the sterile sprouts are removed. So, we may obtain 3-4 fruits/stem and 3-4 fruits/sprout arbour.

The varieties and hybrids used are classified into two groups, according to pulp colour:

I. *Charantais Group* – varieties with yellow pulp, perfumed: Cristal, Odybis, Cantor, Vedor, Doublon, Savor.

II. Group of green-pulp varieties, sweeter and with less perfume, like: Overgen, Halon, Noy Israel from the group Ogen.

In open field, we may initiate the crop, according to the cultivator's possibilities and to his objectives, with several methods: the method of arrangement in open field through direct seeding (when the climatic conditions allow this) and the method of arrangement in open field through planting of seedling (when the environmental temperatures are proper to take the seedlings in field).

These two methods represent classic methods for sweet melon cultivation and they have been successfully applied in the legumiculture from our country.

The method of crop arrangement through planting of seedling in open field has been improved, with the replacement of the harrow and sprinkling irrigation methods with the newest and actual method of drip irrigation. This method, besides the substantial water saving, allows crop fertilization, and it is called fertirrigation.

So, we may call this method of sweet melon crop in open field, with the improvements previously mentioned: ***„the improved classic crop technology of sweet melons"***.

With the perseverance of experts in the improvement of this technology, protecting the seedling with down tunnels of plastic foil, applying a mulch of foil, too, on the soil within the tunnel and applying modern chemical fertilisers (Kemira-type – Cropcare, Ferticare, Agriplant), etc., we may obtain the advantages of a technology that is much improved than the previous one, called: ***„the modernized technology of sweet melon cultivation in down tunnels of polyethylene foil".***

This work presents the influence exerted by the methods of arrangement, irrigation and fertirrigation on yield, in terms of quantity and quality, and of yield distribution as well.

MATERIAL AND METHOD

The research on the influences exerted by the methods of crop arrangement and fertirrigation on hybrid productive potential was performed in comparative competitor crops located in a private vegetable farm from the village Sâmbăteni, commune Păuliş, Arad County, in the Western Plain in Mureş meadow, at about 4-5 km from the hills of the Miniş-Măderat vineyard.

The objective of our researches was to observe the influences exerted by the interaction of the factors that will represent essential technical elements for a frame-

technology of improved cultivars in down tunnels of polyethylene foil on the production of sweet melon hybrids, in terms of quantity and quality.

We arranged for this study comparative competitor crops, with the bifactorial experience method, through the system of sub-divided parcels, in 3 replications.

Factor A – Method of crop arrangement and method of irrigation and fertilization

a_1 – Crop arrangement through planting of seedling in open field, drip irrigation and fertirrigation; **a_2** – Crop arrangement through planting of seedling, application of mulch made of polyethylene foil on soil, crop protection in down tunnel of PE foil, drip irrigation and fertirrigation;

Factor B - Hybrid

b_1 – Fiata F1; **b_2** – Corin F1; **b_3** – Galia F1; **b_4** – Solarbel F1.

We carried out comparative observations on hybrid behaviour successive to the application of the two crop technologies. Concretely, we determined: number of fruits/plant, fruit circumference and diameter, mean fruit weight, yield percentages in the four intervals of production, according to the naturally established intervals in concordance with price evolution on the free market.

Successive to the calculations performed, we determined the mean yields per plant and hectare.

RESULTS AND DISCUSSIONS

In table 1, we present a synthesis of the results of differentiated yield for the two factors, A and B. We present the comparison between the results of the four hybrids and, in the case of the same hybrid, the results under the influence exerted by factor A.

According to table 1, we may observe the differentiation of the production elements in the four sweet melon hybrids (three are early hybrids and one is a semi-late hybrid), among which two have yellow-orange pulp and two have white-green pulp. We may observe differentiations, but not extremely big ones, of the number of fruits/plant and also between the mean fruit weights.

The biggest fruit weights belong to b_1 – Fiata F1 and b_2 – Corin F1, and the smallest ones to b_4 – Solarbel F1, with correspondents in the mean yields/plant. There are significant differences between the yields obtained under the influence exerted by factor A, with big growths under the influence of a_2 – crop protection with PE foil and drip irrigation and fertirrigation ($a_2b_2 \rightarrow$64.40 t/ha compared with $a_1b_2 \rightarrow$55.26 t/ha.

The same table presents the percentage of 1st quality yield of total yield, with a bigger percentage obtained under the influence exerted by factor a_2. it also shows the yield obtained under the influence of the factor B (the hybrid). The biggest yield was recorded in b_2 – Corin F1, 64.4 t/ha – 116.5 % compared with b_4 – Solarbel F1 – 40.71 t/ha. The other two hybrids, b_1 – Fiata F1 and b3 – Galia F1, produce smaller yields, of only 57.93 t/ha and respectively 50.23 t/ha, compared with a_1 – Fiata F1.

The 1st quality yield of b_4 – Solarbel F1, 84.4 % of total yield, is the biggest one compared with the one of the other hybrids, namely 79.1 % - 82.5 %.

The analysis of the data presented in this table makes evident the incontestable superiority of the hybrids Fiata F1 (b_1) and Corin F1 (b_2) in terms of production and of the hybrids Solarbel F1 and Galia F1 in terms of yield quality.

Table 2 presents, according to the statistical calculations specific to the variance analysis method, the significances of yield differences in the comparisons made as effect of the interdependence between the experimental factors.

Table 1

Synthesis of the experimental results related to the sweet melon production in field (with yellow-orange and white-green pulp) in 2007-2008

Factor A	Factor B	Mean weight/fruit (kg/piece)	No. of fruits/plant (piece)	Mean yield					Yield distribution (%)		Mean yield for factor A						
				Kg/ Plant	t/ha	%	Of which 1st quality		July (total)	August (total)	Mean weight/fruit (kg/piece)	Kg/ Plant	t/ha	%	Of which		
							t/ha	%							1st quality		2nd quality
															t/ha	%	t/ha
a_1	b_1	1,698	3,70	6,281	43,97	100,0	32,23	73,3	33,6	66,4	1,626	6,219	43,53	89,9	33,47	76,9	10,06
	b_2	2,024	3,90	7,894	55,26	100,0	42,21	76,4	31,8	68,2							
	b_3	1,570	3,85	6,043	42,30	100,0	32,27	76,3	30,5	69,5							
	b_4	1,210	3,85	4,657	32,60	100,0	27,16	83,3	26,3	73,7							
Mean a_1		**1,626**	**3,83**	**6,219**	**43,53**	**89,9**	**33,47**	**76,9**	**30,55**	**69,45**	*	*	*	*	*	*	*
a_2	b_1	1,881	4,40	8,275	57,93	131,7	45,82	79,1	46,9	53,1	1,740	7,617	53,32	110,1	43,51	81,6	9,81
	b_2	2,165	4,25	9,200	64,40	116,5	52,42	81,4	41,3	58,7							
	b_3	1,527	4,70	7,176	50,23	118,7	41,44	82,5	42,6	57,4							
	b_4	1,385	4,20	5,816	40,71	124,98	34,36	84,4	34,6	65,4							
Mean a_2		**1,740**	**4,39**	**7,617**	**53,32**	**110,1**	**43,51**	**81,6**	**41,35**	**58,65**	*	*	*	*	*	*	*
Exp. mean (Mx)	b_1	1,790	4,05	7,250	50,95	105,2	39,02	76,6	40,25	59,75	1,683	*	*	*	*	*	*
	b_2	2,095	4,08	8,548	59,83	123,5	47,32	79,1	36,55	63,45		*	*	*	*	*	*
	b_3	1,549	4,28	6,630	46,27	95,5	36,86	79,7	36,55	63,45		*	*	*	*	*	*
	b_4	1,298	4,03	5,231	36,66	75,7	30,76	83,9	30,45	69,55		*	*	*	*	*	*
Mean (Mx)		**1,683**	**4,11**	**6,918**	**6,917**	**100,0**	**38,49**	**79,5**	**35,95**	**64,05**	*	**6,918**	**48,43**	**100,0**	**38,49**	**79,5**	**9,94**

Table 2

Singular influences and of the interactions between the experimental factors on the yield of a sweet melon crop in field, arranged in differentiated technology conditions

Variant	Mean yield (t/ha)		Relative yield (%)	Difference (± t/ha)	Significance of difference
1. Influence of crop arrangement and irrigation methods on yield					
a2-a1	53,32	43,45	122,71	9,87	***
a3-a1	48,43	43,45	111,45	4,98	***
a3-a2	48,43	53,32	90,83	-4,89	000
DL 5%= 0,17		DL 1%= 0,25		DL 0,1%=0,40	
2. Influence of hybrid on yield					
b2-b1	59,83	50,84	117,69	8,99	***
b3-b1	46,27	50,84	91,00	-4,57	000
b4-b1	36,66	50,84	72,10	-14,18	000
b3-b2	46,27	59,83	77,33	-13,56	000
b4-b2	36,66	59,83	61,27	-23,17	000
b4-b3	36,66	46,27	79,23	-9,61	000
DL 5%=2,11		DL 1%=2,90		DL 0,1%=3,99	
3. Influence of the interaction between different cultivation and irrigation methods and the same or different hybrids					
a2b1-a1b1	57,93	43,64	132,76	14,29	***
a3b1-a1b1	50,95	43,64	116,76	7,31	***
a3b1-a2b1	50,95	57,93	87,95	-6,98	000
a2b2-a1b2	64,40	55,26	116,54	9,14	***
a3b2-a1b2	59,83	55,26	108,27	4,57	**
a3b2-a2b2	59,83	64,40	92,90	-4,57	00
a2b3-a1b3	50,23	42,30	118,75	7,93	***
a3b3-a1b3	46,27	42,30	109,38	3,97	*
a3b3-a2b3	46,27	50,23	92,11	-3,96	0
a2b4-a1b4	40,71	32,60	124,88	8,11	***
a3b4-a1b4	36,66	32,60	112,44	4,06	*
a3b4-a2b4	36,66	40,71	90,04	-4,05	0
a2b2-a1b1	64,40	43,64	147,58	20,76	***
a3b3-a1b1	46,27	43,64	106,03	2,63	-
a3b3-a2b2	46,27	64,40	71,84	-18,13	000
DL 5%= 3,16		DL 1%= 4,36		DL 0,1%=6,00	
4. Influence of the interactions between the same cultivation and irrigation methods and different hybrids					
a1b2-a1b1	55,26	43,64	126,64	11,62	***
a1b3-a1b1	42,30	43,64	96,94	-1,34	-
a1b4-a1b1	32,60	43,64	74,71	-11,04	000
a1b3-a1b2	42,30	55,26	76,55	-12,96	000
a1b4-a1b2	32,60	55,26	58,99	-22,66	000
a1b4-a1b3	32,60	42,30	77,07	-9,70	000
a2b2-a2b1	64,40	57,93	111,17	6,47	***
a2b3-a2b1	50,23	57,93	86,71	-7,70	***
a2b4-a2b1	40,71	57,93	70,27	-17,22	***
a2b3-a2b2	50,23	64,40	78,00	-14,17	000
a2b4-a2b2	40,71	64,40	63,21	-23,69	000
a2b4-a2b3	40,71	50,23	81,05	-9,52	000
a3b2-a3b1	59,83	50,95	117,43	8,88	***

Variant	Mean yield (t/ha)		Relative yield (%)	Difference (± t/ha)	Significance of difference
a3b3-a3b1	46,27	50,95	90,81	-4,68	0
a3b4-a3b1	36,66	50,95	71,95	-14,29	000
a3b3-a3b2	46,27	59,83	77,33	-13,56	000
a3b4-a3b2	36,66	59,83	61,27	-23,17	000
a3b4-a3b3	36,66	46,27	79,23	-9,61	000
a3b5-a3b3	36,66	46,27	79,23	-9,61	000
DL 5%= 3,65 DL 1%=5,02 DL 0,1% =6,92					

The unilateral analysis of the experimental factors at points 1 and 2 leads to the conclusions that:

- the yields achieved by the hybrid b_2 – Corin F1 are statistically covered, the significance of yield differences compared with b_1 – Fiata F1 being very significantly positive;
- the other significances of yield differences are very significantly negative;
- the mean of the yields obtained successive to the application of the modernized crop technology (a_2) has statistical assurance, the significance of yield difference being very significantly positive (***) compared with a_1 (the mean of the yields obtained successive to the application of the improved classic crop technology).

The complex analysis performed at points 3 and 4 shows also yield differences, characterized as being very significantly, distinctly and significantly positive in 14 cases of 29, very significantly, distinctly and significantly negative in 12 cases of 29, and in 2 cases there is no significance, according to the interactions specified.

CONCLUSIONS

1. The sweet melon hybrids studied react favourably in terms of productive and qualitative potential to the action exerted by the method of crop arrangement through seedling, with application of mulch of PE foil and crop protection under down tunnels covered with PE foil.

2. The modernized crop technology (planting of seedling, crop protection in down tunnels of polyethylene foil, mulch of polyethylene foil, drip irrigation and fertirrigation) proved to be superior compared with the classic crop technology, the planting of seedlings, irrigation and fertilization through the drip system being supported by the productive manifestation of the hybrids cultivated in terms of quantity (mean yield/hectare), quality (fruit diameter and weight) and earliness (early production in the first two decades of July, when the sale price is maximal).

3. We remarked especially the hybrids Corin F1 and Fiata F1 with yields bigger than in the other two cases, Galia F1 and Solarbel F1; these two hybrids excelled in a bigger 1st quality yield of the total yield achieved.

4. We recommend the continuation of experiments in order to improve the results obtained, because the hybrids studied are extremely valuable, and the modernized crop technology represents a top technology in the agricultural practice.

BIBLIOGRAPHY

1. Horgoş, A. – Legumicultură specială, Ed. Agroprint, Timişoara, 2003
2. Ciofu, R. şi col. – Tratat de legumicultură, Ed. Ceres, Bucureşti, 2003.
3. Grumeza, N., şi col. – Tehnica irigării culturilor hortiviticole, Ed. Ceres, Bucureşti, 1979.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

EXTRARADICULAR FERTILIZER WITH CHELATED NATURAL ORGANIC SUBSTANCES - AGROCHEMICAL TESTING IN THE HOUSE OF VEGETATION

Cioroianu T.[1], Carmen Sirbu[1], Maria Negrila[2], Monica Dumitrascu[1], Dana Popoi[3], Adriana Grigorie[1], Ioana Oprica[1]

KEY WORDS: fertilizers, hydrolyzate, collagen, biostimulator, foliar

ABSTRACT

Development of new fertilizers with structure and properties of natural compounds and plant-stimulating effect is one of research directions and priorities in agriculture approached by most operators in the field of chemical fertilizers.

This paper presents a range of fertilizers containing NPK-type matrix with trace elements and organic substances of animal nature with chelated and plant-stimulating properties. Experimental fertilizers contain proteins, polypeptides and amino acids along with macroelements and microelements, foliar-applied fertilizer. Fundamental characteristics of leaf fertilization are its capability of integration with traditional soil fertilization and its rapidity of action.

Experimental fertilizers were tested on culture of tomato in the house of vegetation. The tests were conducted on an unfertilized control, two certified organic fertilizer and three fertilizers obtained. Experimental data are presented on production obtained, in sugar content, vitamin C and acidity of fruit.

INTRODUCTION

In the Grant Agreement with number 141708/2008 which was completed with the Competitive Grant Scheme in the MAPDR were made agrochemical testing activities and were obtained some complex nutrient solutions containing organic substances with properties chelated. In the Testing Laboratory and Quality Control of the fertilizers INCDPAPM - ICPA - Bucharest and Chemical Testing Laboratory of S.C. Chimro S.R.L. tests were made and have led to many variants of processes and formulas of fertilizers with the possibility to use classical system of agriculture, but organic fertilizers obtained were applied extraradicular and agrochemical tests were carried.

The principles were applied to define the technological processes for obtaining these fertilizers were specific standards both organic agriculture and classical.

Were obtained from laboratory phase 3 variants of fertilizers extraradicular with organic substances that were obtained by neutral hydrolysis of collagen.

[1] Institutul National de Cercetare, Dezvoltare pentru Pedologie, Agrochimie si Protectia Mediului - ICPA Bucuresti
[2] Statiunea de Cercetare Dezvoltare Agricola Teleorman
[3] S.C. CHIMRO S.R.L. Craiova

MATERIAL AND METHOD

Protein substances with biostimulator role contain: glycine 30 to 40%, alanine 10 to 15%, proline 10 to 15%, glutamic acid 5 to 10%, hydroxyproline 5 to 10%, acid aspargic 4 to 6%, arginine 4-6 %, serine 3 to 5%, threonine 1 to 3% and the amino acids in significant proportions: lysine 2 to 4%, valine 2 to 4%, leucine 2 to 3%, phenylalanine 1.5 to 2%, isoleucine 1 - 1.5%, histidine 0.7 to 1.5%, methionine 0.2 to 0.5%. Experimental fertilizers have been tested experimentally, by applying extraradicular, in the house of vegetation.

Extraradicular fertilizers obtained experimentally to realize the agrochemical testing were:

- NPK - type with organic materials and trace elements in the array (a variant, coded "Fert 1");
- NK - type with organic materials and trace elements in the array (a variant, coded "Fert 2");
- N - type with organic substances and trace elements introduced in the process of obtaining (a variant, coded "Fert 4").

Experimental fertilizers were tested and compared an unfertilized control leaf (M0), two witnesses with fertilizers certified "ECO" (ECO 1R and ECO 2F). Agrochemical experiments were performed in the house of vegetation of INCDPAPM - ICPA Bucharest in pots type Mitscherlich with 20 kg of soil. Has been made a total of 7 variations with 3 repetitions.

The tests were performed on tomato culture on unfertilized agrofond and fertilized with a complex fertilizer type 15.15.15, in doses of 50 mg to for each nutrient / kg soil.

The experiments were conducted on tomato culture, variety Dacia - Pontica, the soil type mold vermouth with: 3.18 - 3.55% humus, 0.18 - 0.26% nitrogen, 37.6 - 138 ppm phosphorus (P in AL), from 199 to 364 ppm mobile potassium (K in Al) and an alkaline pH of 8.0 - 8.2 pH units.

Experimental fertilizers were applied as 1% concentration solution in quantities of 30 ml / pot, in number of 3 treatments at intervals of 10 to 15 days. The first application was made when the plants had developed 35 - 40 cm.

At the end of the vegetation were performed assessments of the parameters of production and analysis of the value of nutrients in the fruit samples using the average of 3 repetitions remaining in vegetation.

RESULTS AND DISCUSSION

The use of proteins in a complex matrix of macro and micronutrients chelated leads to solutions of fertilizers stable physico-chemically. Besides the properties of chelated, protein hydrolyzate used serves as protective colloid which helps maintain stability of fertilizer applied.

Results of the testing of agrochemical for fertilizers in the culture of tomato, biometric measurements and the analysis performed on samples of fruit are presented in tables 1- 4 and figure 1.

When experiments carried out on a fertilized soil, increases production comparative with the witness M0 was higher by 3.6% (for witnesses ECO) and up to 14.8% (Fert 2) with an upward trend in order: ECO, Fert 1, Fert 4 and Fert 2.

Production increases for experienced variations on a agrofond without fertilization, were 1% (for witnesses ECO) and up to 9% (Fert 2) higher than the unfertilized witness

extraradicular (M0). They had the same upward trend as in the case of experiments carried out on a agrofond fertilized. For fertilized agrofond, the maximum increase (14,8%) was obtained for fertilizer Fert 2 (figure 1).

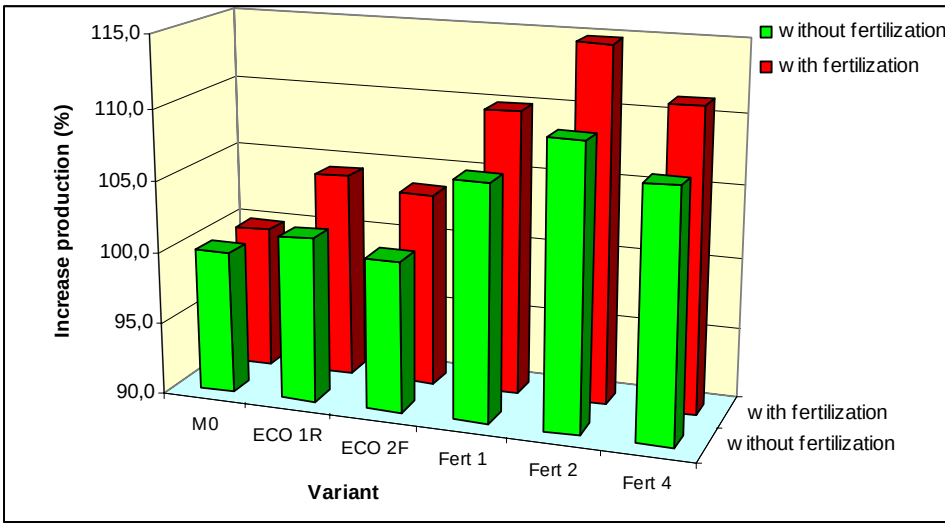


Figure 1. Evolution of production depending on extraradicular fertilization applied to tomato variety Dacia - Pontica (with and without soil fertilization)

CONCLUSION

1. In the experimental work were obtained and characterized three fertilizers with extraradicular application, obtained by associating a type matrix NPK, NK, or N, of micro-nutrients (Fe, Cu, Zn, Mn, Mg) and protein hydrolysates with role chelated and biostimulator.

2. When agrochemical experiments conducted in the house of vegetation on tomato variety Dacia - Ponte, found an upward trend of production increases in order of M0, ECO 2R (3.61%), ECO 1F (4.41%), Fert 1 (9.82%), Fert 4 (11.12%) and Fert 2 (14.73%).

3. Analysis of the parameters defined by production, plant size and average fruit weight showed that if the use fertilizers range "FERT", were obtained significant differences compared to unfertilized witness and the witnesses „ECO”. These differences are not observed in case of dry weight of fruit.

REFERENCES

1. Carmen Sirbu, Cioroianu, T., Dumitru, M., Dorneanu A., Maria Negrila, Daniela Mihalache, Letitia Angelescu, New structures of biofertilizers with chelate proteinic substances with role of biostimulator and protection for sustainable agriculture, Lucrari Stiintifice USAMV Iasi, Seria Agronomie, vol. 51 (2), 2008, pag. 189-194.
2. H.H. Ashmed, H.H. Hsu, U.S. Patent 4491464 /1985, Potassium polyphosphate protein hydrolysate fertilizer,

3. Carmen Sirbu, Cioroianu, T., Dumitru, M., Dorneanu, A., Daniela Mihalache, Letitia Angelescu – Fertilizanti continand hidrolizate proteice chelatante cu aplicatii in agricultura - Simpozionul International “Reconstructia ecologic si necesarul de ingrasaminte in zona gorjului, Tg. Jiu, 4-5 oct. 2007, Ed. New Agris, 2008, 467–474.
4. GU, J.L., Lee, E.S., U.S., Patent no. 0062181, 5.03.2009.
5. Trandafir V., Popescu G., Albu M.G., Iovu H., Georgescu M., The Bioproducts based on collagen”, Ed. ARS DOCENDI, Bucureşti, 2007.
6. Dorneanu, A., Dumitru, M., Cioroianu, T., Dorneanu, E., Sirbu, C., RO, Patent no. 121814, 30.05.2008.

Table 1

Evolution waist tomato plants by foliar treatment applied

No.	Type fertilizer	Plant height*, cm	Difference compared to control, cm	Statistical significance	Difference compared to control, cm	Statistical significance	Difference compared to control, cm	Statistical significance	Difference compared to control, cm	Statistical significance
			M_o		*ECO 1R*		*ECO 2F*		*Average of variants*	
1	M0	74,67	0,00	-	-1,33	ns	-3,00	ns	-4,61	ns
2	ECO 1R	76,00	1,33	ns	0,00	-	-1,67	-	-3,28	ns
3	ECO 2F	77,67	3,00	ns	1,67	ns	-1,67	ns	-1,61	ns
4	Fert 1	82,33	7,67	*	6,33	ns	4,67	ns	3,06	ns
5	Fert 2	84,67	10,00	**	8,67	*	7,00	*	5,39	ns
6	Fert 4	80,33	5,67	ns	4,33	ns	2,67	ns	1,06	ns

DL 5% 6,70 cm; DL 1% 9,52cm; DL 0.1% 13,78 cm.

Table 2

The evolution of tomato fruit production by foliar treatment applied

No.	Type fertilizer	Product plant / pot, g	Difference compared to control, g	Statistical significance	Difference compared to control, g	Statistical significance	Difference compared to control, g	Statistical significance	Difference compared to control, g	Statistical significance
			MO		*ECO 1*		*ECO 2*		*Average of variants*	
1	M0	997,7	0,0	-	-44,0	oo	-36,0	o	-72,9	ooo
2	ECO 1R	1041,7	44,0	**	0,0	-	8,0	ns	-28,9	o
3	ECO 2F	1033,7	36,0	*	-8,0	ns	0.0	-	-36,9	oo
4	Fert 1	1096,3	98,7	***	54,7	***	62,7	***	25,8	*
5	Fert 2	1145,3	147,7	***	103,7	***	111,7	***	74,8	***
6	Fert 4	1108,7	111,0	***	67,0	***	75,0	***	38,1	**

DL 5% 25,5 g DL 1% 36,3 g DL 0.1% 52,5 g

Table 3

Evolution of the average weight of tomato fruit by foliar treatment applied

No.	Type fertilizer	Average weight/ fruit, g	Difference compared to control, g	Statistical significance	Difference compared to control, g	Statistical significance	Difference compared to control, g	Statistical significance	Difference compared to control, g	Statistical significance
			M0		*ECO 1R*		*ECO 2F*		*Average of variants*	
1	M0	94,00	0,00	-	-1,33	ns	-5,00	ns	-9,33	ns
2	ECO 1R	95,33	1,33	ns	0.00	-	-3,67	ns	-8,00	ns
3	ECO 2F	99,00	5,00	ns	3,67	ns	0.0	-	-4,33	ns
4	FERT 1	113,67	19,67	**	18,33	**	14,67	**	10,33	*
5	FERT 2	113,33	19,33	**	18,00	**	14,33	**	10,00	*
6	FERT 4	104,67	10,67	*	9,33	ns	5,67	ns	1,33	ns

DL 5% 9,88 g DL 1% 14,04 g DL 0.1% 20,33 g

Tabele 4

Evolution quantity of dry matter of tomato fruit by treatment foliar applied

Nr. crt.	Type fertilizer	Dry substance %	Difference compared to control, %	Statistical significance	Difference compared to control, %	Statistical significance	Difference compared to control, %	Statistical significance	Difference compared to control, %	Statistical significance
			M0		*ECO 1R*		*ECO 2F*		*Average of variants*	
1	M0	4,82	0.00	-	-0,07	ns	-0,11	ns	-0,13	ns
2	ECO 1R	4,89	0,07	ns	0,00	-	-0,04	ns	-0,06	ns
3	ECO 2F	4,93	0,11	ns	0,04	ns	0.0	-	-0,02	ns
4	Fert 1	4,98	0,16	ns	0,09	ns	0,05	ns	0,03	ns
5	Fert 2	5,09	0,27	*	0,20	ns	0,16	ns	0,14	ns
6	Fert 4	4,99	0,18	ns	0,11	ns	0,06	ns	0,04	ns

DL 5% 0,25 % DL 1% 0,35 % DL 0.1% 0,51 %

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✔*Biologie*
✔*Horticultură*
✔*Tehnologia prelucrării produselor agricole*
✔*Ingineria mediului*

Vol. XIV (XLX) - 2009

RESEARCHES CONCERNING THE FOLIAR FERTILIZATION UPON THE PRODUCTIONOF TOMATOES, ON SANDY SOILS

Ciuciuc Elena[1], Dorneanu Aurel[2]

KEY WORDS: tomato, sandy soils, foliar manurial

ABSTRACT

To the culture of tomatoes were to test 15 types of foliars manurial on fond of 100 P2O5 100 K2O 100 N through the use complex manure 15-15-15. With each of foliars manures they accomplished how much by threes fertilizations to interval of 10 days.

They remarked through efficiency productions types: Multi Protek applied at 2% concentration (40.4 tha), Lecol 120-60-60 applied at 0,5% concentration (39.2 tha, , Basfoliar Activ applied at 1% concentration (39.2 tha), Folimax Startapplied at 0.3% concentration(32.7 tha), and the types Fertifarm 311 + PP, Fertifarm 111 + PP applieds at 1% concentration.

INTRODUCTION

In the structure of the assortment of plants vegetable cultivated on the sabulous soils, after the green water-melons, tomatoes have the eldest weight be cultivated as much in spaces how much protegees and in fields without protegee(Toma V. and colab. 2002).

On the strength of the experimental results (Toma V., 1983, Toma V. And colab., 2003) He established that, can achieved big productions of tomatoes is necessary the fertilization accordingly the cults with organic manures and chemical.

Assured necessary of nutritious elements in certain phases of vegetation as well as avoided the loss manurial through eluviation is can appealed successfully to the foliar fertilization the cultures of tomatoes.

Currently is manufactured a series of manure with adhibition foliară wagons differ between they through their composition and the report among the elements contained, influencing differently breed and the productivity of the plants.

Established most efficient combinations of nutritious which elements to assure an increase efficaciousness to the culture of were necessary these testing in the experimental field.

MATERIAL AND METHODS

Were monofactorială and he located in the experimental field after the method of the block of flats in 4 repetitions.

[1] Centrul de Cercetare Dezvoltare pentru Cultura Plantelor pe Nisipuri Dăbuleni
[2] ICPA Bucureşti

In each variant they he sowed how much 2 rows off 0, 7 m between rows and 0, 3 m between plants by turns the of a surface variants be of 7m2.

The kind used - Rio Grande.

They tested 15 types foliar manurial applieds in concentrations differed(the talble 10 the insured fond of 100 kg /ha N,100 kg/ha P2O5 and 100 kg/ha K2O insured through the adhibition manurial complex 15-15-15. With several of foliar foliar manures to test they accomplished how much 3 fertilizations to aisle of 10 days.

On road of the vegetation period they applied 6 the affusions through irrigation through affusion and they accomplished 3 praşile handbooks.

He caused the production of tomatoes obtained on each variant fractionally, and the results were to interpret statistically.

The table 1

The foliars manurial to test

Number the variant	The variants	The concentration (%)	Number tratament s
V1	Unfertilized foliar		
V2	Bionat Plus	0.3	3
V3	Folimax Start	0.3	3
V4	Lecol 90-60-60	0.5	3
V5	Vinafert 1	0.5	3
V6	Fertec B	0.5	3
V7	Fertec K	0.5	3
V8	Humafert 1	2	3
V9	Flexom	0.25	3
V10	Folifert Ca	0.8	3
V11	Fertifarm 311-PP	1	3
V12	Fertifarm 111-PP	1	3
V13	Lecol 120-60-60	0.5	3
V14	Vinafert 2	0.5	3
V15	Basfoliar activ	1	3
V16	Multi Protek	2	3

RESULTS

The productions of tomatoes were different be accessible to the guy manurial used(the table 2).

In the variant unfertilized with foliar manure (splashy except with water) he achieved a production of 27, 0 t t/ha against which in all rest variants they obtained efficiencies contained between 0, 3 - 13, 4 t/ha.

The fertilization with the guys: Lecol 90-60-60 in conc. of 0, 5%, Fertec B in conc. of 0, 5% and Folifert Ca in conc. of 0,8% drove to the of a procurance efficiencies of production of 2, 7 t/ha(10%).

The fertilization with the manure foliar Bionat Plus in conc. of 0,3% drove to the of a procurance the efficiency of 4, 8 t /ha(18%), insured efficiency from statistical viewpoint as the significant, and through the fertilization with Folimax Start in conc. of 0, 3 and Fertifarm 311 + PP in conc. of 1% they achieved productions of tomate of 32, 7 t /ha,

respectively an efficiencies of 5, 7 t/ha (21%) distinctly significant. Efficiencies of significant production he achieved and in the fertilizer variant with Fertifarm 111 + PP in conc. of 1%.

The table 2

The influence foliar manuresabout the production of tomatoes.

Current nr.	***Yield***		***Difference (t/ha)***	***Significance***
	T/ha	***%***		
V1	27,0	100	Mt.	
V2	31,8	118	+4,8	*
V3	32,7	121	+5,7	**
V4	29,7	110	+2,7	
V5	31,5	117	+4,5	*
V6	29,7	110	+2,7	
V7	27,9	103	+0,9	
V8	29,4	109	+2,4	
V9	27,3	101	+0,3	
V10	29,7	110	+2,7	
V11	32,7	121	+5,7	**
V12	32,1	119	+5,1	**
V13	39,2	145	+12,2	***
V14	27,5	102	+0,5	
V15	39,2	145	+12,2	***
V16	40,4	150	+13,4	***

DL 5% = 3,8 t/ha
DL 1% = 5,0 t/ha
DL 0,1% = 6,6 t/ha

In the variants fertilizers with Lecol 120-60-60 in conc. of 0, 5% and Basfoliar Activ in conc. Oof 1% they obtained productions of tomatoes of 39, 2 t/ha, the efficiencies of production obtains 12, 2 t /ha(45%) be very significant.

Most big production of tomatoes(40, 4 t/ha) he obtained in the variant fertilizer with Multi Protec in conc. of 2%, the efficiency achieved be of 13, 4 t/ha(50%) against the witness unfertilized.

CONCLUSIONS

1. Through the foliar fertilization the culture of tomatoes with foliar manures is assured considerable efficiencies of production.

2. They remarked through erect productions the multi guys Protec applied in conc. of 2, Lecol 120-60-60 in conc. of 0, 5%, Basfoliar Activ in conc. of 1%, Folimax Start in conc. of 0, 3%, Fertifarm 311 + PP in conc. of 1%, Fertifarm 111 + PP in conc. of 1%, Bionat Plus in conc. of 0, 3% and Vinafert in conc. of 0, 5%.

BIBLIOGRAPHY

1. Dorneanu - Conduction fertility of the soil. The publishing house Ceres. Bucureşti, 1976
2. Toma V. - Research looking the fertilization tomatoes rathe on sands in the sight of the decrease of the consumption of energy. Scientific works SCCCPN Dăbuleni. Vol. VI, 1983.
3. Toma V., Ifrim Aurelia. Ciuciuc Elena. Nanu Şt., Croitoru Mihaela- Research looking the capitalization of ecologic conditions from the zone of sabulous soils from the south Olteniei through vegetable cults The annals Univ. From Craiova, vol. VII, 2002.
4. Toma V., Nanu Şt., Ifrim Aurelia, Ciuciuc Elena, Croitoru Mihaele - Research looking the efficaciousness manures with phosphorus to the tomatoes culture rathe, on the sabulous soils. Scientific works symposium Internațional,, The utilization manures with phosphorus in Romania. Current appearances and of view,,, 2003.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

USING SOME TYPES OF WATERS MODIFIED STRUCTURAL AND THE ELECTROMAGNETIC WAVES ON GERMINATION OF THE SEEDS AND GROWING PLANTS OF CUCUMBER (CUCUMIS SATIVUS L)

Constantin Daniela[1], Palaghia Chilom[2]

KEY WORDS: cucumbers, seeds, germination, modified waters, electromagnetic waves.

ABSTRACT

Using waters modified structurally and electromagnetic waves at cucumber seeds have been intensified germination processes of the seeds and growing plants.

Best values have been registered in combination between light water and electromagnetic waves, realizing germination augmentation up to 17,6%, but also modified water –D_2O 144ppm with 15,8%, germination increase and 275% increase of accumulation of the vegetative mass.

It has been used the Maribelle hybrid.

INTRODUCTION

Using in agriculture the different methods of stimulation of seeds and especially the physical and chemical ones under all their aspects represents a preoccupation, which along time proved to be very useful to change germination processes of the seeds or modifications in their growing elements, fructification and even composition of the comestible plants and organs.

Using in the present case the modified waters and the electromagnetic waves, proved to be useful for research and production, being in the same time unpolluted. (Palaghia Chilom, Gabriela Marinescu).

METHOD AND MATERIAL

There have been realized researches in laboratory conditions, following the process of germination of the seeds and in the field – to obtain seedlings, for diverse experiments, following intervention of the modifications.

Seeds have been wetted with three types of modified waters, for 24 hours, and a part of them have been submitted to the physical treatment with electromagnetic waves, still 24 hours, correspondent to the specific of the variants (table no.1).

[1] Liceul Stefan Odobleja, Craiova – Post – graduate
[2] Universitatea din Craiova

Table no.1

The specific of variants

A factor	B factor	Combination
a_1 – distilled water (DW)	b_1 – physically non stimulated	$a_1b_1 – V_1$
	b_2 – physically stimulated I_1	$a_1b_2 – V_2$
a_2 – light water (LW)	b_1 – physically non stimulated	$a_2b_1 – V_3$
	b_2 – physically stimulated I_1	$a_2b_2 – V_4$
a_3 – water 25 ppm	b_1 – physically non stimulated	$a_3b_1 – V_5$
	b_2 – physically stimulated I_1	$a_3b_2 – V_6$
a_4 – water 144 ppm	b_1 – physically non stimulated	$a_4b_1 – V_7$
	b_2 – physically stimulated I_1	$a_4b_2 – V_8$

In laboratory conditions – on Iacobsen germinator have been observed germination elements of the seeds and growing up plants for 7 days, their values being presented in table no.2.

Table no.2

Aspects concerning the germination of the seeds and the growth of the plants under the influence of the applied treatment

A factor	B factor stimulation	Combination	Germination %	The weight of the vegetativive mass		Diferences bbetween grad. fact. A
				g	%	
a_1 – mt distilled water	b_1 – non stimulated	a_1b_1	100,0	0,8*	100,0 I	-
	b_2 – stimulated	a_1b_2	86,6	0,9**	100,0 II	112,5
a_2 - LW	b_1 – non stimulated	a_2b_1	93,3	1,4*	175,0	-
	b_2 – stimulated	a_2b_2	86,6	2,4**	266,0	152,0
a_3 – 25ppm	b_1 – non stimulated	a_3b_1	86,6	2,0*	250,0	-
	b_2 – stimulated	a_3b_2	80,0	2,7**	300,0	120,0
a_4 – 144ppm	b_1 – non stimulated	a_4b_1	100,0	4,0*	300,0	-
	b_2 – stimulated	a_4b_2	93,3	4,6**	311,0	102,2

In conditions of space production of the seedlings have been observed aspects connected to the influence of treatments on growing elements of the seedlings produced in plastic glasses, Jiffy 7 flower pots and alveole in floating system. (table no. 3)

Table no.3

Morphological elements at the cucumbers seedling

Var.	Variants specific	H (cm)	Ø (mm)	No. of leaves	Overall weight (g)	Stem (g)	Leaves stalk (g)
1	Cup of plastic	8,90	5,10	2+1	3,4	1,16	2,24
2	Jiffy – 7	10,10	5,00	2+1	5,7	1,90	3,80
3	Water cubes	9,84	6,02	3+1	5,2	1,80	3,40

RESULTS AND DISCUSSIONS

From information in chart 2 will be observed that the rhythm of seed's germination was influenced differentiated of used treatments, increasing from 80,6 at a_1b_1 (AD) arriving at 94,8% at a_2b_2 (AU + electromagnetic waves).

If the types of used waters are analyzed, light water realized the best values, and treatment combination in association with electromagnetic waves have produced the most favorable modifications, differences will be observed from values of growing plants which at a_4b_2 have exceeded the witness a_1b_1 with 211 %. (chart 2).

By using physical treatments have been registered increments towards combination only on modified waters.

Seedlings obtained from realized combinations show differences between variants, and under general aspect the best values have been obtained in case of using Jiffy 7 flower pots, but with values close to situation of obtaining seeds in alveolar palettes. In all cases, physical treatments have been realized increments.

The best combinations proved to be a_2b_1 and a_2b_2; a_3b_1 and a_3b_3 regarding total weights of plants in system of production in Jiffy 7 flower pots.

The Maribelle hybrid

Culture aspects

CONCLUSIONS

- The use of modified waters brought favorable modification at the level of germination elements of seeds and accumulations in growing plants, highlighting light water (AU);

- by using electromagnetic waters, the values of analyzed elements have presented increments;
- the best values have been obtained through combinations between the two factors, and the association between AU and electromagnetic waves;
- Jiffy 7 flower pots have offered best conditions of obtaining seedling.

BIBLIOGRAPHY

1. Palaghia Chilom, 1991 – Cercetari privitoare la folosirea apei magnetizate la tomatele de sera, Analele Universitatii din Craiova XXII pag. 281-287;
2. Palaghia Chilom si colab., 1995 – Cercetari privind folosirea apei structurat – activate la specii de plante legumicole cultivate in sere. Cel de-al treilea Simpozion International Biotehnologii azi si maine, Bucuresti, pag. 118-123.;
3. Gabriela Marinescu, Palaghia Chilom, 1994 – Reserches concernant les modification biochimiques dans les fruittes de concombres es utilisant l'eau structuré. Annals of the University of Craiova Chemistry Series.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

STUDIES REGARDING THE ACCUMULATION OF SOME BIOCHEMICAL INDEXES FROM LEAVES UNDER THE INFLUENCE OF FOLIAR TREATMENTS WITH BORON NATURAL ORGANIC COMPOUNDS AT WATERMELONS AND PEACH TREE ON PSAMOSOILS

Mihaela Croitoru, Răţoi I, Toma V., Anica Durău[1]

KEY WORDS: boron, chlorophyll, horticultural plants, sandy soils.

ABSTRACT

The boron has a great fisiological importance for plants because encourage the blossom, fecundation and development of seeds, stimulate increasing of root, intensify some ensime as saccharose, pectase, tirosinase, dehydrogenase, operate indirect upon the photosynthesis through intensification of glucides transport, in special, saccharose from leaves. On psamosoils from southern Oltenia was studied the influence of some boron natural organic compounds in complex with the organic fertilzers upon some biochemical process from leaves at watermelons and peach tree. The rezults showed the positive effect of boron natural organic compounds upon the increasing and development of plants. The quantity of total chlorophyl presented values too great at this species in stage of plants intense increasing and in variants which effectuated treatments with products on the boron base (4,98 – 5,53 mg/g fresh substance in variant treated with Folibor at peach tree, 4,46mg/g fresh substance, in variant fertilized with Folibor + 30 t/ha manure at watermelons). Also, the activity of catalase enzime was too intense in variants fertilized boron natural organic compounds. The application of treatments with boron natural organic compounds + chemical and organic fertilizers contribute to increasing of metabolic activity at studied species.

INTRODUCTION

The boron has a great physiological importance for plants because favors the efflorescence, the fecundation and the development seeds, stimulates the growth of the roots and the accumulation of the chlorophyll in leaves, activates a series of enzymes and acts indirectly about the photosynthesis accelerating the transport of glucides, chiefly the sucrose from leaves. He takes effect favourably about the efflorescence and blossom of the plants because stimulates the quick germination of the seeds. Also the boron influences the synthesis in plants aromatical compounds, influences the penetrability of the protoplasmatics membranes, translocation of glucides, divizion and the extension of the cells, the differentiation of the cells, maturation of fruits [1, 2, 3, 4]. On psamosoils meridional Oltenia he studied the of a compound organic natural influence have the boron in complex with organic manures, about of a biochemical process from plants to the green watermelons and the peach trees.

[1] Research- Development Centre for Plants on Sandy Soils Dăbuleni

MATERIAL AND METHODS

The role on which have it compounds structurally natural have the boron, on the background organic fertilization, about the cults of green watermelons and peach trees they set up which experiences contained a number of six variants, thus:

V1 – Witness unfertilizer;
V 2-N150 P2 O5 100 K2 O100;
V 3- Manure, 30 t /ha;
V 4- Agrofound unfertilizer, Folibor standard, 5 l/ha, 2 treatments;
V 5-Manure, 30 t /ha + Folibor standard, 5 l/ha, 2 treatments;
V6-Manure, 15 t /ha + Folibor standard 5 l/ha, 2 treatments.

The experiences were placed in block of flats randomizate, in 4 repetitions.

The experimentation to the green watermelons he did in the year 2005 on the kind Dulce de Dăbuleni cultivated through direct sowing in field, and in the year 2006 on hybrid Audry F1 cultivated through sapling. To peach tree he took under consideration the kind Redhaven. The other technological works were one recommended in the technologies of cultivation elaborated of CCDCPN Dăbuleni.

Prolusion and experimental determinations:
- contained of chlorophyll (a + b)(mg /g) - the method colorimetric;
- contained of carotene(mg/ g) - the method colorimetric.
- the activity of the enzyme Catalaza (ml $KmnO_4$)- the method with permanganate.

RESULTS AND DISCUSSION

Achieved a levels of great production the plants draw upon the soils big amounts of nutritious substances. The adhibition of compound organic, natural you have the boron in complex with the organic manures intensifies the metabolism of the plants, a series of physiological indexes improving the production as much quantitative how much and qualitative.

Thus, to two one horticultural were caused the content in chlorophyll (a + b), carotene and the activity of the enzyme catalaza from leaves, in different from phases vegetation depending on the fertilization with compounds organic natural you have the boron.

To the green watermelons, the results obtained equal-phase of intense growth of the haulm emphasized differences as much between the variants taked under consideration how much and between two one years of experimentation. In the case of the culture through sowing (year 2005) contained of were elder be contained between 2,14mg/g f.s in the variant unfertilized and 4,46 mg/g s.f. in the variant fertilized with 30t/ha manure + Folibor.

The adhibition compounds on base of boron on found manurial drove to values ale the content of chlorophyll in leaves the big comparative maul with one from the variants fertilized ust chemical his organic (4,46mg/ g s.f. in the variant fertilized with Folibor + 30t /ha manure and 4,31 mg/g s.f. in the variant with Folibor + 15t/ha manure), (table 1).

The boron stimulates the accumulation of the chlorophyll in leaves. Contained of presented the values the big all maul in the variants in which they applied products on base of boron. Carotenes localized in cuantozoms, as companions have the chlorophylls, having the roles of protective screens for chlorophylls and enzymes, chiefly against the act harmfully the ultraviolet radiations.

In same phase of vegetation the activity of the enzyme were else intense in the variants in which they applied products on base of boron (25, 6 ml KMnO4).

And in the year 2006 when was through sapling, most good results were obtained all in the variants in which they applied products on base of boron (table 1). Activity of the enzymes were else reduced in the case of the culture through sapling, with period of vegetation the short maul and also in climatical different conditions.

Table 1

Influence of compounds organic natural of boron upon the content of chlorophyll, carotene and about activity of the enzyme catalaza in the leaves of qualphase watermelons of offshoots intense growth (2005-2006)

Variants	Chlorophyll (a+b) (mg/g f.s*)		Carotene, (mg/g f.s)		Enzyme catalaza (ml $KMnO_4$)	
	2005	2006	2005	2006	2005	2006
Witness unfertilized	2,14	3,09	0,49	0,39	19,2	12,4
N 150 P_2O_5 100 K_2O100	4,14	3,33	0,69	0,44	25,6	14,0
Manure 30 t/ha	4,00	3,61	0,73	0,62	23,7	13,8
Agrofound unfertilized, Folibor standard, 5 l/ha, 2 treatments	3,36	3,58	0,73	0,67	25,6	14,0
Manure 30 t/ha + Folibor standard, 5 l/ha, 2 treatments	4,46	3,74	0,63	0,63	25,6	13,6
Manure 15 t /ha + Folibor standard, 5 l /ha, 2 treatments	4,31	3,82	079	0,79	25,0	13,8

* - fresh substance

In the phase of the fruits the content of presented the values the low maul the gift is maintained an elder content in the variants in which they applied products on base of boron (2,28mg/g f.s in the variant fertilized with 30t/ha manure + Folibor), (table 2).

In the phase of the fruits the content of presented the values the low maul the gift is maintained an elder content in the variants in which they applied products on base of boron (2,28mg/g f.s in the variant fertilized with 30t/ha manure + Folibor), (table 2).

The peach tree is considered as a species with big requirements of nutritious substances on all period of vegetation, which substances influences in determinate ways the metabolism of the plant, therefore breed and fructification.

In the phase of intense growth of the ratoon, contained of chlorophyll, in one 2 years of were, elder in all the variants fertilized, and most big values were determinate in the variants in which he applied Folibor (4,98mg/ g f.s - 5,53mg/ g f.s in the variant fertilized just with Folibor), (table 3).

Table 2

Influence of compounds organic natural of boron upon the content of chlorophyll, carotene and about activity of the enzyme catalaza from leaves from maturation phase fruit watermelons (2005-2006)

Variants	Chlorophyll, (a+b) (mg/g f.s*)		Carotene, (mg/g f.s)		Enzyme catalaza (ml $KMnO_4$)	
	2005	2006	2005	2006	2005	2006
Witness unfertilized	1,27	1,25	0,91	0.25	13,2	8.9
N 150 P_2O_5 100 K_2O100	1,76	1,50	0,53	0.40	14,5	10.5
Manure 30 t/ha	2,27	2,20	0,53	0.52	14,8	11.2
Agrofound unfertilized, Folibor standard, 5 l/ha, 2 treatments	2,22	2,5	1,01	0.65	15,0	12.0
Manure 30 t/ha + Folibor standard, 5 l/ha, 2 treatments	2,28	2,30	1,02	0.60	15,3	11.9
Manure 15 t /ha + Folibor standard, 5 l /ha, 2 treatments	2,12	2,35	0,96	0.68	15,7	12.4

* - fresh substance

Table 3

Influence of compounds organic natural of boron upon the content of chlorophyll, carotene and about activity of the enzyme catalaza from leaves from peach trees of intense growth of the ratoon (2005-2006)

Variants	Chlorophyll, (a+b) (mg/g f.s*)		Carotene, (mg/g f.s)		Enzyme catalaza (ml $KMnO_4$)	
	2005	2006	2005	2006	2005	2006
Witness unfertilized	4,01	3,14	1,01	0,81	0,1	3,6
N 150 P_2O_5 100 K_2O100	4,26	4,50	1,22	1,00	1,1	9,2
Manure 30 t/ha	4,59	4,26	1,00	1,05	1,2	8,2
Agrofond unfertilized, Folibor standard, 5 l/ha, 2 treatments	5,53	4,98	1,23	1,09	1,6	7,4
Manure 30 t/ha + Folibor standard, 5 l/ha, 2 treatments	5,23	4,46	1,02	1,05	2,9	9,0
Manure 15 t /ha + Folibor standard, 5 l /ha, 2 treatments	4,85	4,45	1,11	0,96	2,1	9,0

* - fresh substance

Contained of carotene from the leaves of were less accessible to the treatments with products on base of in particular boron in the year 2005 were a year without production. In the year 2006 can noticed easy growthes ale the content of carotene in leaves (1,09 mg/g f.s) in the variant treated with Folibor.

Also, the intensity of the enzyme were elder in the variants fertilized in which they applied and produced on base of boron, and the values were else big in the year 2 of study, year in which the production of were very good. In the phase of his ratoon the deceleration of their growth, in were determined an amount of different chlorophyll in two one years of study. In the year 2005, a year without production, contained of continued to accumulated in leaves, the values determinate be else big comparative with the phase of intense growth of the ratoon, and also else big in the variants fertilized (table 4).

Also the activity of the enzyme were else intense in all the studious variants. Due to the fact that the plants have no spent for the realization of the production, continued the process of intense growth on the of a background great humidities.

Table 4

Influence of compounds organic natural of boron upon the content of chlorophyll, carotene and about activity of the enzyme catalaza from leaves from fruit maturation phase peach trees (2005-2006)

Variants	Chlorophyll, (a+b) (mg/g f.s*)		Carotene, (mg/g f.s)		The enzyme catalaza (ml $KMnO_4$)	
	2005	2006	2005	2006	2005	2006
Witness unfertilized	5,01	2,93	1,10	0,64	3,2	3,8
N 150 P_2O_5 100 K_2O100	5,53	4,64	1,23	0,99	4,5	5,0
Manure 30 t/ha	6,13	4,58	1,12	1,01	4,8	5,8
Agrofound unfertilized, Folibor standard, 5 l/ha, 2 treatments	6,17	5,11	1,18	1,06	3,8	5,2
Manure 30 t/ha + Folibor standard, 5 l/ha, 2 treatments	7,90	4,96	1,13	1,06	5,3	6,5
Manure 15 t /ha + Folibor standard, 5 l /ha, 2 treatments	7,60	4,84	1,11	1,00	5,2	6,3

* - fresh substance

CONCLUSIONS

1. The adhibition of the treatments with compound organic natural have the boron in complex with organic drove to the growth metabolic activity to the studious species.

2. Contained of presented the values the big equalphase maul of intense growth of the plants, to both studious species, and most good results were determinate in the variants in which they applied compound organic natural have the boron (4,98-5,53mg/g fresh substance in the variant tratată with Folibor to peach tree, 4,46mg/g fresh substance, in the variant fertilized with Folibor +30t /ha manure to watermelons).

3. Also, the activity of the enzyme were else intense in the variants fertilized in which they applied and treatments on base of boron.

REFERENCES

1. Irina Băjescu, Aurelia Chiriac, Distribuția microelementelor în solurile din România, Implicații în agricultură, Editura CERES, București. , 1984.
2. Munteanu N., Dorina Iurea, Istrate M., Chinte P., Research on the pigment content in various apple tree varieties, treated with capsicoside, Cercetări Agronomice în Moldova, vol, XLI, No.3./2008.
3. Muntean N., Dorina Iurea, Mustea M., Improving the vine crop technologies by using glycoside substances, under conditions of economic efficiency and enviromental protection, Cercetări Agronomice în Moldova, Vol.XLI, No. 4(136),2008.
4. Neamțu G., Cîmpeanu G., Carmen Socaciu, Biochimie vegetală, Editura Didactică şi Pedagogică, R.A, Bucureşti,1993.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

CONDITIONS TO BE SATISFIED BY THE SEED

Dădulescu Laurențiu[1]

KEY WORDS: crop, conditions, European Council Directives

ABSTRACT

In this paper are presented in the light of developments of scientific and technical knowledge the conditions to be satisfied by the seed, according to the Council Directives 66/401/EEC, 66/402/EEC, 2002/55/EC and 2002/57/EC. The seed shall have sufficient varietal identity and varietal purity as regards its characteristics. For the production of seed of hybrid varieties, the abovementioned provisions shall also apply to the characteristics of the components, including male sterility or fertility restoration.

INTRODUCTION

The measures provided for in this Directive are in accordance with the opinion of the Standing Committee on Seeds and Propagating Material for Agriculture, Horticulture and Forestry,

The conditions for seed production, field inspection, sampling and testing provided for in Directives 66/401/EEC, 66/402/EEC, 2002/55/EC and 2002/57/EC are based on internationally accepted standards, as established by the International Seed Testing Association (ISTA) and the Organisation for Economic Cooperation and Development (OECD).

The experience gained, in particular, in the context of the application of Commission Regulation (EC) No 217/2006 of 8 February 2006 laying down rules for the application of Council Directives 66/401/EEC, 66/402/EEC, 2002/54/EC, 2002/55/EC and 2002/57/EC as regards the authorisation of Member States to permit temporarily the marketing of seed not satisfying the requirements in respect of minimum germination, has shown that the minimum germination percentages of pure seed required by Directives 66/402/EEC and 2002/55/EC as regards Avena nuda L. Zea mays L., as super-sweet corn, Hordeum vulgare L., as naked barley, and Sorghum bicolor (L.) Moench do not allow a sufficient availability of seed of those species. In the light of technical knowledge, it is therefore appropriate to reduce the minimum germination requirements of Directives 66/402/EEC and 2002/55/EC.

[1] Ministry of Agriculture

MATERIAL AND METHOD

The seed shall have sufficient varietal identity and purity.

In particular, the seeds of the species listed below shall conform to the following standards or other conditions.

The minimum varietal purity shall be examined mainly in field inspections carried out in accordance with the conditions laid down in Table 1.

The seed shall conform to the following standards or other conditions as regards germination, analytical purity and content of seeds of other plant species:

Table 1

The standard conditions for the varietal identy and purity of the seed

Species and category	Minimum varietal purity (%)
Arachis hypogaea:	
— basic seed	99,7
— certified seed	99,5
Brassica napus other than hybrids, other than varieties to be used solely for fodder purposes, Brassica rapa, other than varieties to be used solely for fodder purposes	
— basic seed	99,9
— certified seed	99,7
Brassica napus spp. other than hybrids, varieties to be used solely for fodder purposes, Brassica rapa, varieties to be used solely for fodder purposes, Helianthus annuus, other than hybrid varieties including their components, Sinapis alba:	
— basic seed	99,7
— certified seed	99,0
Glycine max:	
— basic seed	99,5
— certified seed	99,0
Linum usitatissimum:	
— basic seed	99,7
— certified seed, 1st generation	98,0
— certified seed, 2nd and 3rd generations	97,5
Papaver somniferum:	
— basic seed	99,0
— certified seed	98,0

The minimum varietal purity shall be examined mainly in field inspections carried out in accordance with the conditions laid down in Annex I.

2. In the case of hybrids of Brassica napus produced using male sterility the seed shall conform with the conditions and standards set out in points (a) to (d).

(a) The seed shall have sufficient identity and purity as regards the varietal characteristics of its components, including male sterility or restoration of fertility.

(b) Seed shall not be certified as certified seed unless due account has been taken of the results of official post-control plot tests on samples of basic seed taken officially and carried out during the growing season of the seed entered for certification as certified seed to ascertain whether the basic seed has met the requirements for basic seed laid down in respect of identity as regards the characteristics of the components, including male sterility, and the standards for basic seed laid down in respect of the minimum varietal purity laid down in point

(c).The minimum varietal purity of the seed shall be:

- basic seed, female component - 99,0 %,
- basic seed, male component - 99,9 %,
- certified seed - 90,0 %.

In the case of basic seed of hybrids, the varietal purity may be assessed by appropriate biochemical methods.

(d) The standards in respect of the minimum varietal purity laid down in point (b) in respect of certified seed of hybrids shall be monitored by official post-control tests on an appropriate proportion of samples taken officially. Appropriate biochemical methods may be utilised.

3. Where the condition cannot be satisfied, the following condition shall be met: where for the production of certified seed of hybrids of Helianthus annuus a female male-sterile component and a male component which does not restore male fertility have been used, the seed produced by the male-sterile parent shall be blended with seed produced by the fully fertile seed parent. The ratio of male-sterile parent seed to male-fertile parent shall not exceed two to one.

4. Standards or other conditions applicable where reference is made to them in the table 2:

(a) the maximum contents of seeds laid down in column 5 include also the seeds of the species in columns 6 to 11;

(b) the determination of total content of seeds of other plants species by number need not be carried out unless there is doubt whether the conditions laid down in column 5 have been satisfied;

(c) the determination of seeds of Cuscuta spp. by number need not be carried out unless there is doubt whether the conditions laid down in column 7 have been satisfied;

(d) the presence of one seed of Cuscuta spp. in a sample of the prescribed weight shall not be regarded as an impurity where a second sample of the same weight is free from any seeds of Cuscuta spp.;

(e) the seed shall be free from Orobanche spp.; however the presence of one seed of Orobanche spp. in a sample of 100 grams shall not be regarded as an impurity where a second sample of 200 grams is free from any seeds of Orobanche spp.

5. Harmful organisms which reduce the usefulness of the seed shall be at the lowest possible level. In particular, the seed shall conform to the following standards or other conditions:

6. Particular standards or other conditions applicable to Glycine max:

(a) in respect of Pseudomonas syringae pv. glycinea the maximum number of sub-samples within a sample of 5000 seeds minimum per lot subdivided into 5 subsamples which have been found to be contaminated by the said organism shall not exceed 4;

Table 2

Harmful organisms which reduce the usefulness of the seed

Species	Harmful organisms			
	Maximum percentage by number of seeds contaminated by harmful organisms (total per column)			Sclerotinia sclerotiorum (maximum number of sclerotia or fragments of sclerotia in a sample of the weight specified in column 4 of Annex III)
	Botrytis spp.	Alternaria linicola, Phoma exigua var. linicola, Colletotrichum lini, Fusarium spp.	Platyedria gossypiella	
Brassica napus				10 (b)
Brassica rapa				5 (b)
Cannabis sativa	5			
Gossypium spp.			1	
Helianthus annuus	5			10 (b)
Linum usitatissimum	5	5 (a)		
Sinapis alba				5 (b)

CONCLUSIONS

The percentage hybridity shall be assessed in accordance with current international methods, in so far as such methods exist. In cases where the hybridity is determined during seed testing prior to certification, the determination of the hybridity during field inspection need not be done.

Harmful organisms which reduce the usefulness of the seed, shall be at the lowest possible level.

The satisfaction of the abovementioned standards or other conditions shall, in the case of basic seed, be examined in official field inspections and, in the case of certified seed, be examined either in official field inspections or in inspections carried out under official supervision.

REFERENCES

1. Gerić, I., Zlokolica, M., Gerić, C., 1989. Application of isoenzymes in control of genetic purity of seed of agricultural plants. Agricultural News 3-4, 555-564.
2. Nikolić, Z., Milošević, M., Taški-Ajduković, K., Vujaković, M., 2007. Genetic purity as a component of seeds quality. Proceedings 42nd Croatian and 2nd International Symposium on Agriculture, Opatija, 245-248.
3. OECD Seed Schemes „2006“. OECD Schemes for the Varietal Certification or the Control of Seed Moving in International Trade. Paris, 2006.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✔*Biologie*
✔*Horticultură*
✔*Tehnologia prelucrării produselor agricole*
✔*Ingineria mediului*

Vol. XIV (XLX) - 2009

CONDITIONS TO BE SATISFIED BY THE CROP

Dădulescu Laurențiu[1]

KEY WORDS: *crop, conditions, European Council Directives*

ABSTRACT

In this paper are presented in the light of developments of scientific and technical knowledge the conditions to be satisfied by the crop, according to the Council Directives 66/401/EEC, 66/402/EEC, 2002/55/EC and 2002/57/EC. The crop shall have sufficient varietal identity and varietal purity or, in the case of a crop of an inbred line, sufficient identity and purity as regards its characteristics. For the production of seed of hybrid varieties, the abovementioned provisions shall also apply to the characteristics of the components, including male sterility or fertility restoration.

INTRODUCTION

The measures provided for in this Directive are in accordance with the opinion of the Standing Committee on Seeds and Propagating Material for Agriculture, Horticulture and Forestry,

The conditions for seed production, field inspection, sampling and testing provided for in Directives 66/401/EEC, 66/402/EEC, 2002/55/EC and 2002/57/EC are based on internationally accepted standards, as established by the International Seed Testing Association (ISTA) and the Organisation for Economic Cooperation and Development (OECD).

The OECD revised its standards in respect of the isolation distances for cotton seed crops. Consequently, it is appropriate the isolation distances for cotton seed crops, as laid down in Directive 2002/57/EC, with those international standards.

MATERIAL AND METHOD

The previous cropping of the field shall not have been incompatible with the production of seeds of the species and variety of the crop, and the field shall be sufficiently free from such plants which are volunteers from previous cropping.

The crop shall conform to the following standards as regards distances from neighbouring sources of pollen which may result in undesirable foreign pollination and in particular, in the case of Sorghum spp., from sources of Sorghum halepense (Table 1).

[1] Ministry of Agriculture

Table 1

Standards regarding the distances from neighbouring sources of pollen

Crop	Minimum distance
Phalaris canariensis, Secale cereale other than hybrids:	
— for the production of basic seed	300 m
— for the production of certified seed	250 m
Sorghum spp.	300 m
xTriticosecale, self-pollinating varieties	
— for the production of basic seed	50 m
— for the production of certified seed	20 m
Zea mays	200 m

These distances can be disregarded if there is sufficient protection from any undesirable foreign pollination.

3. The crop shall have sufficient varietal identity and varietal purity or, in the case of a crop of an inbred line, sufficient identity and purity as regards its characteristics. For the production of seed of hybrid varieties, the abovementioned provisions shall also apply to the characteristics of the components, including male sterility or fertility restoration.

In particular, crops of Oryza sativa, Phalaris canariensis, Secale cereale other than hybrids, Sorghum spp. and Zea mays shall conform to the following standards or other conditions:

A. Oryza sativa:

The number of plants which are recognizable as obviously being wild plants or red-grain plants shall not exceed:

0 for the production of basic seed,

1 per 50 m2 for the production of certified seed.

B. Phalaris canariensis, Secale cereale other than hybrids:

The number of plant of the crop species, which are recognizable as obviously not being true to the variety shall not exceed:

one per 30 m2 for the production of basic seed,

one per 10 m2 for the production of certified seed.

C. Sorghum spp.

(a) The percentage by number of plants of a Sorghum species other than the crop species or plants which are recognizable as obviously not being true to the inbred line or to the component shall not exceed:

(aa) for the production of basic seed

(i) at flowering: 0,1 %,

(ii) at maturity: 0,1 %;

(bb) for the production of certified seed

(i) plants of the male component which have shed pollen when the plants of the female component have receptive stigmas: 0,1 %,

(ii) plants of the female component

at flowering: 0,3 %,

at maturity: 0,1 %;

(b) The following standards or other conditions shall be satisfied for the production of certified seed of hybrid varieties:

(aa) sufficient pollen shall be shed by the plants of the male component while the plants of the female component have receptive stigmas;

(bb) where plants of the female component have receptive stigmas, the percentage of plants of that component which have shed pollen or are shedding pollen shall not exceed 0,1 %;

(c) Crops of open pollinated varieties or synthetic varieties of Sorghum spp. shall conform to the following standards: the number of plants of the crop which are recognizable as obviously not being true to the variety shall not exceed:

one per 30 m2 for the production of basic seed,

one per 10 m2 for the production of certified seed.

D. Zea mays:

(a) The percentage by number of plants which are recognizable as obviously not being true to the variety, to the inbred line, or to the component shall not exceed:

(aa) for the production of basic seed:

(i) inbred lines, 0,1 %,

(ii) simple hybrid, each component, 0,1 %,

(iii) open-pollinated varieties, 0,5 %;

(bb) for the production of certified seed:

(i) hybrid varieties component:

inbred lines, 0,2 %,

simple hybrid, 0,2 %,

open-pollinated variety, 1,0 %,

(ii) open-pollinated varieties, 1,0 %;

(b) The following other standards or conditions shall be satisfied for the production of seed of hybrid varieties:

(aa) a sufficient pollen shall be shed by the plants of the male component while the plants of the female component are in flower;

(bb) where appropriate, emasculation shall be carried out;

(cc) where 5 % or more of the female component plants have receptive stigmas, the percentage of female component which have shed pollen or are shedding pollen shall not exceed:

1 % at any official field inspection, and

2 % at the total of the official field inspections.

Plants are considered as having shed pollen or shedding pollen where, on 50 mm or more of the central axis or laterals of a panicle, the anthers have emerged from their glumes and have shed or are shedding pollen.

4. Hybrids of Secale cereale.

(a) The crop shall conform to the following standards as regards distances from neighbouring sources of pollen which may result in undesirable foreign pollination.

Table 2

The standard distances from neighbouring sources of pollen

Crop	Minimum distance
— for the production of basic seed	
— where male sterility is used	1000 m
— where male sterility is not used	600 m
— for the production of certified seed	500 m

(b) The crop shall have sufficient identity and purity as regards the characteristics of the components, including male sterility.

In particular, the crop shall conform to the following standards or other conditions:

(c) Where appropriate, certified seed shall be produced in mixed cultivation of a female male-sterile component with a male component which restores male fertility.

5. Crops to produce certified seed of hybrids of Avena nuda, Avena sativa, Avena strigosa, Hordeum vulgare, Oryza sativa, Triticum aestivum, Triticum durum, Triticum spelta and self-pollinating xTriticosecale

(a) The crop shall conform to the following standards as regards distances from neighbouring sources of pollen which may result in undesirable foreign pollination:
the minimum distance of the female component shall be 25 m from any other variety of the same species except from a crop of the male component,
this distance can be disregarded if there is sufficient protection from any undesirable foreign pollination.

(b) The crop shall have sufficient identity and purity as regards the characteristics of the components.

CONCLUSIONS

The percentage hybridity shall be assessed in accordance with current international methods, in so far as such methods exist. In cases where the hybridity is determined during seed testing prior to certification, the determination of the hybridity during field inspection need not be done.

Harmful organisms which reduce the usefulness of the seed, in particular Ustilaginaceae, shall be at the lowest possible level.

The satisfaction of the abovementioned standards or other conditions shall, in the case of basic seed, be examined in official field inspections and, in the case of certified seed, be examined either in official field inspections or in inspections carried out under official supervision.

REFERENCES

1. AOSCA (Association of Official Seed Certifying Agencies), 2003. Operational procedures, crop standards and service programs publication. AOSCA Web site, http://www.aosca.org.
2. Gerić, I., Zlokolica, M., Gerić, C., 1989. Application of isoenzymes in control of genetic purity of seed of agricultural plants. Agricultural News 3-4, 555-564.
3. Nikolić, Z., Milošević, M., Taški-Ajduković, K., Vujaković, M., 2007. Genetic purity as a component of seeds quality. Proceedings 42nd Croatian and 2nd International Symposium on Agriculture, Opatija, 245-248.
4. OECD Seed Schemes, 2006. OECD Schemes for the Varietal Certification or the Control of Seed Moving in International Trade. Paris.
5. Prakash, V. and Narasinga Rao, M.S., 1988. Structural similarities among the high molecularweight protein fractions of oilseeds. J. Biosci. 13, 2: 171–180.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✔*Biologie*
✔*Horticultură*
✔*Tehnologia prelucrării produselor agricole*
✔*Ingineria mediului*

Vol. XIV (XLX) - 2009

USING THE ECOLOGIC BIOFERTILIZER CROPMAX, IN OBTAINING VEGETABLE CROPS

Maria Dinu[1], P. Savescu[1], I. Pintilie[2], D. F. Apostol[3]

KEY WORDS: Cropmax, tomatoes, green pepper, solarium, production

SUMMARY

In the last decades the pollution of our environment, using ventilation in growing vegetables, as well as the technical insurgence in the food industry such as the use of additional substances creates a particular dimension to nutrition, having direct implications on human health.

For the experiment recorded in this article, we used Cropmax ecological bio fertilizer. It was applied as foliar fertilizer, in the growth period of tomatoes and green peppers, in solarium green houses.

The increase in early crops of tomatoes was between 12,8-17,3%, of a total increase in production of 10,1-12,5%.For the green pepper a total of 25.3 t/ha was obtained compared to a total of 22.3t/ha for the untreated samples.

MATERIALS AND METHOD

The research was conducted between 2007-2008 and was aimed at changing production methods, using Cropmax in growing tomatoes and green pepper in green houses and solariums.

During the vegetation stage, after planting, the soil was fertilized once, using 0.20% Cropmex in 500 l of water, necessary for one hectare of crop, resulting in 750-1000 ml/ha of used product.

The entire plant was sprayed, with a focus on the lower part of the leaf, where the absorbing capacity is greater.

The growth stage in which the plants were fertilized was as follows:

- for tomatoes: when fruits begin forming, in the first blossom period;
- for green peppers: when blossoms appear on the branches (sprouts).

RESULTS AND DISCUSSIONS

For this experiment data was gathered from the tomatoes from a green house crop, using Sellhardy and Vemone hybrids, the main focus being the potential increase in productivity of the plants by using the ecologic bio fertilizer Cropmax.

[1] University of Craiova, Faculty of Horticulture
[2] Research Development Station in Vegetables Crop Işalniţa
[3] Agency for fees and intervention in agriculture, Craiova

Two samples of each hybrid were used, S1 – unfertilized and S2 – fertilized with Cropmax 0,20%.

The data analyzed was the dynamics of the yields, measuring the early and total stages, as stated below.

The average yields samples recorded and set according to the early stages (unti10.07) and final stages (until 15.09) highlight both the difference between hybrids and the treatments received (table 1).

Table 1.

The effect of Cropmax on the early and total tomato yields grown in green houses (average values)

Hybrid	Sample	Sample characteristic	Early yield (20.06.-10.07.)			Total yield (20.06.-15.09.)		
			t/ha	%	± diff. to IS	t/ha	%	± diff. to IS
Sellhardy	S1	Unfertilized	24,2	100,0	IS	62,4	100,0	IS
	S2	Fertilized with Cropmax 0,20%	28,4	117,3	4,2	67,8	112,5	5,4
Vemone	S1	Unfertilized	28,9	100,0	IS	56,3	100,0	IS
	S2	Fertilized with Cropmax 0,20%	32,6	112,8	3,7	62,0	110,1	5,7

The Vemone hybrid has an earlier developing stage compared to Sellhardy and yields of 28.9 t/ha yields compared to 24.2 t/ha for Sellhardy, outlining a genetic characteristic.

The treatment applied was beneficial to both hybrids, with increases in production of 12.8% for Vemone and 17.3% for Sellhardy; the slight difference between the two occurs due to the very rich foliage of the Sellhardy hybrid which thus retains a greater quantity of solution and has a more intense photosynthetic activity.

The average total yield of the two hybrids, for the unfertilized samples was 56.3 t/ha for Vemone and 62.4 t/ha for Sellhardy, highlighting the hybrid-related particularity.

An increase in production was recorded for both treated samples (S2) - 12.5% for Sellhardy and 10.1% for Vemone, both hybrids having a positive reaction to the Cropmax treatment.

The hybrids were grown on large surfaces in green houses and solariums. Vemone was appreciated for its early blossom and Selhardy for its total production and the fruit's long life.

For the purpose of this experiment we used the Delta F1 hybrid solarium crop. It underwent a prolonged growth cycle, seeding took place in April and harvesting, in the middle of September.

A treatment with 0.2% Cropmax was applied in the blooming stage by gentle spraying of the entire plant.

The results are indicative of both early production stages as well as total production for both varieties.

For the green pepper treatment with Cropmax had a greater influence in early production stages, the treated sample knew an increase of 25.3 t/ha, in comparison with the untreated sample output of 22.3 t/ha – a boost in production of 13.4%. (Table 2)

Table 2.

The effect of Cropmax on the early and total tomato yields grown in green houses (average values)

Hybrid.	Sample	Early yield (20.06.-10.07.)			Total yield (20.06.-15.09.)		
		t/ha	%	± diff. to IS.	t/ha	%	± diff. to IS
V1	Unfertilized	22,3	100,0	IS	42,1	100,0	IS
V1	Unfertilized	25,3	113,4	3,0	45,5	108,0	3,4

*IS – initial sample

The total value of production was 45.5 t/ha for the fertilized sample and 42.1 t/ha for the untreated sample – a boost in production of 8.0%.

We regarded the behavior of the Delta F1 hybrid in a controlled environment; the boost in early production stages are valuable considering only one treatment was applied and the plant's growth dynamic is slightly slower than the other variety observed in this study.

Research conducted on tomatoes and green peppers in solariums outline the behavior of the hybrids in these particular conditions. By treatment with 0.20% Cropmax, tomatoes and the green pepper production value were considerably higher than the untreated samples.

It is necessary that research become more diverse, such as applying treatment to seeds and crops, in multiple and a larger variety of stages, number of treatments, types and concentrations so that an optimum solution can be reached in aim for the best practice to generate the highest production levels.

CONCLUSIONS

The tomato:

- The yield potential was positively influenced by the treatments applied, boosts in production recorded at 12,8-17,3% in the early stages and 12,8-17,3% for the total output, noting the better effect on the Sellhardy variety.

The green pepper:

- Early production for treated samples registers a total level of 25.3 t/ha, comparable to the 22.3 t/ha for the untreated samples.

REFERENCES

1. G.Neamtu, F.Irimie – Fitoregulatori de crestere. Editura Ceres, Bucuresti, 1991.
2. Gh.Posta, V.Berar – Cercetari privind influenta unor substante bioactive asupra cantitatii si calitatii productiei la ardeiul gras cultivat in camp.Buletinul AGIR nr.1-2, ianuarie-iunie,2008.
3. Radulescu Hortensia, M.Goian – Contaminarea nitrica a alimentelor. Editura Mirton, Timisoara.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✔*Biologie*
✔*Horticultură*
✔*Tehnologia prelucrării produselor agricole*
✔*Ingineria mediului*

Vol. XIV (XLX) - 2009

EFFECT OF THE MODERNIZATION OF FIELD CROP TECHNOLOGY ON THE PRODUCTIVE AND QUALITATIVE POTENTIAL OF SOME WATERMELON HYBRIDS

A. Horgoş[1], Alexandra Becherescu[1], D. Popa[1], I. Ciucuriță[2]

KEY WORDS: technology, modernization, hybrid, tunnel, foil

ABSTRACT

Until the widespread apparition of plastic materials, watermelon cultivation has been performed according to methods of crop arrangement that provided an early production, specific to the technological level, concretely: the method of arrangement in open field through direct seeding (when the climatic conditions allow this) and the method of arrangement in open field through seedling planting (when temperatures are proper to take the seedling outdoor). Technological modernization took place when plastics were used as means of crop protection. At the moment, we may speak about ***„the improved classic crop technology of watermelons”*** *and about* ***„the modernized technology of watermelon cultivation in down tunnels of polyethylene foil”****.*

This work presents the effect of this modernization on the yield achieved.

INTRODUCTION

Watermelon cultivation has been performed until the widespread apparition of plastic materials according to methods of crop arrangement providing an early production, specific to the technological level, concretely: the method of arrangement in open field through direct seeding (when the climatic conditions allow this) and the method of arrangement in open field through seedling planting (when temperatures are proper to take the seedling outdoor). Technological modernization took place along time with the utilization of plastics as protection means of the planted seedlings and then of plants against the low temperatures during the first part of the spring. So, we may call this method of watermelon crop in open field, with the improvements previously mentioned: ***„the improved classic crop technology of watermelons”***.

With the perseverance of experts in the improvement of this technology, protecting the seedling with down tunnels of plastic foil, applying a mulch of foil, too, on the soil within the tunnel and applying modern chemical fertilisers (Kemira-type – Cropcare, Ferticare), Agriplant, etc., we may obtain the advantages of a technology that is much improved than the previous one, called: ***„the modernized technology of watermelon cultivation in down tunnels of polyethylene foil”***.

The classic crop technology, either through direct seeding in open field or planting of seedlings in open field, still uses Romanian fertilizers, which are less qualitative.

[1] U.S.A.M.V.B. Timişoara
[2] Asociație Familială Com.Păuliş, Sat Sâmbăteni, Jud. Arad

In this work, we present the effect of this crop technology modernization on the yield achieved, in terms of quantity and quality as well, in high-quality hybrids used at the moment in production.

MATERIAL AND METHOD

The experimental plot was located near the village Sâmbăteni, commune Păuliş, in the Western Arad Plain, in Mureş meadow, in a private vegetable farm.

The objective of the researches performed was to study the possibilities of maximal manifestation of the productive potential of some hybrids known as very productive and qualitative, successive to the application of the two crop technologies: the improved classic technology and the modernized technology. We proposed the following objectives:

- the study of the new hybrids with a productive potential known as a very high one, by applying the two crop technologies (improved classic and modernized);
- verification of the possibility of attaining, in practice, of the theoretical productive potential specified by producers, successive to the tests performed in our own fields.

By improving this modernized technology with the optimization of drip irrigation and adequate fertilization, in order to highlight the entire productive and qualitative potential of the hybrids studied, we may recommend the vegetable-growing practice the specific methods required for the achievement of this desideratum, contributing at the same time to the improvement of theoretical and practical knowledge in this field.

The research was carried out in comparative competitor crops during 2007-2008, using the method of bifactorial experiences with the system of sub-divided parcels, in 3 replications.

Factor A – Cultivation system:

a_1- Improved classic crop technology (seedlings and drip irrigation with Kemira-type chemical fertilizers);

a_2 – Modernized crop technology (planting of seedlings, with application of mulch made of polyethylene foil on the soil, crop protection in down tunnels and drip irrigation with Kemira-type fertilizers).

Factor B – Hybrid:

b_1- Crisby F_1; b_2- Red Comet F_1; b_3 - Red Star F_1; b_4 - Audry F_1; b_5 - Lady F_1; b_6 – Dumara F_1; b_7 - Montana F_1; b_8 - Caravan F_1 (produced by the companies Nunhems and Syngenta).

The experimental data obtained successive to the researches performed were processed in concordance with current statistical-mathematical methods.

RESULTS AND DISCUSSIONS

The number of fruits differs in reasonable limits from 1.05 piece/plant in Caravan F_1, to 2.2 piece/plant in Red Star F_1 under the influence of a_1, while under the influence exerted by a_2 we may observe an increased number of fruits/plant, but not necessarily in a relationship of direct proportionality with fruit diameter and weight; this is a genotypic expression, and also the converged result of several factors during the vegetation period (table 1).

Table 1

Comparative synthesis regarding yield results of the early, semi-early and late watermelon crops, under the improved classic technology ad the modernized technology, 2007-2008

Hybrid	a_1 – Improved CLASSIC technology								a_2 – MODERNIZED technology							
	Fruits/ plant	Mean yield			Yield distribution				Fruits/ Plant	Mean yield			Yield distribution			
					July		August						July		August	
	Gr./fr (kg/piece)	kg/plant	t/ha	%	t/ha	%	t/ha	%	Gr./fr (kg/piece)	kg/plant	t/ha	%	t/ha	%	t/ha	%
b1	1,80 8,580	15,444	84,9	87,8	47,2	55,6	37,7	44,4	2,10 8,607	18,075	99,4	88,6	70,4	70,8	29,0	29,2
b2	2,10 5,781	12,140	66,8	69,1	30,5	45,7	36,3	54,3	2,40 5,768	13,843	76,1	67,9	47,6	62,5	28,5	37,0
b3	2,20 8,883	19,543	107,5	111,2	46,4	43,2	61,1	56,8	2,40 9,721	23,330	128,3	114,4	79,2	61,7	49,1	38,3
b4	1,70 11,709	19,905	109,5	113,2	52,9	48,3	56,6	51,7	2,00 12,278	24,556	135,1	120,4	93,8	69,4	41,3	30,6
b5	1,40 11,276	15,786	86,8	89,8	45,6	52,6	41,2	47,4	1,60 11,528	18,445	101,4	90,4	59,3	58,5	42,1	41,5
b6	1,15 15,454	17,772	103,2	106,7	39,2	37,9	64,0	62,1	1,20 15,733	18,879	113,8	92,5	67,9	59,7	45,9	40,3
b7	1,75 12,133	21,233	116,8	120,8	38,7	33,2	78,1	66,8	2,10 12,132	25,477	140,1	124,9	78,6	56,1	61,5	43,9
b8	1,05 17,024	17,875	98,3	101,7	32,5	33,2	65,8	66,8	1,20 17,190	20,628	113,5	101,1	51,3	45,2	62,2	54,8
Exp. mean (Mx)	**1,644** **10,623**	**17,464**	**96,7**	**100,0**	**41,7**	**43,1**	**55,0**	**56,9**	**1,875** **10,882**	**20,404**	**113,5**	**100,0**	**68,5**	**60,4**	**45,0**	**39,6**

Density: 5500 plants/ha;
Seeding date for a1: 10-12 May in 2007 and 2008;
Seeding date for a2: 22-24 April in 2007 and 2008
Hybrids 1-5 – early and semi-early, Hybrids 6-8 – semi-late and late

In terms of fruit mean weight, we may remark the hybrids Dumara F_1 (15.454 kg/piece), followed by Caravan F_1 (17.875 kg/piece), Audry F_1 (11.709 kg/piece) and Lady F_1 (11.340 kg/piece), where the weight overtakes 10 kg/piece. The other hybrids are below this mean weight limit, with 5.781 kg/piece.

The mean yields per plant and hectare, as expression of the number of fruits/plant and of their mean weight, belong to very wide limits of variation, from simple to even double. Examples: the extreme limits are maximum 21.233 kg/plant in Audry F_1 and minimum 12.140 kg/plant in Red Comet F_1, and regarding the mean yield/ha, the maximal value recorded is 109.5 t/ha in Audry F_1 and the minimal one is 66.8 t/ha in Red Comet F_1.

From the viewpoint of yield apparition in July and its percentage in the total yields achieved/ha, this is comprised between 33.2 % (b_7- Montana F_1 and b_8 – Caravan F_1) and 55.6 % (b_1 – Crisby F_1), namely between 52.5 and 47.2 t/ha.

Under the influence of a_2, the yield results of the same hybrids are similarly presented, as a result of the application of the modernized technology, which differs from the improved classic one in terms of seedling protection with polyethylene foil in down tunnels and application of a mulch, made of polyethylene foil, too, covering the pipe from the drip irrigation system. Obviously, the fertirrigation with Kemira-type fertilizers will be applied (Cropcare for basic fertilization and Ferticare during vegetation).

Mean yields/plant are of superior level, with values between 13.843 kg/plant in Red Comet F_1 and 25.477 kg/plant in Montana F_1 with correspondence in the mean yield/ha of 76.17 t/ha in Red Comet F_1 (minimal) and 140.1 t/ha in Montana F_1(maximal). The early yield with apparition in July is differentiated from one hybrid to another with percentages between 45.2 % (b_8 - Caravan F_1) and 70.8 % (b_1 - Crisby F_1), net superior compared with the ones under the influence of a_1, in the same period.

Tables 2 and 3 present, according to the statistical calculations specific the method of variance analysis, the significances of yield differences in the comparisons made as effect of the interdependence between the experimental factors.

Table 2 of unilateral and combined analysis of the experimental factors for early and semi-early hybrids leads to the conclusion that the mean of the yields obtained under the modernized crop technology (a_2) is statistically assured, the significance of yield difference being very significantly positive (***) compared with a_1 (the mean of yields obtained under the improved classic technology);

According to the data presented in Table 3 of variance analysis for the late hybrids, the significances of yield differences in the case of comparisons are very significantly positive and negative in one of the cases and significantly positive in one case, proving the superiority of Dumara F_1 (b_6) and Montana F_1 (b_7) compared with Caravan F_1 (b_5), with the specification that all hybrids produce big yields that overtake 113.5 t/ha. Also, the mean of the yields achieved under the modernized crop technology (a_2) has a statistical assurance, the significance of yield difference being very significantly positive (***) compared with a_1 (the mean of the yields achieved under the improved classic crop technology);

Table 2

Singular influences and of the interactions between experimental factors on watermelon yield (early hybrids)

Variant	Mean yield (t/ha)		Relative yield (%)	Difference (± t/ha)	Significance of difference
1. Crop system influence on yield					
a2-a1	108,07	91,10	118,62	16,97	***
DL 5%= 0,60		DL 1%= 0,91		DL 0,1%=1,46	
2. Hybrid influence on yield					
b2-b1	71,47	92,15	77,55	-20,68	000
b3-b1	117,90	92,15	127,94	25,75	***
b4-b1	122,32	92,15	132,74	30,17	***
b5-b1	94,08	92,15	102,10	1,93	-
b3-b2	117,90	71,47	164,97	46,43	***
b4-b2	122,32	71,47	171,15	50,85	***
b5-b2	94,08	71,47	131,65	22,62	***
b4-b3	122,32	117,90	103,75	4,42	*
b5-b3	94,08	117,90	79,80	-23,82	000
b5-b4	94,08	122,32	76,92	-28,23	000
DL 5%=4,03		DL 1%= 5,55	DL 0,1%= 7,64		
3. Influence of the interactions between different crop systems and the same or different hybrids					
a2b1-a1b1	99,40	84,90	117,08	14,50	***
a2b2-a1b2	76,13	66,80	113,97	9,33	**
a2b3-a1b3	128,33	107,47	119,42	20,87	***
a2b4-a1b4	135,10	109,53	123,34	25,57	***
a2b5-a1b5	101,37	86,80	116,78	14,57	***
a2b2-a1b1	76,13	84,90	89,67	-8,77	00
DL 5%= 5,13		DL 1%= 7,07	DL 0,1%= 9,76		
4. Influence of the interactions between the same crop systems and different hybrids					
a1b2- a1b1	66,80	84,90	78,68	-18,10	000
a1b3- a1b1	107,47	84,90	126,58	22,57	***
a1b4- a1b1	109,53	84,90	129,01	24,63	***
a1b5- a1b1	86,80	84,90	102,24	1,90	-
a1b3- a1b2	107,47	66,80	160,88	40,67	***
a1b4- a1b2	109,53	66,80	163,97	42,73	***
a1b5- a1b2	86,80	66,80	129,94	20,00	***
a1b4- a1b3	109,53	107,47	101,92	2,07	-
a1b5- a1b3	86,80	107,47	80,77	-20,67	000
a1b5- a1b4	86,80	109,53	79,25	-22,73	000
a2b2- a2b1	76,13	99,40	76,59	-23,27	000
a2b3- a2b1	128,33	99,40	129,11	28,93	***
a2b4- a2b1	135,10	99,40	135,92	35,70	***
a2b5- a2b1	101,37	99,40	101,98	1,97	-
a2b3- a2b2	128,33	76,13	168,56	52,20	***
a2b4- a2b2	135,10	76,13	177,45	58,97	***
a2b5- a2b2	101,37	76,13	133,14	25,23	***
a2b4- a2b3	135,10	128,33	105,27	6,77	*
a2b5- a2b3	101,37	128,33	78,99	-26,97	000
a2b5- a2b4	101,37	135,10	75,03	-33,73	000
DL 5%= 5,70		DL 1%=7,85	DL 0,1% =10,80		

Table 3

Singular influences and of the interactions between experimental factors on watermelon yield (late hybrids)

Variant	Mean yield (t/ha)		Relative yield (%)	Difference (± t/ha)	Significance of difference
1. Crop system influence on yield					
a2-a1	122,48	106,10	115,44	16,38	***
DL 5%= 4,36		DL 1%= 6,60		DL 0,1%=10,61	
2. Hybrid influence on yield					
b7-b6	128,47	108,50	118,40	19,97	***
b8-b6	105,90	108,50	97,60	-2,60	0
b8-b7	105,90	128,47	82,43	-22,57	000
DL 5%=2,25		DL 1%=3,10		DL 0,1%=4,27	
3. Influence of the interactions between different crop systems and the same or different hybrids					
a2b6-a1b6	113,80	103,20	110,27	10,60	**
a2b7-a1b7	140,13	116,80	119,98	23,33	***
a2b8-a1b8	113,50	98,30	115,46	15,20	***
a2b7-a1b6	140,13	103,20	135,79	36,93	***
DL 5%= 5,07		DL 1%= 7,47		DL 0,1%=11,53	
4. Influence of the interactions between the same crop systems and different hybrids					
a1b7-a1b6	116,80	103,20	113,18	13,60	***
a1b8-a1b6	98,30	103,20	95,25	-4,90	00
a1b8-a1b7	98,30	116,80	84,16	-18,50	000
a2b7-a2b6	140,13	113,80	123,14	26,33	***
a2b8-a2b6	113,50	113,80	99,74	-0,30	-
a2b8-a2b7	113,50	140,13	80,99	-26,63	000

CONCLUSIONS

1. The crop technology applied on watermelon hybrids in open field or protected with tunnels of polyethylene foil, under the influence exerted by the crop arrangement method) plays a decisive role in the manifestation of the productive potential of hybrids.

2. The modernized crop technology (planting of seedlings, crop protection with down tunnels of polyethylene foil, mulch of polyethylene foil, drip irrigation and fertirrigation) proved to be superior compared with the classic crop technology (planting of seedling in open field, irrigation and fertilization through the drip irrigation system), this statement being supported by the productive manifestation of the hybrids cultivated, in terms of quantity and earliness.

3. We remarked especially the hybrids Audry F_1 and Red Star F_1 from the group of the early hybrids and Montana F_1 and Caravan F_1 from the group of the late ones due to the level of the yields obtained (b4 - Audry F_1 – 135,1 t/ha; b3 - Red Star F_1- 128,3 t/ha; b7 - Montana F_1 – 140,1 t/ha; b8 - Caravan F_1 – 113,5 t/ha; b6 - Dumara F_1 – 113,8 t/ha).

BIBLIOGRAPHY

1. Horgoş, A. – Legumicultură specială, Ed. Agroprint, Timişoara, 2003.
2. Grumeza, N., şi col. – Tehnica irigării culturilor hortiviticole, Ed. Ceres, Bucureşti, 1979.
3. Ciofu, R. şi col.– Tratat de legumicultură, Ed. Ceres, Bucureşti, 2003.
4. Nanu, Ş., Toma, V. –Cultura pepenilor verzi, Ararat, 2005.
5. * * * – Programul de fertilizare Kemira

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✔*Biologie*
✔*Horticultură*
✔*Tehnologia prelucrării produselor agricole*
✔*Ingineria mediului*

Vol. XIV (XLX) - 2009

SOME GEOGRAPHICAL ASPECTS REGARDING POTATO CROP IN ROMANIA

Costela Iordache[1]

KEY WORDS: potato, area, production, counties, Romania

ABSTRACT

Potato is one of the traditional crops in our country because of its utilization in alimentation, industry and as fodder. The cultivation area is very wide, as it is a plant that supports various climatic and soil conditions. According to the favorability of the areas, there were individualized specialized basins for the cultivation of this plant. Besides highlighting the importance of the potato, the paper also presents the evolution of crop surfaces and production, as well as the counties that stand out from this point of view.

INTRODUCTION

Originally from South America (Peru and Bolivia), the potato (*Solanum tuberosum*) was brought to Europe in 1534 (Larousse, 1993, p. 802), but it was placed in alimentation later. The first information about its cultivation for ornamental purposes and in alimentation dates from the second half of the 16th century in Spain, then in Portugal, Italy etc.

The presence of this plant on the Romanian territory has been recorded since "March 14, 1769 when the authorities of the Royal Guberniat of the Grand Principality of Transylvania - Sibiu, emitted a circular regarding the potato crop, namely the extension of the crop of *ground apples*." Locally, there are used different names for potato, such as "crumpi", "ground pears", "picioci" etc.

MATERIAL AND METHODS

In order to achieve this study, I used as basic material the statistical data published in the Romanian Statistical Yearbook, editions 1978, 1995, 2003, and 2007. These data refer to the surfaces planted with potatoes and to the total production achieved at the national, regional, and county level. The processing of the statistical data followed the characteristic years of the period 1938-2006. The research methodology relied on using the statistical-mathematical methods, the grouping on intervals, the statistical correlation, graphics, analysis, and synthesis.

[1] University of Craiova, The Faculty of Social-Human Science

RESULTS AND DISCUSSIONS

Potato is a solanaceous plant from which we can use the underground stems called *tubers*. These are underground-metamorphosed stems, which places potato among the very demanding plants with regard to soil conditions (Bârnaure, 1977). It has high demands to soil loosening and texture, preferring the medium, structured, loose, permeable, and rich in nutrients soils. As it is a consumer of nitrogen, phosphorus, potassium, calcium and magnesium, the soil loses these nutrients rapidly, and a proper fertilization is necessary. At the same time, potato is highly demanding to the soil water regime, both water excess and drought being very harmful. Depending on variety, the growing period varies between 70 and 150 days. The advantage of this plant is that under a less demanding climate, it gives high production on relatively small surfaces and that it is rich in carbohydrates, proteins and amino acid combinations adapted to human needs. Considered "the second bread of mankind", potato is one of the most valuable crop plants, being important in human alimentation, animal forage and as raw material in industry.

It is one of the most common foods, widely used because of its nutritional value. The content rich in carbohydrates, proteins, amino acids, vitamins (mainly B and C), potassium etc. makes the potato a major component of human nutrition. In addition, within the food products used daily for the population's alimentation, potato comes immediately after bread. As it is one of the most common foods even in the world, at ONU and FAO initiative, the year 2008 was declared "The International Year of Potato". In the same context, it is worth mentioning, in our country, there are organized traditional ethno-cultural events, such as "The Potato Festival in Raşca (Cluj County) and "The Days of the Potato" in Şinteu (Arad County), both held annually, in October.

The tubers and the stems are a valuable fodder for some animals, especially for pigs and cattle. The industrial importance of the potato is given by its use as row material in the production of alcohol, starch, glucose, dextrin (obtained by the starch's degradation).

Being a sensitive plant to the thermo fluid stress and edaphic conditions, it is growing, particularly, in the depressions of the Eastern Carpathians, in Suceava Plateau and southern Transylvania – the traditional areas of cultivation.

There are grown both Romanian and imported varieties (from Germany, Netherlands, Poland) which, according to the period of vegetation, may be: *early* – Agata, Magic, Roclas, Ostara; *semi-early* – Astral, Rapsodia; *summer* – Rustic, Semenic, Sucevița, Teo; *semi-late (autumn)* – Caşin, Desirée, Mureşan, Santé, Super; *late (autumn)*: Provento, Siricus, Superstar, Titus, etc. Given the geoecological needs of potato, the specialists in the field (Constantinescu Ecaterina et al., 1969, Bîlteanu & Bîrnaure, 1989, Berindei, 1995) identified the following areas of cultivation (Fig. 1):

- *very favorable area* – inter- and sub-mountainous depressions (towards the mountains to the last cultivated fields); semi-early, semi-late, and late varieties are specific to this area;
- *favorable area* – it is represented by the hills and plateaus of Transylvania, Moldavia, Muntenia and Oltenia; there are grown both semi-late and late varieties, as well as semi-early varieties for summer-autumn consumption;
- *favorable area to the early cultivation* – it corresponds to plain and low hills areas suitable for cultivation of the varieties used in the early consumption.

Within these areas, there developed certain *zones specialized in potato cultivation* (Bîlteanu & Bîrnaure, 1989), such as:

- for autumn-winter consumption (very favorable and favorable area);
- for industry and autumn-winter consumption (very favorable area);

- for autumn-winter consumption and with opportunities for early summer (Western Plain and hilly areas);
- for early, very early and autumn consumption, only under irrigation (the Romanian Plain and Dobroudja);
- for very early and early consumption (low areas from the south-west of the country);
- to produce seed potatoes (very favorable area of Transylvania and Moldavia).

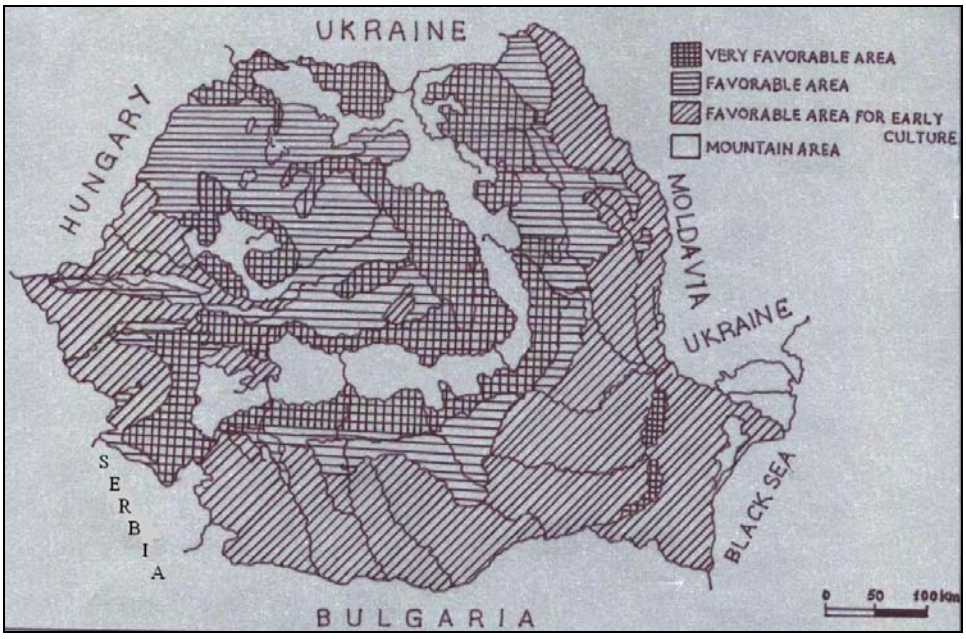


Fig. 1 Potato growing areas (after Constantinescu Ecaterina et. al,1969 – processing)

Regarding the *cultivated surface*, it has gradually expanded from 135.1 thousand ha in 1938 to 291.7 thousand in 1960, following a period of over two decades with a slight decrease and, then, it reached its maximum of 351.4 thousand ha in 1989. Afterwards, the potato crop reduced and it has been cultivated on relatively constant areas in the last years. (Fig. 2 A)

With favorable climatic and soil conditions, the northern and central regions of the country are the most important potato growers. Currently, the potato crop is practiced in all counties of Romania, but the main areas are Suceava Plateau and the depressions of Braşov, Ciuc, Giurgeu, and Maramureş. Among the grown varieties, autumn potatoes hold the greatest share (over 90%).

The early varieties are widespread, especially, in the south of the country, where the alluvial soils have a higher rate, covering large areas in basins of the rivers – the Danube, the Siret, the Olt, the Jiu, the Ialomiţa, the Dâmboviţa, the Argeş, the Buzău, and others. In Dâmboviţa County and in suburban area of the capital it is, also, these varieties are also cultivated. In the sub-Carpathian and plateau areas, potato is cultivated in the "intercalated crop system", too.

Chronologically speaking, until the 60's of the past century, the most important crop areas were the Suceava Plateau and the depressions of Braşov, Ciuc, Giurgeu, Maramureş, Sibiu, and Făgăraş. A relatively small percent went to Western Plain and Hills.

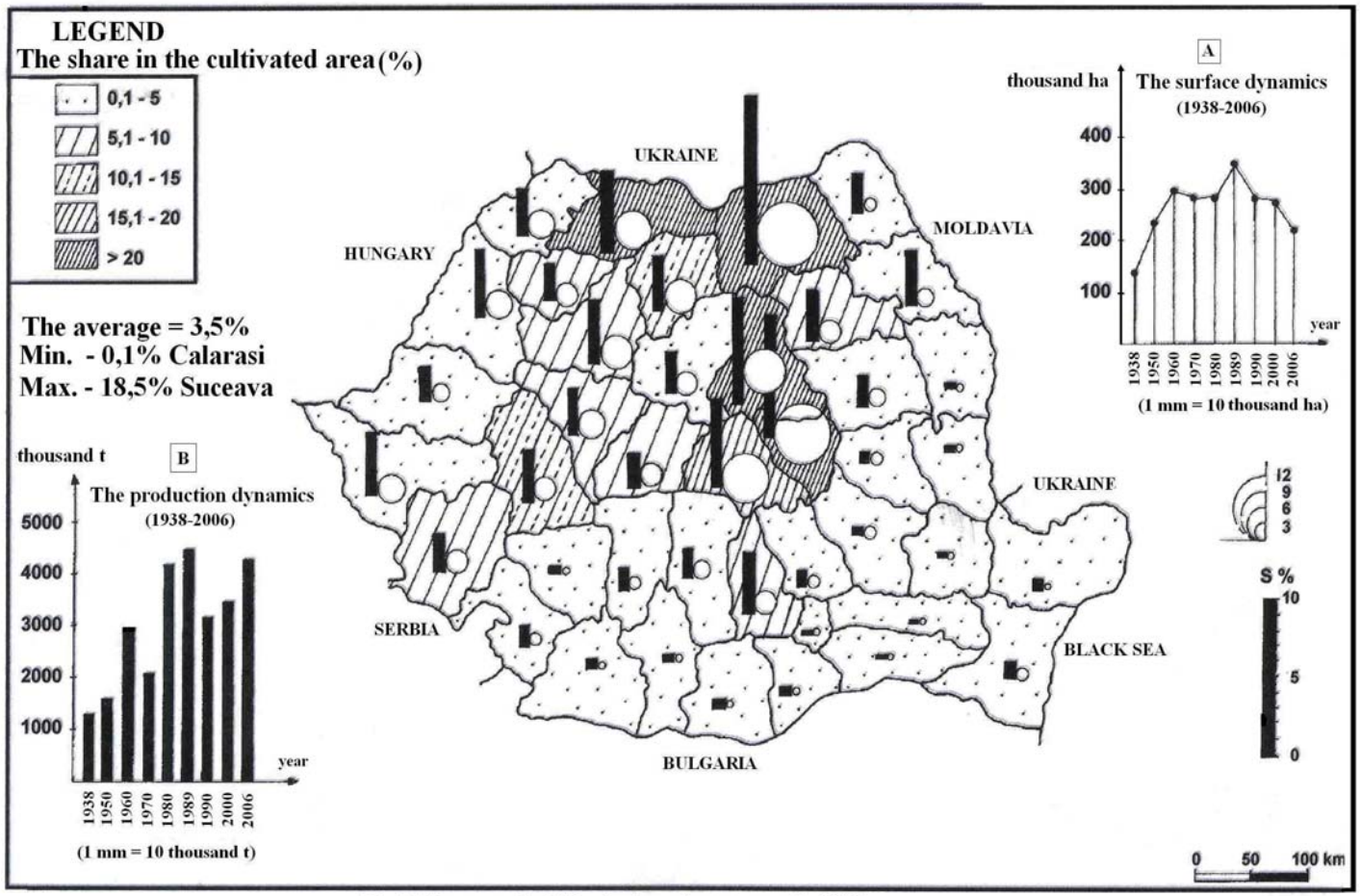


Fig. 2 The geografical distribution of potato crop in 2006

In the following decades, this crop had spread in the south of the country, too, becoming extensive in the plains of Oltenia, Brăila, Burnaz, and Mostiştei in order to supply urban markets. The early varieties are characteristics to the counties of Olt, Dolj, Brăila, Giurgiu etc.

In 2006, potato was grown on 278,055 ha (99.6% in the private system) of which 88.2% represented autumn potato. The most extensive cultivated surfaces were registered in the counties of Suceava (30,759 ha, 11.6% of the national one), Covasna (19,631 ha, 7.1%), Maramureş (15,145 ha, 5.,4%), Braşov (14,791 ha, 5.3%), Harghita (14,260 ha, 5.3%), Cluj (4.6%), Timiş (4.0%), Bistriţa-Năsăud, Bihor, Neamţ etc. Less than 1,000 ha were cultivated in Călăraşi (0.2%), Ialomiţa (0.2%), Ilfov (0.3%). Reported to the county cultivated surface, high rates were held by the following counties: Covasna (24.2%), Maramureş (20.5%), Harghita (20.4%), Suceava (18.5%), Braşov (16.7%) etc. (Fig. 2).

The *total production* increased from 1,331.2 thousands tonnes in 1938 to 3,009.3 thousand tonnes in 1960, 4,420.3 thousands tonnes in 1989; in the following period have been recorded 3-4 thousand tonnes annually (Fig. 2 B). The Suceava Plateau and Braşov, Ciuc, Giurgeu depressions have the highest share of the national potato production (about 30%), followed by the Western Plain and Hills, then by the Romanian Plain. Due to the favorability of the ecological conditions, the traditional cultivation areas (South-Eastern Transylvania, Northern Moldavia), register the *highest average productions per hectare*. In addition, the national average (14,191 kg/ha) in 2006 was exceeded by the following counties: Vrancea (23,482 kg/ha), Caraş Severin (19,267 kg/ha), Galaţi (18,153 kg/ha), Tulcea (17,897 kg/ha), Constanţa (17,545 kg/ha) and others. In the achievement of national production in 2006 (4,015.9 thousand tonnes) the Center (more than 1,027 thousand tonnes) and North-East regions (962,000 tonnes), respectively Suceava (about 400,000 tonnes, 9.9%), Covasna (about 300,000 tonnes, 7.4%), Braşov (over 253,000 tonnes), Cluj, Harghita, Maramureş, Bistriţa-Năsăud, Neamţ, Dâmboviţa (for early and semi-early varieties), Bihor, Caraş-Severin, Botoşani etc. had a significant contribution.

Before 1990, potato was the subject of a major industrialization in the factories from Rădăuţi and Sânsimion (located within areas with ancient traditions in the cultivation of this plant), where it was manufactured starch and alcohol.

For the revitalization of potato crop, it was initiated *the project for restructuring the production of certified seed potato in the micro-zones*; it will run between 2006 and 2010 in partnership with research and development institutions: I.N.C.D.C.S.Z. Braşov, S.C.D.C. Tg. Secuiesc, S.C.D.A. Suceava, I.C.D.P.P. Bucureşti. Overall, the main objectives of this project cover the following aspects:

- the achievement of a sustainable and performing system on micro-zones for the production of the certified seed potato, with low environmental impact and positive effect in the development of the involved rural areas;
- the delimitation of micro-zones in every county that is a seed producer (1-2 micro-zones in Braşov, Covasna, Harghita, Suceava, Neamţ, Botoşani, and Bacău).

CONCLUSIONS

Potato is part of human essential food crops. It is one of the most valuable crop plants, being important as a food, fodder, and industrial crop. At the same time, potato crop is one of the most intensive crops, requiring a large number of technological interventions, with a high cost and negatively impact upon the soil.

Depending on the climatic and soil requirements, the very favorable and favorable ecological zones correspond to the Transylvania inter- and sub-mountainous depressions, at

which we can add, the Suceava Plateau, as a traditional and highly productive area. We also mention Moldavia Plain, the Siret Corridor, the Someş Plateau, the Transylvanian Plain, the Western Plain and Hills, and the Romanian Plain as areas holding high surfaces and productions.

In the post-war period, the cultivated surface expanded continuously until 1960. Afterwards, it maintained at over 250,000 hectares annually, the highest level being reached in 1989. Abolition of intensive farming complexes, reduction or disappearance of school and university canteens, and the building sites, the strong decline in the food industry, but foreign competition too are the causes that led the reduction of the surfaces cultivated with potatoes. In terms of geographical distribution, we notice a very different distribution of this crop not only due to the natural conditions, but especially to the farmers' specialization in very favorable areas from the counties of Braşov, Suceava, Covasna, Maramureş.

The total and average production per hectare is, in the current period, well below the potential of production because of the insufficient mechanization, use of fertilizers and herbicides, operations that require financial resources that many manufacturers do not have. It is also worth mentioning that very strong competitors from Germany, Netherlands, Poland and Turkey, especially on the segment of early potatoes, influence the domestic market.

The revitalization of this culture probably can be achieved by subsidizing, promoting domestic production, discouraging foreign competition, and a relevant financing of the institutions for potato research and development.

REFERENCES

1. Berindei, M., *Zonarea producţiei de cartof*, Edit. Ceres, Bucureşti, 1977
2. Berindei, M., *Cultura cartofului*, Edit. Fermierul Român, Bucureşti, 1995
3. Bîlteanu, Gh., *Fitotehnie*, ediţia a-II-a, vol. I, Edit. Ceres, Bucureşti, 1998
4. Bîlteanu, Gh., Bîrnaure, V., *Fitotehnie*, vol. I, Edit. Didactică şi Pedagogică, Bucureşti, 1989
5. Butnariu, M., et al., *Legumicultură*, Edit. Didactică şi Pedagogică, Bucureşti, 1992
6. Ceauşescu, I., Berindei, M., *Organizarea producţiei de cartof în România*, Edit. Ceres, Bucureşti, 1976
7. Chichea, I., (coord.), *Cartoful timpuriu şi de vară*, Edit. Alma, 2000
8. Chilom, Pelaghia, *Legumicultură*, vol. I, Edit. Universitaria, Craiova, 2002
9. Ciofu, Ruxandra, et. al, *Tratat de legumicultură*, Edit. Ceres, Bucureşti, 2003
10. Constantinescu, Ecaterina, et al., *Cartoful*, Edit. Agrosilvică, Bucureşti, 1969
11. Domuţa, C., Sabău, N., C., *Agrotehnică*, Edit. Universităţii din Oradea, 2001
12. Dumitrescu, M., et. al. *Producerea legumelor*, Edit. Artprint, Bucureşti, 1998
13. Ianoşi, I., S., *Bazele cultivării cartofului pentru consum*, Edit. Phoenix, Braşov, 2002
14. *** *Geografia României, vol. II, Geografie umană şi economică*, Edit. Academiei, Bucureşti, 1984
15. *** *Anuarul Statistic al României*, I.N.S., Bucureşti, 1978, 1995, 2003, 2007

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

THE DYNAMICS AND THE BALANCE OF THE WORKFORCE IN THE ROMANIAN AGRICULTURE

Costela Iordache, Cristina Iliescu[1]

KEY WORDS : occupied population, agriculture, the balance of the workforce

ABSTRACT

The workforce is one of the social economic factors which influence the agriculture. The purpose of this study is to show the numerical and percentage evolution of employed population in agriculture and the balance of the workforce in accordance with the causes which lead to territorial differences.

INTRODUCTION

The workforce is an economic resource, while work is a primary, originary production factor (Otiman, 2000). The structure of workforce on the activities of national economy depends on the type of economy and its degree of development. A branch of the economy with special implications within the society, directly influenced by the natural, economic, historic and social-political factors, agriculture generates a variable number of population, depending on the technical level generated by a development level of a country.

The population occupied in agriculture interests as a production force, by which the worked performed obtains a certain agricultural production, but also as a pressure factor upon the agriculture in the conditions of the population growth which generates a higher and higher request of agricultural products.

As one of the oldest economic branches, agriculture, even nowadays, occupies an important percentage in the Romanian economy, together with forestry, lumbering, hunting and pisciculture. If for a long time people practiced a self sufficient agriculture, for the consume of their own household, nowadays, the higher request of agricultural products on the city markets, generates an increased interest for the agricultural producer to increase the quantities of requested products. On the other hand, we must mention the fact that the collapse of investments from all branches of economy (namely in agriculture) and the reduction of the population incomings, especially for those living in villages, determines a sinuous evolution for this economic sector.

MATERIAL AND METHODS

To achieve this study, we used as basic material the statistics data published in the Romanian Statistical Yearbook, editions 1991, 2007. The processing and the organization of statistical data followed the characteristics years of the period 1930-2006. These data refer to the occupied population, the number of the employees and the workers from

[1] University of Craiova, The Faculty of Social-Human Science

agriculture, the agricultural area and the arable one. The index of the balance of the workforce was calculated only for the year 2006. We have made charts and maps which show the evolution and the territorial differences of agricultural population. The research methodology relied on using the statistical, mathematical methods, the grouping on intervals, the statistical correlation, graphics, analysis and synthesis.

RESULTS AND DISCUSSIONS

The mutations in agriculture reflected in the dynamics and in the structure of workforce from this economic activity. From the *quantitative point of view*, the active population in agriculture decreased step by step from 76.7% in 1930 to 29.7% in 2006 (Fig. 1) which means a decrease with 61.3%.

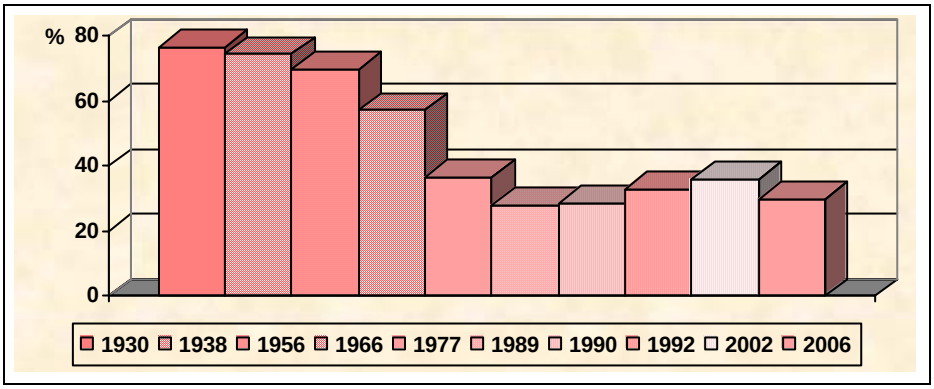


Fig. 1 The dynamics of the percentage of population occupied in agriculture between 1930-2006

We should notice that during *1950 – 2006*, the number of population occupied in agriculture reduced with more than half (from 6.2 million persons to 2.8 million persons), the decline starting since 1960, and registering a minimum in 1989 with a number of 3 million persons. During the nineties it was noticed an abatement until 1994 (about 3.6 million persons), followed by a loss of approximate 380 thousands persons during a very short time interval, after which it started a growing trend up to 2004 (Table no 1):

Table no. 1

The dynamics of the workforce occupied in agriculture* (1950 - 2006)

Years	The occupied population in agriculture		The average number of employees		The density of occupied population in agriculture		The average surface/pers.	
	No. pers (thousand)	%	No. pers (thousand)	%	Pers./100 ha agric. land	Pers./100 ha arable land	Ha agric. land/pers	Ha arable land/pers
1950	6226,3	74,3	250,0	11,8	43,5	66,4	2,3	1,5
1960	6250,4	65,6	340,5	10,5	43,0	63,6	2,3	1,6
1970	4868,3	49,3	472,1	9,2	32,6	50,0	3,1	2,0
1980	3087,6	29,8	603,7	7,9	20,6	31,4	4,9	3,2
1989	3056,3	27,9	660,7	8,3	20,7	32,3	4,8	3,1
1990	3096,9	28,6	693,5	8,6	21,0	32,8	4,8	3,0
2000	3575,0	41,4	141,0	3,9	24,1	38,1	4,1	2,6
2006	2840,0	30,5	133,0	4,7	19,3	30,1	5,2	3,3

Source: The Statistical Yearbook of Romania 1991, 2007 – processed* Forestry, haunting and pisciculture

The percentage of workforce occupied in agriculture from the total population decreased from 74.3% in 1950 to 27.9% in 1989, then it raised to 41.4% in 2000 and dropped to 30.5% during the last up dated year. In 2006, the ratio of occupied population was very different at the county level (Fig. 2).

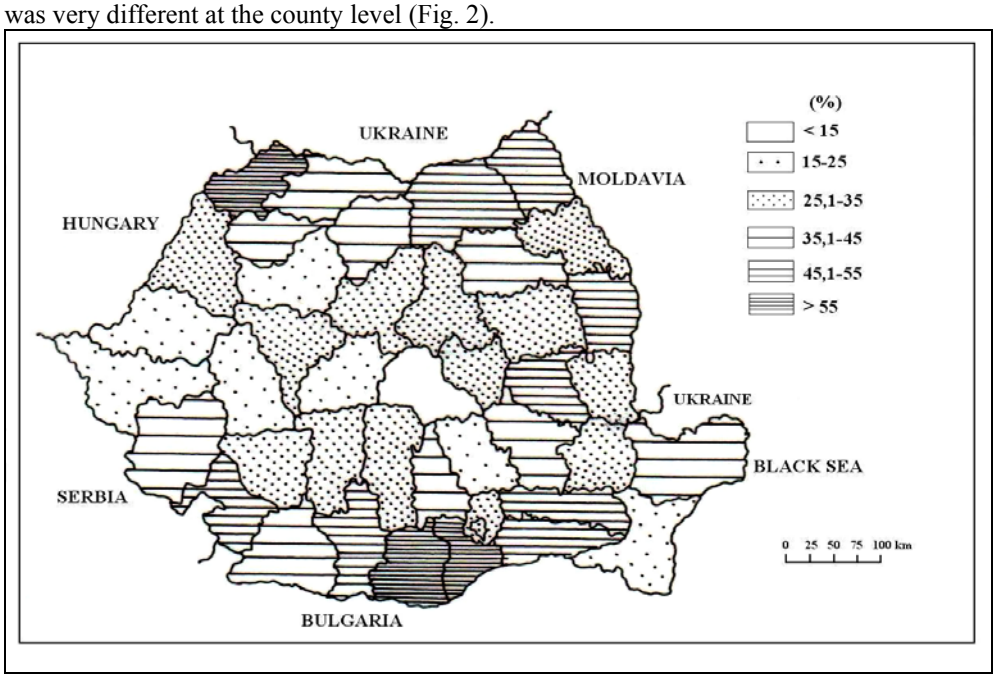


Fig. 2. The ratio of employed population in agriculture in 2006

Regarding the growth of population occupied in agriculture until 2000 it is considered (Văcărel et al., 2004) that it was caused mainly because of the population residing in rural settlements, but characterized by an accentuated trend of demographic aging, the growth being caused, in a high percentage, by pensioners.

The social-structural modifications of the population occupied in agricultural activities had been determined by the dynamics of the technical-material base in agriculture. Thus, mechanization, land improvement works, animal intensive growth plants, etc. lead to an increase in the number of employees, workers, experts with higher education. In this respect, *the average number of employees* counting 250 thousand persons (11.8% from the total number of population) in 1950, it almost doubled in two decades (472.1 thousand persons in 1970) and reached 693.5 thousands in 1990. Subsequently, the decrease is strong, in 2006 being registered only 133 thousand persons. *The workers* from agriculture followed the same numeric evolution, with a growth from 194.8 thousands in 1950 to 389.0 thousands in 1970, respectively 576.9 thousands in 1990 in order for their number to drop to 92 thousand persons in 2006.

In 2006, *depending on the professional status*, the population occupied in agriculture has the following structure : 51.4% self-employees, 42.0% contributing family workers, 6.3% employees, 0.2% employers and 0.1% members of an agricultural holding or of a co-operative.

The workforce in agriculture has a series of *social-economics characteristics* among which we can mention:

- pronounced aging, the age groups over 55 years own a high percentage (34.2% for both sexes and 17.6% for the feminine population in 2006);
- reduced standard of living and education;
- seasonal occupation (higher during spring and summer) determined by the negative cycle of the plants;
- under-occupation of young workforce; (10.1% from the total number represents the population with age between 15-24 years and only 4.0% for the feminine population)

Concerning *the average density of population occupied in agriculture* dropped from 43.5 persons/ 100 ha of land in 1950 to a minimum of 20.6 persons/ 100 ha in 1980, after which it has a relatively oscillatory evolution, but on an ascendant trend. The same dynamics was also registered for the ratio population from agriculture – arable land, but it has higher values: 66.4 persons/ 100 ha land in 1950; 31.4 persons/ 100 ha in 1980 and 30.1 persons/ 100 ha in 2006. Instead, the average agricultural surface, respectively the arable one, which comes to a farmer, had a positive evolution, with a doubling during the eighties (Table no 1, Fig. 3)

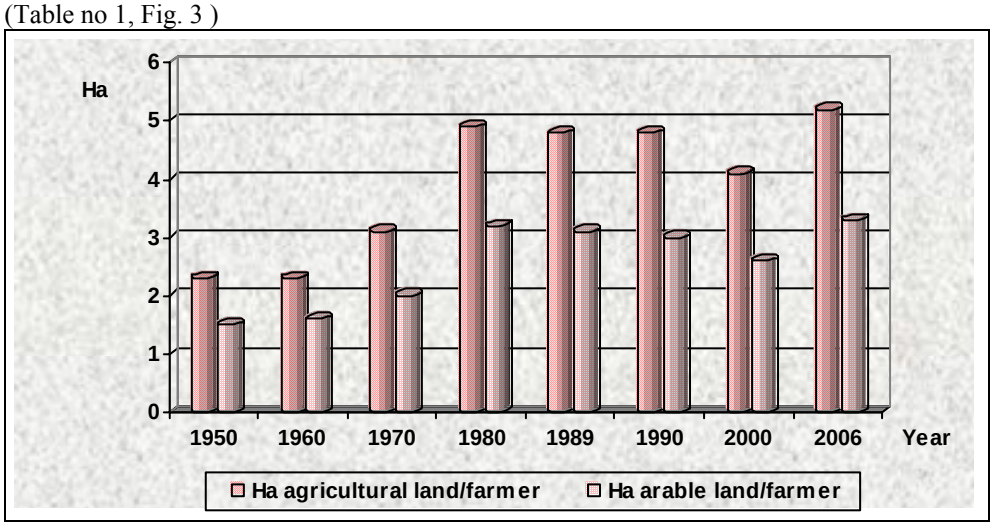


Fig. 3 The dynamics of the average surface which comes to a farmers

The balance of workforce in agriculture is determined by the numeric dimension of active population within this sector and by the need of work within the domains of vegetal and animal production during the same year. The expression of this ratio between the necessary and the existent was evidenced by Iordan in 1973 using the following formulae:

$$Ib = \frac{Pa - Pn}{Pa}$$

where: Ib = the index of the balance

Pa = active population from agriculture

Pn = necessary of workforce to one conventional ha of arable land

The analysis of the map of the geographical distribution for the index of the workforce in agriculture in 2006, (Fig. 4) shows differentiations at territorial level. The areal or local distribution of the values for this index is the result of a cumulation of factors among which the most important ones are : the modernization of agriculture, the structure

of population by age and sex groups, natural conditions, the economical-social development, the density of rural settlements etc.

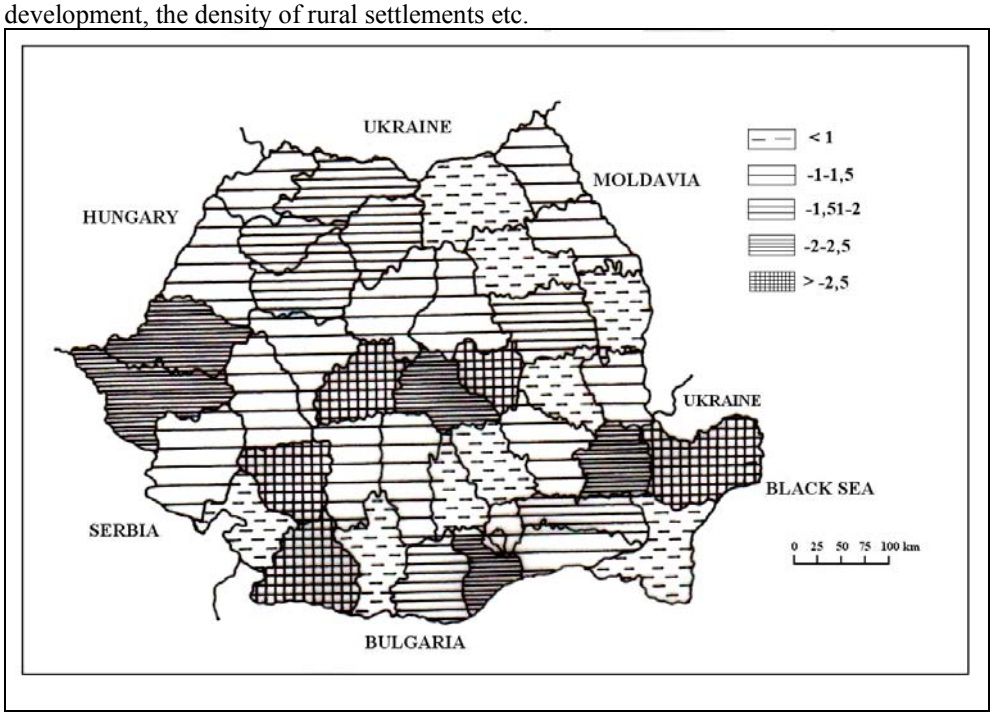


Fig. 4 The index of the balance of workforce in agriculture in 2006

The modernization and the development of the primary sector generated important changes within the dynamics of workforce in agriculture, from the numerical and structural point of view, especially after 1990. The urban economic decline, the early retirements and land reconveyance, started the migrations toward rural areas, fact which explains the growth of the number of person occupied agriculture during the transition period.

The structure of rural population by age and sex groups was modified under the impulse of migration urban-rural. During the eighth decade of the past century, the population occupied in agriculture was deficient in the circumstances in which the adults over 45 years were representing over 66% of the total number of rural active persons – out of which the women exceeded 50%, in 2006 these values dropped to 52.1, respectively to 26.7%.

Natural conditions, especially the geomorphologic and soil conditions, impose the duration for the agricultural season. In the mountainous and hilly regions with arable surfaces and reduced agricultural activities, but with a numerous active population, the workforce is less exploited, which determines a positive index of the balance. This case is characteristic for the Moldavian Tableland, the Subcarpathians, the Someşelor Tableland, the Western Hills, the South Dobrudjan Tableland. The counties Suceava, Neamț, Vaslui, Constanța etc. have a surplus of workforce within the primary sector.

The economical-social development of the administrative units reflects in the value of the workforce balance index. The insufficient technical-material base in most of the counties determines the need of a higher workforce. In some counties from the Romanian Plain (Dolj, Giurgiu), The Western Plain (Timiș, Arad), the Dobrudjan Tableland (Tulcea),

the Transylvania Depression (Sibiu), the high negative values of the analyzed index are correlated with depopulation, aging and feminization of population. These characteristics outline the economical and social status of the respective areas.

The density of rural settlements can determine differentiations regarding the potential of workforce in agriculture. This fact is more obvious in the plain regions characterized by a dispersion of the rural habitat (within the spatial organization there are dominant the big settlements, which determines reduced densities for the habitat). As, in this areas, the active population is few, and the agricultural surfaces are big, the need of workforce is the highest. They are evidenced as areas with workforce deficiency, as it is the case of the Brăila Plain, the Bărăgan, the South Dobrudjan Tableland, the Oltenia Plain, the Burnaz Plain, the Timiş Plain, the Arad Plain.

CONCLUSIONS

The emphasized disparities between the geographical regions or between counties expressed by the contrasts of the ratio of occupied population and of the values of the index of agricultural workforce are generated by economical-social factors associated to some natural conditions. The modernization and the development of agriculture, the structure of population by age and sex groups, the level of economic and social development, the economic interest of rural settlements, the configuration of the relief and soil fertility represent the main generating factors for the territorial contrasts within the balance of the agricultural workforce.

The Strategy of the Romanian agriculture (The Ministry of Agriculture and Alimentation, 1999) shows that there should be facilitated the exploitation process of the land owned by aged owners, by younger and more efficient farmers, using market mechanisms as lease or sale; also part of the people working in agriculture should pass in a non-agricultural activity from the rural area, so that the ration between the workforce and the surface of cultivated land could be improved, in this respect increasing the marginal productivity of work which would cause for the agriculture to be able to provide a decent standard of living in the rural areas.

REFERENCES

1. Blaga, I., *Populaţia activă a României*, Edit. Politică, Bucureşti, 1979
2. Dona, I., *Economie rurală*, Edit. Economică, Bucureşti, 2000
3. Gavrilescu, D., *Economie agroalimentară*, Edit. Expert, Bucureşti, 1996
4. Ilinca, N., *L'indice de la balance de la main d'oeuvre dans l'agriculture de la Roumanie*, in Analele Universităţii „Ştefan cel Mare", Suceava, Secţiunea Geografie, anul IX, 2000
5. Iordan, I., *Zona periurbană a Bucureştilor*, Edit. Academiei, Bucureşti, 1973
6. Otiman, P., I., *Economie rurală*, Edit. Agroprint, Timişoara, 2000
7. Trebici, Vl., Hristache, I., *Demografia teritorială a României*, Edit. Academiei, Bucureşti, 1986
8. Văcărel, I. et al., *Politici economice şi financiare de ieri şi de azi*, Edit. Economică, Bucureşti, 2004
9. *** *Geografia României, vol. II, Geografie umană şi economică*, Edit. Academiei, Bucureşti, 1984
10. *** *Anuarul Statistic al României*, I.N.S., Bucureşti, 1978, 1995, 2003, 2007
11. *** *Strategia Agriculturii Româneşti*, Ministerul Agriculturii şi Alimentaţiei, Bucureşti, 1999

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

EXTRARADICULAR FERTILIZER WITH NATURAL ORGANIC SUBSTANCES OF VEGETABLE ORIGIN - AGROCHEMICAL TESTING IN SOLARIUM

Carmen Sirbu[1], T. Cioroianu[1], P. Rotaru[2], C. Pohrib[3], Monica Dumitrascu[1], Iulia Anton[1]

KEY WORDS: fertilizers, hydrolyzate, collagen, biostimulator, foliar

ABSTRACT

In the last 2 decades, in the world, there is a major development of fertilizer containing humic acids and / or fulvic, their salts, root or foliar-applied products.

This paper presents a range of fertilizers containing NPK-type matrix with trace elements and organic substances. These substances are organic compounds from humic class and have the effect of chelating and plant-stimulating.

Experimental fertilizers have been tested by applying extraradicular in unheated solarium on culture of cucumber, short cycle The agrochemical tests were carried compared with unfertilized control and two witnesses with organic certification. Experimental data are presented on production obtained, in sugar content, vitamin C and acidity of fruit.

INTRODUCTION

In the Grant Agreement no. 135080/2009 concluded with Competitiveness Grants Scheme (MAPDR) were made agrochemical activities for obtaining and testing of complex nutrient solutions containing natural organic substances with stimulating properties of plant development. I.N.C.D.P.A.P.M. - ICPA - Bucharest, together with the University of Craiova, Faculty of Physics and S.C. Marcoser S.R.L., have conducted experiments that have led to many variants of processes and formulas of fertilizers with the possibility to use classical system of agriculture, but organic.

These fertilizers were applied extraradicular and agrochemical tested in solarium but also in the house of vegetation. Principles applied to define the technological processes for obtaining these fertilizers have specific standards of organic agriculture and the classic.

MATERIAL AND METHOD

Were obtained in the laboratory phase of fertilizer solution (3) containing organic substances with stimulating role, obtained by extraction and separation fulvic and humic acids from lignite.

[1] Institutul National de Cercetare, Dezvoltare pentru Pedologie, Agrochimie si Protectia Mediului - ICPA Bucuresti
[2] Universitatea din Craiova - Facultatea de Fizica
[3] S.C. MARCOSER S.R.L. Matca, Galati

Experimental fertilizers have been tested experimentally in solarium by extraradicular application in culture of cucumber.

Extraradicular fertilizers obtained experimentally to realize the agrochemical testing were:

- NPK type with fulvic acid salts and chelated trace elements - code "Omi 1";
- NK type with humic acid salts and chelated trace elements - code "Omi 2";
- NK type with humic and fulvic acids salts and chelated trace elements - code "Omi 3".

Experimental fertilizers were tested against an unfertilized control leaf (M0), two witnesses, fertilizers certified for use in organic agriculture and note "ECO" (ECO 1 and ECO 2). Experiments were performed in solarium at S.C. Marcoser S.R.L., Galati,

Experiments were performed on the culture of cucumber in solarium on hybrid Mirabela F1 on a soil well supplied with: 6.12-6.5% humus, 0.29 - 0.3% nitrogen, phosphorus (P in AL) from 230 to 270 ppm, potassium (K in AL) from 180 to 230 ppm and a slightly alkaline pH of 7.0 - 7.5 pH units. Values determined for the elements Ca, Mg, Zn, Cu and Fe showed a good supply.

Was founded six variants with three repetitions, each having 50 plants / row. Drip irrigation was done every two days with a volume of 2 - 2.5 l / plant, using fertilizers type Plantfert, Agroxilato - K and Alcaplant (solution concentration from 0.1 to 0.2%). Culture of cucumber, short-cycle type, was sown on 26.02.2009 and was planted on 20.03.2009 and ended on 20.07.2009.

Extraradicular fertilizers were applied as solution of concentration 0.5%, in number of 4 treatments at intervals of 7 days. Plant size was 2 - 2.5 m with a development of crown foliage of 50 - 60 cm.

At the end of cultures were carried out assessments on production parameters and nutrient analysis on fruit and leaf samples using the average of 3 repetitions.

RESULTS AND DISCUSSION

The use of extracts of natural substances from lignite, a complex matrix of macro and chelated trace elements, in well established technological conditions, leading to solutions of fertilizers chemically and physically stable.

Add of products containing humic substances distributed on the soil or foliar (liquid or solid) can dramatically improve the efficiency of conventional fertilizers and plant metabolism. Humic and fulvic acids, and their salts stimulate both growth and development of plant roots and also leaf system. At the same time, foliar fertilizers containing humic compounds enhance metabolism and activity of plant photosynthesis.

Fulvic acid readily complexes with minerals and metals making them available to plant roots and easily absorbable through cell walls.

When agrochemical experiments conducted on cucumber, Mirabela F1 hybrids grown in the solarium, indicators: production, sugar content, vitamin C and total acidity of fruits were used to assess the efficiency of fertilizers obtained experimentally with application extraradicular (Table 1).

Statistical processing of data, showed a significant share of fertilizer factor in the production and content of sugars and insignificant for the contents of vitamin C and total acidity of Results of testing of fertilizer to crop cucumber in solarium, are presented in tables 2 to 5.

Analysis of data obtained indicated obtain some very significant production for the three experimental fertilizers, both compared to unfertilized foliar witness and the witness ECO 1. Significant values were obtained with fertilizers OMI 2 and OMI 1 (table 2),

compared with the witness ECO 2 and the average of productions achieved. For OMI 2 fertilizers, sugar content recorded very significant differences compared to unfertilized witness and witnesses called ECO (table 3).

If the content of vitamin C and total acidity for the three fertilizers called OMI, we achieved significant results only to witness unfertilized - M0 (tables 4 and 5). fruits.

Table 1

Evolution of indicators analyzed after foliar fertilization applied

No.	Variant fertilization	Increases resulting from the application of fertilization (%)			
		Production	Sugars	Vitamin C	Total acidity
1	M0	100	100	100	100
2	ECO 1	102,6	99,2	101,0	104,4
3	ECO 2	107,7	104,0	105,3	107,8
4	OMI 1	110,3	107,8	104,8	115,4
5	OMI 2	110,9	118,9	114,6	110,9
6	OMI 3	108,6	110,8	110,2	113,0

CONCLUSIONS

1. In the experimental work three fertilizers were obtained and characterized physico-chemical with extraradicular application be noted by a complex composition due to the combination of a matrix type NK or NPK with trace elements Fe, Cu, Zn, Mn, Mg with humic and fulvic acids, natural substances with biostimulator and chelated role.

2. When experiments carried out in the solarium on cucumber, Mirabela F1 hybrid, found an upward trend of production increases over the witness M0, in order: 2.6% for ECO 1 7.7% for ECO 2%, 8.6% for OMI 3, 10,3% for OMI 1 and 10.9% OMI 2 they find very significant for all tested agrochemical fertilizers, except fertilizers ECO 1 (distinct significant difference)

3. The application of fertilizer extraradicular were obtained significant values for the parameters analyzed only in the production and content of sugars, but vitamin C content and total acidity of fruits were less influenced. Efficiency of fertilizers range evolved ascending order OMI 1, OMI 2 and OMI 3.

BIBLIOGRAFIE

1. Carmen Sirbu, T. Cioroianu, M. Dumitru, A. Dorneanu, Maria Negrila, Daniela Mihalache, Letitia Angelescu, New structures of biofertilizers with chelate proteinic substances with role of biostimulator and protection for sustainable agriculture, Lucrari Stiintifice USAMV Iasi, Seria Agronomie, vol. 51 (2), 2008, pag. 189-194.
2. Carmen Sirbu, T. Cioroianu, M. Dumitru, A. Dorneanu, Daniela Mihalache, Letitia Angelescu – Fertilizanti continand hidrolizate proteice chelatante cu aplicatii in agricultura - Simpozionul International “Reconstructia ecologic si necesarul de ingrasaminte in zona gorjului, Tg. Jiu, 4-5 oct. 2007, Ed. New Agris, 467– 474.
3. Dorneanu A., Dumitru M., Cioroianu T, Emilia Dorneanu, Carmen Sirbu, RO, Patent no. 121814, 30.05.2008.
4. United states patent, US 7,198,805 B2, 3 apr. 2007, Method for producing humic acid salts.
5. United states patent, US 5,026,416, 25 iun. 1991, Liquid crop stimulant.

Table 2

Evolution of cucumber fruit production according to the fertilization treatment applied

No.	Type fertilizer	Average production kg / plant	Difference compared to control, kg	Statistical significance	Difference compared to control, kg	Statistical significance	Difference compared to control, kg	Statistical significance	Difference compared to control, kg	Difference compared to control, kg
			MO		ECO 1		ECO 2		Average of variants	
1	M0	4,17	0,00	-	-0,11	oo	-0,32	ooo	-0,28	ooo
2	ECO 1	4,28	0,11	**	0,00	-	-0,21	ooo	-0,17	ooo
3	ECO 2	4,49	0,32	***	0,21	***	0,00	-	0,04	ns
4	OMI 1	4,60	0,43	***	0,32	***	0,11	**	0,15	***
5	OMI 2	4,63	0,46	***	0,35	***	0,14	***	0,18	***
6	OMI 3	4,53	0,36	***	0,25	***	0,04	ns	0,08	*

DL 5% 0,06 kg DL 1% 0,09 kg DL 0.1% 0,12 kg

Table 3

Evolution of sugar content in fruit of cucumber, depending on the treatment of fertilizer applied

No.	Type fertilizer	Sugar content (%)	Difference compared to control,%	Statistical significance	Difference compared to control, %	Statistical significance	Difference compared to control, %	Statistical significance	Difference compared to control, %	Difference compared to control, %
			MO		ECO 1		ECO 2		Average of variants	
1	M0	3,32	0,00	-	0,03	ns	-0,13	ns	-0,23	o
2	ECO 1	3,29	-0,03	ns	0,00	-	-0,16	ns	-0,25	o
3	ECO 2	3,45	0,13	ns	0,16	ns	0,00	-	-0,09	ns
4	OMI 1	3,58	0,26	*	0,29	*	0,13	ns	0,03	ns
5	OMI 2	3,95	0,63	***	0,65	***	0,49	***	0,40	**
6	OMI 3	3,68	0,36	**	0,39	**	0,23	*	0,13	ns

DL 5% 0,23 (%) DL 1% 0,32 (%) DL 0.1% 0,47 (%)

Table 4

Evolution of Vitamin C content in fruit of cucumber, depending on the treatment of fertilizer applied

No.	Type fertilizer	Content of vitamin C	Difference compared to control, (mg/100 g)	Statistical significance	Difference compared to control, (mg/100 g)	Statistical significance	Difference compared to control, (mg/100 g)	Statistical significance	Difference compared to control, (mg/100 g)	Difference compared to control, (mg/100 g)
		(mg/100 g)	MO		ECO 1		ECO 2		Average of variants	
1	M0	3,27	0,00	-	-0,03	ns	-0,17	ns	-0,20	ns
2	ECO 1	3,30	0,03	ns	0,00	-	-0,14	ns	-0,16	ns
3	ECO 2	3,44	0,17	ns	0,14	ns	0,00	-	-0,02	ns
4	OMI 1	3,42	0,16	ns	0,12	ns	-0,02	ns	-0,04	ns
5	OMI 2	3,74	0,48	*	0,44	*	0,30	ns	0,28	ns
6	OMI 3	3,60	0,33	ns	0,30	ns	0,16	ns	0,14	ns
	DL 5%	0,38 (%)		DL 1%	0,54 (%)		DL 0.1%	0,79 (%)		

Table 5

Evolution of total acidity content of fruits of cucumber depending on the treatment of fertilizer applied

No	Type fertilizer	Total acidity (citric acid)	Difference compared to control, (g/100 g)	Statistical significance	Difference compared to control, (g/100 g)	Statistical significance	Difference compared to control, (g/100 g)	Statistical significance	Difference compared to control, (g/100 g)	Difference compared to control, (g/100 g)
		(g/100 g)	MO		ECO 1		ECO 2		Average of variants	
1	M0	0,98	0,00	-	-0,04	ns	-0,08	ns	-0,08	ns
2	ECO 1	1,02	0,04	ns	0,00	-	-0,03	ns	-0,04	ns
3	ECO 2	1,05	0,08	ns	0,03	ns	0,00	-	-0,01	ns
4	OMI 1	1,13	0,15	*	0,11	ns	0,07	ns	0,07	ns
5	OMI 2	1,08	0,11	ns	0,06	ns	0,03	ns	0,02	ns
6	OMI 3	1,10	0,13	*	0,08	ns	0,05	ns	0,04	ns
	DL 5%	0,12 (%)		DL 1%	0,17 (%)		DL 0.1%	0,24 (%)		

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

POSSIBILITY OF SOME WATER-MELONS HYBRIDS CULTIVATION IN SPECIFIC CONDITIONS OF PROTECTION

Aurel Truşcă[1] Palaghia Chilom[2]

KEY WORDS: water-melons, technology, protection, plant growing, fructification.

SUMMARY

For the researches we have used two new water-melons hybrids (Odem and Dumara) which were cultivated by transplants, in the framework of three combinations of protection in comparison with the witness which was unprotected. The experience followed the influence, on plants, of two factors.

INTODUCTION

The knowledge regarding the cultivation of the vegetable plants and especially the cultivation of the water-melons are multiple and have tendencies of growth due to the practical, economically and medicamentary importance of these.

In the case of water-melons, in present the specialists are researching the possibility of early productions, in the field cultivation, trying the adaptation of the classic technology to a technology with multiple possibility of protection, utilizing high-quality hybrids or using for cultivation transplants and grafted plants which have a high resistance to pathogenetic agents leading to the production of ecologic plants (Spirescu C. şi Toma V., 1990; Naum Şt. 1998;2005 Spirescu C. 1996; Toma V.;Naum Şt Cinciuc C. 2002.).

MATERIAL AND METHOD

To resolve the proposed objectives we had organized and located the experience in the vegetable zone Mehedinţi, inside of a private vegetable farm. The researches were effectuated on a chernozem soil, which presented a clay-sandy texture, slight acid pH and a good supply of humus. The culture was effectuated using transplants produced in containers made from polyethylene foil, sowing in the first half of February and planting in the first half of April. We planted on unmodeled soil using 200 cm x80 cm distance.

The variants specific is presented in followed tables. We used polyethylene foil mulch on V2, V6; mulch and the coverage of transplants with NOVAGRIL on V3, V7; mulch and protection offered by a tunnel covered with polyethylene foil (V4; V8).

RESULTS AND DISCUSSION

We observed the influence of the two experimental factors on water-melon plants respectively the influence of A1 factor-"the hybrid" with the components a1-Odem and a2-

[1] D.A.D.R – Mehedinţi
[2] Universitatea din Craiova

Dumara and the influence of factor B-"the protection" with b1-unprotected; b2-mulch protection; b3-mulch and cover with Novagril and b4-mulch and tunnel protection..

The obtained results are presented in the tables 1; 2; 3, which emphasize the differences between variants.

Table no.1

The influence of protection factor upon some growing and fructification elements in the case of field cultivated water-melon (2007)

The hybrid	Variant	Variants specific	The stalk length (cm)	The sprouts number on plant	The leafs number	The first flowers apparition date	At what node appeared first flowers
ODEM	V1	Classic culture	38	4	29	16.05	4-5
	V2	Culture with polyethylene mulch	54	5	37	11.05	3-4
	V3	Culture with mulch and protected with Novagril	60	6	43	10.05	2-3
	V4	Culture with mulch and tunnel protection	86	7	52	10.05	3-4-5
DUMARA	V5	Classic culture	40	7	31	18.05	4-5
	V6	Culture with polyethylene mulch	59	5	44	16.05	3-4
	V7	Culture with mulch and protected with Novagril	73	6	56	11.05	2-3
	V8	Culture with mulch and tunnel protection	88	7	69	10.05	2-3

Table no.2

The influence of protection factor upon some fructification elements in the case of field cultivated water-melon (2007)

The hybrid	Variant	Variants specific	No. of fruits on plant	No of harvestable fruits on plant	The fruits dimensions L/Φ	The fruits average weight (g)	No. of harvestable plants	Production t/ha
ODEM	V1	Classic culture	2	2	21,4/16	3100	4200	26,0
	V2	Culture with polyethylene mulch	3	2	22,5/17	3400	4500	30,6
	V3	Culture with mulch and protected with Novagril	3	2	24/19	3800	4900	37,2
	V4	Culture with mulch and tunnel protection	4	3	24,5/20	3260	4900	48,0
DUMARA	V5	Classic culture	3	2	22,2/17,6	3600	4500	32,4
	V6	Culture with polyethylene mulch	3	2	23,8/18,2	3900	4600	36,0
	V7	Culture with mulch and protected with Novagril	3	2	24,1/18,3	4100	4600	38,7
	V8	Culture with mulch and tunnel protection	3	2	25,2/18,4	4300	4800	39,5

The influence of the protection factor on the growth and on the fructification elements is emphasized by the data presented in table 1 from which we can see that the protection factor has a positive influence on the plants growth rate.

The stalk length at the first determination was between 38-86 cm for the Odem hybrid and between 40-88 cm for Dumara hybrid (the values were obtained from the average values obtained from 10 plants), the sprouts number was between 4 and 7, and the average number of leafs was between 29-52 at Odem and between 31-69 at Dumara.

We can observe the differences regarding the influence of A factor and the influence of B factor. Thus the double protection had a strong influence on the growth and fructification elements.

The appearance of the first flowers happened in 6 days at Odem hybrid and in 8 days at Dumara hybrid. The appearance of the first flowers was earlier at the double protected variants. Were registered differences between the fructification elements (table 2) and differences regarding the fruits average weight. For the year 2007 (a droughty year) the fruits average weight was between 3100-3800 g/fruit at Odem and 4500-4600 at Dumara.

Table no.3

The fructification elements and the productions obtained under the influence of the protection factor at water-melon hybrids

The hybrid	Variant	Variants specific	Average no. of harvested fruits on plant	Fruits average weight (g)	No. of harvestable plants/ha	Production		
						t/ha	± difference comparatively with the witness	%
ODEM	V1	Classic culture	2	3100	4200	26,0	-9,5	Ws.1
	V2	Culture with polyethylene mulch	2	3400	3400	30,6	-4,9	+4,6
	V3	Culture with mulch and protected with Novagril	2	3800	3800	37,2	+1,7	+11,2
	V4	Culture with mulch and tunnel protection	3	3260	3260	48,0	+12,5	+22,0
	Ws.	Witness (variant average)	2,25	3390	3390	35,5	Ws.2	-
DUMARA	V5	Classic culture	2	3600	3600	32,4	-4,7	Ws.1
	V6	Culture with polyethylene mulch	2	3900	3900	36,0	-1,1	+4,6
	V7	Culture with mulch and protected with Novagril	2	4100	4100	38,7	+1,6	+6,3
	V8	Culture with mulch and tunnel protection	2	4300	4300	41,2	+4,1	+8,8
	Ws.	Witness (variant average)	2	3975	3975	37,1	Ws.2	-

Analyzing the fruits average weight, the number of fruits on plants and the number of harvestable plants we can establish the production reported at the surface unit. The calculated productions where between 26-48, 0 ton/hectare at Odem hybrid and between 32, 4-41, 2 ton/hectare at Dumara hybrid.

We can observe the favorable influence of protection through the progress obtained at double protection (mulch + tunnel). The positive differences in comparison with

the unprotected witness were between 4, 6-22, 0 ton/hectare at Odem and between 4, 6-8, 8 ton/hectare at Dumara.

The experience with the Odem hybrid (general aspect)

The Odem hybrid

The experience with the Dumara hybrid (general aspect)

The Dumara hybrid

CONCLUSIONS

- the water-melon hybrids behaved differently in conditions of similar protection;
- under general appearance in the case of Odem hybrid, for the conditions of the year 2007, we have obtained higher values for all studied elements;
- the protection factor has a favorable influence for water-melon culture especially the double protection which influenced positive the analyzed elements;
- the mulch component, from the framework of protection factor, associated with the tunnel protection conducted at the achievement of best values for studied elements even in comparison with the association between the influence of double protection and the influence of mulch cover.

BIBLIOGRAPHY

1. Ianu St. *Cultivarea de pepeni verzi recomandată pentru solurile nisipoase din sudul Olteniei,* Hortinform, nr. 6/70, 1998.
2. Naum St., Toma V. *Cultura pepenilor verzi;* Ed. Ararat 2005.
3. Spirescu C., *Contribuţii la stabilirea tehnologiei de cultură a pepenilor verzi pe nisipurile din sudul ţării,* Teză de doctorat
4. Toma V., Naum St., Onciuc C.,-*Tehnologia de cultivare a pepenilor verzi în vederea obţinerii de producţii timpurii,* Ed ASAS, SCDPN Dăbuleni 2002

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

ECOLOGICAL FISCAL POLICY IN THE CONTEXT OF NATIONAL FISCAL REGULATIONS

Vută Mariana, Trică Carmen Lenuta, Lazăr Paula

KEY WORDS: *fiscal policy, externality, environmental taxes, fiscal policy*

ABSTRACT

The fiscal policy is an instrument through which the state is trying to influence economical activity but also protect the environment. In the present context when fiscal regulations are changing according to particular aspects of the economical activities but have also an essential role in what concerns the impact upon social responsibility, we have to ask ourselves: "Is ecological fiscal policy an instrument through which the state regulates participants behaviors to the economic activities with an negative impact upon the environment?"

The paper aims to, in the context of using more and more genetic modified organisms and climatic changes, applying national fiscal laws, underline aspects of using environmental taxes, their returns and member states reforms in order to stimulate responsible behaviors for the economic activities participants.

INTRODUCTION

The environment has become a permanent preoccupation to everyone involved in economic, social and political activities.

The environment has become an important aspect after the '80s, once upon the appearance and development of the concept of sustainable development at the same time with the increase of the state role in mastering negative effects inflicted upon environment by the economic agents, by imposing them different instruments to assume the damages done and spending the necessary money to reduce and support the damages done to other participants to the economic activity.

From that moment on states are trying through different fiscal and non-fiscal mechanisms to correct market failures and the negatives effects of externalities but also to intervene, with financial means, in order to sustain those activities aiming to restore the environment, but were short of money. In the present context at European level the environmental policy is part of the European Union policies, been involved in many important economic activities, like, transport, agriculture, industry, etc. Strategies to realize environmental policies are concentrated upon changing the classical approach from the type command-control to alternative models witch use different instruments through which states can influence the economic activity in order to diminish it's negative effects upon the environment and reduce negative externalities.

The European Union member states have introduced a series of fiscal instruments aiming to change both producers and consumers behaviors and accumulate budget resources used in environmental protection and damage control.

The efficiency of the economic instruments even being one of the oldest environmental economy problems has no total resolution yet, because it presume both a profound analysis and a correlation between traditional instruments and instruments like negotiable permits and environmental taxes. In an traditional economic approach, environmental problems are in connection with externalities, the object of pigou's taxes being to incite both consumer and producer to adopt an behavior that will take into account the amount of costs generated by the unfold activity.

The externality is defined as the effect, positive or negative, appeared as a result of the interdependence between different economic agents, effect that is not directly approbate through market mechanisms or price (they are non-paid services and non-compensate damages). Pigou makes an important step in putting into light the notion "external des-economy" as the phenomenon that represents the costs and disadvantages that the activity of an economic agent is imposing to another economic agent in the absence of a financial compensation or commercial exchange.

Another definition given to the concept of externality is the one belonging to Meade (1973): an external economy (or non-economy) is a phenomenon that produces a considerable profit (or a significant prejudice) to one or more persons that are not parties to the process that directly or indirectly caused these effects. Because the definition does not specify the inter-dependence between the agents we can conclude that it is referring to the pecuniary externalities (Scitosky, 1954). These externalities are affecting the welfare of some agents, but this influence is done through the prices.

Baumol and Oates (1975) were defining externality as the influence upon another economic agent satisfaction without this influence being tide to an exchange or a material compensation, while OCDE (2001) considered it an impose cost by an economic agent to another without taking into account the later decision concerning production or consuming.

The state can use different instruments through which it can modify both economic agents and population behaviors regarding environmental problems. It can use direct regulation (norms, quantitative limits), economic incitation (royalties, responsibility and consignation systems, negotiable permits) as well as financial instruments (environmental taxes, subventions and financial aids). Studies on the topic of necessity and obtained results by using environmental instruments have came to different conclusions, some sustaining environmental taxes (Brett and Keen, 2000) and others the negotiable permits (Hanoteau, 2005).

Damiana (1999) had realized an analysis comparing an environmental norm with a tax but taking also into account the impact of using negotiable permits. The conclusion was that the chance in using a specific instrument is the same as the result of an election competition, both polluting and ecological friendly enterprises are financially sustaining their candidates. In 2004, Aidt and Dutta are introducing into the model the negotiable permits proposing a system centered upon the political factor, the lobby influence and the electors in applying a certain environmental policy. Glachant (2008) considered that the solution applied by the state in order to reduce environmental damages was not uniform norms. He sustained that states will reach significant results if negotiable permits are freely distributed, taking into account fiscal regulations.

ENVIRONMENTAL FISCAL OBJECTIVES

OECD (2001) understands through the environmental fiscal policy all the taxes and royalties applied upon products that are damaging the environment or upon polluters under the form of a drawing upon natural regenerative or non-regenerative resources.

The fiscal policy is aiming at limiting production and consumption and any other damaging activity but at the same time is inciting civil society to modify it's harmful behavior.

Fiscal instruments can have both positive and negative effects. Among the positive effects we remind:

- encouraging non-polluting activities and the eco goods production;
- discouraging economical harmful behavior;
- increasing products and services competitiveness.

Among the negative effects we remind:

- social disequilibrium generated by the increasing fiscal pressure;
- wages cuts and prices increasing with s negative impact upon capital and resources competitiveness.

Dick – Madsen (2003) considered that a true environmental fiscal reform should show the fiscal and budgetary neutrality and the social impact (double gain), meaning obtaining an environmental upgrade (first gain) and also creating financial and salaries resources (second gain).

In time it has been noticed that countries tend to put the accent upon environmental taxes in order to regulate market participant's behaviors, in this case the central objective being reducing production and consumption of some polluting products and limiting damaging activities. Among secondary objectives (Haumont, 2004) we find:

- generating fiscal revenues, necessary in financing environmental protection activities;
- inciting consumers into chancing their negative behavior;
- competitiveness distortions (OCDE, 2001).

At international level, the environmental policy is being realized in different ways: norms, interdictions, voluntary agreements, economical incitation (taxes, subventions, and negotiable permits).

These instruments are inciting enterprises to respect the impose norms because reducing pollution will allow it to cut down the amount equal to the environmental tax or the permit cost, stimulating innovation, research and non-polluting technology. If at international level there is no coherence and non-sense in applying these instruments, the impact of these taxes upon competitiveness will not be very important, the big polluters will try to locate their activity in regions were the environmental legislations is less restrictive (Molta and Thise, 1994; O'Brien and co, 2001).

In OCDE member states the encashment obtained from the environmental taxes are, in average, almost 2% of GDP (OCDE, 2002) and almost 90% from total are taxes on carbohydrates and cars, the rest being taxes from industry, energy and waste management (Rapport de Commisaire à l'environnement et au développement durable,2004).

Taxes used in practice can be (EEA, 2000) for covering costs (Holland: tax on polluting water, for house waste, airplane's engine noise), stimulating (Sweden: differential taxes upon fuel, carbon dioxide, pesticides; Denmark: tax upon toxic waste).

European Union member states act according to European directives regarding environmental protection aiming for the ecological reform to have effects both from taxation point of view and the obtained results point of view. According to state development, environmental taxes percentage in GDP differs as shown in table no. 1

Table no. 1

Environmental taxes percentage in GDP for member states (E.U.)

Country	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
BE	2,29	2,54	2,57	2,49	2,52	2,33	2,31	2,27	2,32	2,38	2,36
BG	..	..	..	..	..	2,46	2,77	2,26	3,01	3,38	3,07
CZ	2,91	2,71	2,53	2,43	2,62	2,56	2,62	2,54	2,63	2,73	2,79
DK	4,52	4,78	4,83	5,25	5,34	5,18	5,14	5,29	5,13	5,51	5,83
DE	2,32	2,2	2,15	2,12	2,28	2,38	2,52	2,52	2,65	2,54	2,46
EE	0,77	1,22	1,49	1,78	1,75	1,49	1,94	1,85	1,91	2,11	2,21
IE	3,05	3,1	2,99	2,98	2,97	2,88	2,33	2,32	2,31	2,48	2,26
EL	3,49	3,45	3,44	3,25	3,08	2,56	2,8	2,51	2,39	2,38	2,25
ES	2,19	2,19	2,12	2,28	2,31	2,19	2,08	2,08	2,05	2,00	1,95
FR	2,8	2,87	2,75	2,73	2,77	2,55	2,42	2,51	2,43	2,44	2,36
IT	3,6	3,49	3,47	3,37	3,49	3,17	,03	2,89	3,00	2,83	2,81
LV	1,07	1,58	2,07	3,03	2,46	2,4	2,16	2,3	2,5	2,6	2,66
LU	2,96	2,92	2,96	2,93	2,81	2,78	2,82	2,76	2,81	3,11	3,04
HU	3,07	3,11	3,01	3,49	3,4	2,99	2,85	2,82	2,97	2,88	2,87
NL	3,61	3,82	3,74	3,81	3,93	3,89	3,76	3,63	3,7	3,87	4,02
PL	1,84	1,93	1,82	1,85	2,08	2,09	2,07	2,4	2,46	2,59	2,65
RO	..	..	..	..	..	..	..	1,9	2,46	2,46	2,06
SI	..	..	..	..	2,17	3,04	3,35	3,38	3,42	3,43	3,33
FI	2,92	3,1	3,32	3,29	3,4	3,12	2,94	3,03	3,16	3,21	3,04
SE	2,79	3,14	2,97	3,00	2,86	2,78	2,82	2,91	2,92	2,87	2,9
NO	3,18	3,29	3,02	2,92	2,52	2,17	2,02	2,02	1,95	2,12	1,83
UK	2,92	2,95	2,95	3,12	3,15	3,04	2,81	2,71	2,63	2,57	2,28

…. not available

Source: www.europa.eu.int, eurostat

Analyzing data from table we can state that in the presented period in a powered industrialized state there have not been significant variations that will overcome half a percentage from GDP (Germany, Belgium, Holland, Sweden, exception Norway which registered a decrease in 2005 face to 1994 of over 1 percentage point and Denmark which has registered an increase of 1,5% from GDP, due to the rethinking of fiscal policy, respectively of the impact of the double dividend upon the contributors).

State adhering to European structures in 2004 and 2007 had had evolutions characterized by increasing environmental taxes in GDP, fact due to both economic development on one hand and introduction of common environmental regulations on the other hand.

If we analyze the percentage of environmental taxes in the fiscal revenues we find a decreasing tendency which shows a rethinking of the environmental fiscal policy or that some states have reached the proposed environmental objectives (Norway, Czech Republic, Ireland, Greece, and Luxembourg), or a increasing tendency that can indicate a development of the activities object to environmental taxes or the fact that the proposed objectives through which were aiming changing the consumers and producers behaviors have not been reached (table no. 2)

Table no. 2

Environmental taxes as percentage from total fiscal revenues in member states (E.U.)

Country	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
BE	5,73	5,72	5,47	5,54	5,16	5,12	5,00	5,17	5,29	5,2
BG	..	..	..	..	7,55	8,81	7,5	9,19	9,9	9,00
CZ	7,81	7,24	7,27	7,68	7,57	7,71	7,3	7,36	7,52	7,75
DK	9,72	9,85	10,63	10,65	10,48	10,6	11,04	10,67	11,17	11,58
DE	5,34	5,23	5,12	5,41	5,62	6,24	6,31	6,63	6,48	6,29
EE	3,42	4,15	5,11	5,04	4,75	6,44	5,93	6,05	6,72	7,14
IE	9,38	9,24	9,39	9,34	9,1	7,83	8,12	7,92	8,13	7,35
EL	10,47	10,05	8,93	8,25	6,76	7,66	6,83	6,73	6,9	6,55
ES	6,61	6,38	6,91	6,88	6,45	6,21	6,13	6,05	5,8	5,49
FR	6,54	6,23	6,2	6,17	5,77	5,52	5,83	5,68	5,65	5,38
IT	8,34	7,92	7,92	8,21	7,58	7,29	7,06	7,25	6,95	6,94
LV	5,14	6,45	8,97	7,68	8,12	7,58	8,15	8,77	9,14	9,18
LU	7,77	7,53	7,44	7,32	7,09	7,09	7,04	7,3	8,19	7,86
HU	7,66	7,73	8,94	8,7	7,75	7,32	7,33	7,73	7,46	7,45
NL	9,5	9,43	9,65	9,74	9,74	9,81	9,63	9,89	10,28	10,54
PL	5,19	4,98	5,22	5,96	6,43	6,43	7,33	7,63	8,22	8,09
RO	..	..	..	..	..	..	6,71	8,91	9,01	7,39
SI	..	..	..	5,54	7,87	8,62	8,59	8,65	8,66	8,23
FI	6,55	7,13	7,11	7,39	6,59	6,58	6,78	7,17	7,35	6,9
SE	6,15	5,78	5,74	5,45	5,28	5,55	5,93	5,9	5,73	5,71
NO	7,75	7,16	6,95	5,96	5,09	4,7	4,69	4,6	4,89	4,19
UK	8,31	8,19	8,43	8,4	8,01	7,44	7,47	7,26	7,01	6,56

… not available

Source: www.europa.eu.int, eurostat

At European level the following tendencies are seen:

- diminishing taxes for labor while introducing, increasing or modifying environmental taxes;
- rethinking public expenses according to active population structure modification (Joumard, 2002);
- increasing fiscal pressure because of the increase of public expenditures.

CONCLUSIONS

In order to be included in the fiscal practice and to be easily applicable taxes have to respond to a certain number of criteria that form, the so called fiscal "laws": simplicity, transparency, meaning clarity in what concerns the tax objectives, type of pollution, ways of spending the amounts collected, efficiency.

Fiscal reform should be characterized by fiscal and budgetary neutrality as for the social impact to be counterattacked by ways to reduce fiscal expenditures upon labor, mechanism known as double dividend (Dyck-Madsen, 2003): environmental amelioration and creation of jobs. For contributors, most of the environmental taxes act as direct taxes and if the tax is progressive it will affect available revenues, mostly those of the population with low income rates.

BIBLIOGRAPHY

1. Aidt T.S., Dutta J. (2004) "Transitional politics: emerging incentive-based instruments in environmental regulation", Journal of Environmental Eco-nomics and Management, 47,
2. Baumol W.J., Oates W.E.,(1988) The Theory of Environmental Policy, seconde. édition, Cambridge, Cambridge University Press,.
3. Brett C., Keen M. (2000) .Political uncertainty and the earmarking of environmental taxes., Journal of Public Economics, 75(3)
4. Bürgenmeier B, Horayama Y, Wallart N, (1997) Theorie et pratique des taxes environmentales, Ed. Economica, Paris,
5. Coase J, (1973) Coase Teorem Symposium, Natural Resource Journal,
6. Damania R. (1999) "Political competition, rent seeking and the choice of environmental policy instruments", Environmental and Resource Economics,13
7. Hanoteau J. (2004) "Lobbying pour les permis d.émission négociables et non-neutralité du mode d.allocation", Revue Economique, 55(3)
8. Haumont, F., 2004, Droit de l'environnement, Université catholique de Louvain (UCL), p.60-84.
9. Glachant M, L.effet du Lobbying sur les Instruments de la Politique Environnementale La Revue d.Economie Politique, n_ 5, 2008
10. Meade J. E. (1973), The Theory of Economic Externalities, Institut Universitaire des Hautes Etudes, Geneva.
11. Motta M et Thisse J.F (1994), Does environmental dumping lead to delocation , EuropeanEconomicReviewno.38,3/4avril, http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6V64-45R2GBB-C&_user=10&_rdoc=1&_fmt=&_orig=search&_sort=d&view=c&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=fd539aae5296bc8841494a03804f3794
12. O'Brien P., Carey, D., Hoj, J. et Woergoetter, A.,(2001), Encouraging Environmentally Sustainable Growth in Belgium, OCDE, Economics Department Working Paper n°300,
13. OCDE, (2001), Les taxes liées à l'environnement dans les pays de l'OCDE, OCDE, Paris
14. OCDE, 2002, Les pratiques fiscales dommageables et autres questions fiscales – Rapport d'une réunion d'experts syndicaux tenue dans le cadre du Programme
1. Travailleurs/Employeurs de l'OCDE. PAC/AFF/LMP(2002)2, 34 p. Disponible sur :
2. http://www.olis.oecd.org/olis/2002doc.nsf/43bb6130e5e86e5fc12569fa005d004c/5a77e64c3 6141047c1256c020038e45a/$FILE/JT00129974.PDF
15. Vuță Mariana, Is ecological fiscality an instrument for reducing pollution?, International conference Ecological Performance in a Competitive Economy, PEEC 2008, supplement of Quality-access to success, Journal year 9, no. 94,

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✔*Biologie*
✔*Horticultură*
✔*Tehnologia prelucrării produselor agricole*
✔*Ingineria mediului*

Vol. XIV (XLX) - 2009

THE USE OF SOME ORNAMENTALS IN DESIGNING DECORATIVE POTS

Bala Maria, Berecici Daniel[1]

KEY WORDS: ceramic pots, species, varieties

ABSTRACT

The large number of species and varieties existing in culture, implies knowledge for culture technologies, vegetation parameters needs, pest and disease control and the way they are used. The final purpose is establishing the most efficient cultivation methods and the use of flowers.

Within this research the final purpose was the use of ceramic pots under different forms, by using a great variety of flowers for garden cultivation as well as using interior plants that resist in full sun, shade and semi-shade.

INTRODUCTION

In the present research the purpose was to use of ceramic pots in various forms by using a great diversity of floral species , of those grown in the garden and also of those that decorate the interior of our homes which can be found outside summertime.

The pots assure the decoration of a yard or garden where the possibility of growing ornamentals does not exist (by planting them directly into the soil).

MATERIALS AND METHODS

The flowers used for decoration were taken from the Discipline of Floriculture from the Faculty of Horticulture and Forestry in Timisoara and the ceramics were bought from a company in Harghita county. When combining the plants and associating them we took into account the size of the pot, plant height, root system density, needs of light and water, flowering period, a.s.o.

Depending on those aspects, a series of arrangements has been done, as the following pictures show.

[1] Faculty of Horticulture and Forestry Timisoara

RESULTS AND DISCUSSIONS

Fig.1 – Combination of Clorophytum comossum, Begonia tuberhybrida, Verbena x hybrid

Fig.2 – Design with Impatiens waleriana, Ageratum mexicanum, Alyssum maritimum

Fig.3 – Combination of Pelargonium peltatum, Begonia semperflorens

Fig.4. – Design with Kalanchoe hybrida, Aloe arborescens, Crassula arborescens, Sedum origanum

Fig.5 – Combination of Petunia hybrida, Begonia semperflorens, Alyssum maritimum

Fig.6 – Design with Pelargonium zonale, Verbena x hybrida, Kalanchoe hybrida

Fig.7 – Combination of Coleus blumei, Begonia tuberhybrida, Crassula perforata, Portulaca grandiflora

Fig.8 – Design with Aeonium decorum, Kalanchoe hybrida, Ageratum mexicanum

CONCLUSIONS

For designing the pots, a vast number of species can be used: annuals, biennials and perennials. For the examples shown in the present paper we had focused on the use of annuals that decorate through flowers and leafs and some interior plants that can stay outside summertime: Clorophytum commosum, Hedera helix, Crassula arborescens, Crassula perforata, Saxifraga sarmentosa. Of the realized pots we consider that the best ones are Fig.1, Fig.2, Fig.5 and Fig.6, for the long period of flowering in summer.

The combinations Fig.3, Fig.4, Fig.7 and Fig.8 thrive best in full sun while Fig.1, Fig.2 and Fig.8 are the best for partial shade.

BIBLIOGRAPHY

1. Bala Maria – Floricultura generala si speciala, Ed. de Vest, 2007
2. Bala Maria, Iordanescu Olimpia Alina - Plante floricole utilizate in decorul spatiilor verzi, Ed. Eurobit, 2004
3. Courtier Jane– Gradinaritul in ghivece si cosuri suspendate, Ed. Aquila, 1993
4. Hessayon D.G. – Expert in amenajarea gradinii, Ed. ALL, 2005
5. Hessayon D.G.– Expert in vase cu flori, Ed. ALL, 2005

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

STUDIES CONCERNING THE EFFECT OF MULTIPLICATION METHODS UPON THE QUALITY OF BULBS AND CUT FLOWERS OF TUBEROSES

Fl. Toma, Sorina Petra[1]

KEY WORDS: multiplication, bulbs, cut flowers, quality, tuberose

SUMMARY

Our researches showed establish the effect of classical and modern methods of multiplication upon the quality of bulbs and cut flowers of tuberose. The experiences were initiated from bulbs of one population aboriginal from Bucharest area, very appreciated for it very intense perfume and the long duration of blossoming.

These bulbs were multiplied by classical method, to mean in field culture and, also, by modern method, to mean in vitro tissues.

The results of the researches show o positive influence of the in vitro multiplication upon the quality of bulbs and cut flowers of tuberose, the differences between variants being very significant.

INTRODUCTION

Aboriginal from Mexic, the tuberose (*Polyanthes tuberosa*) is one of the most important species from tropical and subtropical areas (Benschop, 1993). In France it is very cultivated for the perfumes industry but in Romania it is very appreciated like cut flowers (Toma, 1998). The major difficulty in the tuberose technology is the long duration (2-3 years) for production of flowers bulbs (Benschop, 1993; Selaru, 1994). The in vitro production of the planting was studied for most authors but without verifying the effects of this way of multiplication upon the growing and developments of plants in field (Corneanu, 1985).

The temperature of keeping the bulbs in the rest period can significant modify the percent of blossoming but the results of different authors are contradictory (Mukhopadhyay and Shadu, 1987; Shen T.M. and col., 1991, 1997). The aim of our researches was establish the best way of multiplication of tuberose for reduced the duration of flowers bulbs production and the obtained a superior quality of cut flowers; in realization of this aim the understanding of complex biology of tuberose plants was essential.

MATHERIALS AND METHODS

The biological material was represented by bulbs obtained in vitro and in field, bulbs belong to an aboriginal population at Bucharest area. We used bulbs with three different diameter size and two multiplication category so that the experimental scheme included six variants (table 1).

[1] USAMV Bucharest, Faculty of Horticulture

The bulbs from in vitro category with 1 cm diameter were obtained at the final stage of the acclimatization of plants multiplied in vitro; after this stage, the plants were planted in pots with 10 cm diameter, in substrate composed from peat and manure (1:1). In the pots the plants were growing three months before installing the rest period, when each plants had bulbs about 1 cm diameter.

Table 1

The experimental variants

Variant	Diameter size of the bulbs (cm)	The method of bulbs multiplication
V 1	1	field
V 2	1	vitro
V 3	2	field
V 4	2	vitro
V 5	> 3	field
V 6	< 3	vitro

The bulbs from in vitro category with 2 and > 3 cm diameter were taken from plants regenerated from bulbs obtained in vitro with one year ago and cultivated one vegetation period in field.

All the bulbs were keeping in the rest period in glasshouses with 20-22 °C the temperature and 70-80 % the relative humidity.

The planting of the bulbs in the field were made in 20 April, 140 bulbs (4 repetition with 35 bulbs) for each variant.

We made the following observation: the number and the length of leaves, the percent of plants blossomed, the length of the flowers stems, the length of the inflorescences, the number of the flowers in inflorescences, the number and the weight of the bulbs at the final of the rest period.

RESULTS AND DISCUSIONS

The start of bulbs vegetation was realized so lent, that being finalized after five weeks after the planting of the bulbs. First time starting in vegetation the small bulbs and the last time the big bulbs.

After the finalization of the starting in vegetation of the bulbs, the growing of the plants was very intense; the best values of the growing were observed at the plants regenerated from bulbs from in vitro category and at the plants regenerated from the big bulbs (table 2).

Table 2

The dynamics and the variation of the plants growing

Var.	The leaves number				The length of leaves (cm)			
	June	July	August	Sept.	June	July	August	Sept.
V 1	4,1	13,8	25,2	31,4	8,42	20,72	26,24	27,12
V 2	6,2	31,4	52,7	63,5	10,20	34,57	40,10	43,12
V 3	6,3	16,4	30,7	36,2	9,10	20,24	27,48	28,12
V 4	9,1	20,2	40,3	46,5	9,57	27,35	31,25	33,27
V 5	7,5	18,9	32,5	41,6	10,20	22,70	31,72	33,20
V 6	10,8	25,7	51,5	58,4	10,90	28,70	37,30	37,97

We observed that the more intense rhythm of the plants growing was registered in July and August, months when take place the most important phases of vegetation period (the growth of number and length of leaves, the both and the growth of new bulbs, the flower induction and the growth of the flowers, fig. 1-2).

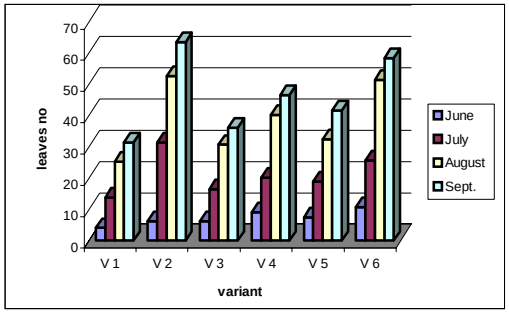


Fig. 1. The variation leaves number

Fig. 2. The aspects of the new bulbs in August

Concerning the percent of plants blossoming we observed that the best values were registered at the variant V6, with plants regenerated from bulbs with > 3 cm diameter from in vitro category (table 3).

Table 3

The variation of plants blossoming and the quality of the flowers

Var.	Plants with flowers (%)			The length of flowers stems (cm)			The length of inflorescences (cm)		
	VII	VIII	IX	VII	VIII	IX	VII	VIII	IX
V 1	-	-	-	-	-	-	-	-	-
V 2	-	-	-	-	-	-	-	-	-
V 3	0,00	7,14	15,71	0,0	42,8	68,7	0,0	5,4	18,3
V 4	21,42	37,14	41,42	10,7	48,5	93,7	1,0	10,4	25,3
V 5	31,42	47,14	47,14	11,9	67,2	97,5	0,8	12,0	29,4
V 6	88,57	94,28	100,00	18,5	81,3	115,4	2,1	20,4	38,4

We, also, observed from table 3, that at the same category of diameter of the bulbs, the plants regenerated from bulbs multiplied in field the values of plants blossoming were with about 50 % more small (fig. 3.).

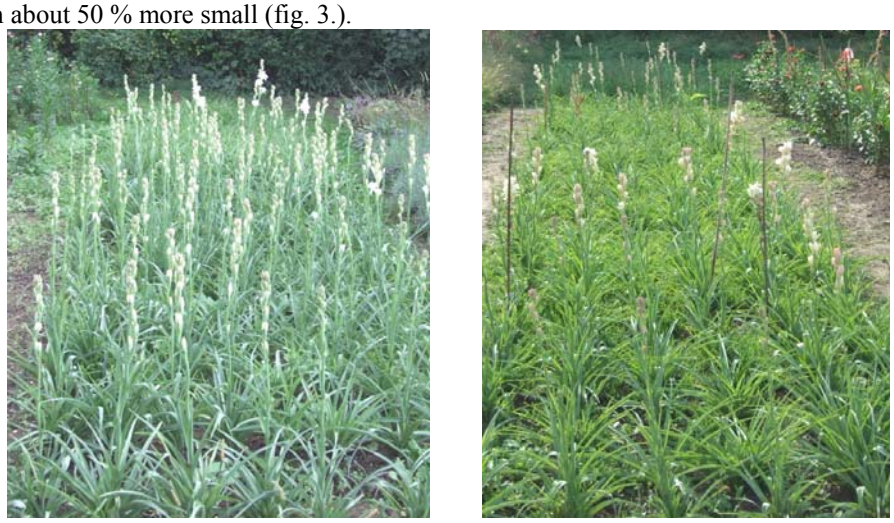


Fig. 3. The differences between variants V 6 (left) and V5 (right) concerning the percent of plants with flowers

The effects of the methods of multiplication were also observed in the number and the quality of bulbs produced by the plants. The observations made at the final of the rest period show that 90 % from plants regenerated from bulbs with 1 cm diameter from in vitro category produced flowers bulbs while the bulbs of the same size but from in field category not produced flowers bulbs in the first year (table 4.).

Table 4

The variation of number and weight of bulbs

Var.	No. of bulbs from category:				The weight of bulbs from category: (g)			
	I	II	III	IV	I	II	III	IV
V 1	0,00	0,10	3,9	9,8	-	20,00	4,80	2,74
V 2	0,90	0,10	3,4	14,2	51,00	30,00	9,50	3,36
V 3	0,35	0,05	5,3	12,0	53,40	27,50	9,24	2,7
V 4	0,50	0,25	2,5	4,3	38,30	23,00	4,45	2,84
V 5	0,00	0,20	7,4	12,4	55,00	31,60	9,85	2,84
V 6	0,25	0,40	3,8	12,4	38,40	26,80	6,80	2,34

Also, it is very imported to observe that the plants which flowered produced flowers bulbs for the next year only at the variants with plants regenerated from bulbs from in vitro category but in a small percent (fig. 4-6).

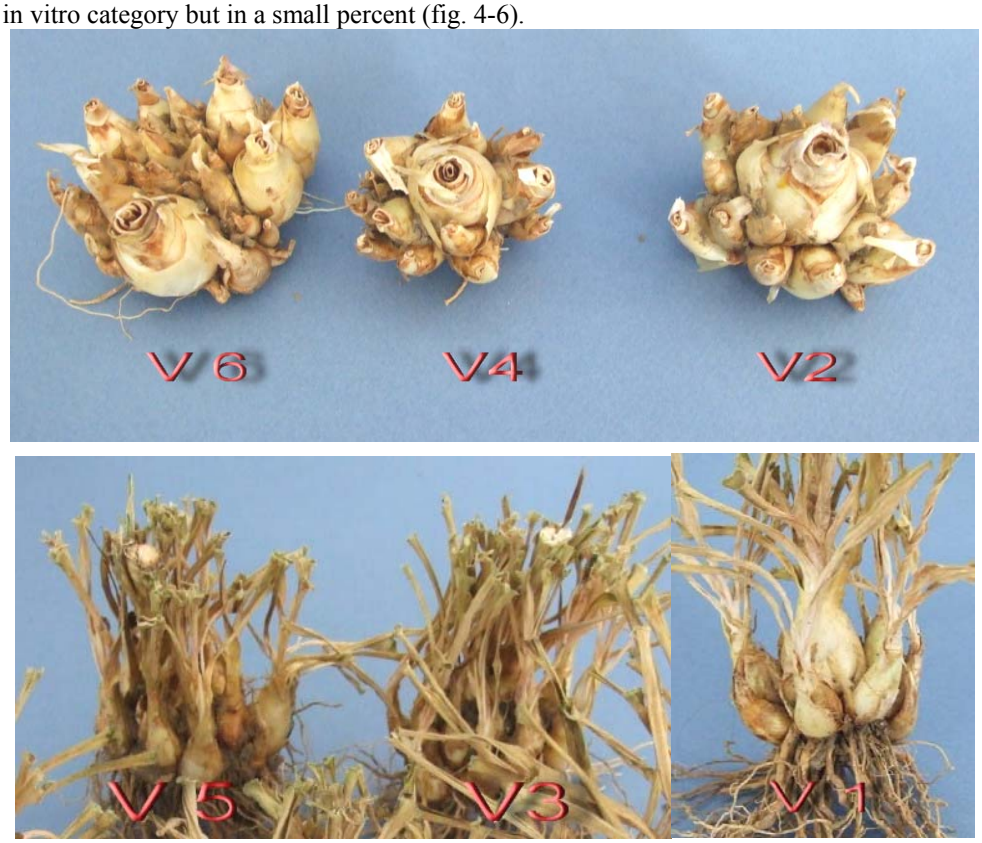


Fig. 4. The differences between variants concerning the number and the quality of bulbs produced for the plants

Fig. 5. The aspect of the flowers bulbs produced by plants from variants V 1

Fig. 6. The total bulbs produced by one plants from variants V 1

CONCLUSIONS

Because of the long period for flowers bulbs production, the method of multiplication is very important for tuberose.

The in vitro multiplication shorted the period of flowers bulbs production at only one year comparatively with three years which are necessary for the multiplication in field.

The percent of plants flowered is, also, superior at the plants regenerated from bulbs from in vitro category, no only for the variant with bulbs of > 3 cm diameter but also for the variant with bulbs of 2 cm diameter.

Normally, the plants which are flowered no produce the flowers bulbs for the next years; but, at the plants regenerated for bulbs obtained in vitro we observed some exception and the quality of the bulbs are very good.

BIBLIOGRAPHY

1. Benschop, M. 1993. Polianthes. p. 589-601. In: A.A. De Hertogh and M. Le Nard (eds.),The Physiology of Flower Bulbs., Elsevier, Amsterdam.
2. Corneanu, G. – Preliminary results concerning the in vitro multiplication of Polyanthes tuberosa L. The 3 th National Conference of tissues and cellules culture, Bucharest, 1985.
3. Mukhopadhyay, A. and Sadhu, M.K., 1987. Growth and flowering responses of Polyanthes tuberosa L. to storage temperature and duration of treatments. Herbertia, 43 : 30-32
4. Shen, T.M., Shen, R.S. and Huang, K.L. 1991. Study on the flower bud development and the regulation of the flowering of tuberose (*Polianthes tuberosa* L.). J. Chinese Soc. Hort. Sci. 37:10-20.
5. Shen, T.M., Huang, T.S., Huang, K.L., Shen, R.S. and Du, B.S. 1997. Breeding for new flower colors in *Polianthes tuberosa*. J. Chinese Soc. Hort. Sci. 43:358-367.
6. Şelaru, E., Sigmond, E., 1994. Studii cu privire la morfogeneza bulbilor şi a florilor de tuberoze. Simpozion cu ocazia aniversării a 125 de ani de învăţământ superior agronomic la Cluj-Napoca, 20 - 22 X : 111.
7. Toma, Fl. – Contribution upon the study of the biology and technology of Polyanthes tuberosa L. PhD Thesis, USAMV Bucharest, 1998.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

THE INFLUENCE OF SOME PRESERVATIVE PRODUCTS ON THE VASE LIFE AT SOME FLOWER SPECIES

Manda Manuela, Nicu Carmen, Anton Doina[1]

KEY WORDS: Freesia, Dahlia, Aquilegia, vase life, preservative solutions

ABSTRACT

The maintenance of the quality of the cut flowers is influenced by a lot of factors: the species and the cultivar, the culture conditions, the moment and the harvesting's technique, the conditioning and the preservation conditions.

This paper has as a purpose the testing of some preservative substances with a view to the extending of the duration of maintenance as fresh cut flowers at Dahlia, Freesia and Aquilegia.

The best results from this point of view were obtained at the preservative product. Fresh for all the analyzed species, and the application of Bionat product in different concentrations influenced differently the vase life duration of the flowers depending on the species: at Dahlia the best results were obtained at 3% concentration, and at Freesia and Aquilegia were obtained good results at a concentration of 5%.

INTRODUCTION

The duration of maintenance of the cut flowers quality refers, on one hand, at the life prolongation of the flowers used for apartments' decorations, and on the other hand, at the maintenance in some special conditions of the flowers obtained in high periods of the production, but with a slow sale rhythm

The decoration period of the cut flowers can be prolongated by: the application of some special treatments, depending on the species, the use of some preservative solutions and by maintenance at low temperatures. The preservative solutions are used a lot in the big producing or consuming of flowers countries for quality maintenance or for the prolongation of the decorative life of the flowers and implicit for the diminishing the loss of the cut flowers. The researches that we have made have as a purpose the study of the influence of some preservative products on the flowers vase life maintenance at some flower species cultivated in field or in greenhouses, used more or less as cut flowers.

MATERIAL AND METHODS

The researches concerning the influence of some preservative products on the duration of maintenance of cut flowers were made in the 2007–2008 at three flower species used as fresh cut flowers (*Freesia, Dahlia, Aquilegia*).

[1] University of Craiova, Horticulture Faculty

The analyzed vegetal material partially comes from the existent collection of plants in the didactic field of Floriculture discipline (*Dahlia x hortensis* Guillaumin, *Aquilegia vulgaris L.*), the flowers of *Freesia hybrida* Hort. "Maximaal" have been procured from commerce.

For the establishment of the duration of maintenance of the cut flowers at the three analyzed species there were used two products: a specific preservative product from the commerce (Fresh) and a foliar fertilizer also recommended for the maintenance of the cut flowers (Bionat), tested in three concentration (2%, 3% and 5%). The experimental variants which had resulted were: Variant 1 - Bionat 2 %; Variant 2 - Bionat 3 %; Variant 3 - Bionat 5 %; Variant 4 – Fresh product; Variant 5 (control) - simple water.

The flowers were kept in the same quantity of water (1 l), and at every two days the water was changed, respectively the preservative solution; once with the refresh of the water it was made the cutting of 2 cm from the floral stem, and the section of the stems was made under water. The temperature was maintained at a constant level during the whole period of experimenting of the duration of flowers' maintenance.

RESULTS AND DISCUSSIONS

Analyzing the diagram concerning opening degree of the *Freesia hybrida 'Maximaal'* flowers, it can be seen a significant difference at the variants where the flowers were kept in preservative solutions, in comparison with the control.

The optimum moment of harvesting at *Freesia* is the phase of coloured flower bud. By applying the preservative products, flowers' opening was held up at V3 - Bionat 5% and V4 - Fresh, and the other two treated variants (V1 - Bionat 2% and V2 - Bionat 3%) registered the same number of opened flowers, as the control (chart. 1).

The first faded flowers appeared at V1 - Bionat 2% and V2 - Bionat 3%, yet from the forth day, when at V3 - Bionat 5% and V4 - Fresh, not all the flowers in inflorescences were opened (chart. 2).

The duration of maintenance of the flowers was between 6 days at V1 - Bionat 2% and 10 days at V4 - Fresh, and at the untreated control (V5) the period of decoration was of 8 days.

At *Dahlia* for the appraisal of the time of maintenance there was registered only the number of faded flowers, because the optimum moment of harvesting is the complete opened inflorescence (chart. 3).

The best results under the duration of maintenance aspect were obtained at V2 - Bionat 3% (12 days) and V4 - Fresh (13 days).

The use of Bionat product in different concentrations influenced the duration of maintenance of the flowers so:

- in a concentration of 5% it determined a diminishing of a day of the decorative period than at V5 - control;
- in a concentration of 3% it determined an prolongation with 4 days of the duration of maintenance;
- in a concentration of 2% it didn't influence the duration of maintenance of the flowers, the values being the same with V5 - control.

The duration of maintenance was between 7 days (V3-Bionat 5%) and 12 days (V4-Fresh), 8 days at V5 - control and V1-Bionat 2%.

Aquilegia vulgaris is a rustic, perennial plant, being used for the decoration of green spaces and less as a cut flower, having a shorter duration of maintenance (4-5 days). The optimum moment of harvesting is when half of the flowers are opened.

The duration of maintenance was between 1 day at V1 - Bionat 2% and 5 days at V4 - Fresh. In comparison with the untreated control (V5 - 3 days) the period of decoration was prolongated with two days when it was used Fresh product (V4) and with one day when it was used Bionat product 5% (V3) (chart. 4).

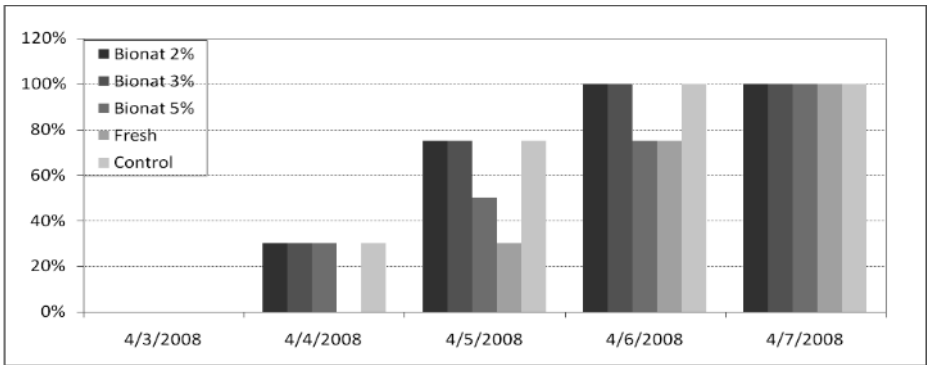


Chart 1. The opening percentage of flowers at *Freesia hybrida 'Maximaal'* depending on the preservative solutions used

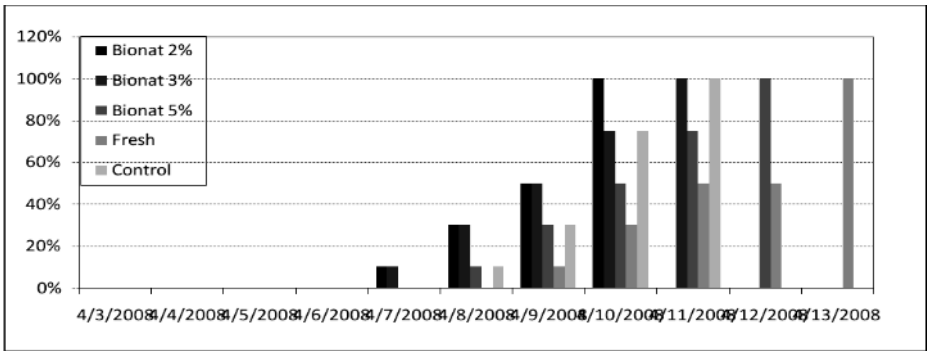


Chart 2. The fading percentage of flowers at *Freesia hybrida 'Maximaal'* depending on the preservative solutions used

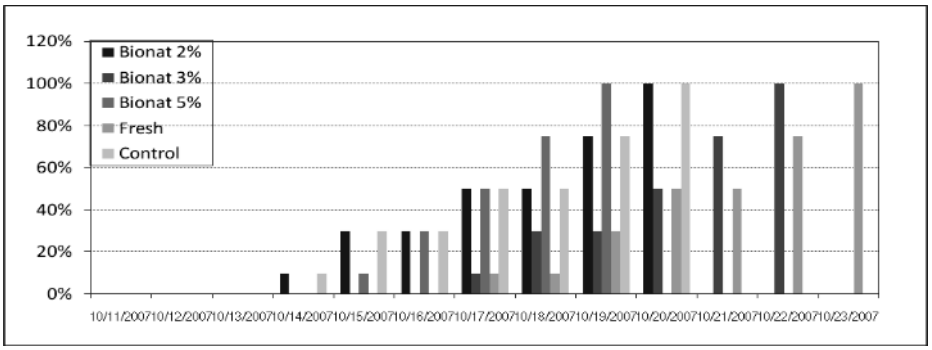


Chart 3. The fading percentage of flowers at *Dahlia x hortensis* depending on the preservative solutions used

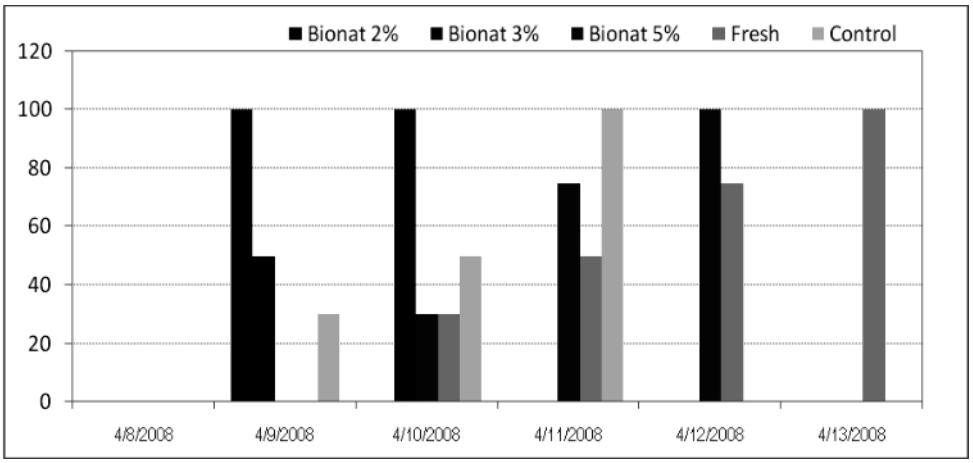


Chart 4. The fading percentage of flowers at *Aquilegia vulgaris* depending on the preservative solutions used

CONCLUSIONS

1. The preservative solutions that we used in the three experiments differently influenced the duration of maintenance of the cut flowers in a fresh condition at D*ahlia*, *Freesia* and *Aquilegia.*

2. The best results from this point of view were obtained at Fresh product, for all the analyzed species.

3. The application of Bionat product in different concentrations directly influenced the duration of maintenance of the flowers, depending on the species: at *Dahlia* the best results were obtained at a 3% concentration, and at *Freesia* and *Aquilegia* there were obtained good results at a concentration of 5%.

4. At *Dahlia* the worst results were obtained for Bionat 5%, and at *Freesia* and *Aquilegia* the lowest duration of maintenance of the flowers was also registered at Bionat, but in a concentration of 2%.

REFERENCES

1. Amariutei Alexandrina - Pastrarea florilor taiate. Editura Ceres Bucuresti, 1987.
2. Anton Doina - Floricultura generala. Ed. Universitaria, Craiova, 2003.
3. Anton Doina, Nicu Carmen, Manda Manuela - Floricultura speciala. Vol..II. Ed. Universitaria, Craiova, 2007.
4. Devecchi M. - Post-harvest physiology of cut flowers of sunflowers ‘Sunrich Orange' (*Helianthus annuus*): first experimental results. ISHS Acta Horticulturae 669: VIII International Symposium on Postharvest Physiology of Ornamental Plants, 2005.
5. Jowkar M.M., H. Salehi - Effects of different preservative solutions on the vase life of cut tuberose flowers at usual home conditions. ISHS Acta Horticulturae 669: VIII International Symposium on Postharvest Physiology of Ornamental Plants, 2005.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

THE INFLUENCE OF THE FOLIAR FERTILIZERS APPLIED ON THE STRAWBERRY LEAVES' CONTENT IN THE MAIN MINERAL ELEMENTS

Manda Manuela[1], Pavel Stefan[2], Ionescu Corina[3]

KEY WORDS: Fragaria sp., leaf fertilizing, dry substances, macro and microelements

ABSTRACT

The objectives of this experiment were: to improve the fertilization scheme of the strawberry plants and the limitation of the chemical pollution effects on the environment by using some autochthonous or imported foliar products, some of them being recommended as biological products (Crompax, Bionat N, Bionat E).

For solving the suggested aims, there were made phenological analysis, biometrical measurements, determinations of the number of flowers/plant, of the percent of bound fruits, the production/ha, and the quality values of the production, the economical efficiency, but also the foliar diagnosis analysis, whose results are presented in this paper.

The results obtained show that all the fertilized variants had increased the accumulation on dry substances, comparatively with control, as well as the contents of strawberry plant leaf in the macro and microelements.

INTRODUCTION

General fertilizer recommendations for strawberry (Fragaria sp.) are difficult to make because the cropping character varies markedly between regions. The leaf fertilizing has a big advantage that gives macro and microelements for strawberry plants, when that has many need.

In this study we used foliar products and fertilostimulators recently created in our country or abroad(which were not tested for the strawberry plant culture), together with older and more consecrated products. Morever, a part from the experimental products are recommended as biological products (Cropmax, Bionat N, Bionat E).

MATERIAL AND METHODS

The leaves have a major role for the fruits production, because they collect both nourishing elements from the soil and reticence absorbants, before the forming and the development of the fruits. An important nutritive substances transfer from the leaves to the fruits appears immediately after the forming of the fruits, until they reach maturity. The impoverishment process of the leaves also continues after this phenologic stage, the nitrogen and other nutritive elements from the leaves migrating as the synthesized carbohydrates in the lower organs of stocking these substances.

[1] University of Craiova, Faculty of Horticulture
[2] Office of Soil Science and Agrochemical Studies - Dolj, Craiova
[3] Vocational High School "Charles Laugier", Craiova

The fruits content in the main mineral elements was analysed after each of the three applied treatments, by harvesting mature leaves (without a petiole) at about 10-14 days after each aspersion. In order to make an interpretation of the results, there were used the dates from the table 1, which represents a synthesis after more authots.

Limits of interpretation on the content of strawberry leaves macroelements (synthesis by several authors)

Table 1

	Period analyzes	N %	P %	K %	Ca %	Mg %	Authors
optimum		2,6-3,5	0,25-0,35	1,0-2,0	0,7-1,5	0,25-0,40	Geoff Langford – 1996; RJ Hill Laboratories – 2002
defficiency		<2	<0.20	<1,0	<0,5	<0,10	
optimum		2,0-3,0	0,20-0,50	1,5-2,5	0,5-1,5	0,25-0,50	Cline R.A. and col.-1990
optimum	maximum flowering-protected culture (25-35 t/ha)	2,07-3,04	0,20-0,38	1,84-2,21	0,77-1,48	0,25-0,70	Almaliotis D., and col. - 2002
optimum	maximum flowering	1,8-3,0	0,20-0,30	1,2-2,0	0,5-1,0	0,25-0,35	Strawberry fertilizer recommendations for the Atlantic provinces-2000
optimum	beginning vegetation period	3,0-3,5	0,2-0,4	1,5-2,5	0,4-1,5	0,25-0,5	Maynard D.N.,-2002
optimum	annual culture	3,0-4,0	0,2-0,4	1,5-2,5	0,5-1,5	0,25-0,45	Campbell C.R.-2001
optimum	maximum flowering	2,3-3,0	-	-	-	-	Diaconeasa M. şi colab.- 2003
optimum	fruit maturation stage	1,6-2,3	-	-	-	-	
optimum		3,0-3,2	0,7-1,0	1,65	-	-	Mirela Iliescu-2003

RESULTS AND DISCUTIONS

Analyzing chart 1, it can be seen that after the first foliar treatment the rythm of accumulation of dry substances in leaves reached values between 35,80% (V4-Bionat E) and 36,73 (V5-Cropmax) towards the untreated variant (35,38%).

At the second application, as a white bud stage, we can see that the rythm of accumulation of the dry substance started to diminish (34,39 - 35,92%) by comparison with the first treatment (fig. 3.44).

At the last determination, made 14 days after the second treatment, the accumulations of dry substance in the leaves reached lower values than the ones obtained at the second application. These were between 33, 28% at the control and 36, 06% at V1-Greenzet. By analyzing the average values for the 3 years of experimentation, it results that the highest content in dry substance is for V1-Greenzet (36,19%), followed closely by V5-Cropmax (36,14 %). (tab. 3.45). Concerning the average leaves' content in nitrogen, it varries after the first application, between 2,57 % at V4-Bionat E and 3,07 % at V2-F411+F231, the registered values being higher than the untreated control (V6-2,55 %).

An optimum content of nitrogen (2, 6-3, 5% - according to Geoff Langford – 1996; RJ Hill Laboratories – 2002) can be seen at all the fertilized variants, excepting the one treated with the biological product Bionat E (V4). (tab. 3.43)

After the second application of the foliar fertilizer, in the phase of a white button, it is registerred a lowering of the leaves' content in nitrogen, than at the first evaluation, at all the variants. The foliar products used on leaves caused the maintaining of a higher level of nitrogen in leaves, between 2,32 % (V4) and 2,77% (V2) than the control (2,19%), only V2 and V5 (fig 3.45) maintaining in optimum limits.

As V. Davidescu-1972 said, the absorbtion capacity of the nitrogen is decreasing as the leaves are getting older. From the results of the tests that were made after the third aplication on the leaves, results that the level of nitrogen from the leaves continued to

decrease reaching values between 2,07% (V4) and 2,37% (V5), but it maintained at a higher level than at the control (1,95%), even if it was under the optimum limit of supplying previously mentioned.

According to Diaconeasa M and col., 2003 the normal content of nitrogen in the srawberry plant leaves is of 2,3-3,0% in the highest flowering cycle and of 1,6-2,3% in the fruits's maturation cycle. Refering to these values it can be said that supplying the plats with nitrogen was an optimum decision both after the second and the third treatment.

Regarding the leaves' content of phosphorus, all the studied variants registerred higher values than the optimum interval specified in the expert literature(0,25-0,35%)-tab.3.46. If we ascribe the obtained values to the optimum level of 0,7-1% established by Iliescu M.-2003, these are under the mentioned level, although making a correlation with the obtained productions, the best results were obtained at a phosphorus contain of 0,4-0,42ppm.

To the untreated plant (0,38 %, 0,30% and 0,27 %), all the foliar fertilized variants presented higher values, between 0,45-0,56% after the first treatment, 0,36-0,46% after the second treatment and 0,31-0,41% after the last treatment (tab. 3.43)

Following the evolution of the accumulation of phosphorus in leaves, it was registered a decrease from the first to the last foliar application for all the variants. The highest level of phosphorus in the leaves was registered at V2 (0,48%).(fig. 3.46)

The leaves' content in potassium presented a similar evolution as the nitrogen and the phosphorus – it decreased from the first to the third treatment, but in contrast with these, it maintained itself to an optimum level, between 1,0-2,0%, including the control (tab.3.43,fig.3.47). If we report the obtained values at an optimum interval of 1,5-2%, mentioned by Diaconeasa M. - 2003, after the first foliar application, all the fertilized variants are situated in this interval; after the second determination, only V4 and V5 are situated on this optimum, and after the third treatment all the variants descend under these limits concerning the leaves' content in potassium.

Comparing the potassium accumulations in leaves at the fertilized variants (1,61-1,67 % after the first treatment, 1,44 - 1,55 % after the second treatment, 1,36 -1,4 % from SUT after the last treatment), having as a content V6 (1,34 %, 1,29 % and 1,22 % from SUT), it can be observed that these are higher at all the variant which have been foliar treated.

The highest average content of the leaves in potassium was registered at V4 – Bionat E (1,54 % from DS), followed by V5-Cropmax (1,53 % from DS), but very close values were presented by the other fertilized variants.

The determination of the leaves' calcium content shows a weak supply of the plants with this element, under the inferior limit of the optimum level (0,7-1,5 %) during the whole period of vegetation, excepting the values registered at V1,V2 and V3 (over 0,7%) after the first treatment.

As we can see in chart 5, all the foliar fertilized variants had a higher average content of calcium, in comparison with the control (0,54), which is between 0,58-0,68% from SUT. V4-Bionat E was an exception, which has registered, in all the three moments of the foliar diagnosis, smaller values than the control. The highest average level of the leaves' content in calcium is for V1-Greenzet (0,68% from DS) and V3-Bionat N (0,65% from SUT). The evolution of the strawberry plant leaves' content in calcium, from the first to the last treatment, shows a drastic lowering of it, at all the studied variants.

On poor magnesium supplied soil, by applying the foliar fertilizers, not even the strawberry plant leaves' content in this element maintained at an optimum level during the flowering and the maturation of the fruits.

After the first treatment, at all the fertilized variants it was seen an optimum supply of magnesium (over 0,25 %), having values between 0,28%-0,32%, than the unfertilized control (0,24 % from SUT). (fig. 3.49). On the other hand, the analysis that we made after the second treatment showed an optimum leaves' content only for V3-Bionat N and V5-Cropmax (0,27 % from SUT), and two weeks after the third treatment (at the beginning of the maturation of the fruits) it was registered a lowering, under the optimum interval of the leaves' content in magnesium, at all the variants.

Concerning plants' supply with magnesium, we can however observe V3 and V5, where it was registered an optimum average content, higher than at the other studied variants, of 0,26%. Following the evolution on years of the leaves' content in magnesium (tab.3.43), we can ascertain that the highest values were registered in the first year of gathering -2003.

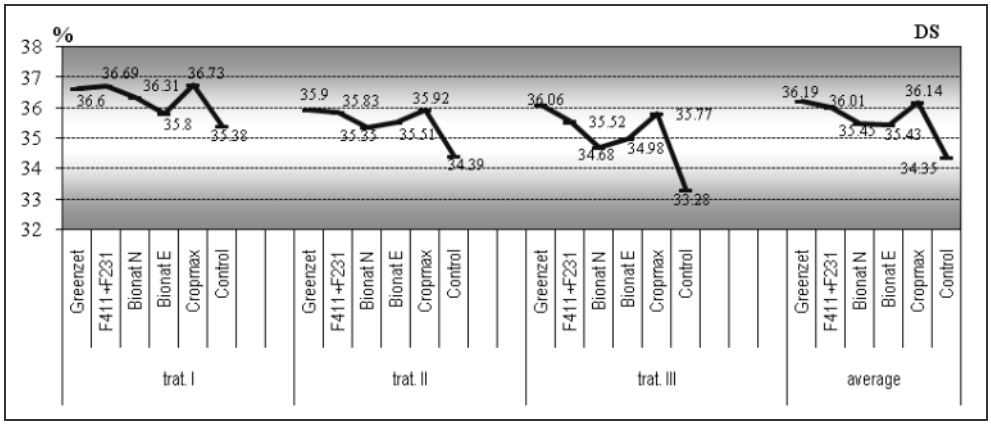


Chart 1: The influence of the foliar fertilizers applied to the evolution of the strawberry plant leaves' content in DS (%)

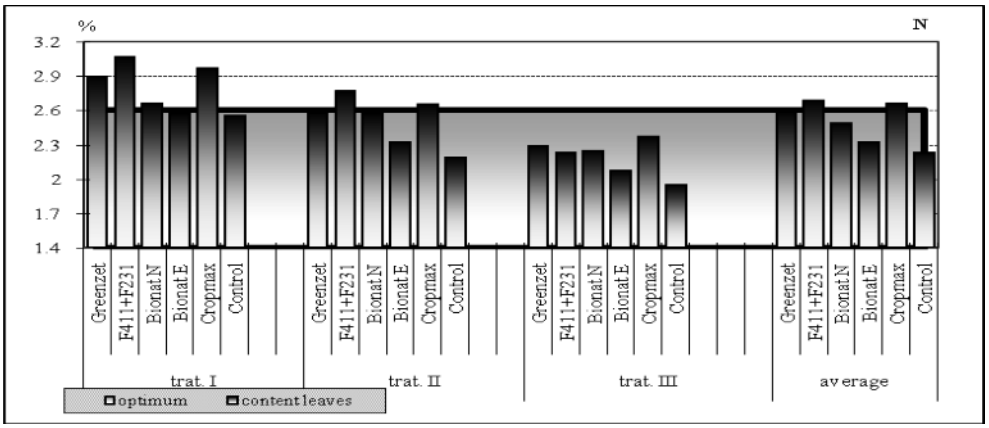


Chart 2: The influence of the foliar fertilizers applied to the evolution of the strawberry plants leaves' content in nitrogen (% from DS)

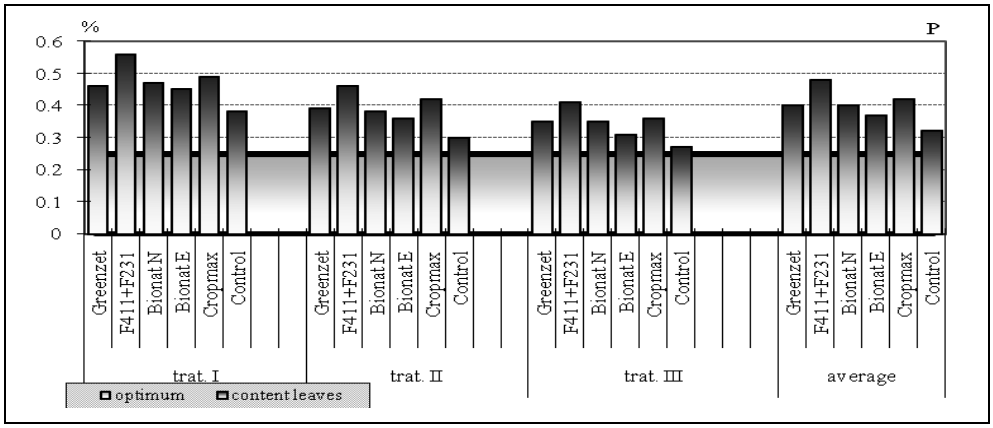


Chart 3: The influence of the foliar fertilizers applied to the evolution of the strawberry plants leaves' content in phosphorus(% from DS)

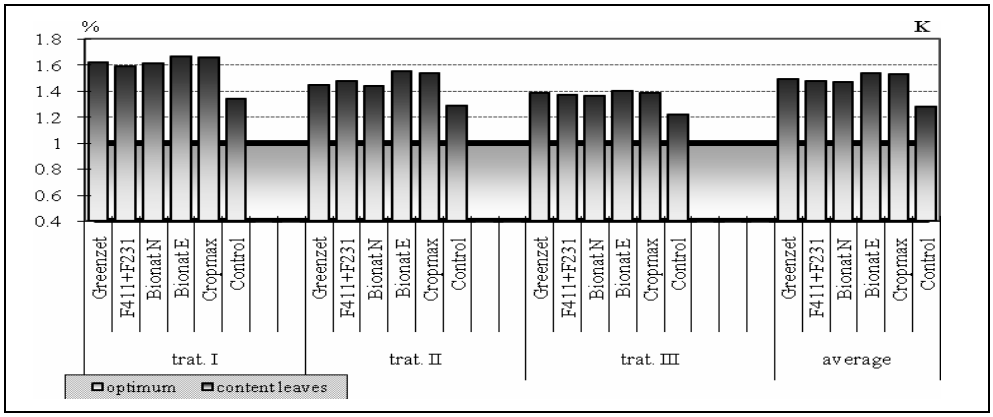


Chart 4: The influence of the foliar fertilizers applied to the evolution of the strawberry plants leaves' content in potassium(% from DS)

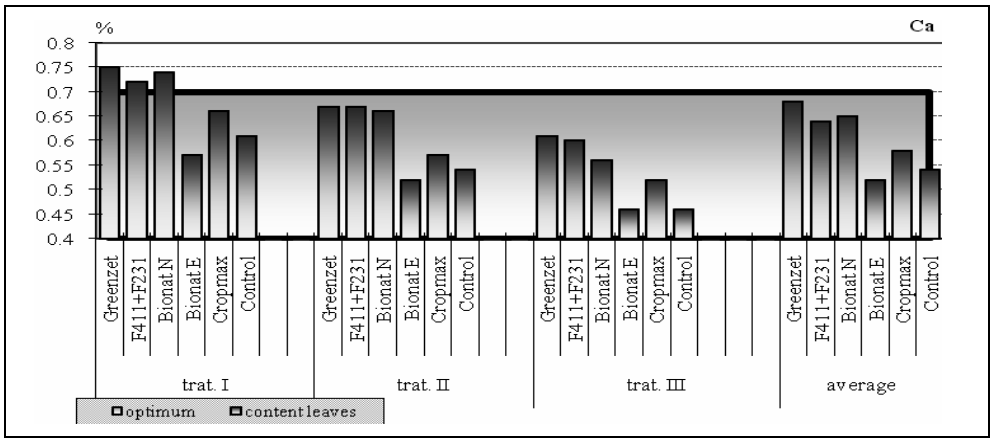


Chart 5: The influence of the foliar fertilizers applied to the evolution of the strawberry plants leaves' content in calcium(% from DS)

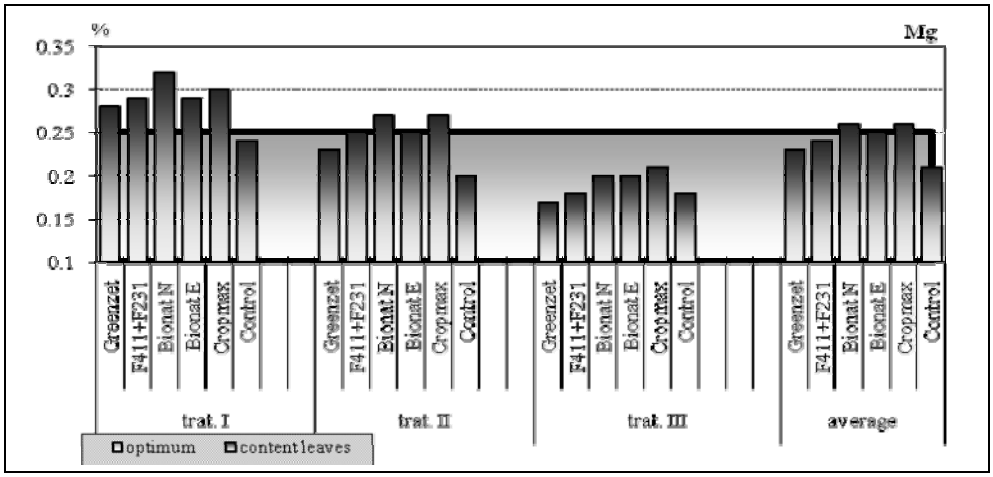


Chart 6: The influence of the foliar fertilizers applied to the evolution of the strawberry plants leaves' content in magnesium (% from DS)

CONCLUSIONS

1. By analysing the average values for the 3 years of experimentation, it results that the highest content in dry substance is for V1-Greenzet, followed closely by V5-Cropmax.
2. The level of nitrogen from the leaves continued to decrease reaching values between 2,07% (V4) and 2,37% (V5), but it maintained at a higher level than at the control (1,95%), even if it was under the optimum limit of supplying previously mentioned.
3. Following the evolution of the accumulation of phosphorus in leaves, it was registered a decrease from the first to the last foliar application for all the variants. The highest level of phosphorus in the leaves was registered at V2 (0,48%).
4. The highest average content of the leaves in potassium was registered at V4 – Bionat E (1,54 % from SUT), followed by V5-Cropmax (1,53 % from SUT), but very close values were presented by the other fertilized variants.
5. All the foliar fertilized variants had a higher average content of calcium, in comparison with the control (0,54 %), which is between 0,58-0,68 % from SUT. The evolution of the strawberry plant leaves' content in calcium, from the first to the last treatment, shows a drastic lowering of it, at all the studied variants.
6. Concerning plants' supply with magnesium, we can however observe V3 and V5, where it was registered an optimum average content, higher than at the other studied variants.

REFERENCES

1. Davidescu D., Davidescu Velicica,1972 - „Testarea stării de fertilitate prin plantă şi sol", Ed. Academiei Republicii Socialiste România.
2. Davidescu D., Davidescu Velicica, 1999 – „Compendium agrochimic". Ed. Acad.
3. Diaconeasa M., Baciu A., Iliescu M., 2003 – „Cultura Căpşunului", Ed. Mihai Duțescu.
4. Haynes R.J., Goh K.M., 1987 – Effects if nitrogen and potassium applications on strawberry growth, yield and quality. Soil Science and Plant Analysis. 18 (4): 457-471

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

MORPHOLOGY AND PHYSIOLOGY ASPECTS TO SOME NEW VARIETIES OF FREESIA CULTIVATED IN A MODERN GREENHOUSE AT THE DIDACTIC BASE OF THE FACULTY OF HORTICULTURE AND FORESTRY IN TIMISOARA

Berecici Daniel Nicola, Bala Maria[1]

KEY WORDS: Freesia, greenhouse, variety, aspects, flowering

ABSTRACT

Freesia is one of the most appreciate cultivated flowers because of the beauty and perfume of the flowers as well as it's long period of maintainance in vase. The experience has been placed in a greenhouse at the Didactic Base of the Faculty of Horticulture and Forestry in Timisoara and it was constituted of 20 new varieties of Freesia. The followed aspects were: plant height, number of ramifications, number of flower stems per plant, stem length, stem length to the first ramification, plant height to the apparition of the floral stem. The results show that the varieties developed different characters on plant height, stem length, number of stems per plant also on the length of the blooming period.

INTRODUCTION

The introduction in culture of a greater number of new Freesia varieties had a big impact on the diversity of Freesia genus and species, so that in present the diversity of colors is huge. It is important to keep the valorous varieties looking on the aspect of floral stem production on unit area, of those that do not present floral deficiency(gladiolus type inflorescence), of those that do have a greater number of floral buds in inflorescence, of those with a larger flowering period and of course of those that have a good resistance to viruses. Also, for bigger productions on unit area, it is important to treat the bulbs with heat when keeping them in summer and before planting to treat them against diseases. It is also important that while the plants vegetate to eliminate plants attacked by viruses and burn them to avoid spreading the viruses in culture and premature degeneration of the seeding material.

MATERIALS AND METHODS

The biological material has been constituted of 5 new Freesia varieties: Albatros (white), Pink Fountain (pink), Figaro (red), Medeo (white) and Mosella (light pink). The experience was placed in a modern greenhouse in which the vegetation factors can be directed through computer. For planting, certified material from Holland was used. The planting was done at the beginning of October 2008 using the classic planting scheme. By

[1] Faculty of Horticulture and Forestry Timisoara

eliminating margins, the four remaining rows of each variety has constituted a variant. Each variant had 20 plants taken in research so 80 plants each variety were followed through vegetation period. The experience was done on each variety individually being monofactoryal and the treatment of results was done by using variant analysis. The average of experience has served as witness on the statistic interpretation of results.

The followed aspects were: total plant height, stem length, plant height to the apparition of the floral stem, stem length to the first ramification, floral stem number per plant, number of ramification.

RESULTS AND DISCUSSIONS

Under aspect of floral stem number per plant the results are presented in Table1.

Table 1.

Floral stem number per plant

	V1	V2	V3	V4	Average	%	Diff.	Signif.
ALBATROS	1.2	1.1	1.1	1.1	1.13	92.02	-0.1	o
PINK FOUNTAIN	1.35	1.5	1.35	1.45	1.41	115.54	0.19	***
FIGARO	1.15	1.2	1.25	1.15	1.19	97.14	-0.04	
MEDEO	1.35	1.35	1.35	1.25	1.33	108.38	0.1	*
MOSELLA	1	1.1	1.1	1.05	1.06	86.91	-0.16	ooo
Average	1.21	1.25	1.23	1.2	1.22	100	0	Witness
sx	0.07	0.08	0.06	0.07	0.06			
s%	12.19	13.86	10.2	13.18	11.75			
DL 5% - 0.08			DL 1% - 0.11			DL 0.1% - 0.15		

From the interpretation of results it can be observed that Pink Fountain had the highest values while Mosella had the lowest values tor the same character. So, Pink Fountain was very significant positive to the witness while Mosella was very significant negative to the witness. In terms of total plant height (Table 2) we can remark that Albatros was very significant positive to the witness and Medeo was significant positive to the witness. Mosella, having the smallest values, was very significant negative to the witness and Pink Fountain was significant negative to the witness.

Table 2.

Total plant height

	V1	V2	V3	V4	Average	%	Diff.	Signif.
ALBATROS	85.9	84.5	90.45	91.8	88.16	112.61	9.88	***
PINK FOUNTAIN	76	74.55	71.9	74.05	74.13	94.68	-4.16	o
FIGARO	81.6	78.5	77.05	74.4	77.89	99.49	-0.4	
MEDEO	83	81.8	81.3	83.7	82.45	105.32	4.16	*
MOSELLA	68.65	67.25	69.75	69.6	68.81	87.9	-9.48	ooo
Average	79.03	77.32	78.09	78.71	78.29	100	0	Witness
sx	3.05	3.02	3.69	4	3.33			
s%	8.64	8.73	10.56	11.36	9.52			
DL 5% - 3.29			DL 1% - 4.56			DL 0.1% - 6.29		

In Table 3 I have noted the values for flower stem length of the varieties taken in research. Albatros, Pink Fountain and Mosella do not present significant differences to the witness. Medeo is significantly distinct positive to the witness and Figaro is significant negative to the witness.

Table 3.

Floral stem length

	V1	V2	V3	V4	Average	%	Diff.	Signif.
ALBATROS	42.65	45.9	46	50.3	46.21	104.71	2.08	
PINK FOUNTAIN	44.85	42.5	42.15	42.9	43.1	97.65	-1.04	
FIGARO	46.4	38.3	38.85	35.25	39.7	89.95	-4.44	o
MEDEO	51.35	49.8	50.9	52.95	51.25	116.12	7.12	**
MOSELLA	39.75	40.4	41.1	40.4	40.41	91.57	-3.72	
Average	45	43.38	43.8	44.36	44.13	100	0	Witness
sx	1.94	2.04	2.19	3.24	2.12			
s%	9.65	10.5	10.82	16.33	10.72			
DL 5% - 3.89			DL 1% - 5.38			DL 0.1 - 7.43		

Interpreting the results for plant height to the apparition of floral stem (Table 4) we can see that Albatros was very significant positive and Figaro significant positive to the witness. Mosella had the smallest values being very significant negative and Pink Fountain and Medeo significant negative to the witness.

Table 4.

Plant height to the apparition of floral stem

	V1	V2	V3	V4	Average	%	Diff.	Signif.
ALBATROS	43.25	38.6	44.45	41.5	41.95	123.12	7.88	***
PINK FOUNTAIN	31.15	31.55	29.25	31.15	30.78	90.32	-3.3	o
FIGARO	35.2	39.7	38.2	39.15	38.06	111.71	3.99	**
MEDEO	31.65	32	30.35	30.7	31.18	91.5	-2.9	o
MOSELLA	28.9	26.85	28.65	29.2	28.4	83.35	-5.67	ooo
Average	34.03	33.74	34.18	34.34	34.07	100	0	Witness
sx	2.52	2.39	3.09	2.49	2.54			
s%	16.54	15.85	20.23	16.23	16.69			
DL 5% - 2.42			DL1% - 3.36			DL0.1% - 4.63		

In appearance of the floral stem length to the first ramification (Table 5) the research has lead to the next conclusions. Medeo is very significant positive to the witness and Pink Fountain is significant positive to the witness. Figaro had the weakest results so it is very significant negative to the witness and Mosella is significantly distinct negative to the witness.

Table 5.

Floral stem length to the first ramification

	V1	V2	V3	V4	Average	%	Diff.	Signif.
ALBATROS	26.7	27.8	27.95	30.45	28.23	107.56	1.99	
PINK FOUNTAIN	31.15	30.45	26.85	27.1	28.89	110.09	2.65	*
FIGARO	22.15	21.25	21.25	20.05	21.18	80.7	-5.07	ooo
MEDEO	31.95	29.05	29.4	30.7	30.28	115.38	4.04	***
MOSELLA	22.3	23.85	22.55	21.85	22.64	86.27	-3.6	oo
Average	26.85	26.48	25.6	26.03	26.24	100	0	Witness
sx	2.09	1.71	1.58	2.19	1.81			
s%	17.4	14.43	13.78	18.79	15.46			
DL 5% - 2.05			DL 1% - 2.84			DL0.1% - 3.91		

Also to express better the high production potential of the Freesia varieties , I have noted data for the number of ramification on floral stem (Table 6). The statistic treatment of the data shows that Albatros was very significant positive and Figaro significant positive to the witness .Mosella and Medeo had recorded smaller values and were significantly distinct negative to the witness.

Table 6.

Number of ramification on floral stem

	V1	V2	V3	V4	Average	%	Diff.	Signif.
ALBATROS	3.7	3.95	3.55	4.13	3.83	126.07	0.79	***
PINK FOUNTAIN	2.8	2.55	3	2.8	2.79	91.69	-0.25	
FIGARO	3.45	3.5	3.45	3.05	3.36	110.61	0.32	*
MEDEO	2.4	2.6	2.7	2.7	2.6	85.53	-0.44	oo
MOSELLA	2.55	2.65	2.6	2.65	2.61	85.94	-0.43	oo
Average	2.98	3.05	3.06	3.07	3.04	100	0	Witness
sx	0.25	0.29	0.19	0.27	0.24			
s%	19.08	20.9	14.03	20.04	17.78			
DL5% - 0.27			DL 1% - 0.37			DL 0.1% - 0.51		

CONCLUSIONS

In terms of productivity that of the number of floral stems per plant the best results were obtained to Pink Fountain. Total plant height has recorded the greatest values to Albatros . Plant height to the apparition of the floral stem had the best results to Albatros. Floral stem length had the biggest values to Medeo. For floral stem length to the first ramification we conclude that Medeo had the best results. Finally, the total number of ramification per plant had good results to Albatros .Mosella and Figaro had the worst results for most of the characters.

BIBLIOGRAPHY

1. Anton Doina & colab., Floricultura speciala vol.2, Ed. Universitaria, 2007
2. Bala Maria, Floricultura generala si speciala, Ed. de Vest, 2007
3. Echim T.,Oprita V., Freesia, Ed. Ceres, 1975
4. Selaru Elena, Culturi pentru flori taiate, Ed. Ceres, 2007

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

IDENTIFICATION OF SPECIES WITH DECORATIVE VALUE IN SPONTANEOUS FLORA IN OLTENIA REGION

Mitroi Daniela, Anton Doina[1]

KEY WORDS: spontaneous flora, decorative plants, morphologic characteristics

ABSTRACT

Introduction of new decorative species in floriculture is highly important at global level. Spontaneous flora offers wide opportunities of selection in plants with decorative value and multiple applications. Straw flowers and decorative grasses have higth demand in floral art, during winter season, when assortment of fresh flowers is more limited. Under the name of straw flowers, which are named also immortelles, a group of floricultural plants is defined, whose cut flowers are skillfully dried and keepingtheir fresh quality for several months, without changing their form or losing their colour, owing to their stiff-straw like structure.

If among spontaneous plants with decorative value just only 10% are used to enhance assortment in green areas, this percentage would be sufficient to diversifying flower arrangements as well for remove monotonous scenery in parks, public gardens etc. This paper aims at outlining the importance of certain plants in spontaneous flora by using them as dried plants (winter arrangements).

INTRODUCTION

An important guideline in floriculture is diversification introducing new species and cultivars. Spontaneous flora is a source of plants with decorative qualities that can be cultivated in respect of ecology, in the individual gardens and green areas around houses in urban and rural areas, in parks etc. and which can stand and mitigate the toxic effects of pollution, like a filter in purifying atmosphere and reducing harmful agents in the air, soil and water. Of the 3298 spontaneous species existing in Romania's flora, more than 500 species can be used in green areas, along with plants already cultivated for decorative purpose (*Ciocarlan V., 2000*).

In USA the guidelines of biodiversity valorification are: new perennial decorative plants, for strength to pests, drought, stress by low temperatures; cultivars were and will be evaluated for early period performances, strength to climate accidents etc.; using potential for decorative purpose in relation to other use (cuisine, medicine, support to applying biologic farming, cosmetics etc.). Maloupa E., and collab. (2000) have studied growth and development of species issued by spontaneous flora (*Thymus mastichina, Lotus cytisoides, Lavandula stoechas, Centranthus ruber, Limonium sinense* and *Limonium pectinatum)* under different environment conditions, to define opportunities for using them as decorative plants in the exterior or interior scenery.

In Holland, every year, around 800-1000 new floricultural produce are homologated and introduced on market, but higher costs require their quite rigorous testing

[1] University of Craiova, Horticulture Faculty

of market (Noordegraaf C.V., 2000). Plummer A. and collab. (2000), launched on market a new floricultural species, cultivated for freshly cut flowers and leaves, by analysing several wild populations (forms) of *Geleznowia verrucosa,* which are different as regards germinative features, flower's size and colour, flowering period, plant's size and leave's colour. Time for keeping flowers and leaves in vase is about 10 days.

In Cyprus the potential of endemic species is studied (*Arabis purpurea, Centaurea akamantis, Onosma fruticasa, Origanum cordifolium, Ptilostemon chamaepeuce* and *Euphorbia veneris*), to be used in sustainable commercial floriculture (Chimonidou D. And colab., 2005).

In Greece, research activity in Floriculture sector within National Institute for Research in Agriculture is focused on collecting and preservation of spontaneous species with decorative features (*Centaurea huljakii, Digitalis* sp., *Scutellaria rubicunda, Teucrium chamaedrys)*. These are Mediterranean and Balkan species materialized through the newly established Balkan Botanic Garden of Kroussa (BBGK), (Johnston M.E., 2005).

In Israel large numbers of floricultural cultivated plants have their origin, especially geophytes. Introducing new species of decorative plants taken over from spontaneous flora continues to be a concern in research activity. A few examples of plants already introduced or ready to be introduced in culture are: geophytes: *Oncocyclus irises, Uriginea maritima, Scilla hyacinthoides*, annual: *Lupinus pilosus* and *Centraurea crocodylleum*; perennial herbaceous: *Eremostachys laciniata* and *Helichrysum sanguineum* (Halevy A.H., 2000)In Brazil were evaluated from decorative point of view new species in genus Tillandsia, (*T. dura, T. gardneri, T. geminiflora, T. stricta* si *T. Tenuifolia*) (Soares Payão Demattê M.E., 2005*).*

This paper aims at identifying and characterizing from morphological and decorative point of view, 8 species of plants in spontaneous flora in Oltenia region, plants with decorative potential that can be used on green areas with a role in improving the environment, and at the same time they can be used as dried plants during winter season, when the assortment of fresh flowers is limited.

MATERIAL AND METHODS

Plants (flowers and decorative grasses) of spontaneous flora in Oltenia region were taken under study, which comply with selection objectives: decorative appearance after drying up, colour, size and aspect of decorative part, adaptation to environment etc. Species studied in the paper are *Achillea millefolium* (yarrow); *Dipsacus laciniatus* (cutleaf teasel); *Eryngium campestre (*field eryngo), *Lunaria annua* (honesty); *Panicum miliaceum* (millet); *Papaver rhoeas* (red poppy); *Physalis alkekengi* (Chinese lantern); *Xeranthemum annuum* (everlasting, immortelle).

Research methods used were specific to literature, plants selection in spontaneous flora with valued esthetic features, and morphologic observations (description) of the plant, the main decorative characteristics were presented in the section „Results and discussion". Flowers' drying consisted in binding the flowers in small bunches (4-5 floral stems in each bunch), and their hanging up on ropes stretched within drying room. It is recommended that floral stems within the bunch have more space to enable better air circulation. Out of the same reason, bunches were placed at distance of 5 -10 cm. Harvesting of flowers aimed at drying up was done during sunny dry weather only, towards afternoon hours, after dew on the plants evaporated. Before introducing them in drying spaces, flowers were processed by removing surplus of leaves and floral stems with defects. Drying up is carried out in about three weeks. Photographs 1-8 show plants after drying.

RESULTS AND DISCUSSIONS

Morphologic and decorative characterization of plants in spontaneous flora that can be used as dried flowers.

***Achillea millefolium* - yarrow**; herbaceous perennial plant that grow on plains up to sub-Alpine region in hay fields, forest skirts, along roads and railroads, on sandy soils, relatively damp, sunny or shady. Species description: repent, oblique or horizontal rhizome, with underground stolons. Erect or ascendant stem; 20-80 cm height, glabrous or lightly hairy, striated, simple or ramified at upper side. Alternate leaves, 2-3 fold pinnate-cut, with very narrow lacinies, lightly hairy. Flowers arranged in ovoid calatidies, and those are grouped into corymbs. Side flowers are white, sometimes gray-shaded, rarely pink; central flowers are tube shaped, hermaphrodite. Flowering is during June-September. Small fruits and achenes, 1.5-2 mm long.

Ornamentally: the plant can be used in parks and public gardens, in groups. It is decorative through plant's shape and inflorescence that are picked up at the beginning of summer, when they start flowering, to keep their colour. Drying up is attenuating the colour; it is used for classical, aerated compositions (fig. 1).

***Dipsacus laciniatus* - cutleaf teasel**; herbaceous, biannual plant, often found in the whole country, especially in southern parts, by the roads, along rivers and fields. The name *Dipsacus* comes from the Greek word *dipsao* = I am thirsty, with reference to the plant's leaves that are intergrown at base; they form a container where dew and rainwater are collected. The stem is erect, cylindrical, angulated, sulcated, glabrous, thorny. Base leaves arranged into rosette, the stem leaves are grouped in pairs and joined at base, forming a container where rainwater is collected; lower leaves are ciliated on their side, hairy on the back side and aculeate on nervures, lobed-crenated, lyre-shaped; top leaves are pinnate-cut. Foliages are rigid involucres, lanceolated or lanceolated-subulated; length is equal to inflorescence, sometimes the length of spiny flower head, or shorter, upward directed. Flowers colour is pale purple or white. Flowering during June - August.

Ornamentally: the plant can be used for kerbstone, groups, and as dried flower (Figure 2). The plant is picked up during July-August, when is flowering.

***Eryngium campestre* - field eryngo**; herbaceous, perennial plant, found in arid, stony places, hay fields, pasture land, slopes, road side and railroad side, mud deposits (alluvium), from steppe region up to the altitude of 600-800 m. Species description: fusi-forme vertical rhizome, up to 1 cm thick, 10-15 cm long, out of which fibrous roots ramify, with numerous fibers in the upper side, circularly enveloping it. Cylindrical stem, glabrous, glandulous-ramified, whitish, up to 50 cm tall. Rigid leaves, 2-3 pinnate-cut, with spiny foliage, decurrently on the leaf's rachis; base leaves are long-petiolated; stem leaves are sessile and enveloping the stem. Flowers are white-greenish, grouped in ovoid flower heads, with involucres of 5-10 thorny bractea, 3-4 cm long; calyx with lanceolated dents that are longer than corolla; corolla with long inflexed petals. Flowering during July-August. Fruit: ellipsoidal thorny di-achena.

Ornamentally: it is used in all types of arrangements: mixed kerbstones, group, massive, rock fields, and terraces. It offers excellent cut flowers that are used both as fresh and dried flowers. Inflorescences are capituliforme, white-greenish colour; they are picked up during late summer or when totally flowering. Drying up is done within air or water containers. (Fig 3).

***Lunaria annua* - honesty**; annual, biennial or triennial plant. It grows spontaneously is southern parts of Romania in thicket, at forest edges, on rocky shores. The name *Lunaria* comes from the Latin word *luna* = moon, referring to the shape of seeds that

suggests the moon shape. Species description: Erect, tall stem of 25-60 (100) cm, simple or ramified, ± rigidly hairy. Ovate triangular leaves, broad and sometimes and deeply cordated, shortly acuminated, tougher at the bottom side, dented towards top, often having a very short mucron, both sides are rigidly hairy, with recumbent hair. Lower leaves have long petiole, the middle and upper ones have short petiole, the supreme ones are sesile, and serated at base. Inflorescence: ombeliform raceme that is later very much prolonged. Large flowers with erect pedicels. Lanceolated sepals, length of 7-9 mm, membranous sided, purple at the tip, and hairy; the exterior ones are clearly saciform dilated at base, hood under tip, the interior ones are simple. Large petals, 19-20 mm long and 9-10 mm wide, red or purple colour, seldom white, with obovate limb and unguicule of 5-6 mm length.

Ornamentally, the plant can be cultivad in parks and public gardens, in ribbons that are grouped or scattered on lawns, parks and home gardens. It can be used as cut flower, or in bunches, fresh or dried (Figure 4). Decorative through leaves; flowers have purple or white colour. Fruits have silver-golden colour. Fruits are picked up during autumn shortly before maturation; decorative flowers are picked during spring season, fresh or dried in the air. Exterior teguments are dried. Fruits are well-known and used individually or in bunches, suitable to Christmas compositions.

Panicum miliaceum - **millet**; herbaceous, annual plant, sporadically cultivated, sometimes sub-spontaneous. Species' description: Erect or ascendant stem, 20 - 100 (150) cm tall, covered with leaves' vagina. Leaves are 5 - 20 mm wide, together with long hairy vagina, with hairs placed on globulous prominences. The short ligula is transformed into a stripe of hairs. Large panicle, 20 cm long, with long and sinuous branches that are usually unilateral, pendulae, repeatedly ramified. Ears are 3 - 4 (5) mm long, ovoid and ellipsoidal, green, rarely black, reddish or purple.

Ornamentally, the plant can be cultivated in parks and public gardens, grouped with other graminea, is sunny places or as cut flowers, especially as dried flowers (fig. 5).

Papaver rhoeas - **red poppy**; herbaceous, annual plant.

Species' description: annual, rarely biannual plants, 20 - 90 cm tall, usually with numerous stems. Basal petioled leaves, elongated, lanceolated or eliptical, or simple pinnate-lobated. Solitary, terminal flowers, 1 - 10 cm diameter, with long hairy pedicels. Fruit, poricide capsule ended with stigmatic disk of 8-12 lobes. Reniform reticulate seeds, dark brown.

Ornamentally: poppies are ephemeral flowers, but they make strong impression thorough flowers' lively red, shape and dimensions. They can be used on all places, from kerbstone to rocks, ribbons, grouped or solitary. Dried capsules are used in arrangements of dried flowers. Grey capsules and average dimensions of 1.5-2.0 cm are currently used in golden or silver lacquer for winter arrangements. Leaves are dried in air, after they are picked up in the summer. The fruit's interesting shape makes it useful in the most modern compositions (figure 6).

Physalis alkekengi - **Chinese lantern**; perennial plant. Species' description: tall stem of 25-60 (100) cm, erect, short pubescent, single or ramified in upper part. Long petiolated leaves, ovoid or elongated ovoid, rarely rhomboidal. Solitary, pedicelated, axillary flowers, with upright pedicel, 7-17 mm long, hairy. Spherical berry, orange red, shiny, 1.2-1.7 cm diameter. Reniform seeds, 2.5 mm long, yellowish, glassy, finely verrucous. Flowering during June-August.

Ornamentally: physalis is often placed in mixed kerbstone; shootings with coloured fruits are used fresh or dried (figure 7) in making up bunches. Flowers have star shape, and fruits are enveloped in orange calyx; they look very nice in the autumn, and are the species' decorative elements. Drying up is made in air, in pots after removing leaves

from the stem. Fruits' lantern shape and lively colour makes them decorative components in dark bleak environments.

***Xeranthemum annuum* - everlasting, immortelle**; herbaceous, annual plant, it is found on sunny fields, in dry resorts; it is very common, especially in southern parts of Romania.

Species' description: the plant has a ramified stem, 20-50 (60) cm tall. Leaves are narrow-lanceolated or narrow-elongated-elliptical. Flowers are grouped in large semi-globulous calatidia, with whitish exterior folioles and purple interior folioles, rarely pink or white; flowering during June-July. Fruit, achene, 4-5 mm long, finely pubescent.

Ornamentally, the plant can be cultivated in parks and public gardens, kerbstone, groups, rocks. They can be cultivated on field for producing flowers for picking-up and drying up (figure 8). It is picked up during full flowering stage. Flowers dried in air keep their purple colour.

Fig. 1 Achillea milefolium

Figure 2: Dipsacus laciniatus

Fig. 3 Eryngium campestre

Figure 4: Lunaria annua

Fig. 5 Panicum capillare

Fig. 6 Papaver rhoeas

Fig. 7 Physalis alkekengi

Fig. 8 Xeranthemum annum

CONCLUSIONS

These species with decorative potential, taken from spontaneous flora in Oltenia region, could provide for décor of parks and gardens from springtime season until late autumn foe they are annual species - from springtime until late autumn (*Lunaria annua, Panicum miliaceum, Papaver rhoeas, Xeranthemum annuum*), biannual - from springtime until beginning of summer season (*Dipsacus laciniatus, Lunaria annua*), and perennial - high variability of flowering time period and duration (*Achillea millefolium***,** *Eryngium campestre, Physalis alkekengi*), and moreover**,** they can be dried up and used as cut flowers in floral arrangements.

BIBLIOGRAPHY

1. Ciocârlan V. 2000 - Flora ilustrată a României. Pteridophyta et Spermatophyta. 1038 pag. Edit. Ceres, Bucureşti.
2. Chimonidou D., J.C. Vlahos, M. Odysseos, K. Georgiou, A. Della, 2005 - Evaluation of species from Cyprus flora for sustainable use in commercial floriculture. ISHS Acta Horticulturae 683: V International Symposium on New Floricultural Crops.
3. Halevy A.H., 2000 - Introduction of native Israeli plants as new cut flowers. ISHS Acta Horticulturae 541: IV International Symposium on New Floricultural Crops
4. Johnston M.E., 2005- The centre for native floriculture. ISHS Acta Horticulturae 683: V International Symposium on New Floricultural Crops.
5. Maloupa E., D. Zervaki, A. Marnasidis, 2000 - Introduction of the mediterranean native species *Thymus Mastichina, Lotus Cytisoides, Lavandula Stoechas, Centranthus Ruber, Limonium Pectinatum* And *Limonium Sinense* into commercial floricultre. ISHS Acta Horticulturae 541: IV International Symposium on New Floricultural Crops.Noordegraaf C.V., 2000 - An approach to select new ornamental crops. ISHS Acta Horticulturae 541: IV International Symposium on New Floricultural Crops.
7. Parvu C., Enciclopedia plantelor, 2002-2005, vol. I-IV, Edit, Tehnica, Bucuresti.
8. Parvu C., Universul plantelor, 2006, Edit. Asab, Bucuresti.
9. Plummer A., A. Crawford, D. Hall, P. Watkins, D. Growns, 2000 - Taming yellow bells: floricultural diversity within *Geleznowia Verrucosa (rutaceae)*. ISHS Acta Horticulturae 541: IV International Symposium on New Floricultural Crops.
10. Soares Payão Demattê M.E., 2005 - Information on brazilian ornamental species of the Genus *Tillandsia* L. (Bromeliaceae). ISHS Acta Horticulturae 683: V International Symposium on New Floricultural Crops.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

PHYSIOLOGICAL INDICES OF SEEDS IN SPONTANEOUS FLORA SPECIES WITH DECORATIV VALUE

Mitroi Daniela, Anton Doina[1]

KEY WORDS: spontaneous flora, decorative plants, seeds

ABSTRACT

Introducing new species with decorative value from spontaneous flora consists in a major goal on the international scale, in the perspective of sustainable development and environment protection. Multiplication of those species is done, in general, through seeds. The quality and quantity of seedling plants depend on seeds' quality. This paper aims at identifying physiologic indices in species with decorative value from spontaneous flora. Results obtained indicated that physiologic indices are genetically determined and influenced by environmental and technological factors.

INTRODUCTION

In Europe, introducing species with decorative value from spontaneous flora began especially in northern parts (Germany, Great Britain, Holland and Scandinavian countries), as a results of conscience level raising brought about by traders and professionals in architecture who uphold the concept of „creative ecology" (by using spontaneous species with ornamental and environmental purposes). Multiplication method that is often used for species in spontaneous flora is the generative one. A major fact is that the seeds of those species, like in most wild species, are characterized by dormancy, a characteristic that expresses a delay of germinative ability. Sometimes this phenomenon is a key factor that enables colonization of lands subject to biotic and abiotic perturbation factors (Bravi A., 2004). Another intersting aspect linked to the importance of environment protection, is recuperation and re-naturalization of deteriorated areas. Redescovering natural vegetation becomes a key reservoir able to contribute to renewal and extending of urban landscape.

Regarding physiological indices, seeds' viability represents a concept that is differently interpreted by technology experts and specialists in vegetal physiology. Technology experts and commercial producers of seeds found that seeds are viable when they have ability to germinate and produce normal seedlings; the term is synonym to germinative ability, in this case. Thus, seeds are either viable or non-viable, depending on ability to germinate and produce normal plantlets and batches of seeds to get levels of viability. In contrast to this concept, physiologists state that viability is the extent to which the seed is metabolically active and it contains enzymes able to catalyze metabolic reactions needed to plantlets' germination and growth. In the above described context the seed can contain live and dead tissue and it can be or not, able to germinate. In physiologists' view, germination consists of a sequence of metabolic reactions and processes that develop within seeds in a state of inhibition, and it culminates with the issue and development of seed's embryo structures.

[1] University of Craiova, Horticulture Faculty

The most used method to evaluate viability is the germination test, that is conducted according to standards of International Seed Testing Association (ISTA).

MATERIALS AND METHODS

A study was conducted on seeds of plants with decorative value, from spontaneous flora in Oltenia region that make up the research material. Species followed up were: *Achillea millefolium* (yarrow), *Dipsacus laciniatus* (cutleaf teasel), *Helicrysum bracteatum* (straw flower), *Gypsophila paniculata* (Baby's breath), *Papaver rhoeas* (red poppy), *Physalis alkekengi* (Chinese lantern), *Panicum milliaceum* (millet), *Xeranthemum annuum* (everlasting, immortelle*).* Picking up of seeds in plants studied was carried out at optimal moment, depending on species. Picking up was done under dry weather; after picked up, seeds were kept in dry and ventilated rooms, at temperatures of 30-35 ^{0}C and humidity of 60-65 %, according to values recommended in literature (Anton D., 2003). Operations of seeds' conditioning (cleaning and sorting out) were done manually, as they were in small amount. Seeds conditioned were kept in papers bags. Determinations were carried out in greenhouse, at temperature of 22 ^{0}C.

This paper aims at determining the technological indices and morphologic characteristics of seeds in species in spontaneous flora, with decorative value. To determine germinative ability, normal germinated seeds were counted in each repetition. At the end of germination period, the seeds that were found swollen, rotted and mouldy - were classified as non-germinated seeds. Germinative energy represents the percentage of normal germinated seeds during 1/3-1/2 of time set for determination of germinative ability.

RESULTS AND DISCUSSIONS

Determination of physiological indices (viability, germinative ability, germinative energy) was conducted in parallel under normal conditions of germination, in greenhouse, at the temperature of 22 ^{0}C. Results obtained are presented in charts 1-8.

According to data obtained, germination in *Achillea millefolium* species began after 3 days, germination rate was quite high within the first 10 days, then followed a slow increase up to 30 days (chart 1). Germination evolved following a polynomial curve of the 4th degree. Germinative ability at 30 days recorded the value of 69 %, while germinative energy was 63 %.

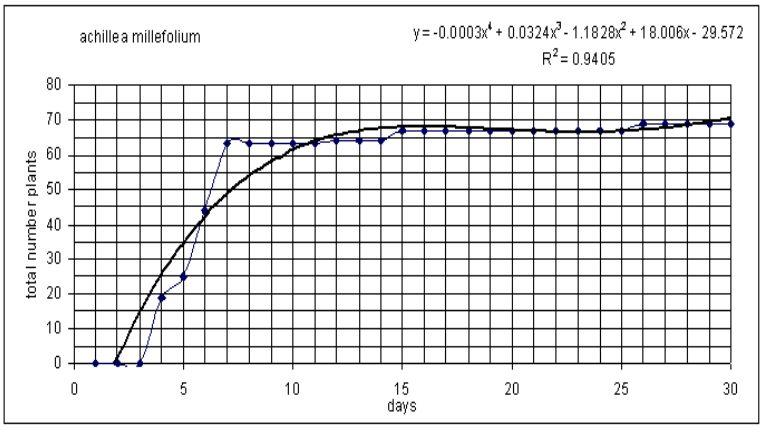


Chart 1

In *Dipsacus laciniatus* species, germination started in the 7th day, the maximum number of germinated seeds (88) was attained after 16 days. Germination develops following a polynomial curve of the 4th degree (chart 2), a quite high rate of germination was recorded within a period of 6-12 days. Germinative energy in this species has recorded the values of 75 %.

The seeds of *Helicrysum bracteatum* species germinated at a high rate, having 9 germinated seeds in the 3rd day and 52 seeds in the 10th day, out of total number of 53 germinated seeds, after 30 days. Germinative ability had the value of 53 %, while germinative energy was quite close to germinative ability. Germination developed following a polynomial curve of the 5th degree (chart 3).

In *Gypsophila paniculata* species, germination started in the 6th day, the maximum number of germinated seeds was attained after 28 days, germinative ability recorded the value of 81 %, while germinative energy was 59 % (chart 4). Germination developed following a polynomial curve of the 3rd degree, a faster evolution within the first 15 days, and then germination was slower.

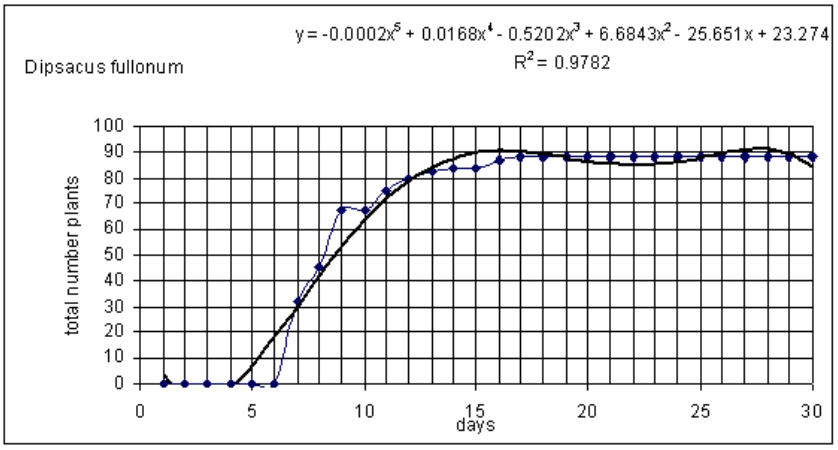


Chart 2

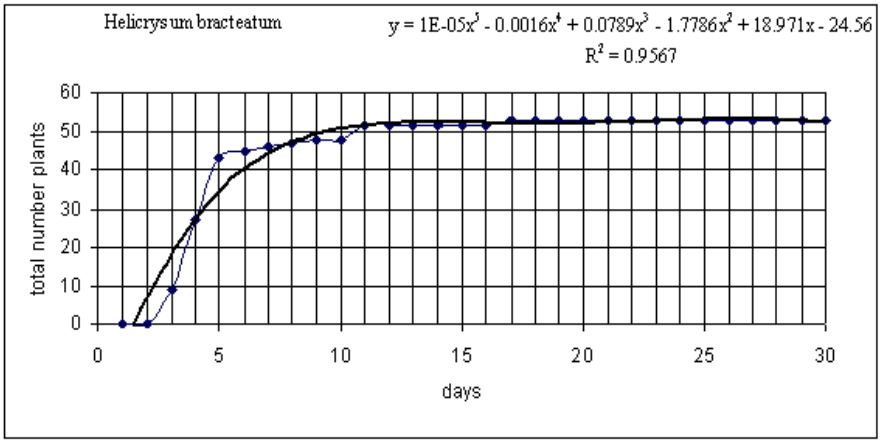


Chart 3

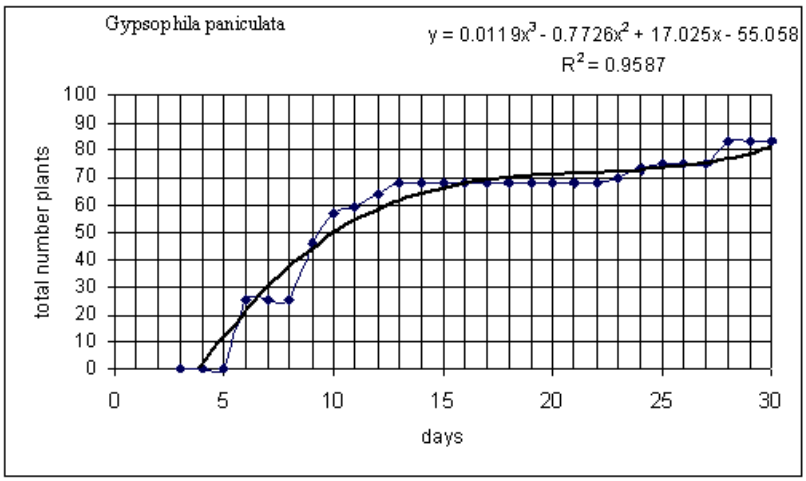


Chart 4

The seeds of *Panicum milliaceum* species germinated quite difficult; the values obtained for germinative energy and germinative ability were quite low. Germination started after 2 weeks, the maximum number of germinated seeds was attained after 28 days. Germinative ability recorded the value of 19 %, while germinative energy was also quite low. Germination developed following a polynomial curve of the 4th degree, concave (chart 5).

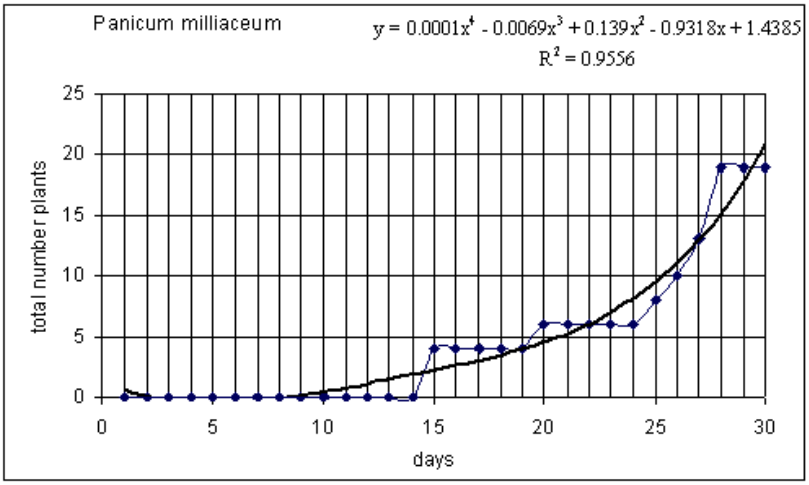


Chart 5

Lower values for germinative ability and for germinative energy were also obtained in greenhouse germination in *Papaver rhoaes* species. Germination started within 3 days, while in the 10th day the number of germinated seeds was 5, a value that keeps constant up to the 12th day. The value for germinative ability was 16 %. Germination developed following a polynomial curve of the 6th degree, that kept almost constant during the 15 days from day 15 up to day 30) (chart 6).

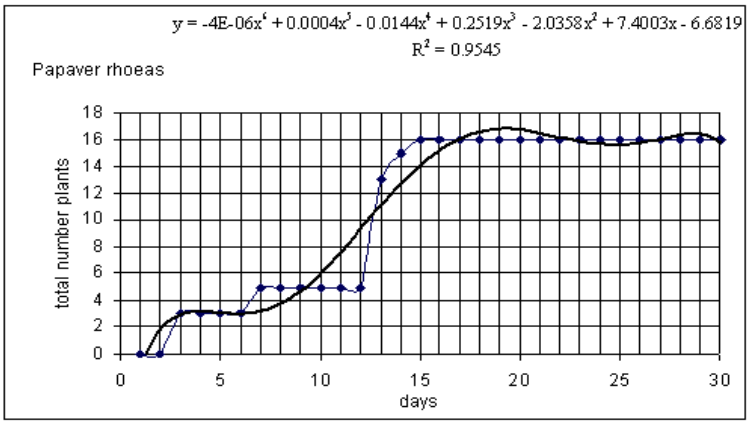


Chart 6

The seeds of *Physalis alkekengi* species recorded germination rate of less than 50 %, after 30 days. Germination started within 3 days, the process recorded a slow progress up to the 10th day, when a low number of germinated seeds was recorded (8 seeds). Germinative ability at 30 days recorded the value of 38 %. Germination developed following a polynomial curve of the 5th degree (chart 7). Literature indicated that germinative ability of seeds in *Physalis* can have significant variation depending on conditions of temperature and light (Suzuki, 1969) Germination in *Xeranthemum annum* species started after 3 days, the germination rate was high within the first 10 days, with slow increase rate up to 30 days (chart 8). Germination developed following a polynomial curve of the 5th degree. Germinative ability at 30 days recorded the value of 36 %, while germinative energy was 30 %.

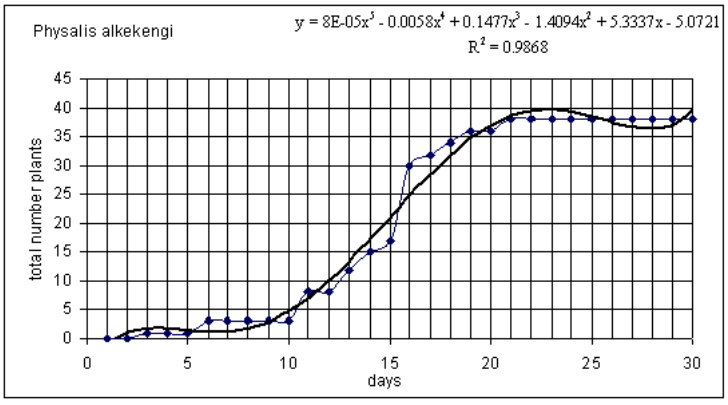


Chart 7

In analyzing data, it is concluded that germinative ability exceeds the value of 50 % in 4 species; the highest value was recorded in *Dipsacus laciniatus* species (88 %). The lowest value was recorded in *Papaver rhoeas* species (16 %). The rate is kept also for germinative energy, 4 out of the 8 species studied recorded values of more than 50 %. The highest value for this physiological index was recorded again in *Dipsacus laciniatus* species (75 %), while the lowest value was recorded in *Panicum milliaceum* species (4 %).

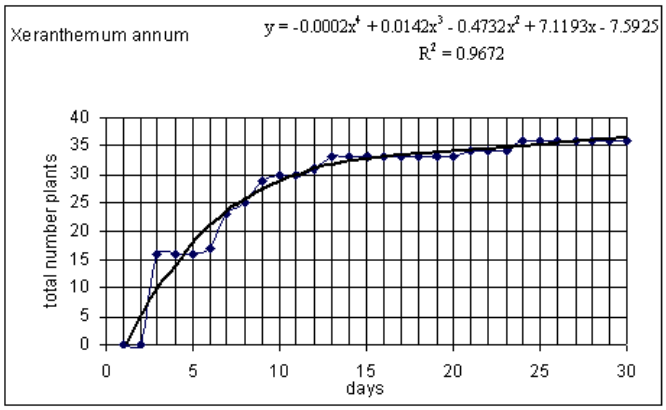


Chart 8

In calculating the relationships between germinative energy and germinative ability in the 8 species analysed, it was found a direct correlation, high-valued; correlation coefficient was 0.952 (figure 1).

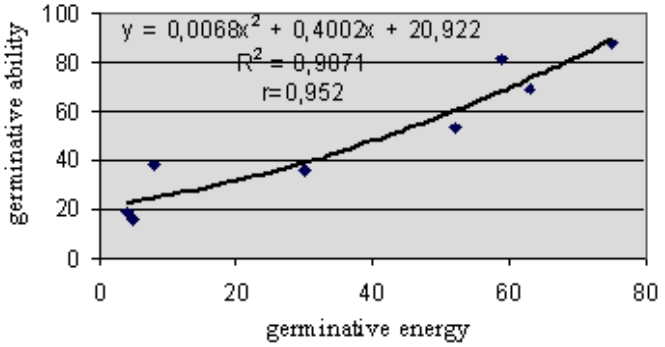


Fig. 1. The relationships between germinative energy and germinative ability

CONCLUSIONS

Physiological indices of seeds in spontaneous flora species with decorative value, consist in species characteristics. Under similar conditions of culture, germination evolves in a different way. Physiological indices are genetically determined and influenced by environmental and technological factors.

BIBLIOGRAPHY

1. Andrei M., Morfologia generala a plantelor, 1997, Editura Didactica si Pedagogica, Bucureşti
2. Anton Doina, Floricultură generală, 2003, Editura Universitaria, Craiova.
3. Bravi Alessio, 2004 - Impiego di specie spontanee per la valorizzazione estetico-paesaggistica di aree urbane, peri-urbane e marginali**.** Tesi Di Laurea, Universita' degli Studi di Pisa
4. Yoshihiro Suzuki, 1969 - Photo- and thermo-induction in seed germination of *Physalis Alkekengi* Plant and Cell Physiology, 1969, Vol. 10, No. 3 699-702
5. Zanoschi Valeriu, Cum se înmulțesc plantele, 1989, Editura Ceres, Bucureşti.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

RESEARCH ABOUT THE INFLUENCE OF MEDIUM CULTURE AND PROPAGATION METHODE CONCERNINC GROWTH AND DEVELOPMENT ON HYDRANGEA HORTENSIS L. PLANTS

Ciontoiu Ionela-Loredana, Anton Doina[1]

KEY WORDS: Medium, stem cutting, bud cutting Hydrangea

ABSTRACT

Hydrangea hortensis L a part of Saxifragacea family, native from Japan, the scientific name of genera is made from Greek ,, hydos"- water and ,,angeion,,- cup.

The paper contain results regarding vegetative propagation by stem cuttings in three medium culture (peat and perlite 2:1, peat and sand 2:1, and peat tablets) and also concerning vegetative propagation by bud cuttings in peat and perlite 2;1, and peat and sand 2;1, following the influence of culture substrate about rooting on unheated parapet and on the system with tempereture controller, the percentage of grip after potting in three medium culture: red peat, soil for ornamental plants with flower and universal substrate but also the influence of cutting type regarding growth and development on Hydrangea plant.

INTRODUCTION

Hydrangea hortensis L. is a summer flowering shrub, very popular, being praised for his large and bright colored inflorescences type corymb.

Inflorescences, large and round consisting of varieties of Hydrangea flowers primarily from sterile and few discreet fertile flowers located within corymb. Inflorescences color is different shades, from white to pink to red and blue. Leaf shape can be spherical, oval, oblong or cordiforme and in most cases, the leaves are dark green on top and the lower green open. It is used for decorating the parks, gardens, alone or in various combinations and as plant in pots to decorate apartments, terraces and balconies

MATERIAL AND METHODS

Research on breeding species of Hydrangea hortensis were conducted in the Discipline of Floriculture greenhouse multiplier, from Horticulture Faculty - Craiova. The main objectives relate to determining the best culture substrate for rooting cuttings, but the best method of propagation. Stem cuttings were used; their size is on average 15-18 cm collected from plants older couples for 10 years. Leaves were removed from entire length of cuttings, cuttings were treated with Radistim 2, biostimulator for woody plants having a specific role in appearance of roots, and paraffin at the top.

[1] University of Craiova, Horticulture Faculty

Cuttings were placed in the substrate approximately half of their length, then executed a slight bending of the substrate around them. After planting, cuttings were wet, wetting repeated at regular intervals as needed. Planting cuttings was done in the three types of substrate on the root system with controlled temperature and on unheated parapet. I planted 30 cuttings in each variant. The hydrangea leaves are placed opposite (the same node are face to face by two leaves, leaves from a node is placed in a plane perpendicular to that of the upper and lower leaf node), so that the bud cuttings are starting to the base of shoot making a horizontal cut just above a pair of buds, then a vertical cut by cuttings among two shoots, thus resulting in two cuttings. Planting cuttings of bud was performed on the system with controlled temperature in the two types of substrate. They planted 30 seedlings in each variant.

RESULTS AND DISCUTIONS

The best percentage of rooting, on unheated parapet, for the cuttings of the stem, was recorded in the substrate composed of peat/perlite 2:1 (60%) and lowest percentage was recorded at substrate composed of peat/sand 2:1 (13.3%). (chart 1)

Over unheated parapet, on the temperature controlled system the highest percentage of rooting in stem cuttings was recorded in peat tablets (46.6%) and lowest percentage was recorded at substrate composed of peat/sand 2:1 (3.3%). (chart 1)

Bud cuttings registered maximum percentage of rooting (100%) in both substrates used (peat/perlite 2:1, peat/sand 2:1). (chart 2)

Number of days from planting seedlings to root was higher for the stem cuttings in peat pill (82 days) and 58 days for substrates peat/perlite 2:1 and peat/sand 2:1, compared to the bud cuttings which have rooted in 31 days in both types of substrate. (chart 3)

Percentage of plant grip after planting was 100% both stem cuttings, and bud cuttings. (chart 4)

I found differences of growth and development in a one year old Hydrangea obtained from stem cutting against a plant obtained from a bud cuttings. Both form inflorescences in the first year, however, a plant obtained from a bud cuttings form shoots from the base resulting in this way a compact plant (fig. 1), compared to a plant obtained from a stem cuttings who form shoots from top of cuttings, leading to an elongated, non-uniform plant. (fig. 2)

Figure 1. Bud rooted cutting
rooted cutting 1 year old plant

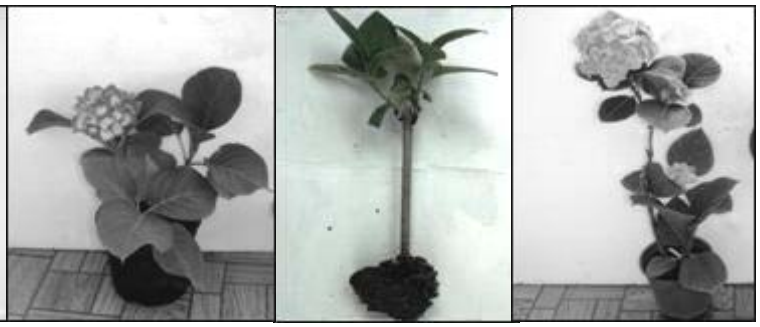


Figure 2. Stem rooted cutting
rooted cutting 1 year old plant

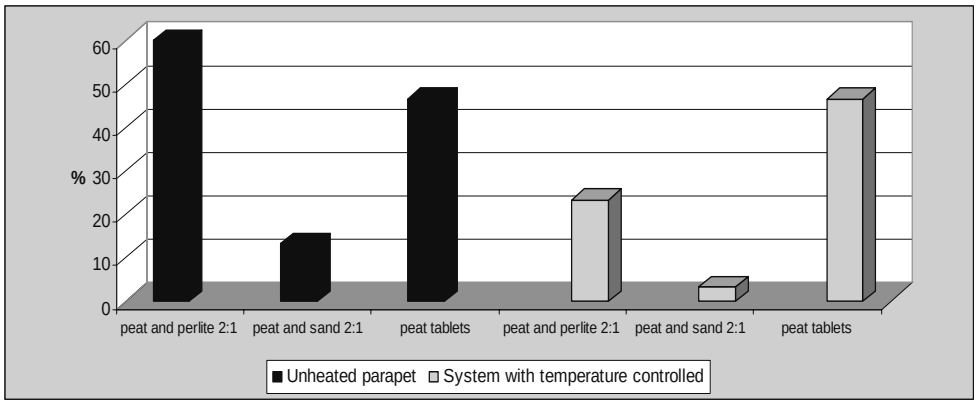


Chart 1. Influence of rooting condition on cuttings rooting percentage

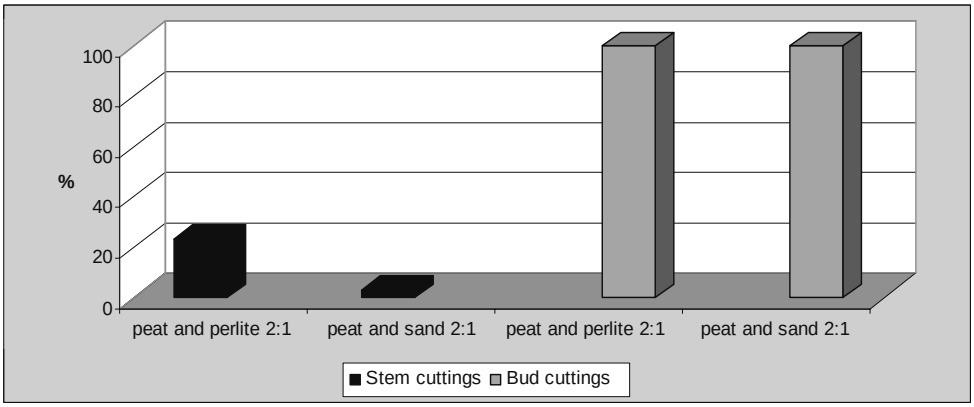


Chart 2. The influence of type of cutting on rooting

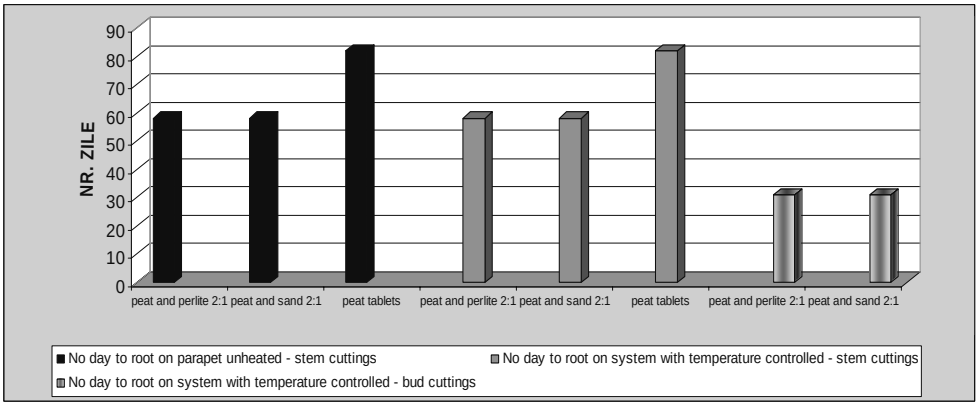


Chart 3. Length of roots of cuttings of Hydrangea according to the terms of rooting

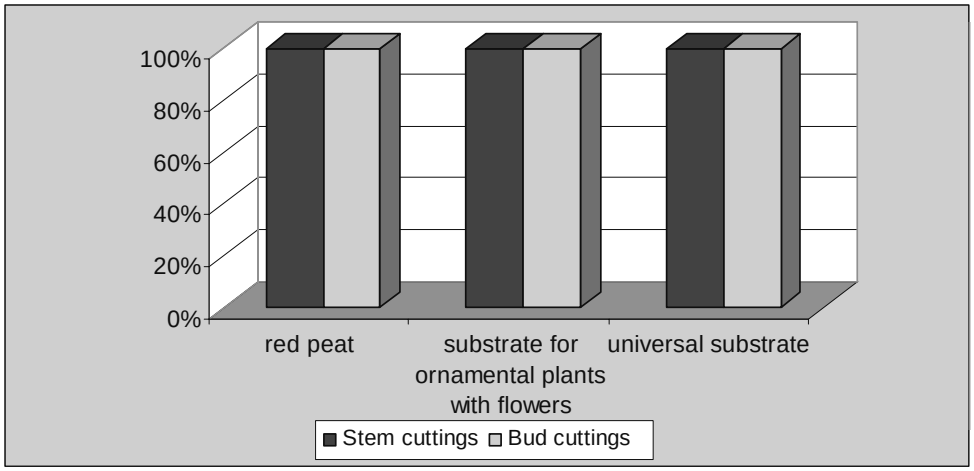


Chart 4. Percentage of plant grip after pot planting

CONCLUSIONS

1. Number of days to cuttings rooting were 31 days for the bud cuttings, and cuttings of strain for 58-82 days for stem cuttings, depending on substrate used.

2. Best rooting percentage was recorded in the bud cuttings in both types of substrate (100%), and the best percentage for stem cuttings was regeistered on substrate composed of peat / perlite 2:1 on unheated parapet

3. Percentage of plant grip after planting was similar for both types of cuttings regardless of the culture substrate used.

4. Hydrangea hortensis L. plants obtained from bud cuttings can be considered a commercial plant by 1 year due to the compact appearance and of inflorescences appeared in a short time.

REFERENCES

1. Anton, Doina, Nicu , Carmen, Manda, Manuela, 2007, Special Floriculture, Vol..II Publisher Universitaria, Craiova
2. Litan, Lucia, Drăgan, Maria , Hydrangea ,Collection "Ceres " Bucureşti
3. Reed, M. Sandra, 2002, Flowering Performance of 21 *Hydrangea macrophylla* Cultivars, U.S. National Arboretum, USDA-ARS, Tennessee State University Nursery Crop Rsearch Station, J. Envirom. Hort. 20(3): 155-160.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✔*Biologie*
✔*Horticultură*
✔*Tehnologia prelucrării produselor agricole*
✔*Ingineria mediului*

Vol. XIV (XLX) - 2009

RESEARCH CONCERNING THE INFLUENCE OF SUBSTRATE AND TIME FOR PROPAGATION ON BOUGAINVILLEA C. SPECIES

Ciontoiu Ionela Loredana, Anton Doina[1]

KEY WORDS Vegetative propagation, Bougainvillea, cuttings, culture substrate

ABSTRACT

Bougainvillea C. is a shrub, part of Nyctaginaceae family native from South, grown for ornamental purposes, very resistant to drought, soil type and environmental conditions.

Present paper contain result regarding vegetative propagation by stem cuttings, harvested in two different periods, in pursuing the percentage of roots depending on substrate culture (peat / perlite 2:1, peat / sand 2:1 and peat tablets on parapet and on the temperature control system, but also the percentage of cuttings grip after pot planting, in three types of substrates (red peat, soil for ornamental plants with flowers and universal soil).

Concerning the percentage of cuttings rooting, the best results were obtained in peat tabletsl, on the parapet, and on the temperature control system the best percentage of rooting was obtained in mixture of peat with sand.

INTRODUCTION

Bougainvillea C is classified as tropical plants including herbaceous plants, shrubs and trees is composed of 30 genera and 300 species. Bougainvillea was raised successfully in many countries, evidence of its great adaptability to a wide range of climatic conditions. Its main attraction, still bright-looking flower paper. They are bracts, the flowers have actually tubular form, small and insignificant in terms of adornment. The three bracts can be simple or abundant and surround each flower. Bracts have a palette of colors from white, yellow to a variety of pink, red and purple.

MATERIAL AND METHODS

Research on breeding species Bougainvillea C were conducted in the Discipline of Floriculture multiplier greenhouse, from Horticulture Faculty - Craiova, greenhouse equipped with a system that controls substrate temperature. It is known that substrate temperature have an important place in the process of vegetative propagation, influencing the rate of root, root system growth and development.

Biological material used (the stem cuttings) for the vegetative propagation was collected from plants in the age of 3 years.To determine which is the best substrate for rooting cuttings of Bougainvillea C., optimum temperature in the substrate, but the optimal

[1] University of Craiova, Horticulture Faculty

period of multiplication of this species were planted cuttings in two different periods, namely: both times period I (16.02.2008) and in period II (02.10.2008) were planted 30 cuttings, each on three substrates for rooting (peat / perlite in a 2:1 ratio, peat / sand in a 2:1 ratio and pills peat) in two places with different temperatures: on parapet in unheated substrate and the system with controlled temperature (23 ° C).

RESULTS AND DISCUTIONS

The largest percentage of roots in the age I was observed on unheated parapet in peat tablets (33.3%) and lowest percentage was recorded in substrates of peat/perlite 2:1 (20%) and peat/sand 2: 1 (20%). (chart 1)

In the same period in temperature controlled system, the highest percentage of rooting was recorded in the substrate of peat/sand 2:1 (43.3%) and the lowest being 20% in the peat tablets. (chart 2)

In the age II, on unheated parapet , the highest percentage of rooting was 23.3% in the substrate of peat/perlite 2:1, and the lowest being 3.3% in the substrate of peat/sand 2:1. (chart 1)

The largest percentage of roots in the age II, on the system with controlled temperature was recorded in the peat tablets (23.3%), compared to the substrate of peat / sand 2:1, where was recorded the lowest percentage (6.6 %). (chart 2)

It was found that the temperature in the rooting substrate is very important, the highest percentage (43.3%) registering the system with controlled temperature in the first period, but also in the second period (23.3%).

Also noticed the lowest percentage of rooting on the unheated parapet (20% in the first period and 3.3% in the second).

However the best age of cuttings rooting was first era, where the percentages recorded were higher in all three substrates in both temperature conditions compared with age II.

Day number from planting to rooting cuttings was higer for second period (93 day) in all three culture media, for first period day number until rooting was 58 on peat and perlite and peat and sand, and 82 day on peat tablets (chart 2).

In 29/05/2008 for first period and 29.03.2009 for second period we planted in pots the cuttings resulted from rootting in three different culture substrates (red peat, soil for ornamental plants with flowers and in the universal soil), where the percentage of rooted cuttings clamping was 100% in both periods . (chart 3).

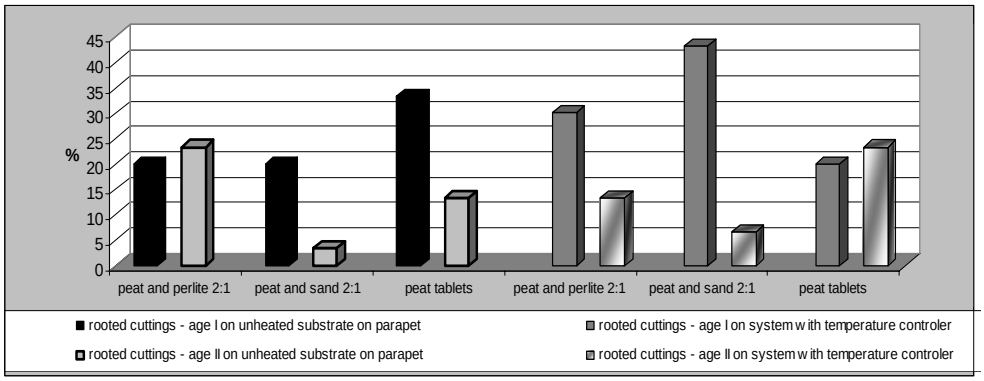


Chart 1.Influence of rooting condition on cuttings rooting percentage

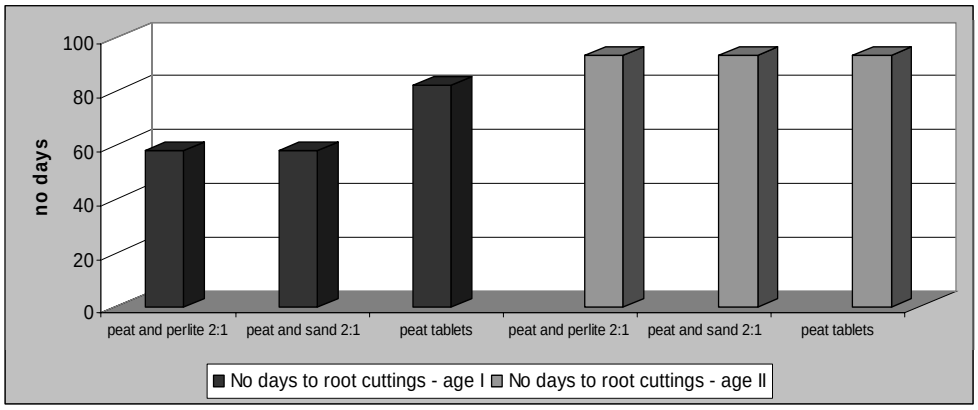


Chart 2. Length of roots of cuttings of Bougainvillea according to the terms of rooting

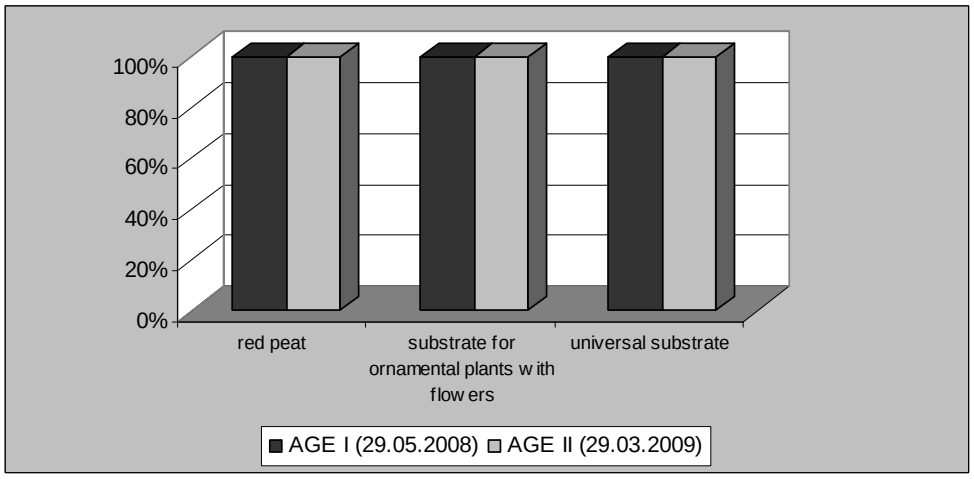


Chart 3. Percentage of plant grip after pot planting

CONCLUSIONS

1. The lowest number of days to root cuttings was 58 days in first period rootedness in peat substrates / sand 2:1 and peat / perlite 2:1.

2. In terms of culture substrate, the highest percentage of rooting cuttings of Bougainvillea C. was recorded in peat / sand 2:1 substrate .

3. The highest percentage of rooting were recorded on the system with controlled temperature (23 ° C) in both periods.

4. As a percentage of grip after planting to pot, the plant is considered a demanding track for the same percentage regardless of the type of substrate used or the culture of breeding age.

REFERENCES

1. Gilman, E. F., 1999, Bougainvillea spp., University of Florida, Cooperative Extension Service, Institute of Food and Agricultural Sciences
2. Norcini, J., Butler, J. şi Rogers, Lucy, University of Florida/IFAS, North Florida Research and Education Center
3. Simon, E., 2005, Brighten up your life with Bougainvillea

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

RESEARCHES REGARDING THE DECORATION PERIOD AT SOME SPECIES AND CULTIVARS OF NARCISSUS GENDER

Constantina Ciurlin (Ghita)[1]

KEY WORDS: geophytes, coronulla, phenophases, decorative characteristics.

ABSTRACT

Narcissus are always present in parks and gardens in the spring. Narcissus gender comprises geophyte plants having tunicated, multiannual bulbs and can have one or more flowers. These are rustic bulbous with decorative characteristics given by the tubular perigon with six divisions(streight or flanged) and a structure specific to the narcissus: the coronulla.

The phenology of some species and cultivars of Narcissus gender was studied in the climatical conditions of Craiova city, in 2008-2009 period. The biological material studied came from Holland and it was made up of Narcsisus pseudonarcissus species and six cultivars: N. triandrus 'Hawera', N. triandrus 'Thalia', N. tazetta 'Geranium', N. tazetta 'Minnow', N. 'Ice follie' and N.' Yellow cheerfulness'.

The main phenophases(spring, the appearance of the flower bud, the coloration of the bud, the blooming) were studied. It was established the duration of decoration and usage recommendations were conceived according to the decorative characteristics.

INTRODUCTION

Narcissus species can have only one flower (ex Narcissus pseudo narcissus) or more than one flower. The hybridization of the species offered numerous species and varieties (cultivars) presenting a great diversity in what concerns the size, the colour and the shape of the perigon and coronulla.

There are between 40-100 species and 8000-10000 cultivars (Elena Selaru, 2007). The Royal Society of Horticulture from London classified Narcissus gender in 12 classes or divisions (Doerflinger Fr. 1973).

Narcissus are used for the decoration of green spaces, lashings, groups on lawns, shores, at trees and schrubs' bases, being extremely appreciated because of their flowers' beauty and elegance and also because of the variety of shapes, colours and shades, and their discrete perfume.

Moreover, they are used in flower pots, specially in forced cultures and in window boxes, in balconies and terraces. Small size species are used in rocky places and the tall ones in groups of flowers and as cut-flowers (bouquets and flower arrangements).

In order to prolong the duration of decoration, it is necessary to provide two extremely important factors right after the flowers' cropping: the water and the energetical substratum. The fading of the flowers is caused by the water deficiency provoked by the

[1] University of Craiova, Faculty of Horticulture

deterioration of the water's absorbtion and circulation through the main vessels or by the increased value of the perspiration. The cut flowers' duration of decoration depends on the factors of the storage environment: the temperature, the air's relative humidity, it's composition and circulation, the light and the quality of the water.

The rustic bulbous, including narcissus, require cold autumns and long springs, with mild temperatures and hot summers in order to have a normal growth and development. The culture should be on fertile, well-drained soils – the most suitable being the sandy and the clay-sandy soils.

MATERIAL AND METHODS

The biological material came from Holland and it was made up of Narcissus pseudonarcissus species and 6 cultivars: N.'Ice follies', N.'Yellow cheerfulness',N. tazetta 'Geranium', N. tazetta 'Minnow', N. triandrus 'Hawera' and N.triandrus'Thalia'.

The behaviour of these rustic bulbous plants was seen about in the didactic field of the Floriculture discipline from Craiova city. The planting took place in October 2007 and observations were made during the period 2008-2009, in the spring. During the researches, a classic technology of culture was applied.

The area is situated on a plane ground with clay-sandy texture, away from draughtiness. The area is characterized by a temperate-continental climate, with hot-summers and soft winters, with thermic and pluviometrical contrasts, the maximum amount of precipitation being registered at the beginning of summer. From the facts previously presented results that the climatic conditions from the studied area are favorable to the culture of the geophyte plants – the rustic bulbous.

North-West and West winds are predominant. 2007-2009 summers were extremely hot in the researched area and the average amount of precipitation was of 752,5 mm in 2007 and 474,7 mm in 2008.

The observations and determinations were made during the period 2008-2009, in spring, and they were concerned with the vegetation phenophases (the spring, the appearance of the floral bud, the beginning of the coloration, the blooming), and the duration of decoration established according to the period of blooming.

It was established the number of days from spring up to blooming, and regarding the blooming, we were concerned about 3 aspects: the beginning of blooming, the mass blooming and the end of blooming. According to the plans behaviour in culture, it was recommended the most indicated way of use for the decorative plants of Narcissus gender.

RESULTS AND DISCUSSIONS

In 2008, the spring took place in the first half of February month(1-15.02) at all the studied plants, except for the N. tazetta 'Geranium' cultivar, which sprang on 20.02. The number of days from spring to blooming was between 42 days at N. pseudonarcissus species and 69 days at N. triandrus 'Hawera' cultivar.

The appearance of the floral bud took place on 15.03 at N. 'Ice Follies' and in the last decade of March for all the other species and cultivars (22-30.03). The period from the appearance of the floral bud up to its colouration was short enough (4-12 days).

The beginning of blooming, the mass blooming and the end of blooming took place in the interval 26.03-20.04, less for N. 'Ice Follies' which bloomed earlier, on 18.03. The duration of blooming was between 6 days at N. tazetta 'Geranium' cultivar and 21 days at N. pseudonarcissus species. Because in 2008 the winter was very soft, with average

monthly temperatures of 6,2°C-1,8°C, in 2009 we noticed that the spring took place much earlier, in the last decade of January at N. triandrus 'Thalia' and in the first decade of February for the rest of the Narcissus gender studied plants. (Graph 1). The process of growing and development from the spring up to blooming was of 50 days at N. pseudonarcissus and N. 'Ice Follies' cultivar and 70 days at N. triandrus 'Thalia' cultivar. (Graph 2) The appearance of the floral bud took place in the second decade of March at all the studied species and cultivars (9-20.03). (Graph 3)

The average period from the appearance of the floral bud up to its coloration was of 10 days (longer, comparative with 2008), except for the N. triandrus 'Hawera' cultivar which needed 20 days to color the floral bud.

The beginning of blooming took place in the last decade of March (23-30.03) at N. pseudonarcissus species and N. 'Ice Follies' and N. tazetta 'Minnow' cultivars, and the end of blooming took place in the second decade of April (11-21.04). The duration of decoration was between 14 days at N. tazetta 'Minnow' cultivar and 20 days at N. 'Ice Follies' cultivar. (Graph 4)

The main decorative feature at Narcissus gender is the flower, which decorates by beauty and elegance, and also because of the variety of colours and shapes. Concerning the studied narcissus, two of them have only one flower: N. pseudonarcissus species and N. 'Ice Follies' cultivar, and the other cultivars have multi-flowers (3-7 flowers).

CONCLUSIONS

1. The spring took place earlier in 2009(about 8-18 days earlier) at four of the studied plants: N. 'Yellow Cheerfulness', N. triandrus 'Thalia', N. pseudonarcissus and N. tazetta 'Geranium'.

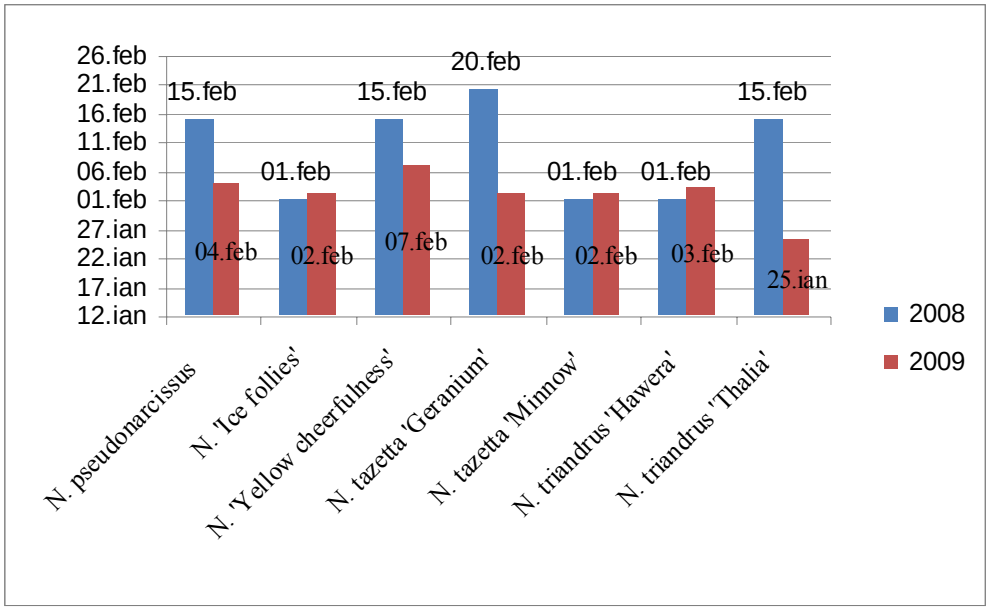
2. The number of days from spring to blooming is between 42-50 days at N. pseudonarcissus species and N. 'Ice follies' cultivar and 62-70 days at N. tazetta 'Geranium' and N. triandrus 'Thalia' cultivars.

3. The blooming took place, in 2008-2009, at the end of March at N. pseudonarcissus species, N. tazetta 'Minnow' and N. 'Ice follies' cultivars, and in the first decade of April at the other studied cultivars.

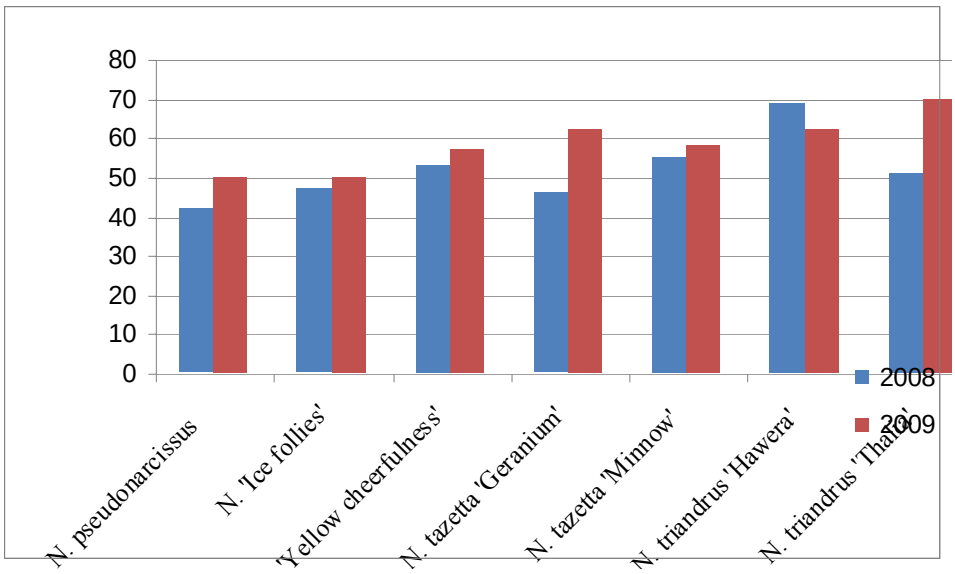
4. The average duration of decoration was of 11,5 days at N. tazetta 'Geranium' cultivar and 20 days at N. 'Ice Follies'.

5. We recommend the studied narcissus for the following uses:

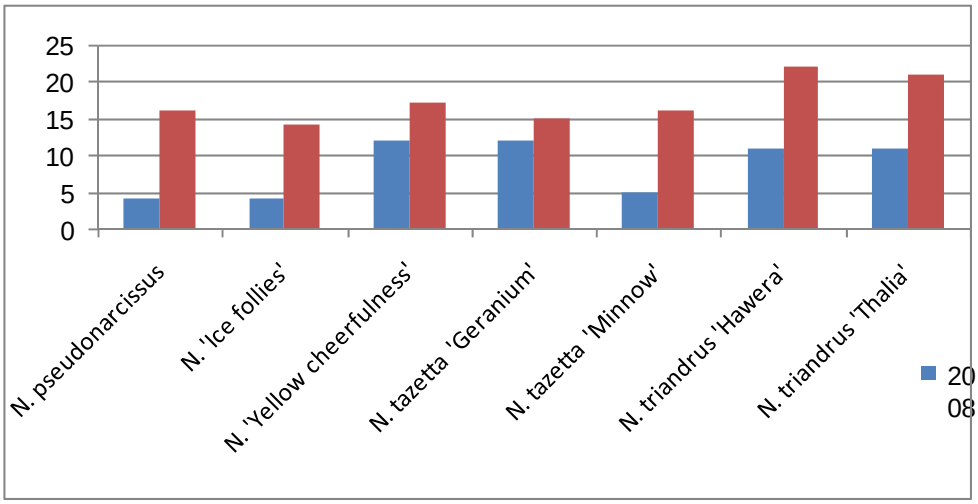
- the decoration of parks and gardens from March(last decade) until April(second decade), in bands, groups on lawns, on shores;
- as cut flowers: N.'Yellow cheerfulness', N.tazetta'Geranium', N. 'Ice folllies' and N. pseudonarcissus (big perfumed flowers, with a long stalk);
- in window boxes, balconies and terraces.



Graph 1. The spring at the studied plants from Narcissus gender, in the interval 2008-2009



Graph 2. The number of days from spring up to the beginning of blooming at the studied plants in the interval 2008-2009



Graph 3. The number of days from the appearance of the bud up to the colouring

Graph 4. The duration of decoration at the studied plants from Narcissus gender, in the interval 2008-2009

BIBLIOGRAPHY

1. Armitage M.A.- Armitage's manual of annual, biennals and half-hardy perennials, Timber Press, Portland, Oregon, 2001;
2. David Trinklein - Bulbi ce înfloresc primăvara, Division of Plant Scient, University of Missouri Extension, 2007;
3. Doerflinger Frederic, Complete Book of BULB GARDENING, Stackpole Books, 1973;
4. Doina Anton, Carmen Nicu - Comportarea în condiţiile oraşului Craiova a unor soiuri de lalele, zambile şi narcise., Analele Univ. din Craiova, Vol.VI(XLII), pg. 304-307, 2001:
5. Elena Şelaru, Cultura florilor de grădină, Ed. Ceres, Bucuresti, 2007;
6. Maria Băla- Floricultură generală şi special, Ed. De Vest, Timişoara, 2007;

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✔*Biologie*
✔*Horticultură*
✔*Tehnologia prelucrării produselor agricole*
✔*Ingineria mediului*

Vol. XIV (XLX) - 2009

RESEARCHES REGARDING THE BEHAVIOUR OF SOME GEOPHYTE PLANTS IN ORDER TO DIVERSIFY THE ASORTMENT

Constantina Ciurlin(Ghiță), Doina Anton[1]

KEY WORDS: geophyte plants, rustic bulbous, Fritillaria, Muscari, Puschkinia

ABSTRACT

Rustic bulbous plants have a great application and usage because of the attained utilitarian and social character, and because of their contribution for the beauty of the landscapes from parks and gardens. As a biological form, they situate in the geophyte plants class, having underground structures of storage named "bulbs".

The phenology of 3 genders of geophytes less cultivated: Fritillaria, Muscari and Puschkinia were studied in the conditions of Craiova city during 2008-2009.

The biological material came from Holland and was made up of 4 species: Fritillaria meleagris, Muscari armeniacum, Muscari botryoides var. album and Puschkinia scilloides(syn. P. libanotica).

The main phenophases and the decorative characteristics of these 4 species were studied. The duration of the decoration and the way of use regarding the studied specie were established.

INTRODUCTION

Flowers have been the most precious jewelry of nature since the oldest times because of their beautiful colors and the variety of shapes.

Fritillaria, Muscaria and Puschkinia genders represent a special category of geophyte decorative plants also called rustic bulbous, since they are less cultivated.

The name of Fritillaria gender comes from the cornet shape of the flowers(fritillis=cornet) and it is made up of more than 100 species, but only few of them, those ones having pedant, bell-shaped flowers, are used in the cultures.

Muscari gender(approximative 50 species) has perennial plants, with stalks that end up in a cluster having cylindrical flowers, with short petioles, coloured in violet-blue and sometimes in white. The most well-known in cultures are: Muscari armeniacum Baker, originary from the North-East of Asia Minor and Muscari bothryoides L. Miller – originary from Europe.

The name of Puschkinia gender is dedicated to the Russian researcher M. Puschkin, a great plant collector. The gender has 2 geophyte species with bulbs: Puschkinia scilloides Adams(sin. P. libanotica) and P. hyacinthoides Book with flowers similar to the hyacinth.

[1] Universitaty of Craiova, Faculty of Horticulture

MATERIAL AND METHODS

The biological material came from Holland and it was made up of 4 species: Fritillaria meleagris (euroasian species), Muscari armeniacum, Muscari botryoides var. 'Album' and Puschkinia scilloides (sin. P. libanotica).

The behaviour of these geophytes was seen about in the didactic field of the Floriculture discipline from Craiova city. A classic technology of culture was applied. The planting took place in October 2007 and observations were made during the period 2008-2009, in the spring.

The area is situated on a plane ground with clay-sandy texture, away from the draughtiness and it is characterized by a temperate-continental climate with hot summers and not very cold winters.

The observations and determinations were concerned with the main phenophases (the spring, the appearance of the flower bud, the colouring of the bud, the blooming), the morphological characteristics and the decorative qualities.

It was established the number of days from the spring to the blooming and the decorative period. According to their behavior in the culture, it was recommended the most indicated way of use for this less known species, charming and fascinating because of their flowers.

RESULTS AND DISCUSSIONS

In 2008, the spring took place on 20.02 at Puschkinia scilloides and on 26.02 at Muscari botryoides 'Album'.

The period from the appearance of the bud up to its colouring was longer at Muscari botryoides 'Album' (7 days) and shorter at Puschkinia scilloides (3 days).

The number of days from spring up to the beginning of blooming was 29 days at Puschkinia scilloides and 36 days at Muscari botryoides 'Album'.

The beginning of blooming took place in the last decade of March at Puschkinia scilloides and at the beginning of April at Muscari botryoides 'Album'.

The decoration period was between 9 days at Muscari botryoides 'Album' and 23 days at Puschkinia scilloides.

In 2009 Fritillaria meleagris and Muscari armeniacum species were introduced in the culture in order to diversify the assortment.

The spring took place on 20 January (very early) at Muscari armeniacum, because of the special climatic conditions; at Muscari botryoides 'Album' and Puschkinia scilloides it took place in the first decade of February (4-9.02), and the last one to sprang was Fritillaria meleagris species, on 25.02. As for the spring, comparative with the year 2008, it was noticed that it took place three weeks earlier at Muscari species and 2 weeks earlier at Puschkinia scilloides. (Graph 1)

The period from the appearance of the bud up to the coloring of the bud was longer at the two species of Muscari and at Puschkinia scilloides (12-17 days), while at Fritillaria meleagris was shorter (6 days).

The number of days from spring up to blooming was 55-69 days for the Muscari species and 39-43 days for the Puschkinia scilloides and Fritillaria meleagris. (Graph 2)

The beginning of blooming took place in the last decade of March at Muscari armeniacum, Muscari botryoides 'Album', Puschkinia scilloides, and in the first decade of April at Fritillaria meleagris. (Graph 3)

The decoration period was between 16 days at Fritillaria meleagris and 19-22 days at Muscari and Puschkinia species. (Graph 4)

The main decorative element at the four studied species of geophytes is represented by the flowers.

CONCLUSIONS

1. The period of spring at the studied genders was between 20.01 at Muscari armeniacum species and 26.02 at Fritillaria meleagris.

2. The number of days from spring up to blooming is between 29-43 days at Puschkinia scilloides and Fritillaria meleagris species and 36-69 days at Muscari armeniacum and M. botryoides 'Album' species.

3. The number of days from the appearance of the flower bud to the beginning of blooming is between 5-19 days at Puschkinia scilloides and Muscari botryoides 'Album' and 9-20 days at Fritillaria meleagris and Muscari armeniacum species.

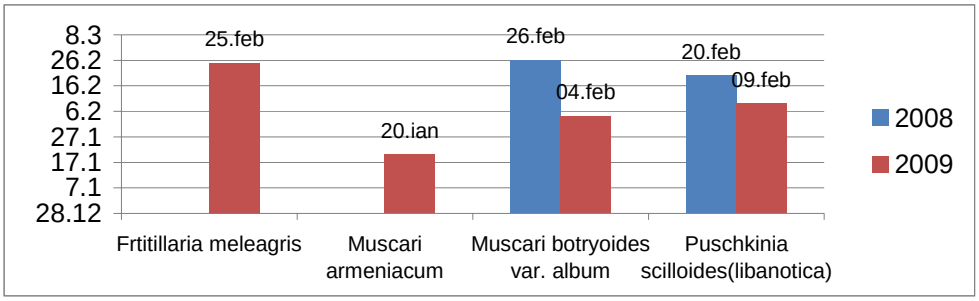
4. The average duration of decoration at Muscari botryoides 'Album' is of 14 days and at Puschkinia scilloides species 22 days, while at Fritillaria meleagris was of 16 days, and 22 days at Muscari armeniacum.

5. We recommend the studied geophytes for the following uses:

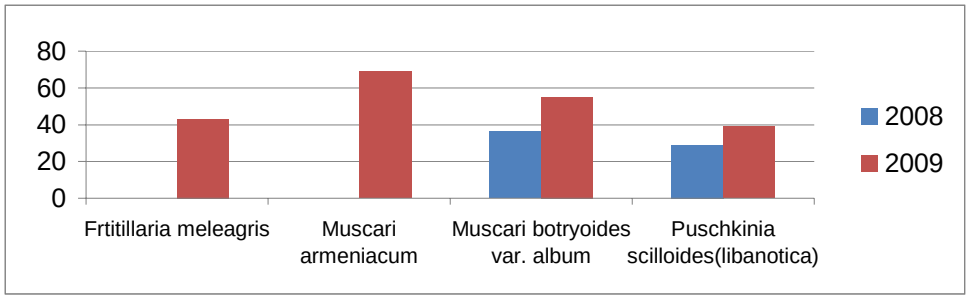
- Fritillaria meleagris (stripped tulip), a delicate species of 20 cm, is suitable for rocks, in groups or alone; it can also be used as a cut flower.

- Muscari armeniacum, 15-20 cm, is excellent for naturalizing, it is planted in large group, same at Muscari botryoides 'Album', and it is appreciated by the lovers of rocky areas; also it is ideal for forcing in flower pots, blooming during the winter months.

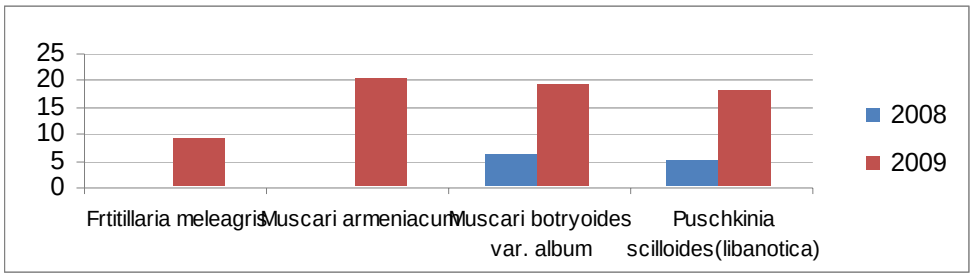
- Puschkinia scilloides (the ribbed Scilla) blooms in the early spring, it can be cultivated in large spots on the massifs edges, in mixt borders, along the alleys, at the base of trees, bushes, in turfs or in rocky gardens.



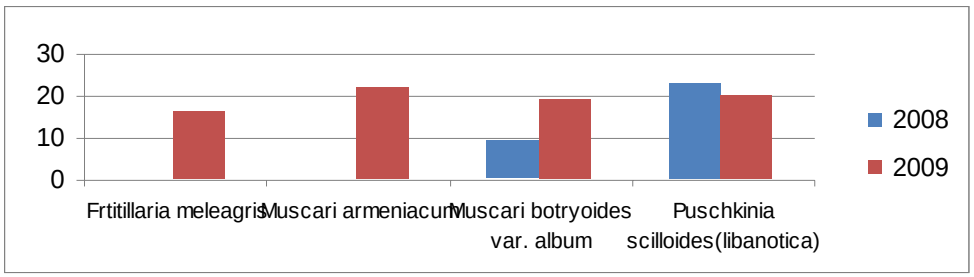
Graph 1. The spring at Fritillaria, Muscari and Puschkinia genders studied in the 2008-2009 interval



Graph 2. The number of days from spring up to the beginning of blooming at Fritillaria, Muscari and Puschkinia genders studied in the 2008-2009 interval



Graph 3.The number of days from the appearance of the bud to the beginning of blooming at Fritillaria, Muscari and Puschkinia genders studied in the 2008-2009 interval



Graph 4. The duration of decoration at Fritillaria, Muscari and Puschkinia genders studied in 2008-2009 interval

BIBLIOGRAPHY

1. Doina Anton, Carmen Nicu, Floricultură special, Vol. I. Ed. Universitaria, Craiova, 2006;
2. Stursa Jan- Plantes à bulbes,Libraerie Grün, Paris, 1997;
3. Şelaru Elena- Cultura florilor de grădină, Ed. Ceres, Bucureşti, 2007

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✔*Biologie*
✔*Horticultură*
✔*Tehnologia prelucrării produselor agricole*
✔*Ingineria mediului*

Vol. XIV (XLX) - 2009

STUDY OF THE STRUCTURAL PARTICULARITIES OF LEAVES IN SUCCULENT FLOWER PLANTS

Mihaela Cristescu[1], Doina Anton, Manuela Manda, Carmen Nicu[2]

KEY WORDS: *succulent, cuticle, stomata, protective hairs, mezophyll cells*

ABSTRACT

The succulent plants are plants little pretentious as far as the water regime is concerned. The study of the morpho - anatomical particularities of their leave constitutes a criterion of taxonomic identification a well as a clue concerning their biological behaviour, such as their resistance to drought. For the succulent plants the leaf mesophyll represents the tissue specialised in storing water, and the structural particularities of the foliar epidermis (thickening of the cuticle, reduced number of stomata, presence of protective hairs, changes of the epidermis cells structure) ensure the reduction of water loss.

In this work are presented the results of my own observations regarding the biometrical values for the mesophyll cells, cells and epidermis formations (stomata, cuticle, protective hairs) in 20 species of flower succulent plants establishing some existent connections among them.

INTRODUCTION

Succulent flower plants show certain morpho - anatomical features which, on the one hand, cause water storage in tissues, and on the other hand reduce its loss (which leads to the fact that for a certain period of time, the plant does not depend on external input of water, or the amount of soil water). The leaves are water storage organ for most succulent flower plants, and the crassulacean type structure characterizes the representatives of this group of plants.

The foliar limb is in general bounded on both lower and upper sides by an epidermis formed of thickened cell membranes and covered with a cuticle more or less thick which restricts evaporation, that`s why only 1/10 of the vapours are removed through the cuticle, the rest being removed through the stomata. In some cases epidermal cells may be of large sizes contributing thus to water storage, together with the mesophyll cells (Dieter J. von Willert,1992).

The stomata are those epidermis formations at which level there are achieved the gas changes, characteristic to certain physiological processes (photosynthesis, respiration) and the water is lost (through transpiration). At the succulent plants, the number of these ones have smaller values than on the non succulents ones: 18 - 33 stomata/mm^2 (Lutge, 1988 citated by Dieter J. von Willert, 1992), 3- 93 stomata/mm^2 (Dieter J. von Willert,

[1] *PhD scholarship through POSDRU/6/1.5/S/14 Project "Increasing the attractiveness, quality and efficiency of university doctoral studies by doctoral scholarships"*
[2] University of Craiova, Faculty of Horticulture

1992).The leaf mesophyll, of a homogeneous type, (there is no notice of a difference between the palisade parenchyma and spongy parenchyma) is composed of parenchymal cells of almost identical shape and size, with thin and cellulose walls, with little cytoplasm and large vacuoles, rich in vacuolar juice, with a composition of mucilaginous substances which have the role to accumulate and retain water. It is generally observed that cells from the outside presents a greater number of chloroplast in comparison with those inside the leaf (Tarnavschi I.T and all. 1974).

MATERIAL AND METHODS

The biological material used was represented by mature leaves belonging to the 20 species of succulent flower plants (*Aeonium domesticum, Aeonium tortuosum Ceropegia woodii, Crassula rupestris ssp marnieriana, Crassula orbiculari, Crassula lycopodyoides, Delosperma pruinosum, Echeveria sp., Kalanchoe rhombopilosa, Kalanchoe tubiflorum, Monanthes sp., Sedum linearum, Sedum mexicanum, Sedum morganianum, Sedum pachyphyllum*, *Senecio articulatum, Senecio jacobsenii, Senecio piramidatum, Senecio kleiniformis, Senecio rowleyanus).*The samples were gathered from the collection belonging to the discipline Floriculture, Faculty of Horticulture and to the greenhouse of the "Alexandru Buia" Botanic Garden from Craiova. In order to emphasize the structure of the leaves, at the level of the foliar limb, there were achieved tangential and transversal cut sections from the middle part of the leaf. The microscopic examination of devices was done at the OPTECH B4 microscope and the photos were achieved with the help of a CANNON device.

RESULTS AND DISCUSSIONS

The form of epidermic cells is different to the species: polygonal epidermic cells with straight or slightly corrugsted walls (*Aeonium tortuosum, Ceropegia woodii, Crassula rupestris ssp marnieriana, Delosperma pruinosum, Echeveria sp.,Kalanchoe rhombopilosa, Sedum morganianum, Senecio jacobsenii, Senecio kleiniformis, Senecio piramidatum, Senecio rowleyanus)* (figure 1), epidermic cells with elongated straight walls (*Crassula lycopodyoides, Sedum mexicanum*) (figure 2), epidermic cells with corrugated walls (*Aeonium domesticum, Crassula orbicularis, Kalanchoe tubiflorum, Monanthes sp., Sedum linearum, Sedum pachyphyllum)* (figure 3) .

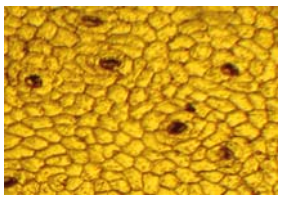


Figure 1
Senecio rowleyanus

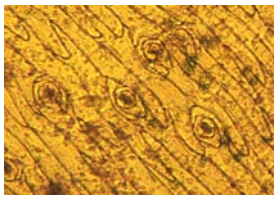


Figure 2
Crassula lycopodyoides

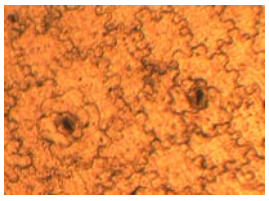
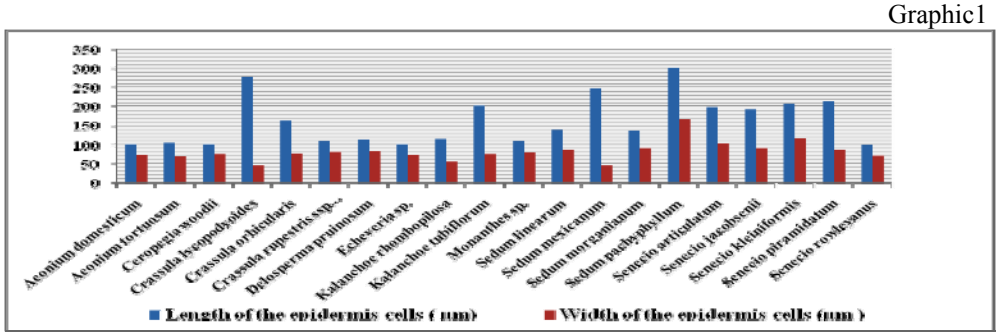


Figure 3
Sedum pachyphyllum

The dimensions of epidermic cells (L/l) (graphic1) - the minimum values were registered of *Senecio rowleyanus (100,35/70,6*µm*)* and *Ceropegia woodii(101,7/74,7*µm*),* the maximum values were registered of *Crassula lycopodyoides* (279/45µm) and *Sedum pachyphyllum (301,5/166,5*µm*)* .

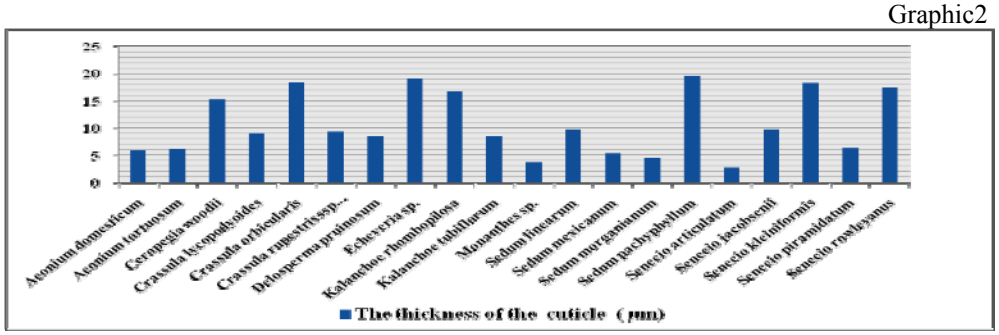
Graphic1



The dimensions of the epidermic cells (L/l)

The thickness of the cuticle (graphic 2) - the minimum values were registered of *Senecio articulatum* (2,71µm) and *Monanthes sp*.(3,74µm) (figure 4), the maximum values were registered of *Sedum pachyphyllum* (19,52µm) (figure 5).

Graphic2



The thyckness of the cuticle

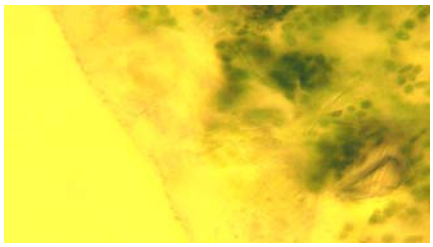


Figure 4 *Monanthes sp.*

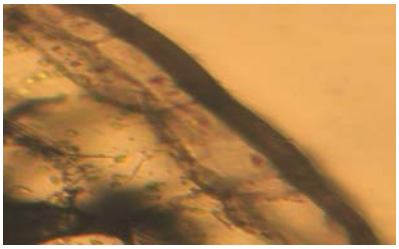
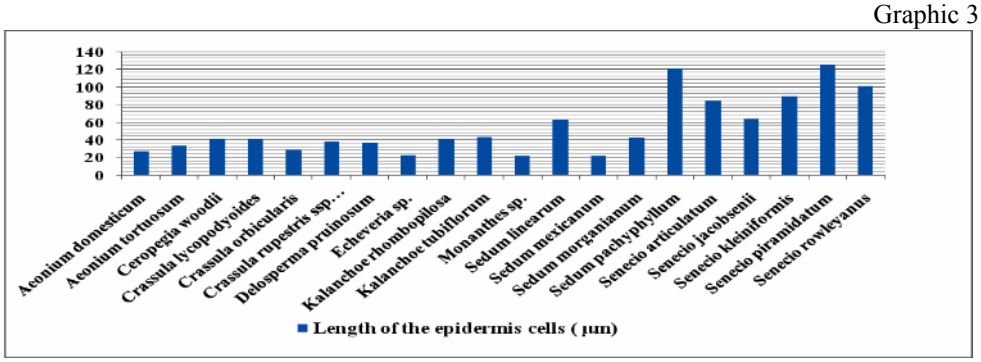


Figure 5 *Sedum pachyphyllum*

The dimensions of the stomata (L) (graphic 3*)* - the minimum values were registered of *Sedum mexicanum* (figure 6) and *Monanthes sp*.(21,6µm) (figure 7),the maximum values were registered of *Senecio piramidatum* (124,65µm) (figure 8) and *Sedum pachyphyllum (120,6*µm) (figure 9) .

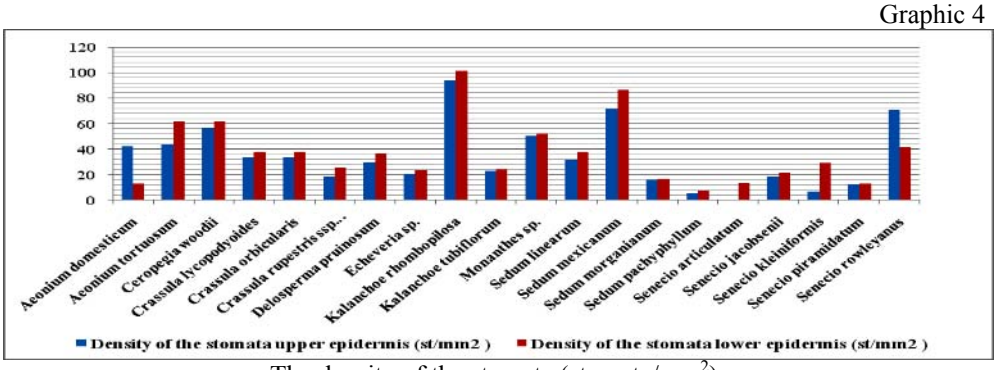
Graphic 3



The dimensions of the stomata (L)

The density of the stomata *(st/mm²)* (graphic 4) - the minimum values were registered of *Sedum pachyphyllum* (7,21 st/mm²) and *Senecio piramidatum* (13,1 st/mm²), the maximum values were registered of *Kalanchoe rhombopilosa* (101,29 st/mm²) and *Sedum mexicanum (86,57* st/mm²) .

Graphic 4



The density of the stomata (stomata/mm²)

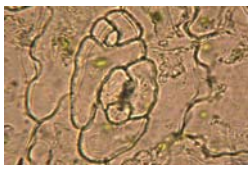


Figure 6
Sedum mexicanum

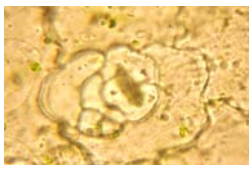


Figure 7
Monanthes sp.

Figure 8
Senecio piramidatum

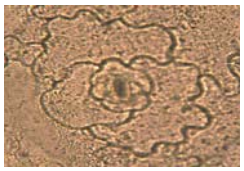


Figure 9
Sedum pachyphyllum

Protective hairs - are epidermal formations reflecting sunlight and protecting the plant from overheating, helping reduce water loss. Only 5 of the 20 species analysed in the present study have protective hairs (*Aeonium domesticum, Aeonium tortuosum, Delosperma pruinosum, Echeveria sp. Kalanchoe rhombopilosa*), their shape, size and density vary depending of the species. (figure 10, 11)

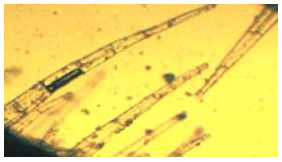


Figure 10
Aeonium domesticum

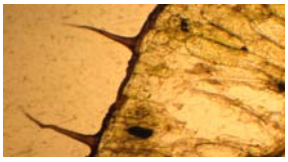
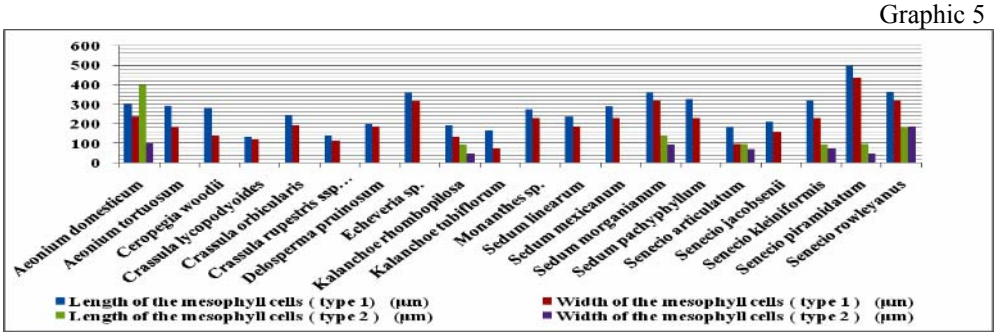


Figure 11
Delosperma pruinosum

Foliar mesophyll (graphic 5) is, in most species, composed of cells of approximately identical shape and size (L/l) (cells of type1). Homogeneous mesophyll composed of round or oval cells of approximately same size had the species *Sedum linearum,(233,2/184,9*µm) (figure 12*) Senecio jacobsenii (207,4/153*µm*)* (figure 13*), Crassula rupestris ssp. marnieriana (135,67/108,6*µm*)* (figure 14). In some species it is observed that the sizes of mesophyll cells decrease from the periphery to the center of the mesophyll. The mesophyll composed of two cell types (peripherally arranged cells, of smaller sizes and with a greater number of chloroplasts, which form the palisade parenchyma - cells of type 2, and bigger cells that store water and in which the chloroplasts are in a smaller number or even lack, which form spongy parenchyma - cells of type 1), was discovered in *Senecio articulatum (92,67/66,3*µm *7- 180,5/95,34*µm*), Senecio piramidatum (93,25/45*µm *– 495,11/433,7*µm*), Senecio kleiniformis(90,13/72,4*µm *– 315,55/225*µm) (figure 16,17,18).

Graphic 5



The dimensions of the mesophyll cells

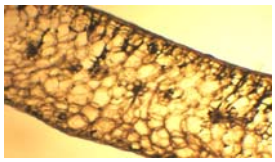


Figure 13
Sedum linearum

Figure 14
Senecio jacobsenii

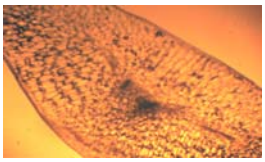


Figure 15
Crassula rupestris

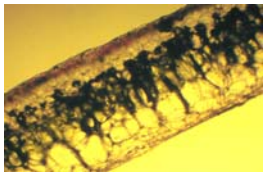


Figure 16
Senecio articulatum

Figure 17
Senecio kleiniformis

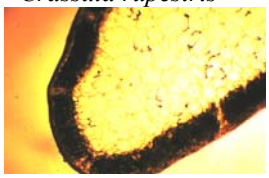


Figure 18
Senecio piramidatum

Adaptation to drought conditions is observed in the fact that each species presents certain structural features of foliar limb which either provide water storage or reduce water losses: Ex: big dimensions of the epidermic cells, mesophyll cells and small size of the stomata*(Ceropegia woodii, Crassula lycopodyoides, Sedum mexicanum*);cuticle thickening, big dimensions of the epidermic cells, small size and low density of the stomata(*Echeveria sp.);* big dimensions of the epidermic cells and mesophyll cells *(Senecio rowleyanus)*, and low density of the stomata *(Senecio piramidatum*);cuticle thickening, big dimensions of the epidermic cells and mesophyll cells, and low density of the stomata (*Sedum pachyphyllum*) etc .

CONCLUSIONS

Flower species studied show those adaptations characteristic to succulent plants: thickening of the epidermal cuticle (*Ceropegia woodii, Crassula orbicularis, Echeveria sp., Sedum pachyphyllum, Senecio kleiniformis, Senecio rowleyanus s.a*), low density of stomates (*Sedum pachyphyllum, Sedum morganianum, Senecio articulatum, Senecio piramidatum*), presence of protective hairs (*Aeonium sp.,Delosperma pruinosum, Kalanchoe rhombopilosa*), big dimensions of the mesophyll cells (*Echeveria sp., Sedum morganianum, Senecio piramidatum*, *Senecio rowleyanus*).

From the data presented, it is observed an interdependence between the various structures analyzed in the sense that where they are less developed the structures that reduce water losses grow to ensure the retention of water and vice versa. For example species with thin cuticle present higher values either for epidermal cells size *Senecio articulatum*) or for the size of mesophyll cells (*Aeonium tortuosum, Aeonium domesticum Monanthes sp., Senecio articulatum)*, or both (*Ceropegia woodii, Crassula lycopodyoides, Sedum mexicanum, Senecio piramidatum).* Also, the small sizes of mesophyll cells may be related to sizes and low density of stomata (*Crassula rupestris*) at which is added the cuticle thickening (*Kalanchoe rhombopilosa*) and/or increase in size of epidermal cells (*Senecio kleiniformis, Kalanchoe tubiflorum*) and small size of epidermal cells is correlated with cuticle thickening and growth in size of mesophyll cells *(Echeveria sp.*).

BIBLIOGRAPHY

1. Andrei M**.** - 1978 - *Anatomia plantelor* - Editura Didactica si Pedagogica Bucuresti;
2. Dieter J Von Willert, Benno M Eller, Marinus Ja Werger - 1992 - *Life Strategies of Succulents in Deserts:With Special Reference to the Namib Desert* - Cambridge UniversityPress;
3. Tarnavschi I.T**.** and all - 1974 - *Practicum de morfologie si anatomie vegetală* - Ed. Univ. Bucuresti.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✔*Biologie*
✔*Horticultură*
✔*Tehnologia prelucrării produselor agricole*
✔*Ingineria mediului*

Vol. XIV (XLX) - 2009

RESEARCH REGARDING THE INFLUENCE OF THE PERIOD OF CUTTINGS PRELEVATION AND BIOSTIMULATORS ON THE ROOTING OF SUCCULENT FLOWER PLANTS

Mihaela Cristescu[1], Doina Anton, Carmen Nicu, Manuela Manda[2]

KEY WORDS: succulent, propagation, cuttings, biostimulators

ABSTRACT

The propagation through cuttings is one of the most frequently used propagation methods of succulent plants.

In the present work are presented the results of two experiments (different period of cuttings prelevation respectively use of biostimulators) regarding the cuttings propagation of 9 species of succulent flower plants. The observations and determinations effectuated in the two experiments have pointed to the rooting process and the dynamic of growing rooted cuttings.

Following the research effectuated it was observed that the period of cuttings prelevation has a significant influence on the rooting time for all species under study, on the dynamic of growth for their majority and on the development of the radicular system in certain species.

Also the use of bio stimulators has influenced the development of the radicular system (the number of roots / cuttings), nevertheless regarding the rooting time and the posterior evolution of the plants there were no significant differences.

INTRODUCTION

The propagation through cuttings of flower succulent plants can relatively easy realize and it presents a series of advantages as well as technically as economically: the obtaining of identical plants with mother plants, from the genotypic and fenotypic point of view, the obtaining of mature plants, marketable in a shorter time in comparison with the propagation by seeds, the propagation of those species that in our conditions they don`t reach maturity or they do not form seeds.

The majority of studies made specify the fact that the propagation by cuttings, for the succulent flower plants from the indoors may realize all the year long. (Stephenson Ray, 2002). The aim of this study was the determining the influence of the prelevation period of cuttings and of the biostimulators over the cuttings rooting and the dynamic of plants growth (within 60 days starting from the planting of pots) on 9 species of succulent flower plants. The purpose of the first experience was that of verifying if there exist differencies concerning the duration, the percentage of rooting, the development of radicular and further

[1] *PhD scholarship through POSDRU/6/1.5/S/14 Project "Increasing the attractiveness, quality and efficiency of university doctoral studies by doctoral scholarships"*
[2] University of Craiova, Faculty of Horticulture

plants evolution, in case of taking off and planting the cuttings, in different periods (November, April).

The biostimulating substances have a benefic effect for the majority of flower plants (and not only) behaving under various aspects: faster rooting, higher percentage of rooted cuttings, a higher medium length, a better further plants growth, protection against pests and diseases during the callus formation and the root issue (Panea T. and all., 1998). The second experience aims at evaluating the same parameters, the effect of the biostimulating substances.

MATERIAL AND METHODS

The researches expand in the greenhouse of the Floriculture discipline at the Faculty of Horticulture of Craiova.The biological material used was represented by cuttings that bellonged to 9 species of succulent flower plants (*Crassula lycopodyoides, Crassula rupestris ssp. marnieriana, Sedum linearum, Sedum mexicanum, Sedum morganianum, Sedum pachyphyllum, Senecio kleiniformis, Senecio piramidatum, Senecio rowleyanu*s). The sampling and shaping the material was a day before planting. For the rooted cuttings it was used a standard substratum for the cactaceae and succulent plants, employing containers of small dimensions with a diameter of 6 - 8 cm.

For establishing the influence of the period of cuttings prelevation upon the rooting cuttings they were reaped in two different periods (Period I–November 2008, Period II–April 2009) and for marking out the biostimulating effect two types of biostimulators were used: Radistim (powder) and Atonik (liquid). For each species 20 cuttings were taken under observation, and in case of biostimulators we established three variants: V1- control, V2- Radistim, V3 – Atonik.

After a week of planting the cuttings we carried out the observations concerning the formation of radicular system, which were performed regularly within two- three days, for catching out the rooting moment for each species (time and rooting percentage). Once the planting rooted cuttings in the pots there were made some determinations concerning the particularities of the radicular system formed.

For all the species taken in the study it was established time, percent of rooting and it was evaluated the radicular system (the medium length of the roots, number of roots/cutting).

For the evaluation of the dynamics growth and development of rooted plants there were made some initial measurements after the planting into pots and afterwards every 30 and 60 days.

RESULTS AND DISCUSSIONS

The rooting period of different species varied between 21 days at *Senecio kleiniformis, Senecio piramidatum* and 42 days at *Crassula rupestris ssp marnieriana* (for period I-November), respectively 10 days at *Sedum linearum, Sedum mexicanum* and 25 days at *Sedum morganianum* (for period II-April).The observations made upon the cuttings rooting marked out that the rooting period was smaller with 9 days (*Sedum pachyphyllum*) to 27 days (*Crassula rupestris ssp marnieriana*), for the cuttings prelevate in April (graphic1). After evaluating the radicular system we observed that the period of prelevation of cuttings influenced less the roots length (the differences varying between 0.1 cm for *Crasula rupestris ssp marnieriana* and 1,5 cm for *Senecio kleiniformis* and more the roots

number on the cutting (from 0,2 for *Sedum morganianum* to 13 *Sedum linearum*), positive differences registered in the favour of the cutting harvested during spring (graphic 2,3).

In accordance with the species, the plants growth (after planting the cuttings rooted in pots) registered values between 0,5 cm for *Sedum pachyphyllum* and 4 cm for *Senecio kleiniformis* (period I) respectively 1,35 cm for *Sedum pachyphyllum* and *4,2 cm* for *Sedum mexicanum* (period II).

The growing plants dynamic is different in the two periods, the rate of growth being twice more (in favour of April) for *Crassula lycopodyoides*, *Sedum linearum*, *Sedum mexicanum* and *Sedum pachyphyllum*. The exception is made by the species of the genus *Senecio* and *Crassula rupestris ssp marnieriana*, were are the approximately the same values for the two periods (graphic 4,5).

The usage of biostimulating agents influenced less the rooting period, between the variants of the same species, differences registereted being at the most three days (*Crassula lycopodyoides and Crassula rupestris ssp. marnieriana*) (graphic 6).

The biostimulators (Radistim and Atonik) influenced the development of the radicular system by the growth of roots number on the cutting for *Sedum linearum* and *Sedum mexicanum* and the roots length growth for *Senecio rowleyanus*, between the variants of the other species not existing significant differences (graphic 7,8).

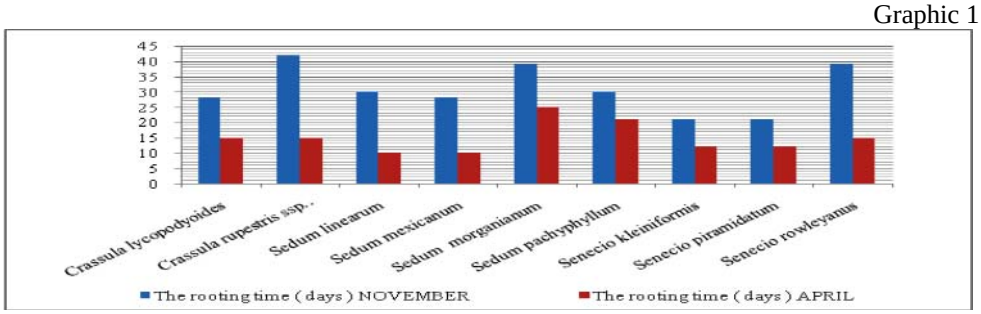
The usage of the biostimulators did not influence in a significant way the dynamic growth for the plants, that registering values between 2,6 cm for *Senecio rowleyanus* and 6,7 cm for *Sedum mexicanum* (for V1 – control), 2,5 cm for *Senecio rowleyanus* and 6,82 cm for *Sedum mexicanum* (for V2-Radistim), 2,62 cm for *Senecio rowleyanus* and 6,89 cm for *Sedum mexicanum* (for V3 – Atonik).

We observed that the effect of the two types of biostimulating substances over the growth is different, dependent on the species. For example, at *Sedum linearum* and *Sedum mexicanum*, the plants growth was much influenced for the variants treated with Atonik and Radistim. For *Crassula rupestris ssp. marnieriana*, bigger dimensions of the plants were registered for control, in comparison with the variants that were used for the biostimulators (graphic 9,10,11).

After 60 days we can observe a certain uniformity of the plants dimension that belong to different variants of the same species. For some species we registered a more obvious development of the foliage in the first 30 days from planting them into the pots. (*Crassula rupestris spp marnieriana, Sedum linearum*).

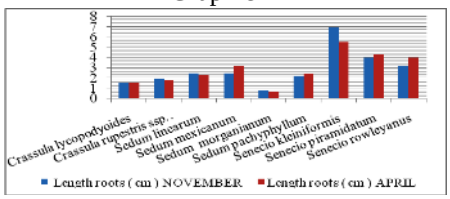
The period of development for the cuttings and the usage for the biostimulators did not influence the rooting procent (graphic 12,13).

Graphic 1

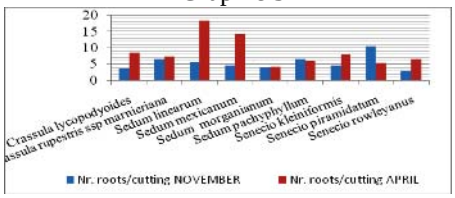


The rooting duration of the cuttings planted in two different periods (November, April)

Graphic 2

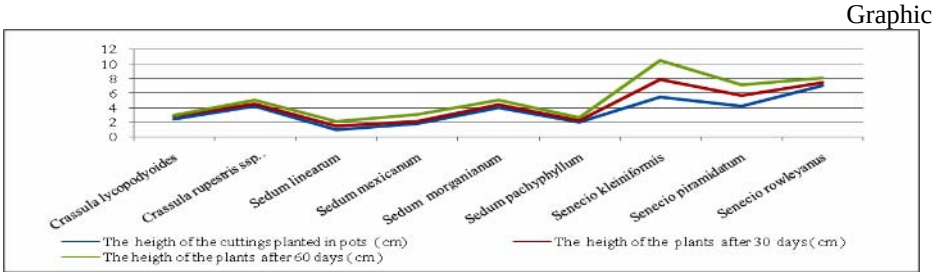


Graphic 3



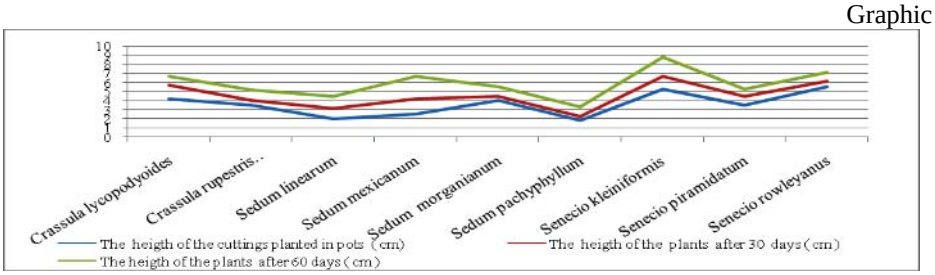
Development of the radicular system of the cuttings planted in two different periods (November, April)

Graphic 4



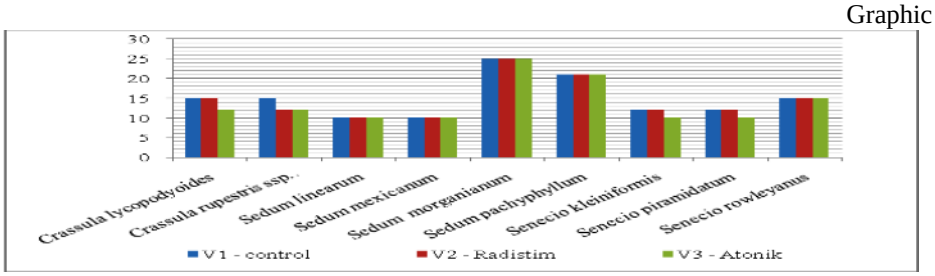
The dynamic growth for the plants (November)

Graphic 5



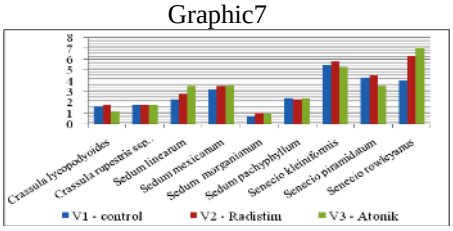
The dynamic growth of the plants (April)

Graphic 6

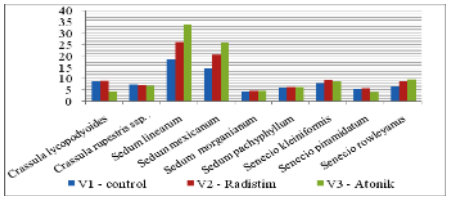


The rooting duration (days)

Graphic7

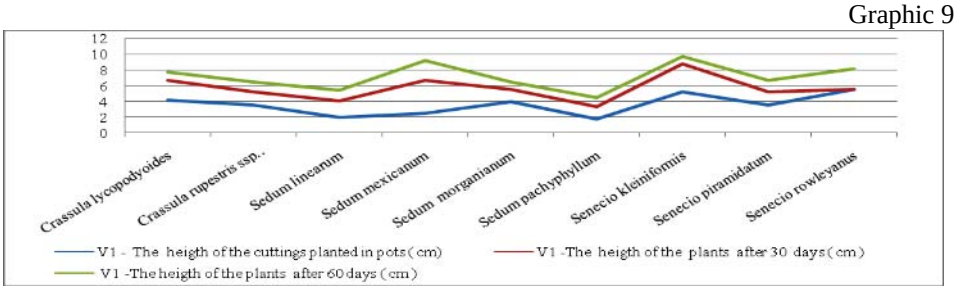


Graphic 8



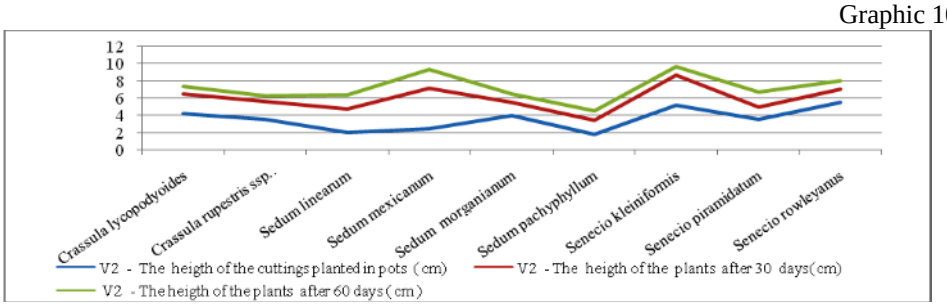
Development of the radicular system - length of the roots (left) and nr. roots/cutting (rigth)

Graphic 9



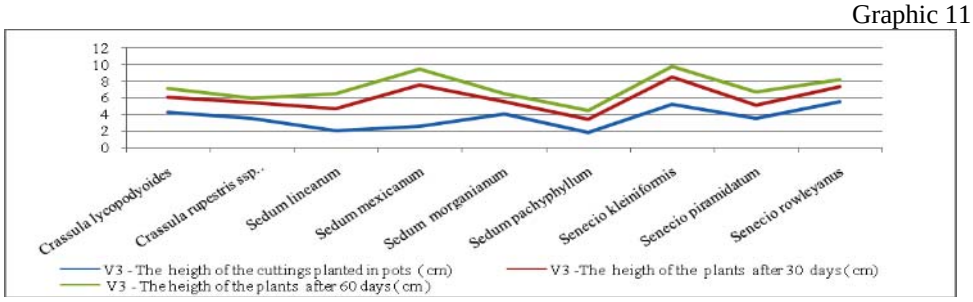
The dynamic growth of the plants (V1)

Graphic 10



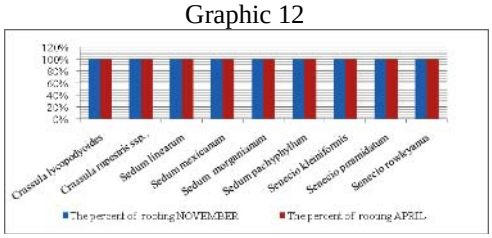
The dynamic growth of the plants (V2)

Graphic 11

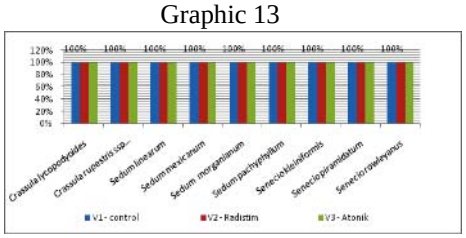


The dynamic growth of the plants (V3)

Graphic 12



Graphic 13



The percent of rooting

CONCLUSIONS

The propagation of succulent flower plants throughout cuttings could realize in different periods of the year, but not with the same efficiency, for the species in study, in period II (April), the rooting period being reduced to 9 days (*Sedum pachyphyllum*) to 27 days (*Crassula rupestris ssp marnieriana);*

The rate growing for plants (after the plantation of the cuttings into the pots) is specific to the species, registering values between 0,5 cm for *Sedum pachyphyllum* and 4cm for *Senecio kleiniformis* (period I) respectively 1,35 cm for *Sedum pachyphyllum*) and 4,2 cm for *Sedum mexicanum* (period II);

The growth plants dinamic is different in the two periods, the growing rate being of almost twice bigger in the second period for *Crassula lycopodyoides*, *Sedum linearum*, *Sedum mexicanum* and *Sedum pachyphyllum*;

The usage of biostimulators influenced the development of the radicular system (number of roots) but as for the rooting time and the further evolution for cuttings there wasn`t registered significant differences.

BIBLIOGRAPHY

1. Hartman T. H., Kester D., Davies F. - 1993 - *Plant propagation* - Ed. Prentice Hall;
2. Milica C. I. , Stan Sabina, Toma Liana Doina - 1982 - *Substante bioactive in horticultura* Ed. Ceres Bucuresti;
3. PaneaT., Popescu S., Ungur,I., Mihaiescu,T. and Chitu V. - 1998 - *Radi-stim - a new bioregulator for rapid vegetative multiplication of the plants* - Acta Hort. (ISHS) 463:191-200;
4. Ray Stephenson - 2002 - *Sedum: Cultivated Stonecrops* - Timber Press.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✔*Biologie*
✔*Horticultură*
✔*Tehnologia prelucrării produselor agricole*
✔*Ingineria mediului*

Vol. XIV (XLX) - 2009

STUDY CONCERNING VEGETATIVE PROPAGATION BY CUTTINGS ON NERIUM OLEANDER L.

Simion Costinela, Anton Doina[1]

KEY WORDS: Nerium, propagation, vegetative, cutting, substrate.

ABSTRACT

Nerium oleander L.part of Apocynaceae family is a shrub cultivated for ornamental purposes, with low claims against environmental conditions, drought tolerant and very tolerant in terms of soil type, with a high decorative value.

This work contains results of the multiplication of species by vegetative cuttings watching the influence of culture substrate (peat tablets, peat and perlite 2:1, peat and sand 2:1), used cutting type (apical or base shoot) and the influence of substrate temperatures on multiplication in two experiments (on parapet, on heated rooting substrate and in ubheated substrate). The best results were recorded in cuttings from the top in peat and perlite on heated substrate.

INTRODUCTION

Decorative plants can be reproduced sexual (with seeds) or asexual (cuttings, shrubs separation, layering, etc). Multiplication through seeds is used generally, if we want to get new varieties or is necessary to obtain a large amount of plants.

Vegetative propagation is based on the acquisition of parts of the plant to recover the entire plant, and because use more developed parts of the plant state, can be achieved in a much shorter time mature plants compared to multiplication by seeds.

Nerium oleander L. can be propagated by cuttings in any time of the year. Grafting, tip or air layers also may be taken to propagate oleanders and also in vitro multiplication to obtain abundant propagation plant material for commercial use.

Nerium oleander L. propagation by seeds it is also used to get new varieties but it takes a long time between planting and flourished. This paper presents data on Nerium oleander L. vegetative propagation, by cuttings.

MATERIAL AND METHODS

Research on vegetative propagation of the species Nerium oleander L was conducted in greenhouse multiplier of the Department of Floriculture, equipped with a system provided with heating of the rooting substrate. Biological material used (shoots) for the vegetative propagation was provided both by the teaching greenhouse of the of Floriculture Department and private sources.

[1]The University of Craiova , Horticulture Faculty

It is well known that substrate temperature and substrate culture occupies an important place for successful crops, influencing on vegetative propagation, the percentage of rooted cuttings and root system development.

To determine the most favorable substrate, for Nerium oleander L cuttings rooting, I planted cuttings from the top and base of the shoot (treated with Radistim) in three rooting substrates (peat tablets, peat and perlite in a 2:1 ratio, peat and sand in a 2:1 ratio).

To test which is optimal temperature for rooting, the cuttings were put on the parapet in unheated substrate and on substrate heated to a temperature of 23° C. The ambient temperature was around 18° C for approximately one and a half month, after was ensured an ambient temperature of 21-22 ° C.

I repeated the experiment in different epochs, in February 2008 and October 2008 after flowering, to determine the optimal period of vegetative reproduction by cuttings of species Nerium oleander L.

The paper includes the results of the second period.

RESULTS AND DISCUSSION

On unheated substrate, the number of days from cuttings planting to root was 104 days, both in the substrate of peat and sand and peat and perlite, the best time for rooting was 81 days recorded in peat tablets, for both, the top shoot cuttings and cuttings from the base of the shoot.

Highest percentage of rooting, 50% was recorded at the top cuttings in peat and perlite substrate 2:1, the lowest percentage for top cutting was 10 % in peat and sand.

For base cuttings highest percent, 20 % was registered in peat and perlite,the lowest (0%) was in sand and peat substrate 2 1(chart1).

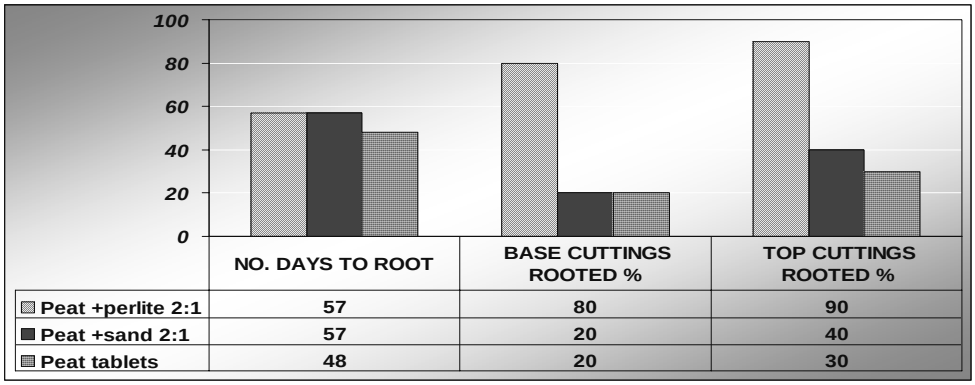
On heated substrate of peat and sand and peat and perlite, the number of days from planting to cuttings root was 57 days in peat and perlite 2;1 and peat and sand 2:1 substrate, for top and base shoot cuttings,while the best time, 48 days, was recorded both tipe of cuttings on peat tablets.

Highest percentage of rooting on heated substrate, 90%, was established at the top shoot cuttings in peat and perlite 2:1, the lowest was 30 % in peat tablets.

For base shoot cuttings the best percentage recorded in peat and perlite (80 %) the lowest, 20% was in peat and sand 2: 1 and peat tablets (chart 2).

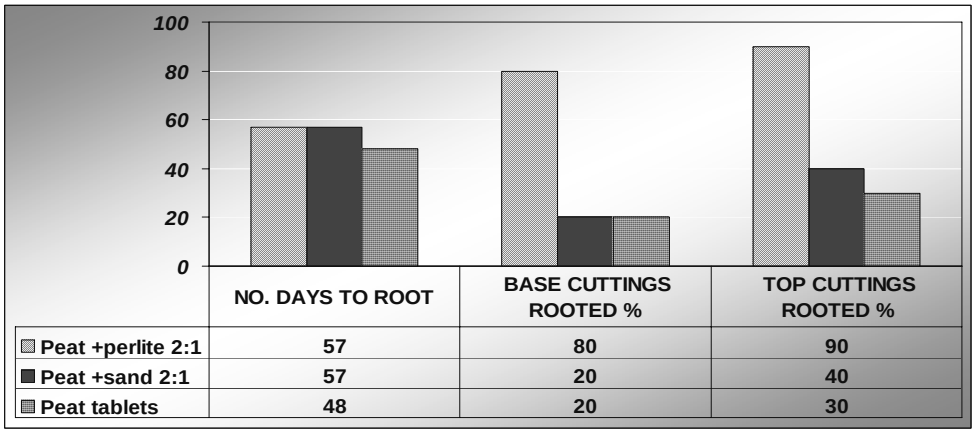
Regarding the influence of substrate temperature on root cuttings, it was found that the highest percentage of rooting was 90% for top cuttings, 80% for the base one on substrate heated at 23 ° C, compared with the rooting of cuttings on unheated substrate, where the highest percentage was 50% for top shoot cuttings and only 20% for base shoot cuttings (chart 3).

In March 2009 I planted rooted cuttings in pots, in three culture substrates (universal substrate, culture substrate for ornamental plants with flowers and red peat culture substrate), the percentage of plant grip after pot planting was 100% in all three medium(chart 4).



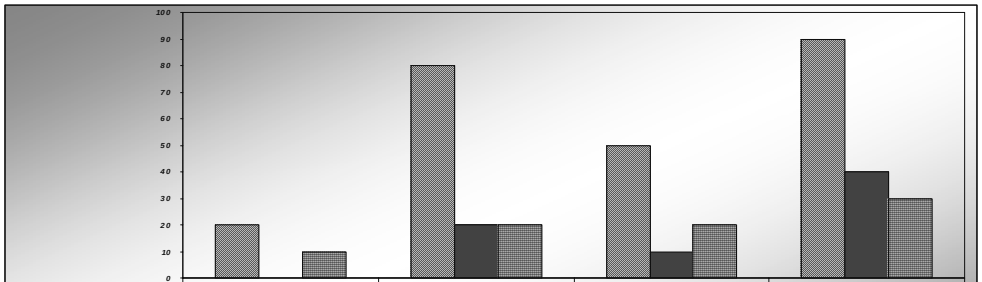
	NO. DAYS TO ROOT	BASE CUTTINGS ROOTED %	TOP CUTTINGS ROOTED %
Peat +perlite 2:1	57	80	90
Peat +sand 2:1	57	20	40
Peat tablets	48	20	30

Chart 1.The influence of culture substrate and cuttings type concerning rooting, on unheated substrate



	NO. DAYS TO ROOT	BASE CUTTINGS ROOTED %	TOP CUTTINGS ROOTED %
Peat +perlite 2:1	57	80	90
Peat +sand 2:1	57	20	40
Peat tablets	48	20	30

Chart 2.The influence of culture substrate and cuttings type concerning rooting on heated substrate



	BASE CUTTINGS UNHEATED SUBSTRATE	BASE CUTTING HEATED SUBSTRATE	TOP CUTTINGS UNHEATED SUBSTRATE	TOP CUTTINGS HEATED SUBSTRATE
Peat +perlite 2:1	20	80	50	90
Peat + sand 2:1	0	20	10	40
Peat tablets	10	20	20	30

%

Chart 3.Influence of substrate temperature concerning cuttings rooting

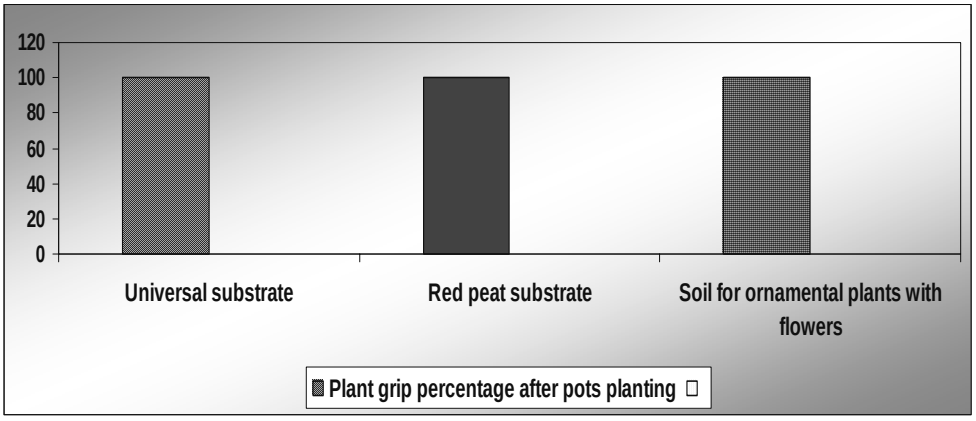


Chart 4. Percentage of plant grip after pot planting (period II)

CONCLUSIONS

1. The highest percentage of rooted cuttings was established on the substrate heated (23° C) composed of peat and perlite 2:1.
2. The time for cuttings rooting was much better, 48 to 57 days, on the heated substrate, compared with 81-104 days for unheated substrate.
3. The cuttings recommended for rooting are top shoot cuttings for unheated substrate, where the percentage of rooted cutting was 50-20, compared to a rate of 20-10 for the base shoot cuttings, and also, for heated substrate where the percentage of rooted cutting was 90-30 ,compared to 80 -20 to basal ones.
4. Although rooted hard, once rooted cuttings resist in any type of substrate, percentage of grip plants after planting in pots being 100%.

REFERENCES

1. Anton Doina. General floriculture, Craiova., Publisher Universitaria ,2003.
2. Anton Doina, Nicu Carmen, Manda Manuela, Special Floriculture, Volume II, Craiova., Publisher Universitaria, 2007.
3. Nicholas J. Growing Oleanders in Northern Climates, International Oleander Society Newsletter. ISSN 1096-5726, 2002.
1. Rauch F. Ornamentals and Flowers, Cooperative Extension College of Tropical Agriculture and Human Resources, University of Hawaii at Manoa, Honolulu, Hawaii 96822 Series no. 4,1979.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✔*Biologie*
✔*Horticultură*
✔*Tehnologia prelucrării produselor agricole*
✔*Ingineria mediului*

Vol. XIV (XLX) - 2009

RESEARCH ABOUT INFLUENCE OF MEDIUM CULTURE CONCERNING GROWTH AND DEVELOPMENT ON NERIUM OLEANDER L. PLANT

Simion Costinela, Anton Doina[1]

KEY WORDS: morphological, vegetation, seeds, Nerium, substrate.

ABSTRACT

Research has aimed to determine the influence of culture substrate on the main morphological characters (total plant height, average number of leaves and average number of shoots per plant, length and average width leaves) from plants species Nerium oleander L. obtained by cuttings.

The highest number of shoots and the highest number of leaves per plant was recorded in plants on the red peat substrate. The highest plants, the highest leaf length and width was obtained from plants of the universal culture substrate.

INTRODUCTION

The main objectives in this experience relates to determining the best culture substrate for optimal growth and development of plant species Nerium oleander L.

MATERIAL AND METHODS

Biological material used was composed of plants obtained from rooted cuttings in a greenhouse multiplier of the Department of Floriculture, on parapet, in two experiments (in the root substrate heating and cold substrate).

Rooted cuttings were planted in three types of substrate, namely, red fertilized peat, grit average 0-15 mm, pH 5 6-6, substrate for ornamental plants with flowers, substrate pH 5-6,5 and universal substrate, pH 5-7.

To track the influence of culture substrate on the main morphological characters of plants atone year after pot planting I have performed at various time intervals, measurements of the average number of shoots per plant (the average growth for a shoot was made on each plant), were recorded data on total plant height (measurements were made from the ground surface to the highest part of plant).

Determinations were made also regarding the average number of leaves on plants and the average length and width of leaves on the plants.

[1] The University of Craiova , Horticulture Faculty

RESULTS AND DISCUSSION

In March 2008 I planted the rooted cuttings in pots, in three culture substrate (red peat substrate, universal soil and substrate for ornamental plants with flowers).

The fixture percentage of rooted cuttings after they were planted in pots in all three culture substrates was 100% (chart 1).

Regarding the influence of culture substrate on branching plants, the observations made at approximate one year after pot planting show that the highest number of branches were recorded in plants of red peat culture substrate, on average 2.2 shoots per plant, the lowest number (1.5 shoots per plant) was registered on plants from universal culture substrate (chart 2).

In the range 17.06.2008-0908.2008 increases shoots in culture substrate for ornamental plants with flowers was on average 3.43 cm, on universal substrate was 1.4 cm, the lowest increases recorded in red peat substrate (0.69 cm).

In 09.08.2008-15.12.2008 interval,on substrate for ornamental plants with flower there was recorded a growth of 4.62 cm, in plants of the universal culture substrate shoots increased by an average of 5.84 cm, the lowest increase (3.88 cm) was in the range of plant shoots in red peat substrate.

In 15.12.2008-07.07.2009 range, the highest growth rate was found in shoots of universal soil (9.92 cm), the lowest increase being recorded on shoots of plants from red peat culture substrate 6.51 cm, shoots increases on soil for ornamental plants with flowers was 7.96 cm (chart 3).

We can see that the increasing of shoots in an interval of one year was 17.6 cm for shoots on the universal substrate, 11.08 cm on the red peat substrate and 61.01 cm in soil for ornamental plants with flowers.

Approximately one year after pot planting ,on plants of the substrate for ornamental plants with flowers was recorded an average height of 35.14 cm ,highest was registered on plants of universal substrate, respectively 35.26 cm, the smallest height, 32.36 cm, was determined in plants on red peat substrate (chart 4).

Data with the influence of substrate on the main morphological characters of leaves (average leaf length and width and the average number of leaves per plant), reveals that the largest number of leaves was recorded in plants on red peat substrate (27.44) and the smallest number was recorded on plants in the universal substrate.

Both leaf length and width of the largest, was found in plants from the universal culture substrate, the lowest values being those of red peat (chart 5).

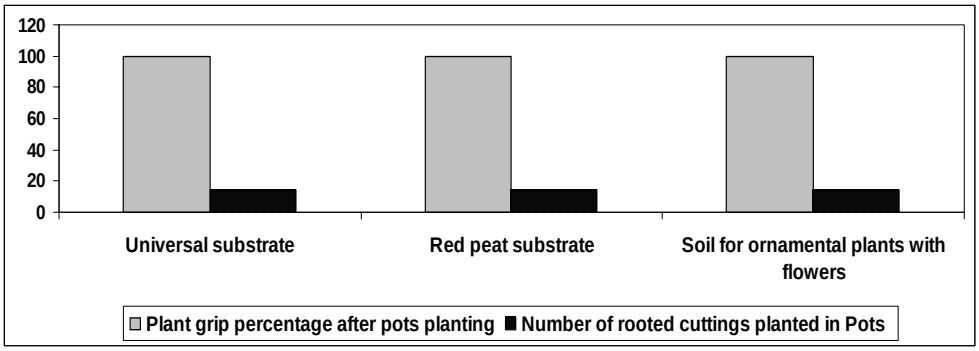


Chart 1.Percentage of grip after pot planting plant (period I)

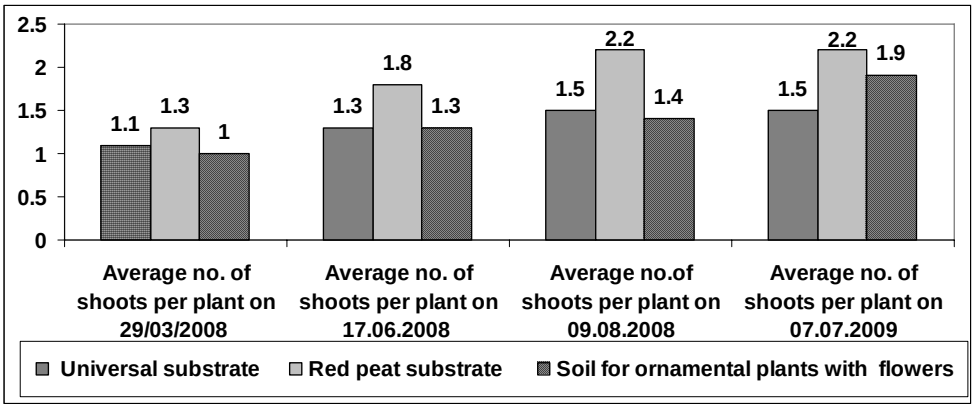


Chart 2. The influence of culture substrate on branching pot plants at different time intervals

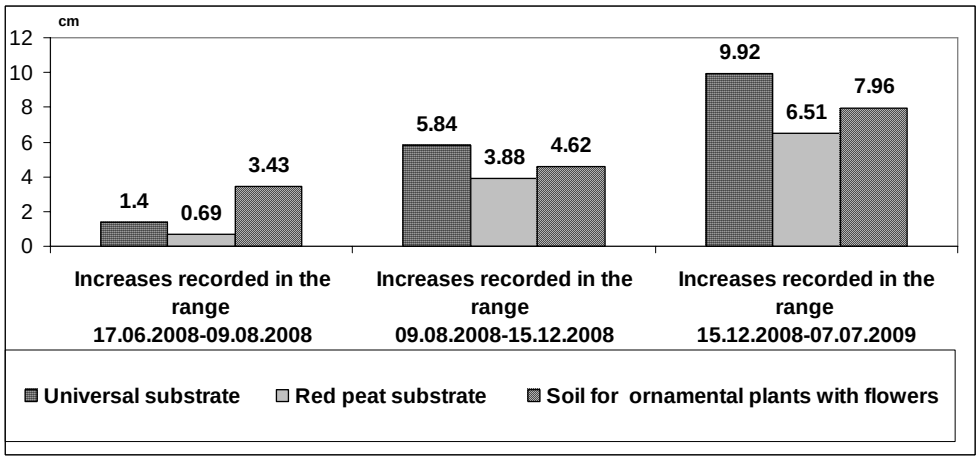


Chart 3. The influence of culture substrate on growth of shoots

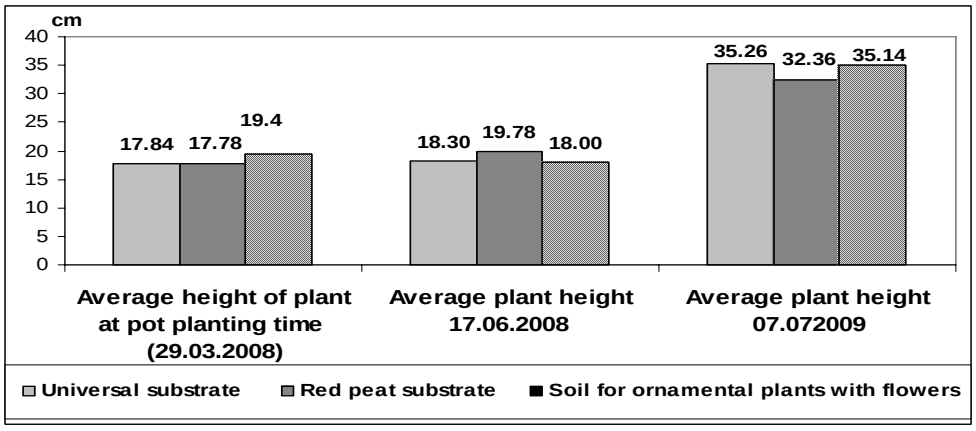


Chart 4. Plant growth dynamics, a year after pot planting

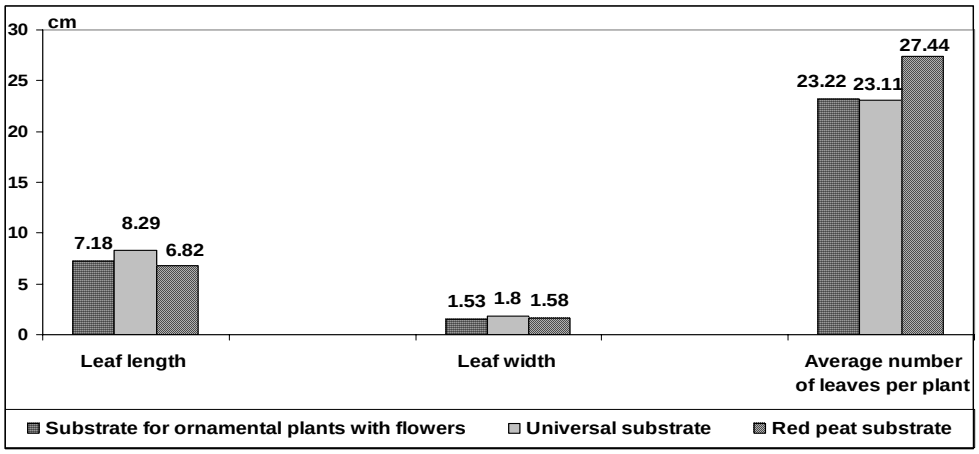


Chart 5. The influence of culture substrate on the morphological characters of leaves at one year after pot planting

CONCLUSIONS

1. Once rooted, cuttings,after planting in pots they resist well in all three substrate, percentage of grip being 100%..
2. Red peat culture substrate, is the most favorable substrate for branching Nerium oleander L.plants obtained by cuttings.
3. Shoots recorded the highest growth rate, 17.6 cm on the universal culture substrate in about one year after pot planting plants.
4. To obtain compact plants it is recommended the red peat substrate.
5. The highest number of leaves was recorded on plants on the red peat substrate,the largest leaf length and width was found in plants of the universal substrate.

REFERENCES

1. Anton Doina. General Floriculture, Craiova., Publisher Universitaria ,2003.
2. Dirr.M.A. & Heuser M.W.The Reference Manual of Woody Plant Propagation. Athens Ga. Varsity Press ISBN 0942375009 [113], 1987.
3. Ingram Dewayne L.si Yeager Thomas H. Propagation of Landscape Plants. Institute of Food and Agricultural Sciences, University of Florida, Gainesville FL 32611, Revised March 1991,.Reviewed October 2003.
4. Sheat. W.G.Propagation of Trees, Shrubs and Conifers. Macmillan and Co, 1948.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✔*Biologie*
✔*Horticultură*
✔*Tehnologia prelucrării produselor agricole*
✔*Ingineria mediului*

Vol. XIV (XLX) - 2009

RESEARCH ON BEHAVIOUR OF *MAGNOLIA SOULANGIANA* IN THE ROOTING PHASE OF *IN VITRO* CULTURE

Radomir Ana-Maria, Tudor Radu Cristinel Mihai[1]

KEY WORDS: Magnolia soulangiana, in vitro rooting

ABSTRACT

This article presents the realizations of the tehnology of producing biological material with rapidly clonal multiplication with reference at the phase of in vitro rooting. Magnolia has a different behaviour in the rooting phase, the results were influenced by the composition of culture media. For the magnolia rooting proved to be efficient the concentration of 0,2 mg/l IBA when the procent of rooting reached 96%.

INTRODUCTION

In the last years the medical plants are more important because are used like base material for obtaining active substances for pharmaceutical and cosmetics industry. In the present in our country ascertained a tendency for returning at phytotherapy, who lead at the extinctions of plantations of *Magnolia soulangiana*. Also, the Magnolia species were planted for ornamental purposes.

Considering the disadvantages of traditional reproduction by seed, marcottage, grafting, summer cutting propagation induction of genetic variability, passing on viral and micoplasmatic diseases as well as the success scored during the last years by the *in vitro* tissue culture propagation of ornamental plants, we took the initiative of *in vitro* propagation of *Magnolia soulangiana* species in order to obtain rejuvenated planting material, in good phytosanitary condition.

MATERIAL AND METHOD

For the realization of this phase the shoots obtained on micropropagation culture media were individualized and cultivated on aseptic substrate with different content of auxin (fig. 1).

[1] INCDBH Stefanesti-Arges

Figure 1. The individualization of magnolia microcuttings

The explants transfer on the rooting culture media was made in a sterile room, on a hood with laminar air flow (fig.1). The surgical type instruments used (tweezers, scalpel with the single use blade) were sterilized in the drying stove, at 120^{o}C temperature for 2 hours and in the working time were sterilized after every utilization. For avoiding the cultures contamination, the operator carried mask and the hands were desinfected by washing with soap and utilising the desinfectants gels (ex. Hexigel).

The 4 culture media tested for rooting of microcuttings of magnolia are complex composition with differente types and concentrations of phytohormones (tab.1).

In order to avoid the weighing errors, the macroelements were used like 10x more concentrate solutions while the microelements and the vitamins for 100x more concentrates solutions. We used phytohormones like dilutions of 100 mg/l(10^{-4}).

The pH registered in a culture medium was adjusted to 5,6-5,8 before autoclaving.

The sterilisating of culture media was realized by autoclaving at 120^{o}C temperature for 20 minutes. During the rooting phase, in the growing room we have ensured controled conditions (photoperiod of 16 hours, temperature between 22-24^{o}C).

The observations were realized weekly and the explants were passed on fresh cultures media when appearing the vitrification phenomenon or oxidatives processes.

Table 1.

The components of culture media tested
for *in vitro* rooting of magnolia

Components (mg/l)	***Factors variables***			
	A.1.	**A.2.**	**A.3.**	***A.4.***
Macroelements	MS 1/2	MS 1/2	MS 1/2	*MS 1/2*
Microelements	MS 1/2	MS 1/2	MS 1/2	*MS 1/2*
Vitamins	LS	LS	LS	*LS*
NaFeEDTA	38,0	38,0	38,0	*38,0*
Dextrose	30.000	30.000	30.000	*30.000*
Agar	7.000	7.000	7.000	*7.000*
Giberellic acid	0,1	0,1	0,1	*0,1*
Indolilbutiric acid	*0,2*	*0,4*	*0,6*	*0,8*

Legend: MS = Murashige – Skoog (1962)
LS = Linsmaier – Skoog (1965)
Vitamins LS (mg/l): Tiamine – 0,4; Inositol – 100,0

RESULTS AND DISCUTIONS

Magnolia has a good behaviour *in vitro* rooting process, the differences registered at the rooting percentages were influenced by the genotypes and by the composition of culture media, especially by the concentration of indolilbutiric acid .

Depending the concentration of auxin, at the magnolia was registered 53 – 96% microcuttings rooted. The maximum values were obtained in the presence of 0,2 mg/l indolilbutiric acid. At this concentration did't registered the formation of calus at the base of microcuttings (fig.2).

Figure 2. *In vitro* rooting of magnolia microcuttings

As one goes along the concentration of auxin growed, has been found a diminution of the number of microcuttings rooted until 53% and a progresive growth at the mass of callus formed at the base of these (fig.3).

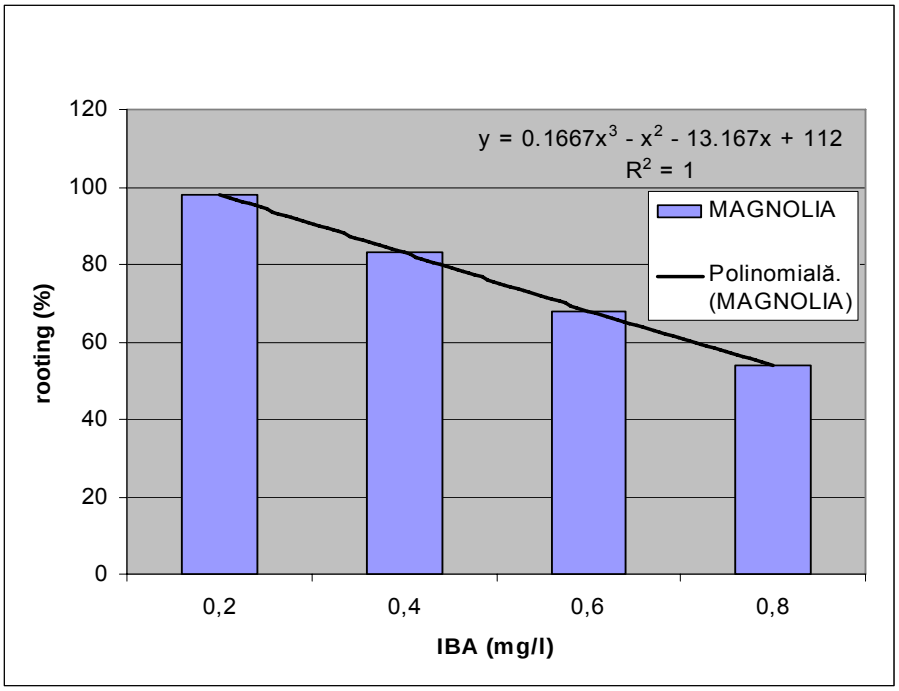


Figure 3. The influence of indolilbutiric acid over rooting of magnolia microcuttings

CONCLUSIONS

For the magnolia rooting proved to be efficient the concentration of 0,2 mg/l IBA when the procent of rooting reached 96%.

BIBLIOGRAPHY

1. Biederman I.E.G. – Factors affecting establishment and development of Magnolia hybrids *in vitro*. Acta Horticulturae, 1987, 212, s. 625-629
2. Gautheret R.J. --La Culture des Tissus vegetaux. Masson et Cie, Paris, 1959
3. Isac Valentina – *In vitro* propagation of *Magnolia soulangiana* species. Factors affecting the growth of apical and nodal bud explants. 4th International Symposium Biotechnology now and tomorrow 26-27 September 1996, Bucharest, Romania:43
4. Kamenicka A., Lanakova Maria, Kuba Juraj – Micropropagation of selected Magnolia spp. *in vitro*. Propagation of Ornamental Plants, 2001, 1(1):41-45
5. Kamenicka A., Takats J. – Direct regeneration of Magnolia spp. Via *in vitro* propagation. Magnolia, 1997, 32(1):1-6
6. Mihalache Steliana David – Rezultate preliminare privind cresterea *in vitro* a speciei *Magnolia soulangiana* var. Alexandrina. Lucrarile celui de al V-lea simpozion national de culturi de celule si tesuturi vegetale, Editura Universitatii Bucuresti:247-254, 1993.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✔*Biologie*
✔*Horticultură*
✔*Tehnologia prelucrării produselor agricole*
✔*Ingineria mediului*

Vol. XIV (XLX) - 2009

RESEARCH OF ALBIZZIA JULIBRISSIN BEHAVIOUR IN THE IN VITRO ROOTING

Tudor Radu Cristinel Mihai[1], Radomir Ana-Maria[1], Costescu Adriana[1], Danci Marcel[2]

KEY WORDS: in vitro,culture media, indolilbutiric acid, Albizzia julibrissin

ABSTRACT

In this work is presented the research realized for obtaining a viable technology of in vitro multiplication at Albizzia julibrissin. For this research were established four rooting culture media, in order to observe the rooting evolution and establish the optimum rooting culture media. After the micro cuts transferee on culture media, the condition in growing chamber was even for all four culture media (16 hours light and 25 degrees). The optimum culture media after the observation was V1 with 0.2 indolilbutiric acid.

INTRODUCTION

Albizia julibrissin is known by a wide variety of common names, such as ***Persian Silk Tree*** or ***Pink Siris***. It is also called ***Lenkoran Acacia*** or ***Bastard Tamarind.***

Albizia julibrissin is a small deciduous tree growing to 5 – 12 m tall, with a broad crown of level or arching branches. The bark is dark greenish grey in color and striped vertically as it gets older. The leaves are tripinnate, 20 – 45 cm long and 12 – 25 cm broad, divided into 6 – 12 pairs of pinnae, each with 20 – 30 pairs of leaflets; the leaflets are oblong, 1 – 1.5 cm long and 2 – 4 mm broad. The flowers are produced throughout the summer in dense inflorescences, the individual flowers have no petals but a tight cluster of stamens 2 – 3 cm long, white or pink with a white base, looking like silky threads. They have been observed to be attractive to bees, butterflies and hummingbirds. The fruit is a flat brown pod 10 – 20 cm long and 2 – 2.5 cm broad, containing several seeds inside (Fig.1.)

Fig. 1 *Albizzia julibrissin*

[1] INCDBH Stefanesti-Arges
[2] USAMV Timisoara

MATERIAL AND METHOD

In this experience for *in vitro* rooting has like variable factor the culture medium.

For *in vitro* rooting of albizzia micro cuttings obtained from multiplication phase was tested 4 culture media.

The explants transfer on the rooting culture media was made in a sterile room, on a hood with laminar air flow (fig.2).

The surgical type instruments used (tweezers, scalpel with the single use blade) were sterilized in the drying stove, at 120°C temperature for 2 hours and in the working time were sterilized and after every utilization during working time. In order to avoiding the cultures contamination, the operator carried mask and the hands were disinfected by washing with soap and utilising the disinfectants gels (ex. Hexigel).

The culture media used in the rooting phase are complex composition with different types and concentrations of phytohormones (tab. 1).

Table 1.

The components of culture media tested *in vitro* rooting of *Albizziei julibrissin*

Components (mg/l)	***Variable factors***			
	A.1.	A.2.	A.3.	*A.4.*
Macroelements	M&S 1/2	M&S 1/2	M&S 1/2	*M&S 1/2*
Microelements	M&S 1/2	M&S 1/2	M&S 1/2	*M&S1 /2*
Vitamins	LS	LS	LS	*LS*
NaFeEDTA	38,0	38,0	38,0	*38,0*
Dextrose	30.000	30.000	30.000	*30.000*
Agar	7.000	7.000	7.000	*7.000*
Giberelic Acid	0,1	0,1	0,1	*0,1*
Indolilbutiric Acid	*0,2*	*0,4*	*0,6*	*0,8*

Legend: LS = Linsmaier – Skoog (1965)
Vitamins LS (mg/l):
Tiamine– 0,4;
Inozitol – 100,0

In order to avoid the weighing errors, the macro elements were used like 10x more concentrate solutions while the microelements and the vitamins for 100x more concentrates solutions. We used phytohormones like dilutions of 100 mg/l(10^{-4}).

The pH registered in a culture medium was adjusted to 5,6-5,8 before autoclaving.

The sterilisation of culture media was realized by autoclaving at 120°C temperature for 20 minutes. During the rooting phase, in the growing room we have ensured controlled conditions (photoperiod of 16 hours, temperature between 22-24°C).

The observations were realized at every five days (table 2).

Table 2.

The micro cuts number rooted in 30 days period

Observatii	V.1.	V.2.	V.3.	***V.4.***
at 5 days	5	3	1	*0*
at 10 days	11	8	7	*3*
at 15 days	48	30	21	*11*
at 20 days	79	70	58	*35*
at 25 days	85	74	68	*39*
***at 30** days*	*85*	*74*	*68*	*40*

RESULTS AND DISCUSSIONS

In this research the good obtain results are influenced by culture media components.

It is observed that when the quantity of indolilbutiric acid is rising in culture media callus phenomenon appears. The callus phenomenon was appeared in V3 and V4 when the quantity of indolilbutiric acid is 0.6 and 0.8 mg/l.

A progressive decrease of rooted micro cuts and an increase of callus phenomenon was observed while the indolilbutiric acid is increasing in culture media.

In whole in vitro rooting period V1 was the variant with biggest number of micro cuts rooted, while in V4 variant was obtained the smallest number of in vitro rooted micro cuts. (Fig. 2.,3.).

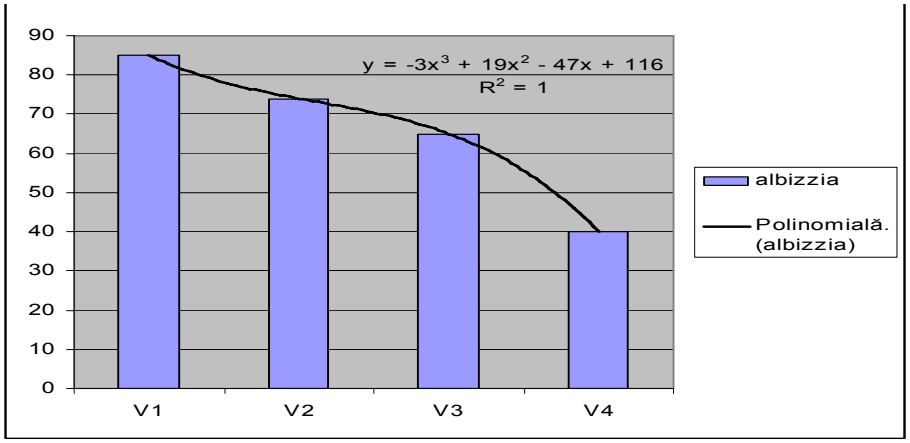


Fig.2. Percent of *in vitro* rooted albizzia micro cuts in all four variants

Fig. 3. In vitro rooted albizzia micro cuts

The whole experience was one month long, and the observation was made every five days. (Fig.4.)

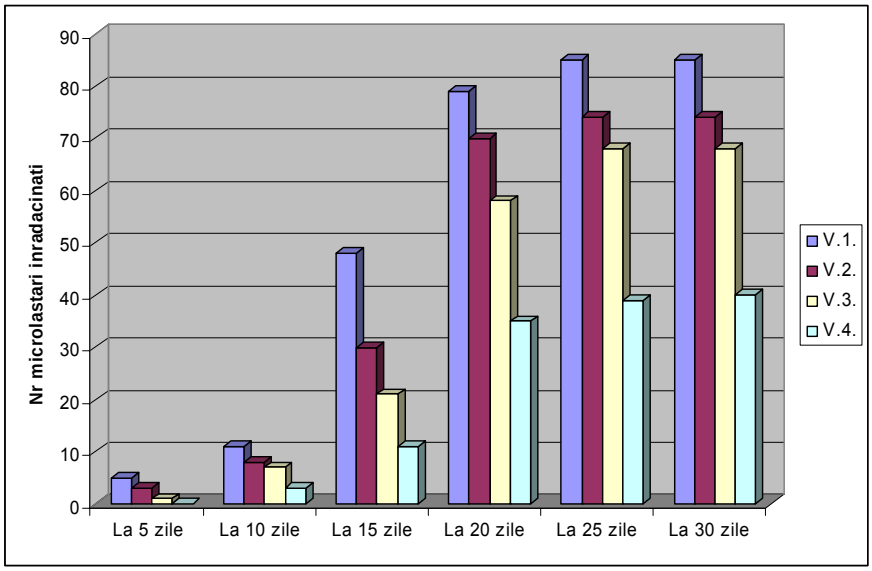


Fig.4. Percent of rooted albizzia micro cuts in whole 30 day period.

CONCLUSIONS

For aseptic rooting of albizzia micro cuts it is recommended to use culture media with 2 mg/l indolilbutiric acid.

In this variant we obtained the largest number of rooted micro cuts, without callus.

RESEARCH OBJECTIVE

This research aim to establish a biotechnology for in vitro rooting of Albiziia Julibrissin.

REFERENCES

1. Badea E.M., Săndulescu D– Biotehnologii vegetale – Fundația Biotech2001.
2. Bordini, R., Sartori ,E. - La produzione del materiale di moltiplicatione in Italia. Vignevini nr.12, 1995.
3. Boxus P. –Biotehnologies Vegetales – UNISAT Universite audiovisuelle francophone 1995.
4. Constantinescu, Gr., Hațieganu Elena –Biologia moleculară a celulei vegetale. Editura medicală Bucureşti, 1983.
5. Dixon R.A. - Plant cell culture a practical approach - Editura IRL Press 1985.
6. Gautheret R. J. - 1959 - La Culture des Tissus vegetaux. Masson et Cie, Paris.
7. Iliescu Ana – Felicia – 2002 – Cultura arborilor şi arbuştilor ornamentali. Ed CERES, Bucureşti.
8. Stănică Florin – 2004 – Microînmulțirea plantelor horticole. Ed. INVEL – Multimedia.
9. Teodorescu A., Marinescu L. – 1999 – Tehnici de culturi *in vitro* pentru înmulțirea şi ameliorarea plantelor. Ed. Tiparg.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✔*Biologie*
✔*Horticultură*
✔*Tehnologia prelucrării produselor agricole*
✔*Ingineria mediului*

Vol. XIV (XLX) - 2009

THE ANTROPHIC CONDITIONS INFLUENCE OVER THE PHOTOSYNTESIS EFFICIENCY OF SYNANTRPHIC PLANT SPECIES FROM THE CITIES OF PITESTI AND MIOVENI

Roşescu Marinela Roxana[1], Chițu Emil[2]

KEY WORDS: photosynthesis, chlorophyll fluorescence, OJIP test, NPQ test, ambient stress

ABSTRACT

The study of the biological processes of synanthropic plants from the urban environment offers information about their ability to adapt to the conditions of the urban ecosystem, an ecosystem strongly modified and antrophic. The experiments were realized during the month of July 2009 on six synanthropic plant species dominant in the Pitesti and Mioveni area: Cichorium intybus L., Conyza canadensis (L.) Cronq., Erigeron annuus L. (Pers.), Lactuca serriola Torn., Polygonum aviculare L. şi Echinochloa crus-galli (L.) Beauv. Measurements of the photosynthesis and transpiration processes, on one hand and of the chlorophyll fluorescence, the OJIP and the NPQ tests, in order to determine the efficiency of photo-system II (PS II) on the other hand, were taken. The efficiency of PS II was correlated to the main environmental factors which influence the photosynthesis process and with the region's natural layers in which the experiments were conducted.

INTRODUCTION

The synanthropic plants are plants related to the human activities. In the urban environment plants are highly stressed (high temperatures and pollution levels, low precipitations, pH soil modifications, extreme low and high fertilizations as well as other anthropic pressures – irrigation, mowing, etc.) Therefore, the synanthropic plants are forced to find surviving strategies to which can be revealed through the recording of physiological processes (photosynthesis, respiration, transpiration). Numerous studies were conducted related to the effect of the environment on the physiological processes of the plants with economic importance (fruit and ornamental trees, various crops). Chitu et al., 2009, have studied the sensibility of the chlorophyll fluorescence at various environmental nutritional, climacteric and stress factors for various apple cultivars. A number of studies have shown that chlorophyll fluorescence parameters provide good indicators of nutrient deficiency (Subhash and Mohanan, 1997; Freedman et al., 2002, quoted by Chitu et al., 2009). Cosmulescu et al., 2008, were preoccupied by the study of physiological "answers" of the black currant cultivars to the environmental impact. It was revealed that the photosynthesis rate is influenced by the leaf temperature and by the active photosynthetic radiation. The same authors have found that, on the case of black currant, the stomatal conductance decreases as the leaf's temperatures rises and this is explained by the existence of adaptive mechanisms through which, at high temperatures and water deficits, the plant is reducing its water losses by closing and opening

[1] National High School "Alexandru Odobescu" Pitesti, Romania
[2] Research Institute for Fruit Growing, Pitesti – Maracineni (RIFG), Romania

its stomatal lowering. Bunce, 2000, has studied the stomatal conductance response to light, humidity and temperature for the fall wheat and barley. Oneaţă, 2007, had studied the influence of CO_2 variation in atmosphere and that of photosynthetic active radiation (PAR) over the physiological processes of the *Magnolia* species, underlining that the CO_2 concentration and PAR play a significant role influencing the researched processes.

MATERIALS AND METHODS

The experiments were realized in July 2009 on six synanthropic plants: *Cichorium intybus* L., *Conyza canadensis* (L.) Cronq., *Erigeron annuus* L. (Pers.), *Lactuca serriola* Torn., *Polygonum aviculare* L. and *Echinochloa crus-galli* (L.) Beauv., dominant species on unmanaged lands in the cities of Pitesti, Mioveni and Maracineni. The areas over which the research was conducted registered for the month of July 29°C ground temperature (vs. the normal average 24.2°C), 29.1°C, air temperature (vs. the normal average 27,4°C), 32.7% air humidity (vs. the normal average 47.2%) and 8.4 hours/day sunshine (260.4 vs. normal average 303.5 hours/month). For the six species the following were measured: photosynthesis and transpiration intensity, chlorophyll fluorescence; the Chlorophyll Fluorescence Induction Kinetics (OJIP) and Non-photochemical Quenching (NPQ) tests were also conducted. The photosynthesis and transpiration rates were measured using a portable LCpro+ system which also measured other parameters such as the stomatal conductance, the leaf's temperature, the photosynthetic active incidental radiation on the leaf's surface. The two tests were conducted using the the FluorPen FP 100. The OJIP test permitted to computing of the 25 indicators.

RESULTS AND DISCUSSION

The 627 sample value represents the number of total determining sessions of indicators: PAR of leaf surface, leaf temperature, and transpiration rate, stomatal conductance for H_2O and photosynthesis rate. Tabel 1 presents the data obtained following the calculation of the coefficients of the simple correlation of the analyzed indicators.

Tabel 1

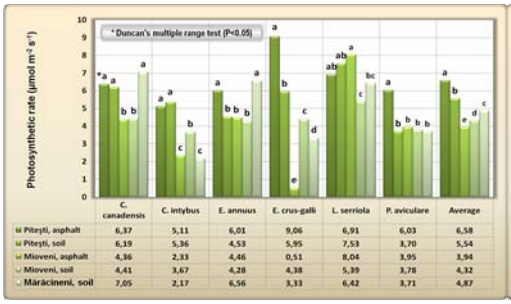
Correlation matrix (Pearson coefficient) of the analyzed indicators

	PAR on leaf surface ($\mu molm^{-2}s^{-1}$)	Leaf temperature	Transpiration rate ($mmolm^{-2}s^{-1}$)	Stomatal conductance ($molm^{-2}s^{-1}$)	Photosynthetic rate ($\mu molm^{-2}s^{-1}$)
PAR on leaf surface ($\mu molm^{-2}s^{-1}$)	1	0.283***	0.138***	0.055	0.041
Leaf temperature	0.283***	1	0.381***	0.209***	0.084*
Transpiration rate ($mmolm^{-2}s^{-1}$)	0.138***	0.381***	1	0.928***	0.511***
Stomatal conductance ($molm^{-2}s^{-1}$)	0.055	0.209***	0.928***	1	0.510***
Photosynthetic rate ($\mu molm^{-2}s^{-1}$)	0.041	0.084*	0.511***	0.510***	1

*** Correlation is significant at the 0.001 level; *Correlation is significant at the 0.05 level.

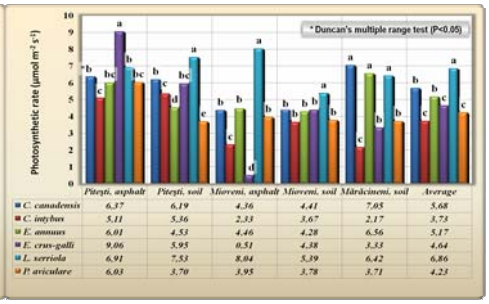
We observe the existence of significant, very significant correlations and positive correlations among the analyzed indicators. The leaf temperature is correlated positive with PAR (r = 0.283***) and with the transpiration rate (r=0.381***); the transpiration rate is correlated with all other indicators, more intensely with the stomatal conductance for water (r = 0.928***), and the photosynthesis rate is correlated more intense with the stomatal conductance (r = 0.928***) and with the transpiration rate (r = 0.510***).

In the following figures, graphically presented, are the results obtained following the determining of the photosynthesis and transpiration rate. Figure 1 shows the variations in the photosynthesis rates by the environment of the experiment, on constant species levels. It was concluded that, on species average, in five homogenous classes, the highest recorded photosynthesis rate was for the Pitesti conditions, in asphalt (6.58 $\mu molm^{-2}s^{-1}$), and the lowest rate of the process in Mioveni, asphalt conditions (3.94 $\mu molm^{-2}s^{-1}$). For *Conyza canadensis*, in Maracineni, in soil, (7.05) and in Pitesti (6.19) they become homogenous with those from Pitesti, asphalt conditions (6.37). For the species *Cichorium intybus*, in Maracineni, soil conditions, they become as unfavorable to the photosynthesis process (2.17) as those in Mioveni, asphalt conditions (2.33). The Maracineni soil conditions are favorable to the photosynthesis intensity for *Erigeron annuus* (6.56), for which the antrophic differences vanish over the average tendency. For *Echinochloa crus-galli*, the Mioveni, asphalt conditions, are unfavorable to the photosynthesis process; this species showed a strong interaction between the antrophic environment and the species through the presence of five homogenous classes for the photosynthesis rate computed values. For *Lactuca serriola*, Mioveni, asphalt conditions, are the most favorable; the computed photosynthesis rate (8.04) being significantly different over the Mioveni and Maracineni, soil conditions. For *Polygonum aviculare*, the photosynthesis process takes place with the highest intensity beginning with Pitesti, asphalt conditions, (6.03) and with insignificant differences in the other environments this making it a unique tendency over the average.



	C. canadensis	C. intybus	E. annuus	E. crus-galli	L. serriola	P. aviculare	Average
Pitești, asphalt	6,37	5,11	6,01	9,06	6,91	6,03	6,58
Pitești, soil	6,19	5,36	4,53	5,95	7,53	3,70	5,54
Mioveni, asphalt	4,36	2,33	4,46	0,51	8,04	3,95	3,94
Mioveni, soil	4,41	3,67	4,28	4,38	5,39	3,78	4,32
Măracineni, soil	7,05	2,17	6,56	3,33	6,42	3,71	4,87

Figure 1. Photosynthesis variation by the environment in which the experiments were conducted on constant species levels



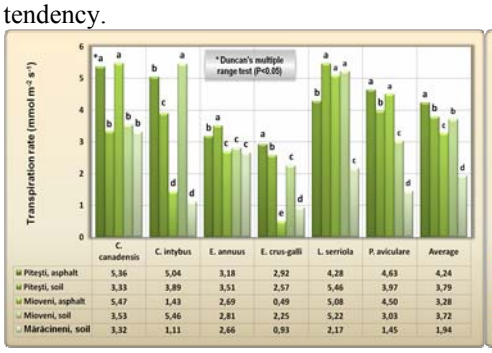
	Pitești, asphalt	Pitești, soil	Mioveni, asphalt	Mioveni, soil	Măracineni, soil	Average
C. canadensis	6,37	6,19	4,36	4,41	7,05	5,68
C. intybus	5,11	5,36	2,33	3,67	2,17	3,73
E. annuus	6,01	4,53	4,46	4,28	6,56	5,17
E. crus-galli	9,06	5,95	0,51	4,38	3,33	4,64
L. serriola	6,91	7,53	8,04	5,39	6,42	6,86
P. aviculare	6,03	3,70	3,95	3,78	3,71	4,25

Figure 2. Photosynthesis variation by species on constant levels of the environment

Figure 2 shows the photosynthesis variation by species on constant levels of the environment were the experiments were conducted and it reveals on the experiment's average the existence of three homogenous classes with the biggest photosynthesis rate belonging to *Lactuca serriola* (6.86 $\mu molm^{-2}s^{-1}$), significantly different of the photosynthesis rates determined for the other species. By studying the interaction between the species and the antrophic environment we observe that in Pitesti, asphalt conditions, the species with the most intense photosynthesis (9.06 $\mu molm^{-2}s^{-}1$) was *Echinochloa crus-galli*, although, on average, it was included in the class with the lowest rate values of the

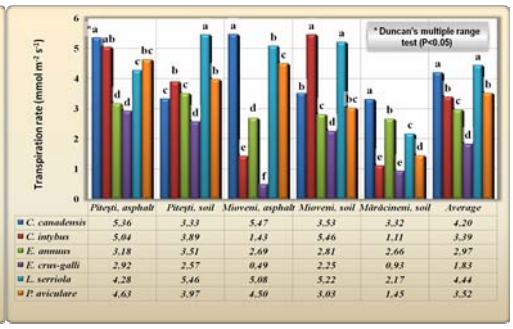
experiment. In Pitesti, soil conditions, the species effect over the photosynthesis rate was amplified through the presence of five value classes, with the species *Erigeron annuus* şi *Polygonum aviculare* behaving different from the general tendency. In the Mioveni, asphalt conditions, although was recorded a decrease in the values for the photosynthesis rates recorded for *Echinochloa crus-galli* and an increase in the case of *Polygonum aviculare*, for the rest of the analyzed species the average tendency was respected. In Mioveni, soil conditions, the species differences have dispaeread all species acting uniformly with the exception of *Lactuca serriola* which remained in the first class of values of the photosynthesis rates (5.39 $\mu molm^{-2}s^{-1}$), significantly different of the values of the other five species. In Maracineni, soil conditions, the values recorded for *Conyza canadensis* and *Erigeron annuus* had reached the photosynthesis rate values recorded for *Conyza canadensis* and *Erigeron annuus* although the two species had a less intense photosynthetic rate.

Figure 3 presents the transpiration rate variance by the environment in which the experiment was conducted, on constant species level and is showing the presence of four homogenous classes, the highest transpiration rate (4.24 $mmolm^{-2}s^{-1}$) being recorded in Pitesti, asphalt conditions, due to higher values for the light intensity, temperature, and water vapor saturation deficit from the atmosphere, all characteristics of the urban microclimate. In Pitesti, asphalt conditions, it was not recorded the same intensity as in Mioveni asphalt conditions. The lowest transpiration rate (1.94 $mmolm^{-2}s^{-1}$) was recorded in Maracineni, soil conditions, due to the pedoclimatic conditions specific to the zone. The soil conditions from Pitesti and Mioveni have a uniform influence over the transpiration rate. For *Conyza canadensis*, the asphalt conditions, in both analyzed cities, had determined a rise in the transpiration rate, the differences being significant over that existent in the case of the soil (regardless of the city) which are homogenous. The Mioveni soil conditions had determined the most intense transpiration (5.46 $mmolm^{-2}s^{-1}$) at *Cichorium intybus*, the differences being significant over the other anthropic environments. For *Erigeron annuus* was found that the differences across the atrophic environments have disappeared while for *Echinochloa crus-galli* the effect of the anthropic environment has been amplified through the presence of five homogenous classes for the values of the transpiration rates. For *Lactuca serriola*, the transpiration process had reduced its intensity in the Pitesti asphalt conditions when compared with those existent in Mioveni. In the case of *Polygonum aviculare*, Pitesti and Mioveni, asphalt conditions, the transpiration process had a more uniform rate while in Mioveni, soil conditions, had a reduced rate over the average tendency.



	C. canadensis	C. intybus	E. annuus	E. crus-galli	L. serriola	P. aviculare	Average
Piteşti, asphalt	5,36	5,04	3,18	2,92	4,28	4,63	4,24
Piteşti, soil	3,33	3,89	3,51	2,57	5,46	3,97	3,79
Mioveni, asphalt	5,47	1,43	2,69	0,49	5,08	4,50	3,28
Mioveni, soil	3,53	5,46	2,81	2,25	5,22	3,03	3,72
Măracineni, soil	3,32	1,11	2,66	0,93	2,17	1,45	1,94

Figure 3. The transpiration rate variance by the environment in which the experiment was conducted, on constant species level



	Piteşti, asphalt	Piteşti, soil	Mioveni, asphalt	Mioveni, soil	Măracineni, soil	Average
C. canadensis	5,36	3,33	5,47	3,53	3,32	4,20
C. intybus	5,04	3,89	1,43	5,46	1,11	3,39
E. annuus	3,18	3,51	2,69	2,81	2,66	2,97
E. crus-galli	2,92	2,57	0,49	2,25	0,93	1,83
L. serriola	4,28	5,46	5,08	5,22	2,17	4,44
P. aviculare	4,63	3,97	4,50	3,03	1,45	3,52

Figure 4. The transpiration rate variance by species, on constant anthropic environment in which the experiment was conducted

In Figure 4, which shows the transpiration rate variance by species, on constant anthropic environment, was observed the existence of four homogenous classes the most intense being present for the species *Conyza canadensis* (4.20 $mmolm^{-2}s^{-1}$) and *Lactuca serriola* (4.44 $mmolm^{-2}s^{-1}$), with differences over the other species being quite significant; the most reduse transpiration level was found for *Echinochloa crus-galli* (1.83 $mmolm^{-2}s^{-1}$). *Lactuca serriola* is reducing its transpiration rate in the case of Pitesti, asphalt conditions, although on average had presented an intense transpiration, for the same conditions a similar behavior was observed for *Erigeron annuus*. In Pitesti, soil conditions, the species had respected the average tendency with only one exception (*Conyza canadensis)* where the plant had a less intense transpiration. The differences among species are more accentuated in the case of Mioveni, asphalt conditions, where we identify six homogenous classes, and were the transpiration rate is reduced significantly for *Echinochloa crus-galli* over the other species. *Cichorium intybus* is identifying its transpiration rate in the case of Mioveni, soil conditions while, under the same conditions, *Conyza canadensis* is reducing its transpiration rate, the remaining species keeping the average tendency. *Lactuca serriola* has a transpiration rate more reduced in Maracineni, soil conditions although on average was placed in the first class. The decrease of the transpiration rates had also been recorded for *Cichorium intybus*.

The chlorophyll fluorescence is an indicator of the energy conversion in the photosynthesis process, offering efficiency information for the photosystem II. Functioning of photosystem II (PSII) is the most sensitive indicator of environmental stress in plants. Changes in PSII activity can be assayed rapidly and non-destructively by measurement of chlorophyll fluorescence. Fv/Fm – dark adapted test - a measurement ratio that represents the maximum potential quantum efficiency of photosystem II (PSII) is a very robust test that have been shown to correlate well with carbon fixation under most conditions. The 155 values of the sample represent the total number of experiments of the following indicators: Fo, Fj, Fi, Fm, Fv, Fm/Fo, Fv/Fo and Fv/Fm (of the 25 researched indicators). The sample average for Fv/Fm was 0.741, and it was close to the maximum value of Fv/Fm (0.80-0.83), which indicates a normal working reaction center for PS II. Tabel 2 has the data following the computing of the simple correlation coefficients of the chlorophyll fluorescence indicators. We observe the existence of very significant positive and negative correlations among the analyzed indicators. In all cases the significance level is $p < 0,01$.

Tabel 2

Correlation matrix (Pearson coefficient) between selected fluorescence indicators determined on leaves adapted to darkness

	Fo	Fj	Fi	Fm	Fv	Fm/Fo	Fv/Fo	Fv/Fm
N	155	155	155	155	155	155	155	155
Fo	1	0.884**	0.568**	0.460**	0.235**	-0,491**	-0.491**	-0.471**
Fj	0.884**	1	0.746**	0.647**	0.470**	-0.214**	-0.214**	-0.147
Fi	0,568**	0,746**	1	0,950**	0,888**	0,359**	0,359**	0.388**
Fm	0.460**	0.647**	0.950**	1	0.971**	0.528**	0.528**	0.523**
Fv	0.235**	0.470**	0.888**	0.971**	1	0.711**	0.711**	0.700**
Fm/Fo	-0.491**	-0.214**	0.359**	0.528**	0.711**	1	1.000**	0.938**
Fv/Fo	-0.491**	-0.214**	0.359**	0.528**	0.711**	1.000**	1	0.938**
Fv/Fm	-0.471**	-0.147	0.388**	0.523**	0.700**	0.938**	0.938**	1

** Correlation is significant at the 0.01 level (2-tailed)

The 155 determining experiments of the 25 OJIP parameters, executed on leaves adapted to darkness were correlated with PAR, with leaf temperature, transpiration rate, stomatal conductance and with the photosynthesis rate. The computing of simple correlation coefficients, show that of a number of 25 analyzed parameters, 19 had correlated synthetic significantly, positive or negative, with the following parameters: PAR, leaf temperature and the photosynthesis rate. Fm/Fo and Fv/Fm had correlated significantly negative with PAR (r = -0.383* in both situations), Ss had correlated distinct significantly, positive, with the photosynthesis rate (r = 0.400**), while Tro/RC had correlated significantly negative cu the photosynthesis rate (r = -0.367*). A number of 18 OJIP parameters had correlated with the leaf temperature. The stomatal transpiration rate had not correlated with any OJIP parameter.

CONCLUSIONS

Analyzing the photosynthesis and chlorophyll fluorescence indicators of leafs adapted to dark conditions the following were observed: the leaf's temperature is correlated with positive with PAR (r = 0.283***) and with the transpiration rate (r=0.381***), the transpiration rate is positive correlated with all other indicators, more intensely with the stomatal conductance (R^2 = 0.8611), 86,11% of the value of the transpiration rate being determined by it, and the photosynthesis rate is more intensely correlated with the stomatal conductance (r = 0.511***) and with the transpiration rate (r = 0.510***). Fv/Fm was correlated most intense negative with Fo (r = -0.471**) and most intensely positive cu Fv (r = 0.700**). The average value for the entire experiment was 0,741, close to the optimum value (0.830) that indicates a low level of stress (either short-term or long-term) and the absence of a strong quenching mechanism. Fm/Fo and Fv/Fm were significantly correlated negative with PAR (r = -0.383*, in both situations); the photosynthesis rate correlated distinct significantly, positive cu Ss (r = 0.400**) and negative with Tro/RC (r = -0.367*); the leaf temperature correlated significantly, positive and negative, with 18 OJIP parameters.

REFERENCES

1. Atanasiu. L., Ecofiziologia plantelor, Editura Ştiinţifică şi Enciclopedică, Bucureşti, 1984
2. Bunce, J.A., Reponses of stomatal conductance to light, humidity and temperature in winter and barley grown al three concentrations of carbon dioxide in the field, Global Change Biology, 6:371-382, 2000
3. Chiţu, E., Ionita, A.D., Cirjaliu-Murgea, M., Chiţu, V., Filipescu, L., Evaluation of Foliar Nutritive Fluids Effect on Apple Photosystem II Efficiency using Chlorophyll Fluorescence, Buletin USAMV, nr. 66(1-2), Horticulture, 2009
4. Cosmulescu, S., Baciu, A., Gruia, M., Physiological Changes in Black Currant Cultivars under Suboptimal Culture Conditions, Buletin USAMV, vol 65(1), Horticulture, 2008
5. Nabil., G., Trought, M.C., Noor, R., Samad, A., To Study Stomatal Conductance at Different Leaf Position and Xylem Flow Rate at Different Depths in the Apple Branch, Pakistan Journal of Biological Sciences,3, 2000
6. Oneaţă, M., Determinări privind schimbul de gaze foliare la puieţii de *Magnolia* în vârstă de doi ani, crescuţi în seră, Analele ICAS 50: 57-75, 2007

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

PHOMA STEM CANKER (BLACKLEG) A THREAT TO OILSEED RAPE (BRASSICA NAPUS L.) IN GREECE.

Ioannis Vagelas, Kyriakos Tsinidis, Stamatia Nasiakou, Grigorios Papageorgiou, Ioannis Ramniotis and Alexandros Papachatzis[1]

KEY WORDS: phoma, crown canker, blackleg

ABSTRACT

Phoma stem canker is an internationally important disease of oilseed rape (Brassica napus L.), causing serious losses. This study provides evidence of phoma stem canker, caused by the species complex Leptosphaeria maculans and L. biglobosa in Greece. Infections were occurred early and resulted serious stem cankers and stem necrosis of oilseed rape before flowering. Moreover the disease caused significant yield losses on season spring varieties.

INTRODUCTION

Oilseed rape (*Brassica napus* L.) is a crop which is grown mainly for its high quality oil and protein. In the face of global climate change, rapeseed could play a much more important role in the future as source of renewable energy provides versatile oil being used as a fuel and a raw material for the chemical industry. Considerable that interest seed yield is very important and diseases can cause yield losses. Phoma stem canker is one of the most economic important diseases on oilseed rape worldwide. Typical symptoms on oilseed rape are leaf symptoms, which may become visible on true leafs. The disease is caused by a complex of *Leptosphaeria* species (Mendes-Pereira et al., 2003), the most important of which is *L. maculans*, associated with damaging stem base canker. This disease has a major economic impact, with significant yield losses (West et al., 2001).

Epidemics are initiated during autumn by air-borne ascospores released from infected stubbles of previous crops. Once in contact with plants, these ascospores germinate and produce leaf lesions. The fungus then grows systemically from the leaf lesions to the stem where it produces cankers which can result in major yield loss. Infected plants are weakened and may produce smaller heads with reduced seed yield and oil.

This paper provides evidence of phoma stem canker, discussed symptoms, severity and yield loss on oilseed rape in central Greece.

MATERIALS AND METHODS

Field experiments – Stem canker symptoms

Experimental oilseed rape plots natural infected with phoma stem canker were used. Disease severity and yield loss due to phoma stem canker in *B. napus* was investigated in field, at the Technological Education Institute (TEI) of Larissa, Greece, using two resistance to stem canker oilseed varieties the Ability (a season spring variety) and Hornet (a season winter

[1] Department of Plant Production, Technological Education Institution of Larissa, 41110 Larissa, Greece

variety). Both varieties marked as high yielding, with high oil content. In 2008/09, the two oilseed varieties, Ability and Hornet, were sown in the second week of October and grown in a randomized block design with three replications in field conditions, at the TEI of Larissa, Greece. Each plot comprised of 2x1 m length with space of 1 m between rows.

Canker severity assessment

Canker severity were estimated assessing disease severity on 100 plants (Rempel and Hall, 1996), picked randomly in the field, by cutting them at the base of the stem and by sorting cankers in five classes (0 to 4) of canker (external stem canker severity). Further at harvest 50 plants were assessed for internal canker symptoms by taking a cross-section of the crown (stem base) that is discoloured by the disease and sorting canker in five classes (0%, 1–25%, 26–50%, 51–75% and 76–100%) of canker (necrosis), (Huang et al., 2009).

Yield loss assessment

Further we estimate yield losses on both above oilseed rape varieties Ability and Hornet. These losses are estimated based on data received from each plot experiment. Thus, yield response to variety Ability or Hornet. Yield loss to incidence of phoma stem canker is estimated as average yield in g $2m^{-2}$ (Table 1.)

Statistical analysis

All experiment data for external, internal stem canker severity and yield were analysed to compare the differences between varieties Ability and Hornet by analysis of variance (ANOVA). Further multiple range tests (Tukey's multiple comparisons) were applied to assess differences between treatments and identify statistical differences between means, respectively; level of significance, $P = 0.05$.

RESULTS

Stem canker symptoms

The data shows that the disease appears early in the season as small grey lesions (Fig. 1A), with black specks (fruiting bodies, pycnidia Fig 1B), found on the leaf surface (phoma stem lesions of canola plants. Later the disease produces lesions and cankers on the stem, appearing as stem cankers at the stem base (crown, Figs 2) and as upper stem lesions (Fig. 1C) second symptom appears as necrosis with yield loss. Further small circular fruiting bodies (pycnidia Fig. 1B) of the fungus are produced on the surface of the infected stem (Fig. 1A and Fig. 2). To our observations all those probably is a systemic progression of the fungus from leaves to the base of the stem where the second symptom, the canker (or necrosis), appears as reported by (West et al. 2001).

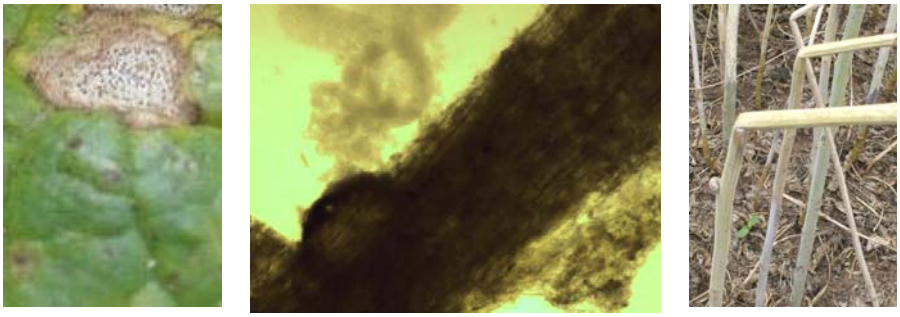
Canker severity assessment

Further our lab data shows that stem canker / blackleg disease is caused by the species complex *Leptosphaeria maculans* / *L. biglobosa*. *Leptosphaeria maculans*, associated with damaging stem base cankers (Fig. 2A), and *L. biglobosa*, often associated with less damaging upper stem lesions (Fig. 2B), produced a brown no pigment and a brown dark pigment mycelia (Fig 1A and B) respectively as described by Fitt et al., 2006.

The data shows significant differences ($P<0.001$) in severity of infection between cultivars. Hornet variety showed a significant greater external and internal stem canker severity compared with the Ability variety (Fig. 3). Further the internal stem canker severities, the percentages of stem cross-sectional area with necrosis were greater on Hornet than on Ability variety (Fig. 3).

Yield loss assessment

The data shows that Hornet and Ability variety may infect by the same *phoma* species and have similar looking symptoms but yields are lower for Hornet variety (Table 1). The high stem canker found at the Hornet variety was high correlated with the low yield of the same variety confirmed the yield loss due the pathogen infection (Table 1). This may suggest that phoma stem canker is most serious disease on summer oilseed rape varieties.



A. **B.** **C.**

Figure 1. Symptoms of disease necrotic spots on leaves (A) and stems (C), caused by *L. maculans*. B: black specks (fruiting bodies, pycnidia) found on the infected plant tissue.

A1. Basal phoma stem canker (red arrow) B1. Upper stem lesions (red arrow)

A2. PDA culture of *L. maculans* B2. PDA culture of *L. biglobosa*

Figure 2. Symptoms of disease on stems A1: basal phoma stem canker, A2: *L. maculans* predominant species present; B1: upper stem lesions, B2: *L. biglobosa* predominant species present) of winter oilseed rape, and cultures of *L. maculans* (no pigment) or *L. biglobosa* (pigment) on potato dextrose agar (A2 and B2 respectively).

CONCLUSIONS

Phoma stem canker (blackleg) seems to be an important disease for cropping oilseed rape (*B. napus*) in Greece. Infection occurred by two main species *L. maculans* and *L. biglobosa* as reported by Vagelas (2009). The disease severity depends on sowing variety. It would be interesting to test the effect of the relationship between canker severity and quantity of primary inoculum produced (Lo-Pelzer et al., 2009), in canker severity classes (Rempel and Hall 1996) on yield losses of numerous oilseed rape varieties (*B. napus*), (West et al, 1999).

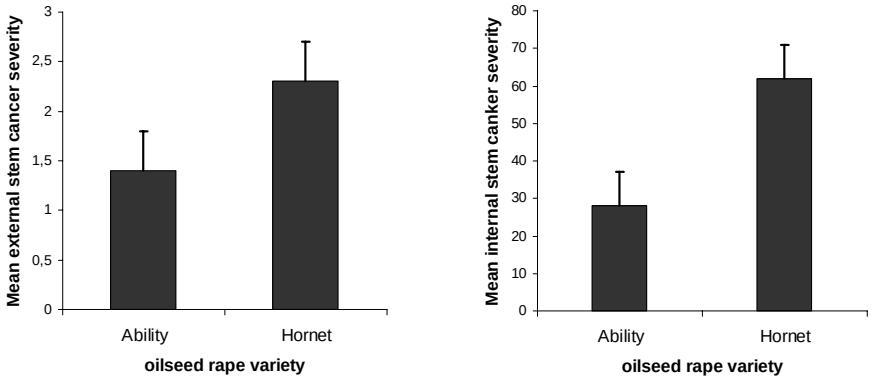


Figure 3. External and internal stem canker severity, of oilseed rape varieties, Ability and Hornet, growing under natural infection conditions.

Table 1

Yield and yield associated with damage of Hornet and Ability variety in field experiments natural infected with phoma stem canker.

Oilseed rape variety	Yield g $2m^{-2}$ (± s.e.m*)	Yield associated with damage (Pearson correlation)
Hornet	737 ± 12 a	Pearson correlation of yield and mean internal stem canker severity = -0,955
Ability	1070 ± 23 b	P-Value = 0,003

* s.e.m= standard error of mean. Values within a column followed by the same letter do not differ significantly ($P = 0.05$) according to Tukey's multiple comparisons test.

BIBLIOGRAPHY

1. Fitt, B.D.L., Brun, H., Barbetti, M.J., & Rimmer, S.R. (2006). World-wide importance of phoma stem canker (*Leptosphaeria maculans* and *L. biglobosa*) on oilseed rape (*Brassica napus*). *European Journal of Plant Pathology,* 114, 3–15.
2. Huang, Y. J., Pirie, E. J., Evans, N., Delourme, R., King, G. J. & Fitt, B. D. L. (2009). Quantitative resistance to symptomless growth of *Leptosphaeria maculans* (phoma stem canker) in *Brassica napus* (oilseed rape). *Plant Pathology,* 58, 314–323.
3. Lo-Pelzer, E., Aubertot, J. N., David, O., Jeuffroy, M. H., & Bousset, L. (2009). Relationship between the severity of phoma stem canker (*Leptosphaeria maculans*/*L biglobosa* species complex) and subsequent primary inoculum production on oilseed rape stubble. *Plant Pathology,* 58, 61–70.
4. Mendes-Pereira, E, Balesdent, MH, Brun, H and Rouxel, T. (2003). Molecular phylogeny of the *Leptosphaeria maculans–L. biglobosa* species complex. *Mycological Research,* 107, 1287–1304.
5. Rempel, C. B., & Hall, R. (1996). Comparison of disease measures for assessing resistance in canola (*Brassica napus*) to blackleg (*Leptosphaeria maculans*). *Canadian Journal of Botany*, 74, 1930–1936.
6. Vagelas, I. (2009). A first report of phoma stem canker (blackleg) of oilseed rape (*Brassica napus* L.) caused by the species complex *Leptoshaeria maculans* and *L. biglobosa* in Greece. *Journal of Plant Pathology* (accepted in press)
7. West, J. S., Kharbanda, P. D., Barbetti, M. J., & Fitt, B. D. L. (2001). Epidemiology and management of Leptosphaeria maculans (phoma stem canker) on oilseed rape in Australia, Canada and Europe. *Plant Pathology*, 50, 10–27.
8. West, J.S., Biddulph, J.E., Fitt, B.D.L & Gladders, P. (1999). Epidemiology of *Leptosphaeria maculans* in relation to forecasting stem canker severity on winter oilseed rape in the UK. *Annals of Applied Biology,* 135, 535-46.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

BIOLOGICAL CONTROL OF BROWN DISCOLORATION ON *AGARICUS BISPORUS* CAUSED BY *PSEUDOMONAS* WITH OLIVE OIL MILL WASTEWATER.

I. Vagelas[1], H. Kalorizou[1], A. Papachatzis[1], E. Koronas[1], D. Bakhshi[2], T. Arvanitis[1]

KEY WORDS: Biocontrol, olive oil mill wastewater, mushrooms brown discoloration.

ABSTRACT

The preventing bacterial brown blotch on Agaricus bisporus caused by Pseudomonas was investigated. Infected mushrooms were treated with talc formulation of olive oil mill wastewater (olive OMW). The talc formulation of olive OMW significantly reduced the visual symptoms of the disease under laboratory conditions, probably due to the activity of the phenolic compounds which contained on olive OMW.

INTRODUCTION

Agaricus bisporus is well known as a common mushroom, is cultivated in all over the word mainly for used as food item. Brown discoloration (brown blotch disease) caused on *A. bisporus* fruits by *Pseudomonas* species is also well known. Infection with *Pseudomonas* spp. caused a specific colour change. Symptoms are dark brown, often wet and sunken lesions on the mushroom caps and stalks. Economically, it currently is the most important disease of mushrooms. The mushroom market in Greece consumes only white fresh mushrooms, but not when covered with bacterial spots (discolorations). Therefore, the disease causes relatively high losses to growers.

Chemical treatments for preventing bacterial brown blotch using chlorine, or other chemical compounds have not been satisfactory, whereas treatments as biocontrol are still under investigation.

Regarding biocontrol treated mushrooms with various plant extracts or microbial as potential inhibitor of the symptoms of the brown blotch disease of *A. bisporus* could be promising due to enzymes and antibiotics they produced. Other promising products for preventing bacterial brown blotch could be the residues of olive oil mill wastewater (olive OMW). The residues of olive OMW appeared to have effective antifungal activity against soil born plant pathogens (12), against post-harvest diseases (12), and could be a promising solution for preventing discoloration of mushrooms.

The aim of this work was to examine the potential inhibitor effects of olive OMW against brown discoloration on *A. bisporus* caused by *Pseudomonas*.

[1] Technological Education Institute of Larissa, Department of Plant Production, 41110 Larissa, Greece
[2] Department of Horticultural Science, Faculty of Agriculture, University of Guilan, Rasht, Iran

MATERIALS AND METHODS

Isolation of the pathogen

Isolation of *Pseudomonas* was made using standard bacteriology techniques following the method of Schaad (1998). Pure *Pseudomonas* colonies was first isolated and grown on King's B medium. Then *Pseudomonas* cultures streaked on Nutrient Agar plates and grown on medium Nutrient Broth at 25 °C for 48 h. Further pathogenicity tests were carried out on mushrooms, as described by Munsch (2000).

Infection process

The potential inhibitor effect of olive OMW against brown discoloration *of A.s bisporus* was performed *in vivo* by using symptom-free mushrooms inoculated with a suspension of the pathogen and symptom-free mushrooms inoculated with a suspension of the pathogen and treated with olive OMW mixed with talc powder 1:4 v:v, or 1:10 v:v, or talc powder only (Fig. 1) and incubated in a humid chamber at 4°C for 5 days. At the end of the experiment typical symptoms on mushrooms were recorded sorting brown discoloration in five classes (0 to 4), where 0 is equal to healthy fruits; 1=slightly brown mushrooms and 4= dark brown mushrooms. All experiments were done in plastic, closed containers; ten mushrooms were placed in each container for each treatment. Each treatment had four replicates.

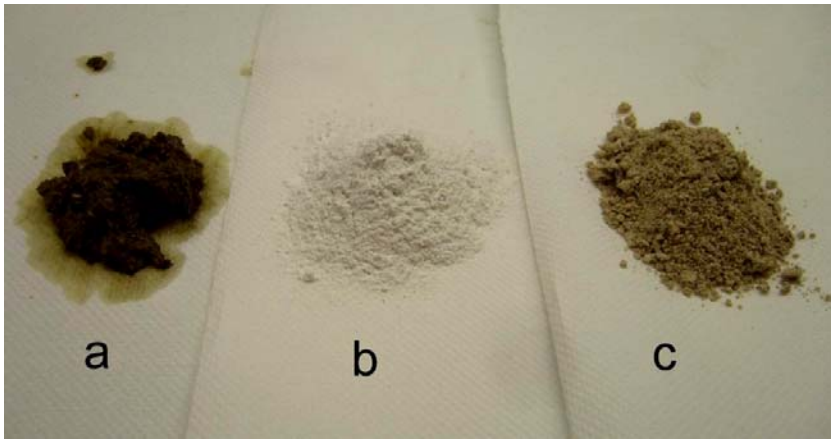


Figure 1. Olive OMW formulation; a: olive OMW mixed with talc powder 1:4 v:v; b: talc powder only and c: olive OMW mixed with talc powder 1:10 v:v

RESULTS AND DISCUSSION

Mushrooms treated with olive OMW in form of talc powder 1:4 v:v significantly reduced Pseudomonas brown discoloration (Figure 2 and 3). A dark brown discoloration was recorded only in treatments with symptom-free mushrooms inoculated with a suspension of the pathogen whereas a slight brown discoloration was recorded only in treatments with symptom-free mushrooms inoculated with a suspension of the pathogen and treated with olive OMW mixed with talc powder 1:10 v:v or with talc powder only.

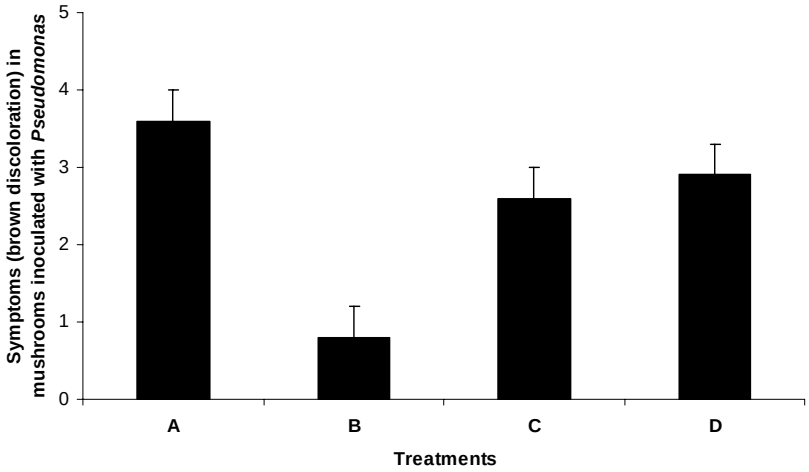


Figure 2. Effect of olive OMW on mushrooms brown discoloration caused by *Pseudomonas* where A: symptom-free mushrooms inoculated with a suspension of the pathogen; B symptom-free mushrooms inoculated with a suspension of the pathogen and treated with olive OMW mixed with talc powder 1:4 v:v; C: symptom-free mushrooms inoculated with a suspension of the pathogen and treated with olive OMW mixed with talc powder 1:10 v:v and D: symptom-free mushrooms inoculated with a suspension of the pathogen and treated with talc powder only.

Olive oil mill wastewater (olive OMW) contains a number of biologically active substances capable of inhibiting the growth of microorganisms (11) and even plants (7). Many phenolic, free fatty acids and aromatic compounds have been detected (5, 11) in olive oil mill residues associated with phytotoxic and antimicrobial properties of these residues (10). Several investigators reported that the inhibition of microbial growth and the toxic activity of olive OMW caused by different chemical compounds of olive residues (1, 2, 5).

Low moleculal-weight phenolic compounds seem to be the main determinants of the anti-microbial effect of olive residues (4, 6) while high molecular-mass polyphenols, organic acid, lipids, oligosaccharides and glycoproteins can contribute to the phytotoxic potential of the waste (3). Thus, several methods have been developed to degrade phenols in olive oil residues.

In the current study brown discoloration on *A. bisporus* caused by *Pseudomonas* significantly inhibited by olive OMW. We assume that the presence of phenolic compounds on olive OMW suppresses bacteria and possible could offer a protection on mushrooms from post-harvest diseases such as brown discoloration. Overall the results of this work demonstrated the high potential of olive OMW as a potential inhibitor against brown discoloration on *A. bisporus* caused by *Pseudomonas*.

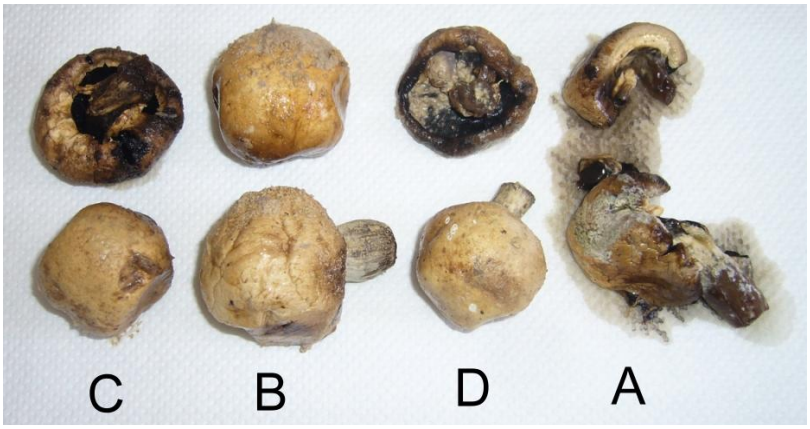


Figure 3. Effect of olive OMW on mushrooms brown discoloration caused by *Pseudomonas* where A: symptom-free mushrooms inoculated with a suspension of the pathogen; B symptom-free mushrooms inoculated with a suspension of the pathogen and treated with olive OMW mixed with talc powder 1:4 v:v; C: symptom-free mushrooms inoculated with a suspension of the pathogen and treated with olive OMW mixed with talc powder 1:10 v:v and D: symptom-free mushrooms inoculated with a suspension of the pathogen and treated with olive OMW mixed with talc powder only.

BIBLIOGRAPHY

1. Aziz N.H., Farag S.E., Mousa L.A.A., Abo-Zaid M.A. (1998) Microbios 93, 43-54.
2. Bisignano G, TomainoA, LoCascio R,Crisafi G, UccellaN, Saija A. (1999) J. Pharm. Pharmacol., 51, 971-974.
3. Capasso, R., De Martino, A., Cristinzio, G. (2002) J. Agric. Food Chem., 50, 4018–4024.
4. D'Annibale A., Casa R., Pieruccetti F., Ricci M., Marabottini R. (2004) Chemosphere, 54, 887–894.
5. Ethaliotis C., Papadopoulou K., Kotsou M., Mari I., Balis C. (1999) FEMS Microbiol. Ecol., 30, 301-311.
6. Fiorentino A., Gentili A., Isidori M.,Monaco P., Nardelli A., Parrella A. (2003) J. Agric. Food Chem., 51, 1005-1009.
7. Martin J., Sampedro I., Garcia-Romera I., Garcia-Garrido J.M., Ocampo J.A. (2002) Soil Biol. Biochem., 34, 1769-1775.
8. Munsch, P., Geoffroy, V. A., Alatossava, T. & Meyer, J. M. (2000). *Appl Environ Microbiol* 66, 4834-4841.
9. Schaad, N.W. (1988). *Laboratory guide for identification of plant pathogenic bacteria*, 2nd edition. St Paul, MN, USA, APS Press, 164 pp.
10. Obied H.K., Allen M.S., Bedgood D.R., Prenzler P.D., Robards K., Stockmann R. (2005) J. Agric. Food Chem., 53, 823-827.
11. Ramos-Comenzana A., Monteolica-Sanchez M., Lopez M.J. (1995) J. Biodeter. Biodegr., 35, 249-268.
12. Vagelas I., Kalorizou H., Papachatzis A., Botu M. (2009) Biotechnol. & Biotechnol. Eq., 2, 1217-1219.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

EFFECTS OF PEST CONTROL AND GROUND COVER MANAGEMENT ON ARTHROPOD POPULATIONS IN VINEYARDS

Constantina Chireceanu[1], Sonica Drosu[1],
A. Şerdinescu[2], Loreta Dumitraşcu[2], Silvia Cazacu[2]

KEY WORDS: arthropods, vineyard, pest and soil management

ABSTRACT

During 2006-2007, a comparative study concerning the effect of chemical, biological and integrated pest control systems applied in vegetation-free, partially vegetation and permanent ground cover conditions on the arthropod populations were carried out in vineyards at Research Institute for Viticulture Valea Calugareasca (southeast sub-Carpathian region of Romania).

The beating of vine foliage was used for arthropods collecting from May to September. The structure and seasonal dynamic of arthropods were appreciated for each experimental block. Arthropod assemblages were low in the spring and increased during the summer.

The vine plots managed by biological and IPM systems and as well the permanent and partially ground cover plots exhibited a higher abundance of the two pest and useful arthropod categories.

INTRODUCTION

The researches focused on the ecological impact of the management practices employed in vineyards on the arthropod populations became a main objective in the sustainable viticulture.

Management strategies, which include the application of insecticides of biological and mineral origin or ground management systems, are alternative options for arthropod pests' control. Ground covers practices are used in many vineyards to support manage arthropod pests, this offering a safe refuge and as well an available and broad food source for natural enemies (Nichollas et all., 2000, Costello & Daane, 1999, 2003, Douglas et al., 2000, Norris & Kogan, 2005).

The aim of this preliminary study was to gather information about the pest and beneficial arthropods status in vineyard under different pest control (chemical, integrated and biological) and ground management systems (partially vegetation, vegetation-free and permanent ground cover) that could be useful in selecting the suitable pest management strategies.

[1] Research-Development Institute for Plant Protection Bucharest
[2] Research -Development Institute for Viticulture and Enology Valea Călugărească

MATERIAL AND METHODS

Site description This study was conducted at the Research Development Institute for Viticulture and Neology Valea Călugărească vineyard, a representative wine growing area situated in sub Carpathian Mountains region from south-east of Romania.

Two combined experiments were initiated during 2006-2007, comparing three-pest control and -ground management systems. The pest control strategies comprised: a) chemical control, including fungicide applications against pathogens (products registered in Romania) and lambda cihalotrin 50 g/l against grape moths (the major pest in vineyards); b) integrated control, using reduced-risk pesticide, *Trichoderma harzianum* and pheromone traps for direct control of grape moth; c) biological control, using products based on copper, sulphur and *T. harzianum* against pathogens and bio-insecticides based on *Bacillus thuringiensis* against the grape moth. Each of pest control systems were applied on plots where three ground managements were practiced, so that resulted nine arthropods sampling plots of 0.5 ha. The ground managements contained: a) vegetation-free (maintained with four mechanic weedings); b) partially with vegetation (two mechanic weedings and selective herbicide applications on inter-row weeds); c) permanent ground cover between the rows during the growing season with a mix of *Festuca rubra*, *Poa pratensis* and *Lolium perene capri* seeded on spring, supplemented by the resident weeds.

Arthropods sampling. From May to September of 2006 and June to September of 2007, every 7-10 days, the seasonal abundance of phytophagous insects and associated beneficial arthropods were monitored separately on the nine vine plots. The samples were collected by shaking foliage over a cloth funnel (10 vines/plot beaten 5 time with a wooden stick). The total fauna was taxonomically identified and separated in two categories, pest and beneficial arthropods, which where separately analyzed.

RESULTS AND DISCUTIONS

During study period of vineyard, a total of 4873 specimens were collected, of which 2715 belonging to pest and 2158 belonging to beneficial arthropods (Tables 1 and 2). Abundance and the species composition of arthropods varied between pest control and ground management plots.

Regarding the pest control systems, the whole arthropods, pest and beneficial, were numerically greater in the biological control plots (731 specimens in 2006 and 1031 specimens in 2007) compared to the IPM plots (697 specimens in 2006 and 999 specimens in 2007) or chemical plots (565 specimens in 2006 and 850 specimens in 2007). This confirms the results presented by Filip and Margarit (1996) at Murfatlar vineyard.

Referring to the ground cover managements, the largest number of arthropods was collected from plots partially with vegetation (688 specimens in 2006 and 1041 specimens in 2007) followed by permanent ground cover plots (668 in 2006 and 942 in 2007) and vegetation free plots (637 specimens in 2006 and 897 specimens in 2007).

Combining data from all variant plots, in 2006, the arthropods assemblage were more abundant in the IPM pest control x partially with vegetation plot (263 specimens), followed by biological control x permanent ground cover plot (254 specimens); in chemical control x vegetation-free and chemical control x partially with vegetation plots were found less arthropods (172 specimens and 182, respectively). In 2007, the arthropods number was superior in the plots that combined biological control x partially vegetation and IPM x permanent ground cover (393 specimens and 343, respectively) than the chemical control x vegetation free (255 specimens) or x permanent cover plots (285 specimens).

The data showed a rather different situation regarding the arthropods composition recorded on the nine inspected vine plots. More species were found in IPM x permanent ground cover and biological control x partially ground cover with vegetation plots compared to plots that combined the chemical control with each of ground managements. Pest arthropods represented 54.26% (2006) and 45.74 % (2007) of fauna collected from all plots. Analysing the pest arthropods assemblage, it was noticed that the higher specimens number was registered in the biologically treated plots without and partially ground cover with vegetation (266 specimens and 201, respectively). Pests were represented by Homoptera 35.39% (2006) and 21.77% (2007), Hymenoptera 15.41% (2006) and 30.84% (2007), Orthoptera 15.97% (2006) and 16.1% (2007), Coleoptera 13.62% (2006) and 14.04% (2007), Diptera 8.25% (2006) and 5.68% (2007), Lepidoptera 5.27% (2006) and 3.10% (2007), Heteroptera 3.08% (2006) and 2.57% (2007), Thysanoptera 2.88% (2006) and 2.63% (2007), Isoptera 3.39 % (2007).

Among Homoptera associated with grapevine, leafhoppers and grasshoppers were the most commonly found, comprising 30.71% (2006) and 19.13% (2007). Population density of the leafhoppers was superior in the IPM treated plots (2006) and in the biologically treated plots (2007) partially ground cover with vegetation or no vegetation. Their abundance was low in permanent ground cover x biological control plot in 2006 (17 specimens) and in permanent ground cover x IPM plot in 2006 (19 specimens). In these types of plots, the beneficial arthropods, especially spiders-Aranea had a high-level abundance. Among all of predators, spiders (Aranea) were dominant group, comprising 48.02% and 53.37% of total beneficial arthropods collected in 2006 and 2007, respectively. At individual plot, the spiders abundance reached the highest percentages of 16.31% (2006) and 22.12% (2007) in plots managed with biologic and IPM program where ground was covered partially or permanent with vegetation. Spiders are considered the permanent residents of the vineyards because most species overwinter here and they are important predators of many pest species in vineyards, particularly, of the leafhopers and lepidopteran complex (Castello et al. 1999).

Beneficial arthropods represented 45.74% in 2006 and 54.26% in 2007 of the entire fauna from all plots. They were more numerous in the biologic control x permanent ground cover plot, followed by the IMP x partially ground cover plot in 2006; and in the IMP x permanent ground cover or x partially ground cover plots in 2007.

The predators, insects, mites and spiders, formed the most abundant group, constituted 80.14% (2006) and 86.42% (2007). Other predators as Anthocoridae, Miridae, Nabidae, Chrysopidae, Hemerobiidae, Coccinellidae, Carabidae, Staphylinidae groups, were found at grater densities in biologically and IPM treated plots compared to chemical ones and in the presence of ground cover also compared to no vegetation plots. These data indicated that the using of low toxicity pesticides in vineyards and the presence of vegetation during the growing season could contribute to increase arthropods abundance, that confirm results presented in numerous researches from this field. The ground cover is considered a form of conservation biological control and enhance of natural enemies (Douglas et al., 2000, Norris & Kogan, 2005).

Parasitoids accounted 356 specimens distributed on hymenopteras from families Chalcididae 29.14% (2006) and % (2007), Braconidae 4.64% (2006) and 4.97% (2007), Ichneumonidae 18.87% (2006) and 13.25% (2007) and flies from family Tachinidae 3.755 (2006) and 1.37% (2007). Parasitoids as well as predators presented similar situation in experimental plots.

Arthropod population dynamics presented in figure 1, show a low level in the spring and increased during the summer in all kind of plots. The population density of

arthropods assemblage was superior in vine plots with permanent and partially ground cover and in biological an IPM treated plots also than in chemical treated or without vegetation plots.

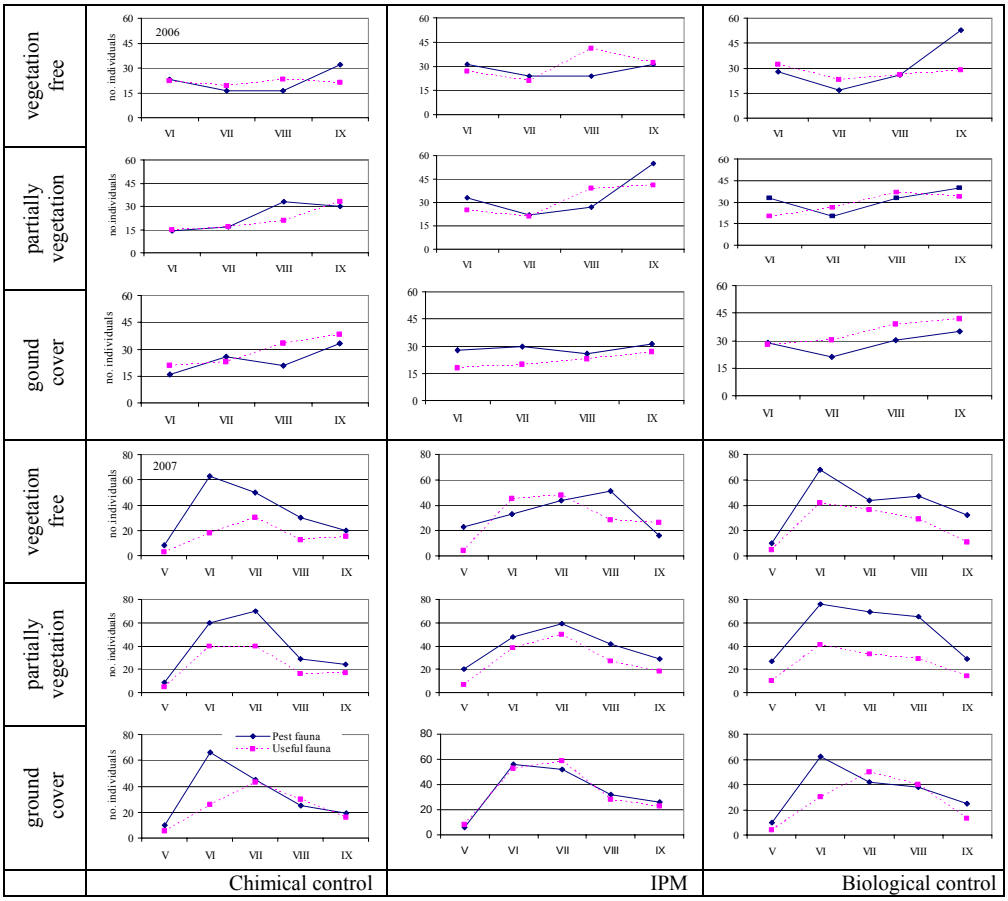


Fig. 1. Arthropod population dynamics in chemical, IPM and biological treated viticultural plots located on the vegetation-free, partially vegetation and permanent ground cover plots, in 2006 and 2007 years in Valea Calugareasca vineyard

CONCLUSIONS

The pest control and the ground cover managements in vineyard influenced the densities and species composition of pests and associated natural enemies.

Arthropods were more abundant in the biological and IPM pest control systems applied on the plots where the ground was partially or permanent covered with vegetation during the growing season comparatively to chemical treated and vegetation-free plots.

Our first data seem to confirm a positive effect of biological and IPM pest control systems and permanent and partially ground covered on the beneficial arthropods associated with pests in vineyard. More observations are necessary to carry out in next time in order to consolidate this opinion.

BIBLIOGRAPHY

1. Costello M. and Daane K. - Abundance of spiders and insect predators on grapes in central California. The Journal of Arachnology 27:531-538, 1999.
2. Costello M. and Daane K. - Spider and leafhopper (*Erythroneura spp.*) response to vineyard ground cover. Environ. Entomol. 32(5): 1085-1098, 2003.
3. Filip I and Margarit Gr. - Fauna de insecte utile din podgoria Murfatlar. Anale ICVV vol. XV, 239-248, 1996.
4. Niclolls I. Clara, Parrella P. Michael, Altieri A. Miguel. - Reducing the abundance of leafhopper and trips in a northern California organic vineyard through maintenance of full season floral diversity with summer cover crops. Agricultural and Forest Entomology, 2, 107-113, 2000.
5. Norris F., and Kogan M. - Ecology of interactions between weeds and arthropods. Annual Review of Entomology. Vol. 50: 479-503, 2005.
6. Douglas A. Landis, Stephen D. Wratten and Geoff M. Gurr. Habitat Management to Conserve Natural Enemies of Arthropod Pests in Agriculture. Annual Review of Entomology. Vol. 45: 175-201, 2000.

Table 1.

Pest arthropods collected in the plots managed under different pest control and ground management systems in Valea Călugărească vineyard

Taxon	Chemical Control						IPM						Biological Control					
	vegetation-free		partially vegetation		permanent ground cover		vegetation-free		partially vegetation		permanent ground cover		vegetation-free		partially vegetation		permanent ground cover	
	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007
1. ORTHOPTERA	30	42	23	19	15	10	18	36	13	26	17	6	21	90	10	25	15	19
Gryllidae - *Oecanthus sp.*	21	36	17	11	13	8	14	32	12	19	11	6	13	75	4	15	12	19
Phaneropteridae *Polisarcus denticauduc* Charpet.	-	2	-	1	-	2	-	1	-	-	-	-	-	-	-	-	-	-
Acrididae - *Locusta migratoria* L.	4	-	2	4	-	-	-	-	-	3	-	-	4	-	3	6	-	-
Catantopidae - *Calliptamus italicus* L.	5	4	4	3	2	-	4	3	1	4	6	-	4	15	3	4	1	-
2. ISOPTERA - Rhinotermitidae	-	8	-	-	-	20	-	-	-	-	-	14	-	-	-	-	-	16
3.THYSANOPTERA -Thripidae	-	-	-	3	-	4	4	6	5	2	3	5	2	6	8	17	7	2
4. HETEROPTERA	8	2	2	6	3	8	5	1	1	4	2	8	5	9	1	2	4	4
Miridae	3	1	2	2	2	1	5	1	1	4	2	8	5	4	-	1	1	2
Pentatomidae	5	1	-	3	1	4	-	-	-	-	-	-	-	5	1	1	3	2
Tingidae	-	-	-	1	-	3	-	-	-	-	-	-	-	-	-	-	-	-
5. HOMOPTERA	35	51	37	38	32	18	59	47	42	46	37	27	40	56	48	51	26	38
Cixiidae	-	2	-	8	-	2	-	10	-	2	-	2	-	5	-	3	-	4
Hyalesthes obsoletus Signoret.	-	2	-	8	-	2	-	5	-	-	-	-	-	5	-	3	-	4
Cixus sp.	-	-	-	-	-	-	-	5	-	2	-	2	-	-	-	-	-	-
Iassidae - *Hysteropterum sp*.	8	21	9	9	4	2	8	7	7	8	4	4	9	25	5	20	2	6
Membracidae *Stictocephala bisonia* Kopp&Yonke	3	3	-	4	4	1	-	8	3	1	1	2	3	6	1	3	2	5
Cercopidae - Afroforine *Philaenus spp.*	9	14	8	5	7	7	20	4	15	13	6	6	7	8	9	9	4	7
Cicadellidae	15	9	17	9	10	5	27	12	17	12	17	5	11	7	27	13	9	12
Afrodine	-	-	-	-	-	-	-	5	-	4	-	-	-	4	0	4	-	-
Cicadelline - *Cicadella viridis* L.	8	4	12	4	4	2	4	3	3	1	8	1	8	-	13	-	2	-
Tiflocibine	5	2	6	3	6	1	18	1	14	3	9	2	2	3	6	6	5	7
Empoasca vitis	5	2	6	3	3	1	17	1	13	3	6	2	2	3	6	6	2	7
Zygina sp.	-	-	-	-	3	-	1	-	1	-	3	-	-	-	-	-	3	-
Deltocefaline	2	3	1	2	-	2	5	3	-	4	-	2	1	-	8	3	2	5
Aphididae	-	6	-	3	7	1	4	6	2	8	9	3	10	5	6	3	9	4
Phylloxeridae	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-
Lecaniidae	-	-	-	-	-	-	-	-	-	2	-	2	-	-	-	-	-	-
6. HYMENOPTERA - Formicoidea	4	56	8	64	12	72	23	43	21	49	19	60	20	70	26	49	22	64

Taxon	Chemical Control						IPM						Biological Control					
	vegetation-free		partially vegetation		permanent ground cover		vegetation-free		partially vegetation		permanent ground cover		vegetation-free		partially vegetation		permanent ground cover	
	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007
7. COLEOPTERA	10	22	4	22	17	28	20	36	13	28	26	32	12	25	6	30	29	17
Chrysomelidae	-	13	-	10	-	8	-	14	-	10	-	10	1	8	2	12	10	12
Elateridae	5	4	3	2	1	-	2	4	1	8	8	1	1	-	3	7	3	-
Meloidae	-	-	-	-	4	-	-	2	-	-	-	-	-	1	-	4	-	-
Curculionidae	2	4	1	2	-	7	8	1	4	4	7	7	5	11	1	3	10	5
Buprestidae	-	-	-	2	12	1	-	1	-	5	-	3	-	1	-	4	-	-
Bruchidae	2	-	-	3	-	-	-	-	-	-	-	-	-	2	-	-	-	-
Dermestidae	-	-	-	-	-	-	-	2	-	-	-	3	-	2	-	-	-	-
Halticidae	1	-	-	-	-	2	2	-	-	-	3	-	5	-	-	-	6	-
Latridiidae	-	-	-	2	-	7	8	3	8	-	8	4	-	-	-	-	-	-
Nitidulidae	-	-	-	-	-	-	-	4	-	1	-	4	-	-	-	-	-	-
Scirtidae	-	1	-	1	-	3	-	5	-	-	-	-	-	-	-	-	-	-
8. LEPIDOPTERA	2	3	6	9	10	2	3	11	3	5	4	2	9	6	15	12	1	3
Geometridae	2	1	6	3	7	2	3	5	3	1	3	2	5	1	13	5	1	3
Tortricidae	-	2	-	6	3	-	-	6	-	4	1	-	4	5	2	7	0	0
9. DIPTERA	7	8	7	10	7	3	5	18	12	7	7	18	17	4	10	15	11	14
Brachycera	6	7	2	-	4	-	4	5	10	2	3	10	12	2	6	7	6	8
Nematocera	1	1	5	10	3	3	1	13	2	5	4	2	5	2	4	8	5	6
Total specimens	**96**	**192**	**87**	**171**	**96**	**165**	**137**	**198**	**110**	**167**	**115**	**172**	**126**	**266**	**124**	**201**	**115**	**177**

Table 2.

Beneficial arthropods collected in the viticultural plots managed under different pest control and ground management systems in Valea Călugărească vineyard

Taxon	Chemical Control						IPM						Biological Control					
	vegetation-free		partially vegetation		permanent ground cover		vegetation-free		partially vegetation		permanent ground cover		vegetation-free		partially vegetation		permanent ground cover	
	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007
1. ACARINA -Trombidae	0	2	-	-	-	2	-	4	-	-	-	11	-	16	-	2	-	7
2. ARANEAE	43	65	50	49	62	84	57	94	62	78	42	87	48	67	50	41	60	60
3. MANTODEA -Mantidae *Mantis religiosa*	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
4. THYSANOPTERA - Aeolothripidae	2	-	-	-	1	-	1	12	5	16	3	13	3	9	4	7	7	4
5. DERMAPTERA - Forficulidae *Forficula auricularia* L	8	12	6	1	2	1	6	9	6	4	2	4	1	5	3	3	6	3
6. HETEROPTERA	5	-	3	2	1	10	9	3	8	3	6	10	2	2	4	4	2	9
Anthocoridae - *Orius sp.*	4	-	-	2	1	8	7	-	8	2	2	5	-	2	-	4	1	9

Taxon	Chemical Control						IPM						Biological Control					
	vegetation-free		partially vegetation		permanent ground cover		vegetation-free		partially vegetation		permanent ground cover		vegetation-free		partially vegetation		permanent ground cover	
	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007
Miridae	-	-	-	-	-	1	-	2	-	-	-	4	-	-	-	-	-	-
Deraeocoris ruber	-	-	-	-	-	1	-		-	-	-		-	-	-	-	-	-
Pilophorus perplexus Douglas & Scott	-	-	-	-	-	-	-	2	-	-	-	4	-	-	-	-	-	-
Nabidae	1	-	3	-	-	1	2	1	-	1	3	1	2	-	4	-	1	-
Nabis sp.	1	-	3	-	-	1	2		-	1	3	1	2	-	3	-	1	-
Hymacerus sp.		-	-	-	-	-		1	-					-	1	-	-	-
7. NEUROPTERA	9	5	3	4	10	-	11	7	7	7	6	9	11	1	15	3	13	8
Chrysopidae	9	5	3	4	8	-	10	5	5	5	6	5	8	1	9	3	10	8
Chrysoperla carnea Steph.	9	4	3	2	8	-	8	4	5	3	5	4	8	1	7	3	7	6
Chrysopa sp.	-	1		2		-	2	1		2	1	1	-	-	2	-	3	2
Hemerobiidae - *Hemerobius sp.*	-	-	-	-	2	-	1	2	2	2	-	4	3	-	6	-	3	-
8. HYMENOPTERA	5	21	9	15	16	12	17	2	22	23	21	17	25	11	19	29	25	13
Chalcididae	2	18	4	10	10	6	6	2	13	11	9	9	14	7	12	15	18	10
Braconidae	1	1	-	1	1	2	3	-	1	2	1	-	5	2	1	4	1	3
Ichneumonidae	2	2	5	4	5	4	8	-	8	10	11	8	6	2	6	10	6	-
9. COLEOPTERA	5	1	9	11	9	10	7	5	1	5	4	7	7	12	4	17	13	21
Coccinellidae	4	-	6	8	8	5	6	3	1	5	3	5	6	6	2	13	13	16
Coccinella 7-punctata L.	-	-	1	2	-	-	-	3	-	3	-	2	3	-	-	3	4	4
C. 10-punctata	1	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-
Propylea 14-punctata L.	3	-	3	-	5	2	6	-	1	-	3		3	4	1	-	5	6
Coccinula 14-punctata L.	-	-	-	-		2	-	-	-	2	-	3	-	2	-	7	-	1
Thea 22-punctata L	-	-	-	-			-	-	-	-	-		-	-	-	3	-	1
Scymnus sp.	-	-	-	6		1	-	-	-	-	-		-	-	-		2	4
Stethorus punctilum Weise	-	-	1		3		-	-	-	-	-		-	-	-		1	
Carabidae -*Lebia humeralis* .	-	1	-	3	-	2	-	2	-	-	1	2	-	1	-	2	-	3
Staphilinidae	1	-	3	-	1	3	1	-	-	-	-	-	1	5	2	2	-	2
10. DIPTERA	9	12	5	2	15	1	17	4	10	15	4	13	20	4	11	17	13	12
Nematocera - Sciaridae	6	10	2	2	10	1	10	4	9	11	2	9	13	3	6	12	9	12
Brachycera - Tachinidae	3	2	3	-	5	-	7	-	1	4	2	4	7	1	5	5	4	-
Total	**86**	**118**	**85**	**84**	**115**	**120**	**126**	**140**	**121**	**151**	**88**	**171**	**117**	**127**	**110**	**123**	**139**	**137**

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✔*Biologie*
✔*Horticultură*
✔*Tehnologia prelucrării produselor agricole*
✔*Ingineria mediului*

Vol. XIV (XLX) - 2009

THE MODIFICATION OF SOME BIODIVERSITY INDEX AFTER PESTICIDES APPLYING IN THE BANU MARACINE VINEYARD

Rodi Mitrea, C. Stan, O.Tuca, I. Mitrea, Ciupeanu Calugaru Eleonora Daniela, Nițu Tănțica[1]

KEY WORDS: viticultural ecosystem, biodiversity, indicators species

ABSTRACT

Apllying the similute coefficient it come out that after the herbicidation the species abundence decrease to 75%. If it is applied the similitude coefficient it come out that the diversity of the pathogen species from the vineyard has decrease to 85,7%. Using the similitude coefficient regarding the biodiversity of the vineyard entomofauna where has been applyed control methods, it come out a decreasing to 93,2%.

Thus, in the viticultural ecosystem from S.D. Banu Mărăcine before the use of control methods there has been inventoried 113 species representing weeds, phytopathogen agents, harmfull, beneficial and indifferent entomofauna.

Using the similitude coefficient regarding the species abundence, after appying the control methods, it come out a decrease of 90,3%

INTRODUCTION

The viticultural ecosystem represent an apart category of ecosystem from the ones made by human.

The agricultural ecosystems biodiversity it is generally appreciate as considerably lower than the biodiversity of the natural ecosystems. Under ecological and agricultural report, the decrease of the biodiversity constitute a considerable risk. Thus, the agricultural ecosystem become vulnerable to the actions of the physical factors, but, especially to the biological factors.

The single crop culture has become very sensitive to the demographical explosion of different pests, their control requirying the frequent use of the pesticides on large scale. The result of this action, initially appreciated as benefic, it is represented by the quantitative increase of the crop, without a special attention for the quality of the crop.

Besides these, the pests addapt very rapide, few generations, to the new pesticides, generating resistant forms, able to produce new populational explosions. As a consequence, a great part from the "cultural energy" introduced by human in the agricultural ecosystems help to the regulate on rational base of the abundence and frequency of different species that can live on the cultivated species.

[1] University of Craiova, Faculty of Horticulture

One of the path of the re-ecologization of the agriculture it is represented by the biodiversity increase of the agricultural ecosystems on structural and genetic plane, as well the species enriching of the actual crops.

As well, it is impose when it is possible to replace the organic synthesis pesticides with the biological control in order to reestablish the biodiversity, the complexity and the stability of the agricultural ecosystems.

MATERIAL AND METHOD

The indicators species for the biodiversity from the viticultural ecosytems susceptibile to be modificate through pollution has been determined within the viticultural ecosystem from the Didactical Station Banu Mărăcine.

The weeds control degree has been apreciated through the numbering of the weed species on m^2 after the control methods and framing in two group: annual weeds and perennial weeds, comparatively with the natural state of weeding.

The evolution of the phytopathogen agents has been followed through direct observation in the field and laboratory using the binocular and the miscroscope ML 4, establishing the spectrum of the phytopathogen agents active during the vegetation period.

The density of the acarian populations has been estimated through visual control during the vegetative repose and the vegetation period, prelevation of samples and their analyze in the laboratory.

The surveillance of the moth generations has been made on the recorded capture in the the pheromone traps ***atraBOT, atraAMBIG***, and ***atraPil***. The pheromone traps has been placed at the end April and begining of May, 3 traps/ha.

The reading of the traps has been made weekly, the change capsule impregnated with synthetic pheromone as well the adhesive plates has been made at 4-5 weeks. For capturing other insects species there has been used food traps and coloured stiky traps.

Knowing the fact that the diversity or the species abundence can be quantitative expressed through the intermediation of the „diversity index", we have used the similitude coefficient (comunity coefficient) according to the adapted formula of Sörensen:

$$S_s = 100 \frac{2c}{a+b}$$

S_s – the similitude coefficient;

a – the number of species from the vineyard flora and fauna;

b – the number of species after the applying of the control methods;

c – the number of commune species.

RESULT AND DISCUSSION

The viticultural center Banu Mărăcine it is characterized through the stability of the climatic system, from the altitude and latitude point of vie. The climatic province where it is framed it is of cfax type, manifesting an temperate-continetal character, with mediterranean influence, chracterized through gentle winters, warm summers and insufficient rainfall during the vegetation period (Giugea N., Olteanu I., 2001).

The average annual temperature of the air it is of $10,8^0$C, the rainfall reach the levell of 583 l/m^2, and the duration of the sun shining it is one of the favourable for the vine, 2245,5 hours/year.

The study of the weeding degree of the vineyard from the S.D. Banu Maracine has emphasize that the number of the weeds it is small (15 species), but the covering degree of the soil it is high of almost 80–85 species (table 1).

Table 1

The natural state of weeding in the vineyard at S.D. Banu Mărăcine

The species	nr. weed/m^2	% participation
Setaria pumila	8	7,5
Poa pratensis	6	5,7
Sorghum halepense	3	2,8
Elymus (Agropyron)	4	3,8
Hordeum sterilis	1	0,9
Bromus sterilis	2	1,9
Bromus arvensis	2	1,9
Bromus hordeoceus	2	1,9
TOTAL MONOCOTILEDONATE	**29**	**27,4**
Stellaria media	18	16,9
Cardaria draba	17	16,0
Lamium purpureum	13	12,2
Vicia grandiflora	12	11,3
Taraxacum officinale	8	7,5
Cirsium arvense	6	5,7
Amaranthus retroflexus	3	2,8
TOTAL DICOTILEDONATE	**77**	**72,6**
MONOCOTILEDONATE + DICOTILEDONATE	**106**	**100**

After applying a total herbicide (Cosmic) the number of weeds on surface unit (weed/m^2) decrease considrable, reducing also the number of species. Thus after 2 herbicidation there has been eradicated some annual monocotiledonate species (*Hordeum murinum, Bromus sterilis, Bromus arvensis, Bromus hordeaceus*), and from dicotiledonate *Vicia grandiflora* and *Stellaria media (table 2).*

Table 2

The floristic composition of the vineyard after herbicidation

The species	nr. weed/m^2	% participation
Setaria pumila	1	7,1
Poa pratensis	2	14,2
Sorghum halepense	1	7,1
Elymus (Agropyron) repens	1	7,1
TOTAL MONOCOTILEDONATE	**5**	**35,7**
Cardaria draba	3	21,4
Lamium purpureum	2	14,2
Taraxacum officinale	2	14,2
Cirsium arvense	1	7,1
Amaranthus retroflexus	1	7,1
TOTAL DICOTILEDONATE	**9**	**64,3**
MONOCOTILEDONATE + DICOTILEDONATE	**14**	**100**

Apllying the similute coefficient it come out that after the herbicidation the species abundence decrease to 75%.

$$S_s = 100\ \frac{2x9}{15+9} = 75\%$$

Regarding the complex of phytopathogen agents identified in the vineyard from the Didactical Station Banu Maracine, this comprise 12 species, classified in: key species, secondary species and species with damaging potential. The pathogens has been classified after the value of the attack degree, after the specificity where the damage it is produced and the attack potential.

A. Key species
   1. Plasmopara viticola
   2. Uncinula necator
   3. Botryotinia fuckeliana
B. Secondary species
   4. Agrobacterium tumefaciens
   5. Elsinoë ampelina
   6. Pseudopeziza tracheiphilla
C. Species with damaging potential
   7. Septoria ampelina
   8. Court noué fan leaf

After applying the control methods, which has been correlated with the vine phenology, there has been recorded very low values of the attack degree at the key pathogen, without being signalized the attack of some secondary or with damaging potential species.

The decreased values of the attack degree for the key pathogen during the research period (2007-2008) has been heavily influenced by the meteorological conditions from the 2 years.

The phytopathogen agents that hasn't produced attacks after the control measures are (*Elsinoë ampelina, Pseudopeziza tracheiphilla* and *Septoria ampelina*).

If it is applied the similitude coefficient it come out that the diversity of the pathogen species from the vineyard has decrease to 85,7%.

$$S_s = 100\ \frac{2x9}{12+9} = 85{,}7\%$$

This aspect it is less relevant, important being the fact that the incidence of the key phytopathogens (*Plasmopara viticola, Uncinula necator* and *Botryotinia fuckeliana*) in the vineyard from the Didactical Station Banu Maracine it is generally high.

Regarding the entomofauna from the vineyard of the Didactical Station Banu Mărăcine, this it is represented by 86 species of arthropods , 44 species harmful to the vine, 14 beneficial species and 28 indifferent species (table 3).

The 44 harmfull species are classified function the attack degree and the specificity of the attack as well the produced damages in: key species, secondary species, species with damaging potential and migratory species.

Table 3

The vineyard entomofauna structure from the S.D. Banu Mărăcine

Order	*Nr. damaging species*	*Nr. beneficial speciese*	*Nr. indifferent species*	*TOTAL*
Acari	2	0	0	2
Orthoptera	7	0	0	7
Dermaptera	1	0	0	1
Thysanoptera	1	0	1	2
Heteroptera	4	0	6	11
Homoptera	2	0	0	2
Hymenoptera	3	4	0	7
Neuroptera	0	2	0	2
Coleoptera	15	7	16	38
Lepidoptera	8	0	4	12
Diptera	1	1	0	2
TOTAL	44	14	28	86

After the applying of the control methods, which has been correlated with the vine phenology there has been recorded low values of the attack degree at the key species, without being signalized the attack of the secondary species species with damaging potential or the migratory species.

The low values of the attack degree produced by the key pests during the research period (2007-2008) has been considerable inf;uenced by the climatic conditions.

The phytosanitary treatments applyed for controling the pests have affected the indifferent entomofauna, but especially the beneficial species.

As a consequence of the phytosanitary treatments, during 2008 there has not been recorded the attack of the vine moths (*Lobesia botrana, Clysia ambiguella, Sparganotis pileriana*) the number of males captured being almost null. The attack of the secondary species *Panonychus ulmi*, *Calepitrimerus vitis* and *Pulvinaria vitis* has not be signalized during 2008.

Among the species with damaging potential and migratory species there has not been signalized during 2008 the presence of the species: *Ephippiger ephippiger* and *Hyphantria cunea.*

Regarding the beneficial entomofauna, the number of the species has decreased considerable, during 2008 there has not been signalized the presence of the species: *Trichogramma spp*., *Adalia decimpuncata,* şi *Hemerobius spp.*.

Using the similitude coefficient regarding the biodiversity of the vineyard entomofauna where has been applyed control methods, it come out a decreasing to 93,2%.

$$S_s = 100\ \frac{2x75}{86+75} = 93{,}2\%.$$

The biodiversity of the viticultural ecosystem it is appreciate as lower comparative with one of the natural ecosystem, and after using the pesticides with pollution risk the decrease it is obviously.

Thus, in the viticultural ecosystem from S.D. Banu Mărăcine before the use of control methods there has been inventoried 113 species representing weeds, phytopathogen agents, harmfull, beneficial and indifferent entomofauna.

Using the similitude coefficient regarding the species abundence, after appying the control methods, it come out a decrease of 90,3% .

$$S_s = 100\ \frac{2x93}{113+93} = 90{,}3\%.$$

CONCLUSION

The profound intervention of the human in the viticultural ecosystem has led to considerable lack of poise, thus the problems related with pests, diseases can not be solved only using the cultural and physics methods, leading to the search of more efficient controling methods. The control of the harmfull organisms required the use of pesticides that represent one of the most important factors which affect the biodiversity, the pesticides representing complex chemical synthesis substance, toxic or very toxic.

The pesticides generate considerable danger regarding the pollution of the crop and environment as well the apearance of the resistance phenomenon at the harmfull organisms to some phytopharmaceutical products.

As a consequence, when it is possible the replace of the pesticides with biological control method in order to restorate the biodiversity, complexity and stability of the agricultural ecosystems.

The biodiversity of the viticultural ecosystem it is appreciate as lower comparative with one of the natural ecosystem, and after using the pesticides with pollution risk the decrease it is obviously, using the similitude coefficient regarding the species abundence, after applying the control methods, it come out a decrease of 90,3%

REFERENCES

1. Ivan Doina, Fitosociologie si vegetatia Romaniei, Edit Didactica si Pedagogica Bucuresti, 1979.
2. Giugea N. Olteanu I., Banu Maracine Traditie si vocatie viticola. Edit. Universitaria, Craiova, 2001.
3. Mitrea I and colab. The study of the viticultural ecosystem biodiversity S.D. Banu Maracine-Craiova, UŞAMV BUCUREŞTI Lucrări Ştiinţifice seria B-LI-2008.
4. Stan C. and colab. Establisihing the trophical chains from the vineyard susceptible to be modified through polution. Analele Univ. din Craiova seria Biol., Hortic., T.P.P.A., I. Med; Vol. XIII (XLIX) pp. 395-400; ISSN 1435-1275 Craiova, 2008.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✔*Biologie*
✔*Horticultură*
✔*Tehnologia prelucrării produselor agricole*
✔*Ingineria mediului*

Vol. XIV (XLX) - 2009

THE IDENTIFICATION OF SOME PLUM GENOTYPES WITH RESISTANCE TO THE MAIN VIROTIC DISEASES THROUGH DAS-ELISA

Poenaru Silvia[1], Preda Silvia[2]

KEY WORDS: DAS-ELISA, genotype, plum, viruses,PPV.

ABSTRACT

The study followed the behaviour of seventeen plum genotypes regarding the infection with the main virotic diseases in natural field conditions. Using the serologic method DAS-ELISA was determined the concentration of the viral protein in the plants tissues for the viruses : Plum pox (PPV), Prunus necrotic ring spot (PNRSV), Prune dwarf (PDV) and Apple chlorotic leaf spot (ACLSV). The plum genotypes of age 9 to 22 years observed were: Scoldus, Iskra, Kirke, Roma, Čačanski secer, Pacific, Silvia, Wilhemina spath, Helena, Andreea, Aurii de Bistriţa F4, Čačanska lepotica, Hütner, Alina, H 36-5-8, H 36-6-8 and Agen 707. Through serological tests all genotypes proved to be resistant to PNRSV, PDV and ACLSV. Regarding the presence of the Plum pox virus was confirmed the infection at five plum cultivars: Helena, Pacific, Silvia, Čačanski secer, Agen 707. For the five cultivars infected with PPV was determined also the frequency, the intensity and the attack degree on leaves.

INTRODUCTION

Every year the fruit tree diseases produced by viruses generate worldwide severe yield losses(Németh, 1986; Roistacher, 1992; Martelli, 1993).

In Romania, according researches carried out in the last years, the number of diseases caused by viruses in plum trees is 8. After the degree of the spread, in first place is positioned Plum pox virus, followed by Prune dwarf virus and in a less degree by Apple chlorotic leaf spot virus (Minoiu, 1998). The viruses don't kill the trees but cause yield losses and reduces the marketability of fruit. For example, PPV has caused considerable losses in Europe, with susceptible cultivars reporting yield losses of 80-100% (Levy and colab. 2000).

The main viruses in plum and their spread in Romania area
(Minoiu N. and colab.,1998)

Table 1

No. crt	Viruses	The degree of the attack	Economical impact
1	Plum pox virus	Very strong	Very strong
2	Prune dwarf virus	Very strong	Strong
3	Prunus necrotic ring spot virus	Reduced	Very strong

[1] University of Craiova, Faculty of Horticulture, Budget Postgraduate through the Project POSDRU/6/1.5/S/14 „The increase of the attractiveness, of the quality and of the efficiency for the doctorate university studies through the grant of postgraduate scholarships".
[2]Fruit Growing Research & Extension Valcea.

4	American line pattern	Reduced	Reduced
5	Plum bark split (Apple chlorotic leaf spot virus)	Medium	Strong
6	Rasberry ring spot virus	Sporadic	Very strong
7	Tomato ring spot virus	Reduced	Strong
8	Myrobolan stunt virus	Reduced	Strong

The purpose of the researches carried out in the germplasm fond of the Fruit Growing Research & Extension Valcea was to identify the plum genotypes with resistance to the main viral diseases for the use of them in plum future breeding programs.

MATERIAL AND METHODS

Seventeen plum genotypes were studied: Scolduş, Iskra, Kirke, Roma, Čačanski secer, Pacific, Silvia, Wilhemina spath, Helena, Andreea, Aurii de Bistriţa F4, Čačanska lepotica, Hütner, Alina, H 36-5-8, H 36-6-8 and Agen 707.

The genotypes visual response to the infection with the main viruses was determined with the help of the frequency and intensity attack on leaves. The frequency attack ($F\%=(n\times N)/100$) represents the relative value of the affected organs (n) reffered to the total numer of analyzed plants (N). The intensity attack ($I\%=\sum(i\times f)/b$) represents the extension attack degree reffered to the plant affected area.

Thus, was calculated the attack degree (AD%) using the formula: $AD\% =(F\%\times I\%)/100$) (Cociu&Oprea,1989) which represents the expression of the plants suffering degree.

For the determination of the viral concentration was used the serologic method Double Antibody Sandwich-Enzyme Linked Immunosorbent Assay (DAS-ELISA). According to this method, the presence of viral specific antigens in infected sap is detected through a colorimetric reaction (Figure 1), that develops because of the reaction of an enzyme (alkaline phosphatase) conjugated to antibodies in the presence of an appropiate substrate (paranitrophenylphosphate) (Boscia&Myrta,1998). The work protocol was followed according to the instructions given by the manufacture firm (Bioreba,Switzerland) of the reagents for the four viruses: PPV,ACLSV,PDV,PNRSV. The readings were performed at 405 nm and the values obtained (optical density at 405 nm) represents the response of the plant extract regarding the infection with each virus that was tested.

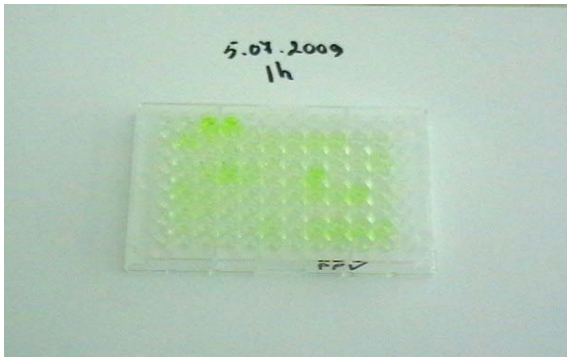


Figure 1. ELISA Microplate-colorimetric reaction

RESULTS AND DISCUSSIONS

For the ten varities serological tested regarding the infection with the virus Prunus necrotic ring spot (Figure 2) it was observed that the values obtained at 405 nm confirmed the fact that no infection was made in natural field conditions. The DAS-ELISA values oscillated between 0,500 (Scoldus) and 0,538 (Iskra). Comparing this values with the one of positive whitness (1,311) was ascertained that the varieties were not infected with this virus.

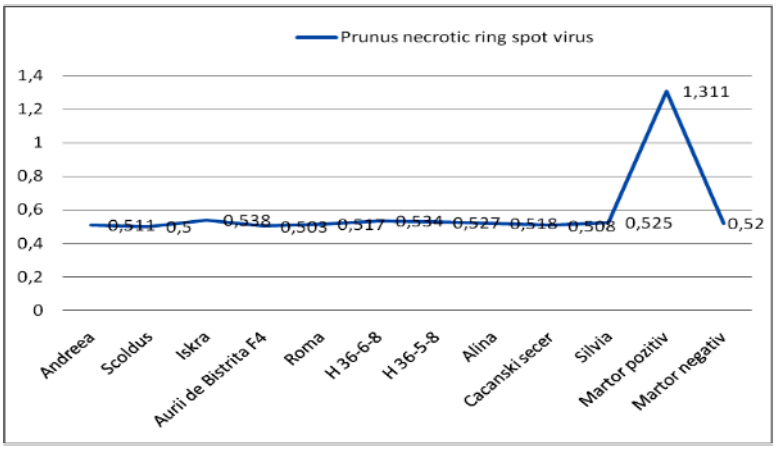


Figure 2. Values at 405 nm for Prunus necrotic ring spot virus

In case of the Prune dwarf virus, all the values obtained at 405 nm were smaller than the value of the positive whitness (1,031), thus no infection was recorded (Figure 3). The values oscillated between 0,442 (Andreea) and 0,691 (Iskra).

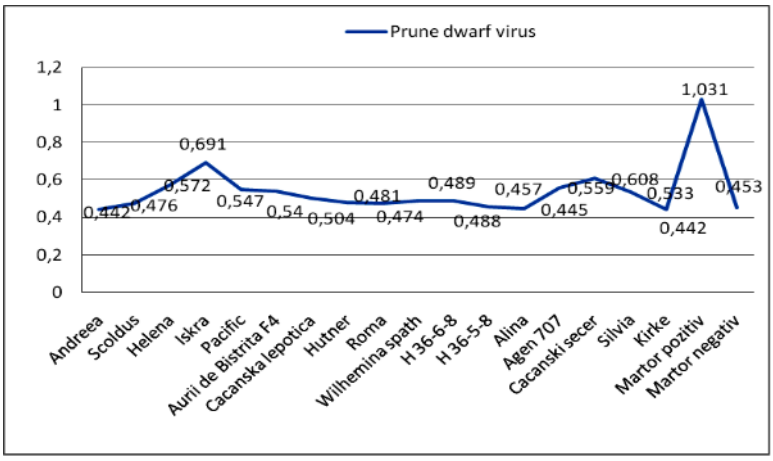


Figure 3. Values at 405 nm for Prune dwarf virus

The values obtained at 405 nm for Plum pox virus oscillated between 0,406 (Agen 707) and 3,234 (Helena) (Figure 4). Thus, was recorded the presence of the virus in the tissues of five varieties: Helena (>3,000), Pacific (2,935), Silvia (2,491),Čačanski secer (1,266), Agen 707 (0,927).

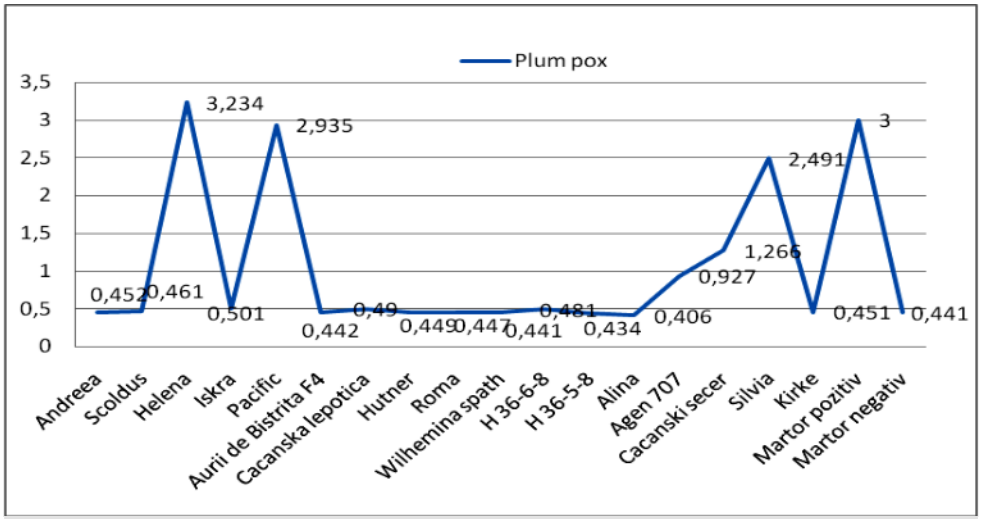


Figure 4. Values at 405 nm for Plum pox virus

For Apple chlorotic leaf spot virus, the values at 405 nm showed that the varieties were not infected in natural field conditions. The limits between the values oscillated were 0,460 (Aurii de Bistrița F4) and 0,515 (Pacific) (Figure 5).

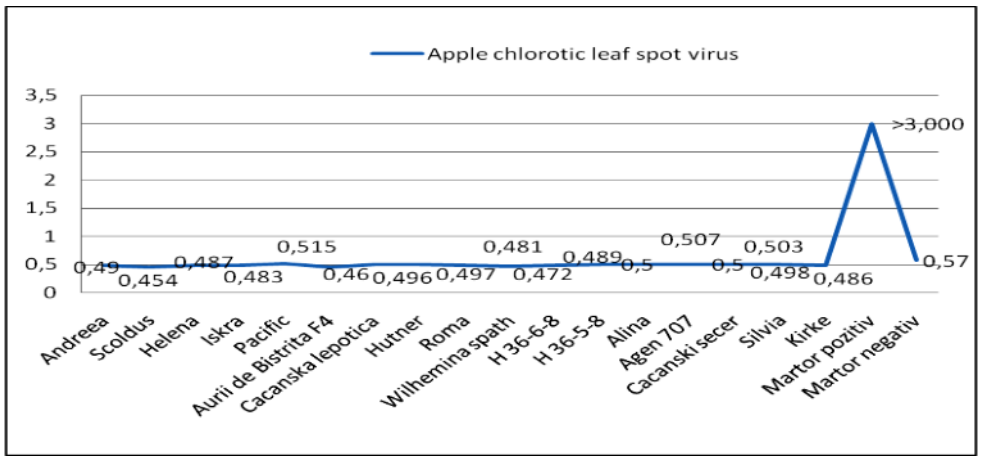


Figure 5. Values at 405 nm for Apple chlorotic leaf spot virus

Visually, in the field, for PDV, PNRSV and ACLSV no symptoms were observed, response confirmed also by the serological tests performed.

For the varieties Silvia, Helena,Pacific, Agen 707 and Čačanski sécer, the symptoms on leaves were characteristic and they oscillated from symptoms less evident (+) for the variety Čačanski sécer, to evident symptoms (++) for the varieties Silvia and Pacific, to symptoms very evident (+++) for the variety Helena. Regarding the attack on leaves, the highest values for the frequency (94,5%) and intensity (54,3%) of the symptoms on leaves was observed in case of the variety Helena (Figure 6).

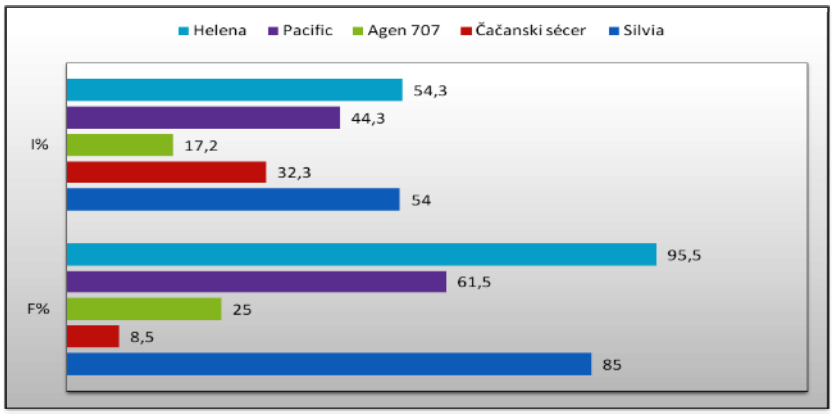


Figure 6. The frequency and intensity attack of Plum pox virus on leaves

Regarding the attack degre of the PPV on leaves (Figure 7), in case of the varieties Helena (51%) and Silvia (45,4%) was notated a very powerful attack, a strong one at the variety Pacific (27,2%) and a week attack in case of the varieties Agen 707 (4,3%) and Čačanski sécer (2,7%).

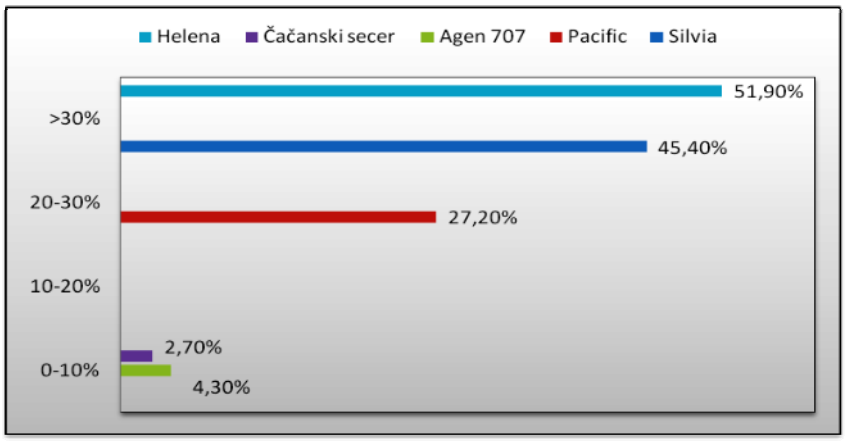


Figure 7. The attack degree (%) of the PPV on leaves

CONCLUSIONS

From seventeen genotypes analyzed from the point of view of their behaviour to the infections in natural field conditios with the viruses Plum pox, Apple chlorotic leaf spot, Prunus necrotic ring spot, Prune dwarf, all were found not to be infected with ACLSV, PDV and PNRSV.

The varieties Silvia, Helena,Pacific, Agen 707 and Čačanski sécer were diagnosed through DAS-ELISA as infected with PPV, the relative viral concentration oscillated between 0,927 (Agen 707) and 3,234 (Helena). The symptoms on leaves were very variable, from less evident to very evident.

The PPV attack degree on leaves was very powerful in case of the two varieties: Helena (51,9%) and Silvia (45,4%).

The biological material represented by the folloowing plum genotypes: Scoldus, Iskra, Kirke, Roma, Wilhemina spath, Andreea, Aurii de Bistrița F4, Čačanska lepotica, Hütner, Alina, H 36-5-8, H 36-6-8 was not infected with the four main viruses in natural fiel conditions. Thus, it can be used as sources of resistance to the PPV, PNRSV, PDV and ACLSV in future breedings programs.

BIBLIOGRAPHY

1. Boscia D**.,** Myrta A. Serological detection of viruses included in certification protocols for stone fruits. Options Méditerranéennes, Série B/No.19, Stone fruit viruses and certification in the Mediterranean:problems and prospects,1998.
2. Cociu V., Oprea Şt**.** Metode de cercetare în ameliorarea plantelor pomicole.Ed. Dacia, Cluj Napoca, 1989.
3. Levy L., Damsteegt V., Scorza R. and Kolber, M. Plum pox-potyvirus disease of stone fruits. The American Phytopathological Society.
4. http://www.apsnet.org/online/feature/PlumPox/Top.html.
5. Martelli G.P. Graft-transmissible diseases of grapevines. Handbook for detection and diagnosis. FAO Publication Division, Roma, Italy, 1992
6. Minoiu N., Isac Maria, Parnia P., Duțu I., Cociu V., Roman R., Maxim A., Vlădianu Doina, Platon I., Preda Silvia. Cercetări asupra virozelor prunului şi combaterea lor în România. Revista Protecția Plantelor, Anul VIII, Nr. 30, 1998.
7. Németh Mária. Virus, Mycoplasma and Rickettsia Diseases of Fruit trees. Ed. Academiai Kiado, Budapest, 1986.
8. Roistacher C.N. Graft-transmissible diseases of citrus. Handbook for detection and diagnosis. FAO Publication Division, Roma, Italy, 1992.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✔*Biologie*
✔*Horticultură*
✔*Tehnologia prelucrării produselor agricole*
✔*Ingineria mediului*

Vol. XIV (XLX) - 2009

THE SPECTRUM OF THE HARMFUL ARTHROPODS FAUNA FROM THE S.D. BANU MARACINE APPLE ORCHARDS

Tuca O.[1], Mitrea I., Stan C.

*KEY WORDS: arthropods,harmful, fauna, appl*e

ABSTRACT

In order to obtain high and quality yield, within the cultivation technology, one of the most important action is represented by the protection against the diseases and pests.

First step of the integrate management of the pests it is the establishing of the harmful entomofauna, than we have to know the biological reserve of the pests, we have to inventorying and follow the evolution of the pest populations. Also it's very important to know the climatic conditions during the vegetative repose, which can modify the entomofauna forecasting establish in the autumn.

The research that make the object of this paper has been materialized through establishing the structure of the harmful entomofauna from an apple orchard within the fruit-growing ecosystem Banu Mărăcine- Craiova.

INTRODUCTION

Regarding the apple pests in Romania, according to V. Rogojanu and T. Perju (1979), as well based on our data, it come aut that the main pests are framed in to the Insecta class, orders: *Heteroptera, Homoptera, Coleoptera, Lepidoptera, Hymenoptera* etc; as well some species belonging to the *Acari* order.

The research has been made in a apple orchard at the Didactical Station Banu Maracine, and has focused on the identification of the harmful species of arthropods.

During 2008 at the S.D.Banu Maracine there has been collected entomological material, and then analyzed in order to establish the harmful fauna of arthropods that affect the plum trees.

MATERIAL AND METHOD

In order to establish the harmful entomofauna of the plum orchard from S.D. Banu Mărăcine, during 2008, there has been made collects of the entomological material, using different means and method: colecting using the entomological net, pheromonal traps, light traps, food traps, visual control, analyzing the sample with the magnyfing glass and miscroscop, in the field or in laboratory.

The collects has been made in different phenophase of the plum.

[1] University of Craiova

The entomological material collected from the Banu Maracine ecosystem has been determined using different guides for determine the species of insects.

RESULTS AND DISCUSION

The year 2008 has been characterized by an excesive droughtnes climate with very high temperature during spring and summer (table 1).

Regarding the air relative humidity, had low values during April-September of 36%-66%, which favorized the instalation of a hydric stress climat. Besides the fact that there has been recorded a period of droughtness, the air average temperature during the vegetation period, has been higher than the multiannual average (Table 1).

Table 1

The temperature during the vegetation period in 2008

Month	Average temperature (^{o}C)
	Monthly average
January	- 0,4
February	1,5
March	6
April	12,7
May	17,5
June	21,2
July	25
August	22
September	15
October	12
November	7,5
December	1,7

Table 2

The humidity during the vegetation period in 2008

Month	Rainfall (mm)	Relative humidity (%)
	Monthly sum	
January	51	36,4
February	73	31,4
March	36	35
April	24	42,8
May	53	61,7
June	99	63,8
July	118,8	54,6
August	148,6	43,6
September	64,3	75
October	100	40,3
November	15	49
December	52	47

The structure analyze of the phytopagous arthropods, from the Banu Maracine ecosystem, impose a first remarque that not all the phytophagous arthropds encountered in the plum orchard, are harmfull for this species. Some of them are only passing, a plum orchard represent a biotope which ensure if not food at least a temporary shelter.

The colected data has been processed and presented in the table 3. Thus, the harmful fauna, encountered in the apple orchard from the fruit-growing ecosystem Banu Maracine, comprise a number of 25 species.

From the total of 25 species of harmful arthropods 10 species belong to the Lepidoptera order (40%), followed by the Coleoptera and *Homoptera* order each with 6 species (24%) (table 3).

Table 3

The harmful arthropods from the plum orchards S.D. Banu Maracine, 2007

Nr. crt.	Species denomination	Family	Order
1	*Bryobia rubrioculus* Scheut.	*Tetranychide*	*Acari*
2	*Quadraspidiotus perniciosus* Comst.	*Diaspididae*	*Homoptera*
3	*Ceresa bubalus* F.	*Membracidae*	*Homoptera*
4	*Eriosoma lanigerum* Hausm.	Eriosomatidae	Homoptera
5	*Psylla mali* Schmdt.	*Psyllidae*	*Homoptera*
6	*Aphis pomi* De Geer.	*Aphididae*	*Homoptera*
7	*Dysaphis plantaginea*	*Aphididae*	*Homoptera*
8	*Rhynchites bachus* L.	*Curculionidae*	*Coleoptera*
9	*Anthonomus pomorum* L.	*Curculionidae*	*Coleoptera*
10	*Oxythyrea funesta* Poda.	*Scarabeidae*	*Coleoptera*
11	*Melolontha melolontha* L.	*Scarabeidae*	*Coleoptera*
12	*Epicometis hirta* Poda.	*Scarabaeidae*	*Coleoptera*
13	*Capnodis tenebrionis* L.	*Tenebrionidae*	*Coleoptera*
14	*Hoplocampa testudinea* Klug.	*Tenthredinidae*	*Hymenoptera*
15	*Vespa germanica* Fab.	*Vespidae*	*Hymenoptera*
16	*Leucoptera scitella* Zell.	*Leucopteridae*	*Lepidoptera*
17	*Stigmella malella* Staint.	*Stigmellidae*	*Lepidoptera*
18	*Phyllonorycter blancardella* F.	*Gracillariidae*	*Lepidoptera*
19	*Cydia pomonella* L.	*Tortricidae*	*Lepidoptera*
20	*Yponomeuta malinella* Zell.	*Yponomeutidae*	*Lepidoptera*
21	*Operophtera brumata* L.	*Geometridae*	*Lepidoptera*
22	*Euproctis chrysorhoea* L.	*Lymantriidae*	*Lepidoptera*
23	*Hyphantria cunea* Drury.	*Arctiidae*	*Lepidoptera*
24	*Aporia crataegi* L.	*Pieridae*	*Lepidoptera*
25	*Lymantria dispar* L.	*Lymantriidae*	*Lepidoptera*

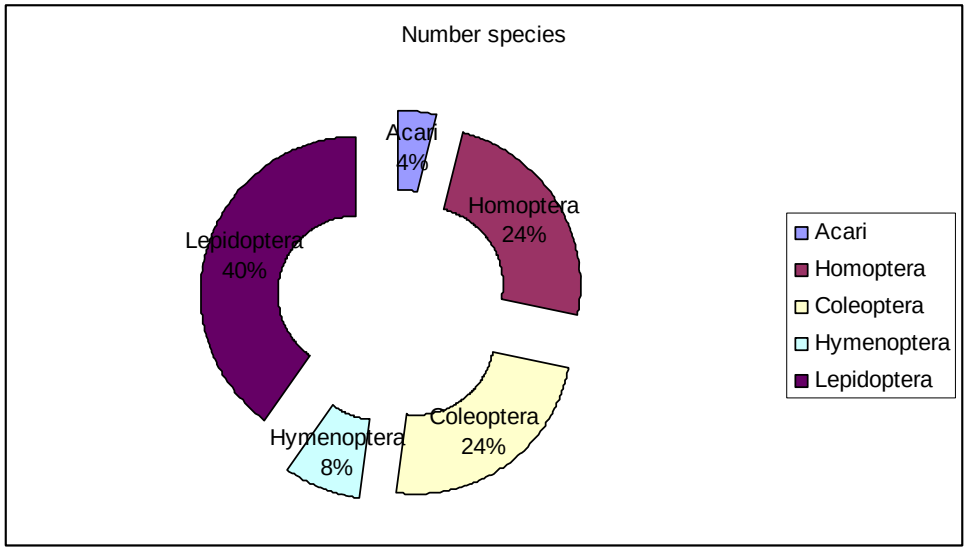


Fig. 1. The structure of the harmful fauna of arthropds in the fruitgrowing area S.D. Banu Mărăcine in 2007

CONCLUSIONS

In the plum orchard from the S. D. Banu Maracine, only a few species have a high economically influence. These are the species encountered year by year, and represent the key species, that required a special attention.

Following the recorded data we can acertain that the main pests of the apple in the fruit-growing ecosystem Banu Maracine, during 2008, belong to the *Lepidoptera* and *Homoptera* order:

Green apple aphid (*Aphis pomi* De Geer.);
Rosy apple aphid *(Dysaphis plantaginea)*
Small ermine moth (*Yponomeuta malinella* Zell.).
Codling moth (*Cydia pomonella* L.);

REFERENCES

1. Brues CT, Melander AL, Carpenter FM. 1954. Classification of Insects. Cambridge, Mass., Bulletin M.C.Z., Harvard College.
2. Chapman RF. 1998. The Insects: Structure and Function. 4th ed. Cambridge University Press.
3. Oldroyd H. 1958. Collecting, Preserving and Studying Insects. London, Hutchinson.
4. Panin L, 1951. Determinatorul Coleopterelor dăunătoare şi folositoare din R.P.R. Editura de Stat, Bucureşti.
5. Rogojanu V., Perju T., 1979 Determinator pentru recunoasterea daunatorilor plantelor cultivate. Ed. Ceres, Bucuresti.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

OBSERVATIONS ON KEY PESTS OF APPLE PLANTATIONS AND PEAR, PLUM, SWEET CHERRY AND CHERRY OF THE WORKING AREA OF UNIT PHYTOSANITARY VASLUI, VASLUI COUNTY IN 2008.

M. Tălmaciu, Nela Tălmaciu, Monica Herea, F. Roşca[1]

KEY WORDS: insects, coleoptere, entomophagus, predatory

SUMMARY

In some plantations about district Vaslui observations were made on the main pests of orchard of apple and pear, plum, cherry and sour cherry. It was followed more often pests biology, ecology, attack, damages and measures of prevention and control that were applied in these plantations.

The most dangerous pests in the period over which it has taken some measures to combat it was: Laspeyresia pomonella (apple worm), Laspeyresia funebrana (worm plumes), Eurytoma schreineri (waspy plum seed) and Rhagolethis cerasi (worm cherries).

The surveys conducted in the field have been elaborated: organic sheet, summary table and graph warning treatments.

INTRODUCTION

Coleopters are the most numerous species, more than 300,000, not only of insects, but the world creatures. All are characterized by transforming the previous wing sheath, which covers very well rest abdomen and defend it.

Coleopters part of the ventral sclerify is also strongly reinforced and so the body is so well protected and this part.

Culture fruit trees and shrubs are of major importance in economic terms. Fruit trees and fruit bushes are one of the most appreciated foods are essential in making a proper diet. With all the measures being undertaken in our orchards harmful operating very damaging several species, including species of beetles: Anthonomus pomorum, Sciaphobus squalidus, Melolontha Melolontha, Agriotes spp.

There are also species of predatory beetles, which can populate the fruit ecosystems such as species of Carabus, Calosoma, Pterostichus, etc. Brachynus.

Ideally, some species (predatory and harmful) to be in balance so that pest does not cause damage. In the present study is a comparative study of coleopterelor found in orchards of apple, pear, plum, cherry and cherry.

MATERIAL AND METHOD

The research was conducted in 2008 of orchard of apple, pear, plum, sweet cherry and cherry fruit on the farm "Marul de aur" of Băcăoani, Vaslui.

[1] University of Agronomy Sciences and Veterinary Medicine of Iassy, Unit Phytosanitary Vaslui

Collection of material was made using Barber traps soil type. Setting traps was made in mid-May, they worked until late July, each 6 traps for each type of plantation.

The objective reasons (heavy rains, thunderstorms, strong winds) was only made possible the harvesting of material from two following dates: 2.06.2008 and 9.06.2008.

On the other harvesting times there were no species of beetles, or traps were filled with soil, plant debris or were not at all.

Research is done for the first time this year in 2008, and will continue to establish a structure of beetle species in this area depending on the species planted and of course depending on the number of chemical treatments applied by default so depending on the degree of pollution.

From the material collected species were selected the beetles were then determined.

RESULTS OBTAINED

In the 4 types of plantations (apple, pear, plum, cherry and cherry) in 2008 were made a different number of treatments against such pests (Table 1)

- the plantations of apple and hair treatments were made 14
- in plantations of plum, 4 treatments were made
- the plantations of cherry and cherry were made 6 treatments

Table 1

Chemical treatments performed in 2008 on the farm "Marul de aur"

No.	Plantation	No. of treatments	The product used	Pests
1	Apple	14	**T1**- Aplaudus Super- 20 l/ha; **T2** - Merpan 80 WG -3 KG/ ha + Actellic 50 EC 1 l/ha ; **T3** - Karate Zeon 0,2 l/ha + Calypso 480 SC 0,3 l/ha; **T4** - Calypso 480 SC 0,3 l/ha; **T5**– Actellic 50 EC 1 l/ha; **T6** - Decis 25 WG 0,030 kg/ha ; **T7** - Actellic 50 EC 1 l/ha ,Calypso 480 SC 0,3 l/ha ; **T8** - Koragen 2 l/ha ; **T9** - Talstar 10 EC 0,4 l/ha ,Actellic 50 EC 0,5 l/ha; **T10** - Talstar 10 EC 0,4 l/ha, Calypso 480 SC 0,4 l/ha, Karate Zeon 0,4l/ha; **T11** - Talstar 10 EC 0,4 l/ha, Calypso 480 SC 0,4 l/ha, Karate Zeon 0,4l/ha ; **T12** - Imidan 1 l/ha; **T13** - Actara 25 WG 0,2 kg/ha, Imidan 0,8 l/ha; **T14** - Koragen 0,1 l/ha, Imidan 0,8 l/ha	- aphids, gargle flowers , Scale woolly - apples worm, aphids, - San Jose, various pests - apples worm, aphids, lice - aphids, defoliatoare, worm apples - mites, aphids, defoliatoare - defoliatoare, Scale Janos, San Jose
2	Plum	4	**T1**- Actellic 50 EC 1 l/ha; **T2** - Decis 25 WG 0,030 kg/ha ; **T3** - Karate Zeon 0,3 l/ha; **T4** - Karate Zeon 0,3 l/ha	- plum worm, aphids, - San Jose, wasp, worm plums, aphids - aphids, wasp,
3	Cherry and sweet cherry	6	**T1** - Merpan 80 WG -3 KG/ ha + Actellic 50 EC 1 l/ha; **T2** - Actellic 50 EC 1 l/ha; **T3** - Karate Zeon 0,3 l/ha; **T4** - Calypso 480 SC 0,4 l/ha, Karate Zeon 0,3 l/ha; **T5** - Actellic 50 EC 1 l/ha; **T6**- Karate Zeon 0,3 l/ha	Cherries worm, aphids, - cherries worm, aphids, - cherries worm, aphids, - aphids, defoliatoare - aphids, worm cherries - aphids,

Fauna of beetles collected in 2008, the traps and harvesting is as follows:

I. of apple fruit plantations (Table 2) were collected:

a. get 20 copies of the collection of beetles belonging to a number of 9 species.

a. Trapp no 1 have been collected most specimens (7 specimens) belonging to 4 species, and the trap no. 2 were collected 6 specimens belonging to most species (5). No trapping. 6 not taken any species of beetles.

b. To harvesting II were collected in all 23 specimens belonging to a total of 6 species, the highest number of copies (6) and species (4) were collected in trap number 4. Trap number 3 and 6 specimens were collected belonging to two species.

Table no 2

The situation on the species and number of specimens collected from apple fruit plantations in 2008

Data collection	Name of species	Number of specimens / trap						Number of specimens / species	Total specimens collected
		1	2	3	4	5	6		
02.06. 2008	1.Harpalus distinguendus	4	1	-	2	1	-	8	
	2.Harpalus tardus	1	1	-	-	1	-	3	
	3.Anthicus antherimus	1	-	-	-	-	-	1	
	4. Microlestes maurus	1	2	-	-	-	-	3	
	5.Amara crenata	-	1	-	-	-	-	1	
	6. Pseudophonus rufipes	-	1	-	-	-	-	1	
	7.Epicometis hirta	-	-	1	-	-	-	1	
	8. Opatrum sabulosum	-	-	-	1	-	-	1	
	9. Otiorrhyncus rauncus	-	-	-	-	1	-	1	**43**
	Total 9 species	**7**	**6**	**1**	**3**	**3**	-	**20**	
09.06. 2008	1.Pseudophonus rufipes	1	-	-	1	-	-	2	
	2.Microlestes maurus	-	1	-	1	-	-	2	
	3.Harpalus distinguendus	-	2	5	3	3	3	16	
	4.Meligethes aeneus	-	-	1	-	-	-	1	
	5.Helophons griseus	-	-	-	1	-	-	1	
	6.Harpalus atratus	-	-	-	-	1	-	1	
	Total 6 species	**1**	**3**	**6**	**6**	**4**	**3**	**23**	

II. Pear orchard (Table 3) were collected:

a. Take the collection were collected 44 specimens of beetles belonging to a total of 13 species. The largest number of specimens (16) was collected in the trap no. 4 and also the highest number of species (6). No trapping. 3 was not collected any species of beetle.

b. the collection II were collected in all 30 specimens of beetles belonging to a total of 7 species. The largest number of specimens (9) and species (3) were collected in the trap no. 3. other traps were between 1 and 5 copies belonging to 1, 2 or 3 species.

III. of plumorchads (Table 4) were collected:

a. the first harvest was collected only 13 specimens belonging to 7 species. Number of copies of beetles on traps being between 2 and 4. Trap no. 1 has no copy of a beetle.

b. to harvesting II were collected only 5 copies of beetles belonging to 4 species. Traps, 3 and 6 had no copy of a beetle.

Table no 3

The situation on the species and number of specimens collected from fruit plantations hair in 2008

Data collection	Name of species	Number of specimens / trap						Number of specimens / species	Total specimens collected
		1	2	3	4	5	6		
02.06. 2008	1. Pentodon idiota	1	-	-	-	-	-	1	**74**
	2. Harpalus tardus	1	-	-	-	-	-	1	
	3.Opatrum sabulosum	1	-	-	3	3	2	9	
	4. Pedinus femuralis	1	2	-	-	-	1	4	
	5.Drastirus bimaculatus	1	-	-	1	1	-	3	
	6. Epicometis hirta	-	1	-	-	1	-	2	
	7. Dermestris frischi	-	3	-	-	-	-	3	
	8.Harpalus distinguendus	-	1	-	-	-	-	1	
	9. Ocyura maura	-	-	-	5	-	-	5	
	10. Laria loti	-	-	-	4	-	-	4	
	11.Microlestes sinutus	-	-	-	2	2	-	4	
	12. Pleurophonus coesus	-	-	-	-	-	3	3	
	13.Antihicus antherimus	-	-	-	1	-	-	1	
	14. Montana picipes	-	-	-	-	1	2	3	
Total 14 species		**5**	**7**	**-**	16	**8**	**8**	**44**	
09.06. 2008	1. Montana picipes	1	-	-	-	1	-	2	
	2.Drastirus bimaculatus	6	2	5	1	3	3	20	
	3. Longitarsus talidus	-	1	-	-	-	-	1	
	4. Pleurophonus coesus	-	-	3	-	-	-	3	
	5. Opatrum sabulosum	-	-	1	-	-	-	1	
	6.Trichodes favorins	-	-	-	-	1	-	1	
	7. Ocyura maura	-	-	-	-	-	2	2	
Total 7 species		**7**	**3**	**9**	**1**	**5**	**5**	**30**	

Table no. 4

The situation on the species and number of samples collected from plantations of plum orchards in 2008

Data collection	Name of species	Number of specimens / trap						Number of specimens / species	Total specimens collected
		1	2	3	4	5	6		
02.06. 2008	1. Opatrum sabulosum	-	3	-	1	1	-	5	**18**
	2. Pseudophonus rufipes	-	1	-	-	-	-	1	
	3. Harpalus distinguendus	-	-	1	-	-	-	1	
	4. Harpalus atratus	-	-	1	-	-	-	1	
	5. Pentodon idiota	-	-	-	1	-	-	1	
	6. Pedinus femuralis	-	-	-	-	2	1	3	
	7.Ceuthorrhynchus follianarius	-	-	-	-	-	1	1	
Total 7 species		**0**	**4**	**2**	**2**	**3**	**2**	**13**	
09.06. 2008	1. Harpalus distinguendus	-	2	-	-	-	-	2	
	2. Malachins bipestulatus	-	-	1	-	-	-	1	
	3. Harpalus griseus	-	-	-	-	1	-	1	
	4. Coccinella 10 punctata	-	-	-	-	-	1	1	
Total 4 species		**0**	**2**	**1**	**0**	**1**	**1**	**5**	

IV. of sweet cherry and cherry orchards (Table 5) were collected:

a. the first collection of 59 specimens belonging to 11 species. The largest number of specimens was collected in trap number 6, and the greatest number of species (6) was collected in the trap no. 2. Other traps were between two and 12 copies, that between two and 5 species.

b. the collection II was collected 23 specimens of beetles belonging to a total of 8 species. The largest number of specimens (11) took the trap number 2, and the lowest number of copies (2) have had traps 3 and 5. The largest number of species collected (4) he has no trap. 4 capcane had between two and 12 copies, that between two and 5 species.

Table no.5

The situation on the species and number of specimens collected from cherry and cherry fruit plantations in 2008

Data collection	Name of species	Number of specimens / trap						Number of specimens / species	Total specimens collected
		1	2	3	4	5	6		
02.06. 2008	1.Harpalus distinguendus	1	1	1	5	5	9	22	
	2. Opatrum sabulosum	1	-	-	-	-	-	1	
	3. Harpalus tardus	-	3	1	4	-	3	11	
	4. Harpalus calceatus	-	3	-	-	-	-	3	
	5. Ophonus azureus	-	2	1	1	-	-	4	
	6. Calathus ambiguens	-	2	-	-	-	-	2	
	7. Pseudophonus rufipes	-	1	3	-	3	2	9	
	8. Staphilins spp.	-	-	-	1	-	-	1	
	9. Calathus fuscipes	-	-	-	-	2	-	2	
	10. Anisodactylus signatus	-	-	-	-	-	3	3	
	11. Amara familiaris	-	-	-	-	-	1	1	
Total 11 species		2	12	6	11	10	18	59	**82**
09.06. 2008	1.Anisodactylus lineatus	1	-	-	-	-	-	1	
	2. Ontophagus taurus	2	-	-	-	-	-	2	
	3.Harpalus distinguendus	-	6	-	2	2	-	10	
	4. Amara crenata	-	2	-	-	-	-	2	
	5.Pseudophonus rufipes	-	3	1	1	-	-	5	
	6. Amara similata	-	-	1	-	-	-	1	
	7.Chaetocnema hartemins	-	-	-	1	-	-	1	
	8. Epicometis hirta	-	-	-	1	-	-	1	
Total 8 species		**3**	**11**	**2**	**5**	**2**	**-**	**23**	

Regarding the frequency of species in the 4 types of plantations (apple, pear, plum, cherry and cherry) shows the following (Table 6).

- A total of 2 species Harpalus distinguendus and Opatrum sabulosum were collected in all 4orchards.

- Two species (Harpalus tardus and Epicometis paper) were collected from 3 orchards.

- A total of 6 species (Microlestes Maurus , Pedinus femuralis, Amara crenata, Antihicus antherimus, Harpalus atratus and Pentodon idiota) were collected in two orchards. .

- As many as 27 species (Drastirus bimaculatus, Pleurophonus coesus, Monotoma picipes, Ophonus azureus, Harpalus calceatus Duft., Anisodactylus signatus, bins Loti Dermestris frisch, Calathus ambiguens, Calathus fuscipes, Ontophagus taurus, Otiorrhyncus rauncus, Meligethes aeneus, Harpalus griseus, Longitarsus talidus, Trichodes favorins, Ceuthorrhynchus follianarius, Coccinella 10 points, Malachins bipestulatus, Harpalus griseus, Staphilins spp Amara familiaris, Anisodactylus lineatus, Amara Similea and Chaetocnema hartemins) were collected from only one orchards.

Table no 6

The structure of beetle species with the highest number of specimens collected in 2008

No.	Name of species	Total no. of copies	Harvesting
1	Harpalus distinguendus Duft.	60	Mar, păr, prun, cireş şi vişin
2	Drastirus bimaculatus	23	Păr
3	Pseudophonus rufipes De Geer	18	Mar, păr, prun, cireş şi vişin
4	Opatrum sabulosum L.	17	Mar, păr, prun, cireş şi vişin
5	Harpalus tardus Panz.	15	Mar, păr, prun, cireş şi vişin
6	Microlestes maurus	9	Mar, păr

CONCLUSION

1. The largest number of specimens of beetles (82), was collected in plantations of sweet cherry and cherry, followed by plantations of pear (73) and plum (18).

2. The largest number of species collected (17) was recorded in plantations of sweet cherry and cherry, followed by plantations of hair (16), apple (12) and plum (10).

3. The species with the highest number of specimens collected in the 4 types of plantations were Harpalus distinguendus (60 copies), Drastirus bimaculatus (23 copies), Pseudophonus rufipes (18 copies), Opatrum sabulosum (17 copies), Harpalus tardus (15 copies) and Microlestes Maurus (9 copies).

BIBLIOGRAPHY

1. Gaëtan du Chatenet, 1990 – Guide des Coléopterés d'Europe. Délacrois et Niestlé, Paris.
2. Panin I., 1951 - *Determinatorul Coleopterelor dăunătoare şi folositoare din R.P.R.* Editura de Stat, Bucureşti.
3. Reitter E., 1908 - *Fauna Germanica. Die Käfer des Deutschen Reiches Band* I, Stuttgart.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

STOLBUR MYCOPLASMA A HARMFUL PATHOGENIC AGENT OF GRAPEVINE IN ROUMANIA (SHORT COMMUNICATION)

I. V. Pop[1]

KEY WORDS: grapevine, stolbur mycoplasma

Stolbur disease was first described by Sukhov and Vovk (1949) on vegetable cultures in Soviet Union. In 1954, I have identified this disease on tomato, pepper, eggplant, potato and *Covolvulus arvensis*, as well as, the vector of the pathogen, *Hyalesthes obsoletus*, in Roumania (Săvulescu and Pop, 1956, a, b).

In the last decades, stolbur mycoplasma heavily infect potato plants, especially in potato cultures planted in the regions with high temperatures, for industrial production.

Stolbur agent was assumed to be a virus until the discovery of plant phytoplasmas (alias Mycoplasma – like – organisms) by Doi et all (1967), Ploaie and Maramorosch (1969).

Later, phytoplasma in the stolbur group have been shown to be associated with Grapevine Vergilbungskrankheit in Germany (Maixner et al., 1994) and Bois noir in France (Daire et al., 1993), the occurance of these diseases being related to the wide geographical distribution of the vector of stolbur mycoplasma, *Hyalesthes obsoletus* (Maixner, 1995; Sforza et al., 1998), whereas Flavescence dorée mycoplasma is transmitted by the leafhopper *Scaphoideus titanus* (Schwester et al., 1991).

During the time, some researches have published their field observations concerning the occurrence of mycoplasma – like diseases in Romanian vineyards, but without any experimental basis.

In the early summer of the last year, as well as in 2009, mycoplasma – like symptoms were observed by us, especially in some vine varieties planted in the southerly regions of the country.

The first typical symptom appeared in summer and increased in severity until harvest. Plants are often stunted, leaves are chlorotic, edges roll downward, in an angular shape, and leaf blade becomes britle. Spots, which enlarge into bands, appear along the main veins. Colour of the spots and bands varies with the cultivars. White-fruited varieties usually have crem-yellows spots whereas red-fruited cultivares have readish discolorations. Canes ripen poorly and unevenly, often showing green and brown sections. Sometimes, numerous small black pustules appear along the diseases branches. Plants of white – fruit varieties may be more or less chlorotic and thouse of black – and red – fruit varieties are often antierly red. Fruits of the infected plants are usually smaller and discoloured. Vines with partially infections are sometimes observed.

[1] Research Institute for Plant Protection, Bucharest

Leaf samples from typical diseased plants were tested by PCR procedure. All samples were free of Grapevine associated virus 3, reacted positive with grapevine bois noir mycoplasma, and negative with grapevine flavescence dorée mycoplasma.

The result of investigations lead to the conclusion that the stolbur mycoplasma is the causal agent of the grapevine disease investigated by us, frequently found in Roumanian vineyards.

Extensive investigations concerning distribution, etiology, evolution, epidemiology, prevention and control of the presented mycoplasma disease are in progress.

LITERATURE

1. Daire, X., Clair, D., Larrue, J. et al. Occurrence of diverse MLOs in tissues of grapevine affected by grapevine yellows in different countries. Vitis 32, 247-248, 1993.
2. Doi, Y., Teranaka, M., Yora, K., Asuyama, H. Mycoplasma-or PLT group-like microorganisms found in the phloem elements of plants infected with mulberry dwarf, potato witches' broom, aster yellows, or Paulownia witches' broom. Ann. Phytopatol. Soc. Japan 33, 259-266, 1967.
3. Maixner, M. Detection of the German grapevine yellows (Vergilbungsktankheit) MLO in grapevine, alternative hosts, and a vector by specific PCR procedure. Eur. J. Plant Pathol. 101, 241-250, 1995.
4. Maixner, M., Ahrens, U., Seemüler, E. Detection of mycoplasmalike organisms associated with a yellows disease of grapevine in Germany. J. Phytopath. 142, 1-10, 1994.
5. Ploaie, P., Maramorosch, K. Electron microscopic demonstration of particles resembling Mycoplasma or Psittacosis - Lymphogranuloma -Trachoma group in plants infeceted with European Yellows-type diseases. Phytopatholgy 59 (5), 536-544, 1969.
6. Savulescu, A., Pop, I. Contributii la studiul stolburului in Romania. Bul. St. Sect. Biol. si St. Agr., Acad., R.S.R., 8 (4), 723-737, 1956 a.
7. Savulescu, A., Pop, I. Contribution a l'etude de la virose "stolbur" en Roumanie. Acad. R.P.R., Revue de Biologie 2 (1), 33-46, 1956 b.
8. Schvester, D., Carle, P., Moutous, G. Sur la transmission of flavescence darée des vignes par una cicadelle. C.R. Acad. Agri. 47, 1021-1024, 1961.
9. Sforza, R. Epidemiologie du Bois noir en Region Rhone-Alpes. Recherche des vecteurs, éthologie et biologie de *Hyalesthes obsoletus* Sing. Thèse de doctorat de l'Université de Paris VI. 8 avril 1998.
10. Sukhov, K. S., Vovk, A. M. Stolbur paslenovykh, USSR Acad. of Sciences, Moskva-Leningrad, 1949.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✔*Biologie*
✔*Horticultură*
✔*Tehnologia prelucrării produselor agricole*
✔*Ingineria mediului*

Vol. XIV (XLX) - 2009

GENOTYPIC VARIATION OF ATTACK DEGREE (AD %) WITH DOWNY MILDEW IN FOUR TABLE GRAPE VARIETIES, GROWN IN TRANSYLNANIA, UNDER CONVENTIONAL AND ORGANIC CONTROL TREATMENTS

Bunea Claudiu-Ioan[1]

KEY WORDS: Table grape varieties, attack degree (AD %), organic, conventional cultivation.

ABSTRACT

Four table grape varieties (Timpuriu de Cluj, Napoca, Chasselas dore, Muscat Hamburg) were tested in 2007, in Gherla, Cluj county, Romania, concerning their level of attack degree (AD%) with downy mildew (Plasmopara viticola Berk & Curt) under two types of disease control treatments: conventional and organic. Four treatments were applied both in the organic and conventional variants of control.

The conventional system has comprised the use of two systemic fungicides: Ridomil gold MZ 68WP and Melody Duo 66,8 WP in the first interval T1 (T1 = before flowering stage) and two contact fungicides: Folpet 50 WP and Dithane M 45 in the second time T2 (T2 = between flowering and green grape berry stages).

The organic treatments were applied in the same interval (T1) with the following products: Bordeaux mixture 0,5% + purine of greater nettle fermented 1/20 dilution and copper sulphate 1% and at the second interval (T2), with Bordeaux mixture 1% + soluble sulphur 0,4% and Trichodex 25 WP. The results showed that it can be identified table grape types which, in the case of organic treatment, has an attack degree (GA%) as low or close with that recorded in the condition of conventional horticulture practical.

INTRODUCTION

Both recent and older papers (Husfeld, 1962; Zăvoi, 1979; Deacon & Berry, 1993) published in Romania or abroad, have already emphasized the impressing level of intervarietal variability of attack degree (AD%) among different grape varieties, both under natural or/and artificial inoculation with downy mildew.

Within *Vitis vinifera* species no cultivar has been ranked so far as immune to downy mildew, consequently conventional control of this disease is still widely spread in all countries growing European grape varieties (Boso and Kassemeyer, 2008).

The present paper intends to make a comparison of biological efficiency of two systems of downy mildew control, conventional vs. organic, in four table grape varieties. The level of biological efficiency was expressed by AD%, registered in the tested varieties under the two systems of downy mildew control.

[1] University of Agricultural Science and Veterinary Medicine, Cluj-Napoca

MATERIAL AND METHODS

Four grape varieties destined for table grape production (Timpuriu de Cluj, Napoca, Chasselas dore, Muscat Hamburg) were tested in 2007, in Gherla, Cluj county, Romania, concerning their level of attack degree (AD%) with downy mildew (*Plasmopara viticola* Berk & Curt) under two types of control treatments: conventional and organic.

The conventional system has comprised the use of two systemic fungicides: Ridomil gold MZ 68WP and Melody Duo 66,8 WP in the first interval (T1= before flowering stage) and two contact fungicides: Folpet 50 WP and Dithane M 45 in the second time (T2= between flowering and green grape berry stages).

The organic treatments were applied in the same interval (T1) with the following products: Bordeaux mixture 0,5% + purine of greater nettle fermented 1/20 dilution and copper sulphate 1% and at the second interval (T2), with Bordeaux mixture 1% + soluble sulphur 0,4% and Trichodex 25 WP.

Five days after the phenophases treatment application for downy mildew control was applied, the frequency (F%) and intensity (I%) of downy mildew symptoms were noted. F% referred to number of leaves/vine showing disease symptoms while I% referred to the area of leaf covered by downy mildew spots. AD% was computed using the formula:

$$\text{AD\%} = \frac{F\% \times I\%}{100}.$$

RESULTS AND DISCUSSION

Both type of treatment (A) and phenophases treatment application (C) showed significant effects on AD% level while the variety (B), three double interactions (type of treatment × variety, type of treatment × phenophases treatment application and variety x phenophases treatment application) and triple interaction (type of treatment × variety × phenophases treatment application) proved nonsignificant (table 1).

From table 2, the synthesis of effects A (type of treatment), C (phenophases treatment application), AxC, the interaction between the two factors, we can say that the the type of culture applied influenced the phenotypic manifestation of GA %.

In this way, the type of conventional culture showed an attack degree significant lower (3.11) than organic culture (3.93), what proves, that now the conventional treatments has more efficiency in fighting and prevention of downy mildew compare with organic once.

The interaction AxC, under the dates from variances table, is nonsignificant and it is nor discussed here. We mention that this point is important because we can conclude the four types of table grapes, analyzed in 2007, can achieve high or less level of atack degrees (AD%) in both conditions: organic and conventional treatments.

Table 1

Table of variance for the three way experiment
(systems of disease control, grape variety, phenophases treatment application)

Sourse of variability	SS	DF	S^2	F test	
Total	134.75	63			
Blocks	8.05383	3			
Type of treatment(A)	16.8921	1	16.8921	8.70232	>4,08
Variety(B)	9.73548	3	3.24516	1.67181	<2,84
Phenophases treatment application (C)	8.30881	1	8.30881	4.28046	>4,08
AxB	4.20866	3	1.40289	0.72273	<2,84
AxC	0.0225	1	0.0225	0.01159	<4,08
BxC	0.08218	3	0.02739	0.01411	<2,84
AxBxC	0.09721	3	0.0324	0.01669	<2,84
Error	87.35	45	1.9411		

Table 2

Effect of system of treatment, phenophases treatment application and of their interaction upon the level of AD%, Gherla, 2007

System of disease control treatments	Phenophases treatment application		
	T 1	T 2	Mean of system of treatments
Convențional	2.80 b *	3.41 ab	3.11 B
Organic	3.65 ab	4.20 a	3.93 A
Mean of phenophases treatment application	3.23 M	3.80 M	

DS 5% for two means of disease control system = 0.63
for two means of variety = 0.63
for two means of interaction = 0.89 – 0.97

Note*: differences between any two values followed by at least one common letter are not significant.

CONCLUSIONS

In conclusion we can state that it can be identified table grape types which, in the case of organic treatment, has an attack degree (GA%) as low or close with that recorded in the condition of conventional horticulture practical.

These results are of great interest since such varieties seem to be better adapted to organic control practices of downy mildew and, consequently, are recommended for organic grape yards and, on the other hand, they could prove as valuable genitors in creating new table grape varieties adapted to organic control of downy mildew.

BIBLIOGRAPHY

1. Boso, S.; Kassemeyer, H. H., Different susceptibility of European grapevine cultivars for downy mildew, Vitis, 47 (1) 33-49, 2008
2. Deacon, J.W. & Berry, L.A., Biocontrol of soil-borne plant pathogens: concepts and their application, Pestic. Sci., 37: 417-426, 1993
3. Husfeld, B., Reben, In: Hanbdbuch der Plantzenzüchtung, Bd.VI, Springer Verlag, Berlin, 1962
4. Zăvoi, A., Ameliorarea plantelor horticole, Reprogr. Univ. din Craiova, 414 p. 1979.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓ *Biologie*
✓ *Horticultură*
✓ *Tehnologia prelucrării produselor agricole*
✓ *Ingineria mediului*

Vol. XIV (XLX) - 2009

A LICHEN SPECIES MENTIONED BY JULES VERNE

Mustafa Yavuz[1] Gülşah Çobanoğlu[2]

KEY WORDS: Lichens, Jules Verne, *Usnea melanoxanthra, U. melaxantha, U. aurantiacoatra*.

ABSTRACT

In this study, "Twenty Thousand Leagues under the Seas" of Jules Verne has been examined and evaluated from lichenological point of view. It is found that, Verne mentions Usnea aurantiacoatra (Jacq.) Bory as Usnea melanoxanth(r)a in his novel.

INTRODUCTION

In some cases, novels and poems have a valuable importance and have been common sources for ethnographic and ethnobotanical studies. In Turkey, there is an initiative paper (Dönmez & Bayraktaroğlu 2005), examining a novel of Yaşar Kemal[3] regarding to its botanical and ethnobotanical context, after a similar study prepared on the travel accounts (10 volumes) of a seventeenth century traveller Evliya Çelebi (Baytop 2003).

Present study is based on an evaluation of Jules Verne's *"Twenty Thousand Leagues under the Seas"* with an attempt to read a novel from lichenological point of view.

Jules Verne:

Jules Gabriel Verne was born in 1828 in Nantes, Western France. In 1863 he published his first novel *Five Weeks in a Balloon*. The most successful of his works include: *Journey to the Centre of the Earth*, 1864; *From the Earth to the Moon*, 1865; and *Twenty Thousand Leagues under the Seas*, 1870. In the same year he was appointed to *"Chevalier"* of the *Légion d'honneur*. In 1905, ill with diabetes, Verne died at his home.

According to *UNESCO Index Translationum* database statistics, Jules Verne has his magnificent grade as the third of most translated authors in the world (Web01).

In *Twenty Thousand Leagues under the Seas*, Verne predicts a number of interesting inventions and discoveries as he usually does in his novels. Published in 1870, the novel is about *Captain Nemo* and his submarine *Nautilus*, as seen by one of his passengers, *Professor Pierre Aronnax*. The expedition in the novel begins from Long Island in 1868 and tragically ends near Norway, the same year.

[1] Leader of Biology, Isparta BILSEM Science and Arts Centre, Science Department, Vatan M. 4405 S. No: 8 Isparta, 32040, TURKEY. mustafay007@gmail.com
[2] Ass. Prof. Dr., Marmara University, Science and Letters Faculty, Biology Department, Göztepe Campus, Istanbul, 34722, TURKEY. gcoban@marmara.edu.tr
[3] He was appointed to many awards in France such as *Legion d'Honneur* (1984), *Commandeur Payé* (1988), Ministry of Culture, *Commandeur des Arts et des Lettres Order* (1988) and University of Strasbourg, *Doctorate of Honour* (1991).

Lichens:

Lichens are symbiotic associations of a fungus with a photosynthetic partner, either a green alga or a cyanobacterium. Some lichens have a shape of leaves (foliose lichens); others cover the substrate like a crust (crustose lichens) or they seem such as a shrub or a fibril (fruticose lichens).

Lichens are often primary successive, the first to settle in places lacking soil, constituting the sole vegetation in some extreme environments such as those found at high mountain elevations and at high altitudes. Some survive in tough conditions of deserts and others on frozen soil of the Arctic regions. A recent ESA research shows that lichens can even endure extended exposure to space (Sancho et al. 2007).

MATERIAL AND METHODS

"Twenty Thousand Leagues under the Seas" (originally *Vingt Mille Lieues Sous les Mers*) of Jules Verne has been translated and published in Turkish Language as *"Denizler Altında Yirmi Bin Fersah"* in two volumes, a total of 807 pages (Figure 1). From this novel, the only lichenological matter has been examined, noted.

Some texts in original French version of the novel have been compared to those in Turkish and English translations.

Relevant lichen record was checked from online databases (Feuerer 2007). Checklists of Argentina, Australia, Chile and New Zealand were examined as well as Antarctica. Because, the localities mentioned in the novel, South Shetland and South Orkney Islands are closer to Argentina and Chile while Ross Island is closer to Australia and New Zealand (Figure 2). The lichen nomenclature follows the recent literature on Index Fungorum Database (2009).

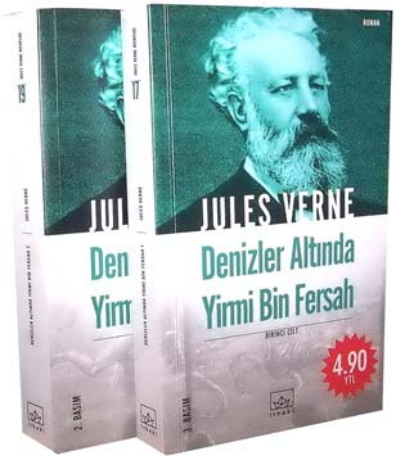
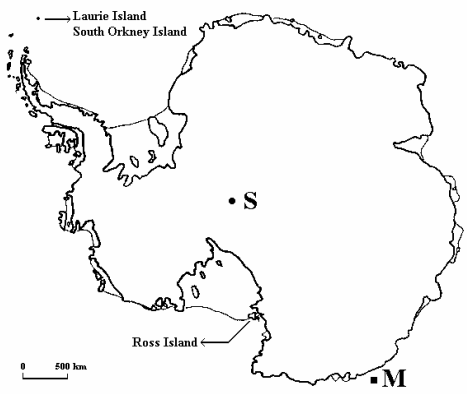


Figure 1: 20,000 Leagues Under the Seas



S: South Pole, **M:** Magnetic South Pole

Figure 2: Antarctic Pole and Ross Island

RESULTS

In his famous novel, Verne gives excellent descriptions of interesting places, marine habitats and biota such as fishes, coral reefs and algae... etc. For instance, from the story, on 19th March 1868, Professor Pierre Aronnax, one of the passengers in Nautilus, tells about the vegetation of Antarctica, and a lichen species *Usnea melanoxanthra* in Volume II, Chapter 14, page 274 – 275:

"...In these Antarctic districts, as is well known, Sir James Clark Ross had found the craters of Mt. Erebus and Mt. Terror in fully active condition on the 167th meridian at latitude 77 degrees 32' (Figure 2).

The vegetation on this desolate continent struck me as quite limited. A few lichens of the species Usnea melanoxanthra sprawled over the black rocks. The whole meagre flora of this region consisted of certain microscopic buds, rudimentary diatoms made up of a type of cell positioned between two quartz-rich shells, plus long purple and crimson Fucus plants, buoyed by small air bladders and washed up on the coast by the surf..." (Sorkun 2007).

Jules Verne has related a lichen species in his novel as *Usnea melanoxanthra*. There has been a redaction -or type- error in transcription of species' name as *melanoxanthra* instead of *melanoxantha.* The term "*melanoxanthra*" is used in Turkish and other translations of the novel, but not in Spanish translation and some original French versions. It is found that, the spelling error in the latter half of the Latin term ("-antha" vs. "-anthra") has been first introduced in translations of the novel. For a comparison, the English translation and the original French version of same text are given below:

"A few lichens of the species *Usnea melanoxanthra* sprawled over the black rocks."

"Quelques lichens de l'espèce *Usnea melanoxantha* s'étalaient sur les roches noires."

There have been several French versions and English translations of the novel, published online. Among these, Lewis Mercier (1872) and Judy Boss (1995) make no mention of Latin name for this lichen species, while Gérard Martin (1997) uses *Unsnea* instead of *Usnea.* For an instance from correct English translations, F. P. Walter version significantly mentions *Usnea melanoxantha* (Web03).

In today's lichenological nomenclature, there are not any taxonomic records of *Usnea melanoxanthra*. However, our knowledge based on records of *Usnea melanoxantha* and *Usnea melaxantha* dates back to the eighteenth century[4]. After French naval expedition to Antarctica in 1837-40, Dumont d'Urville reported *Usnea melanoxantha: "doit appartenir a la famille des lichens, peut-être a l'Usnea melanoxantha"* (Øvstedal & Lewis Smith 2001).

J. D. Hooker, the appointed surgeon-botanist to James Clark Ross' British expedition in 1839-43, collected *Usnea melaxantha* and many other lichens from Antarctica. His collections were published by his father J. W. Hooker: *"Usnea melaxantha carpets the surface of these huge blocks, with its fronds varied of yellow, fawn and black. ... There are about thirty species of Lichen, among these, Usnea melaxantha, which is quite different from the yellow Kerguelen's Island Usnea, being larger and more handsome..."* (Hooker 1843).

Erik Acharius reports *Usnea melaxantha* in his *Lichenographia Universalis*, and *Methodus Lichenes* with a synonym; "*Lichen aurantiacoater* Jacq" (Acharius 1803, 1810). In addition, Nikolaus Joseph von Jacquin gives figures (Figure 3) and descriptions of *Lichen aurantiacoater* in his *Miscellanea Austriaca* (Jacquin 1781). In recent nomenclature, *Lichen aurantiacoater* is a basionym of *Usnea aurantiacoatra* (Jacq.) Bory (Index Fungorum 2009).

[4] The first report of lichens from Antarctica was by Torrey in 1823 (Øvstedal & Lewis Smith 2001, Fogg 1992). The specimen was collected by Captain Napier from South Shetland Islands (US Sealing Expedition) in 1820-21 and was reported by Torrey as *Usnea fasciata*. Eights also reports the same species in 1833 (Øvstedal & Lewis Smith 2001, Godley 1965).

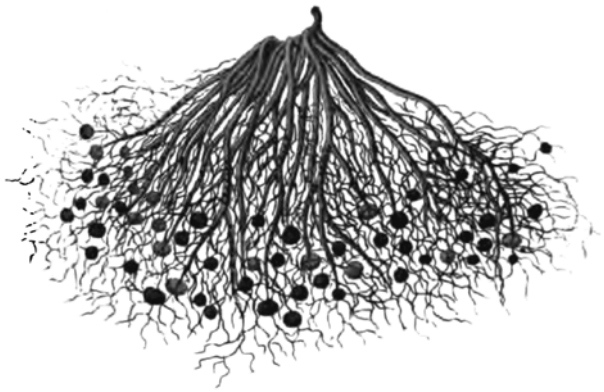


Figure 3: *Lichen aurantiacoater* (Jacquin 1781)

Figure 4: *Usnea aurantiacoatra* (© Pete Bucktrout, Web02)

It is found that, "*Usnea aurantiacoatra* (Jacq.) Bory" (Figure 4) is reported at checklists of Bouvet, South Georgia and South Orkney islands as well as the main Antarctic continent (Feuerer 2007). *Usnea* genus in Antarctica is dominantly represented by *Usnea aurantiacoatra* (SCAR 2001, Pereira et al. 2007) moreover; this species has an ability to grow up on man-made substrates such as metal (Martins et al. 2004).

DISCUSSION

The relation among the terms used for naming this Antarctic lichen species; *Usnea melanoxantha*, *Usnea melaxantha* and *Usnea aurantiacoatra* are given in Table 1.

It is obvious that Jules Verne had used *Usnea melanoxanth(r)a* as a novel-topic in his "Twenty Thousand Leagues under the Seas" which was published at the end of 1869 or in 1870. He might have taken this lichen name from one of his compatriots: d'Urville. Because, J. D. Hooker and J. W. Hooker both use the term "*Usnea melaxantha"* while d'Urville and Verne use *"Usnea melanoxantha"* (Table 1).

d'Urville had identified his lichens by following Acharius' way. In the title about *Usnea melaxantha*, Acharius refers to Jacquin's *Lichen aurantiacoater*. According to database of Index Fungorum (2009), *Lichen aurantiacoater* is basionym of "*Usnea aurantiacoatra* (Jacq.) Bory".

In Øvstedal & Lewis Smith (2001) study, it is also proofed that, collections of Antarctic lichens by Torrey (1823) and J. D. Hooker (1847) included *Usnea aurantiacoatra* (Jacq.) Bory., which were reported as *Usnea melaxantha.*

As a result, the first record of *Usnea melanoxantha* from Antarctica is dated to 1840s and Verne has completed his novel in 1870. In this way, for a thirty-year-time, Verne had enough time and capability to reach at the knowledge on Antarctic lichens and use it as a story-matter in his novels[5].

As mentioned in Dönmez and Bayraktaroğlu (2005) study, the novels are very important written sources for linguistic, folkloric and other research areas dealing with

[5] He also mentions lichens in his "An Antarctic Mystery" as *"In summer it is covered with green mosses, grey lichens…"* (Hoey 1899)

human sciences. Even in this century, we still read exciting novels of Jules Verne, sincerely respect in his memory; admire his genius and appreciate his interest in lichens and other botanical elements.

Table 1: Naming of *Usnea melanoxantha*

Basionym	**Report**	**Time**	**Correction**
Usnea melanoxanthra	Translations	Today	*Usnea melanoxantha*
Usnea melanoxantha	Verne	1870	*Usnea melaxantha*
Usnea melaxantha	J. D. Hooker, J. W. Hooker	1839-43	*Usnea aurantiacoatra* (Jacq.) Bory
Usnea melanoxantha	d'Urville	1837-40	
Usnea melaxantha Syn: *Lichen aurantiacoater* Jacq.	Acharius Acharius	1810 1803	
Lichen aurantiacoater Jacq.	Jacquin	1781	

ACKNOWLEDGEMENTS

The authors of this article are thankful to Assoc. Prof. Dr. A. Ali Dönmez from Hacettepe University, Faculty of Science, Department of Biology; for his kind contributions.

REFERENCES

1. Acharius E. 1803. *Methodus qua Omnes Detectos Lichenes Secundum Organa Carpomorpha ad Genera, Specie et Varietates Redigere Atque Obsevationibus Illustrare Tentavit.* Sect. I. Stockholmiae.

2. Acharius E. 1810. *Lichenographia Universalis in qua Lichenes Omnes Detectos, Adiectis Obsevationibus et Figuris Horum Vegetabilium Naturam et Organorum Carpomorphorum Structuram Illustrantibus ad Genera, Species, Varietates Differentiis et Obsevationibus Sollicite Definitas Redegit.* Gottingae.

3. Baytop A. 2003. Evliya Çelebi (1611-1682?) Seyahatnamesi'ndeki Türkiye Bitkileri. Pages 34-59 in F. Günergün ed. Türkiye'de Botanik Tarihi Araştırmaları. TÜBİTAK Yayınları. Akademik Dizi. Ankara.

4. Dönmez A. A., Bayraktaroğlu S. O. 2005. Plants of the İnce Memed: A novel written by Yaşar Kemal. Proceedings of the IVth International Congress of Ethnobotany (ICEB 2005), İstanbul. 2006. 573-576.

5. Feuerer T. 2007. Checklists of Lichens and Lichenicolous Fungi.

6. Fogg G. E. 1992. *A History of Antarctic Science.* Cambridge University Press. ISBN 0521361133.

http://www.biologie.uni-hamburg.de/checklists/lichens/antarctica/antarctica_l.htm (July 2009)

http://www.biologie.uni-hamburg.de/checklists/lichens/antarctica/norway_bouvet-island_l.htm (July 2009)

http://www.biologie.uni-hamburg.de/checklists/lichens/antarctica/uk_south-georgia_–l.htm (July 2009)

http://www.biologie.uni-hamburg.de/checklists/lichens/antarctica/uk_south-orkney-islands_l.htm (July 2009)

7. Godley E. J.1965. Botany of the Southern Zone: Exploration to 1843. *Tuatara.* 13 (3) 141-182.

8. Hoey C. 1899. An Antarctic Mystery (The Sphinx of the Ice Fields. Verne J.) J.B. Lippincott Co. Philadelphia.

9. Hooker W. J. 1843. Notes on the Botany of the Antarctic Voyage. *The London Journal of Botany.* Vol II: 247-329

10. Index Fungorum Database (Custodians: CABI Bioscience, CBS and Landcare Research) (Access in July 2009)

http://www.indexfungorum.org/Names/NamesRecord.asp?RecordID=408322

11. Jacquin N. J. 1781. *Miscellanea Austriaca ad Botanicam, Chemicam et Historicam Naturalem Spectantia cum Figuris.* Vol II. Vindobonae

12. Martins M. F. N., Spielmann A. A., Putzke J., Pereira A. B. 2004. Lichenized Fungi on Man-Made Substrata in Deception Island, South Shetland Islands, Antarctica. *Actas del V° Simposio Argentino y I° Latinoamericano sobre Investigaciones Antárticas CD-ROM.* Resúmen Expandido. No 201BH. 4 pp.

13. Øvstedal D. O., Lewis Smith R. I. 2001. *Lichens of Antarctica and South Georgia: A Guide to Their Identification and Ecology*. Cambridge University Press. UK. ISBN 0521 66241 9. p:14-16.

14. Pereira A. B., Spielmann A. A., Martins M. F. N., Francelino M. R. 2007. Plant Communities from Ice-Free Areas of Keller Peninsula, King George Island, Antarctica. *Oecol. Bras.,* 11 (1): 14-22.

15. Sancho L. G., De La Torre R., Horneck G., Ascaso C., De Los Rios A., Pintado A., Wierzchos J., Schuster M. 2007. Lichens Survive in Space: Results from the 2005 Lichens Experiment. Astrobiology 7 (3): 443–54.

16. SCAR 2001. Scientific Committee on Antarctic Research. Management Plan for Specially Protected Area (SPA) No. 14. Lynch Island, South Orkney Islands. *Bulletin 143*. http://www.scar.org/publications/bulletins/143/spa14/index.html

17. Sorkun M. 2007. *Denizler Altında Yirmibin Fersah. Vol. 1, 2*. – (Verne J. Vingt Mille Lieues Sous les Mers 1870). Ithaki Yayınları. Istanbul.

18. WEB01: http://databases.unesco.org/xtrans/stat/xTransStat.a?VL1=A&top=50&lg=0 (July 2009)

19. WEB02: http://www.abc.net.au/science/news/stories/2007/2046337.htm (July 2009)

20. WEB03: http://jv.gilead.org.il (July 2009)

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

PRELIMINARY STUDIES REGARDING THE BIRD FAUNA FROM STOENEŞTI SETTLEMENT – OLT COUNTY

Bălescu Carmen

KEY WORDS: birds, phenology, diversity, threat status of conservation

ABSTRACT

The present paper contains preliminary studies about the bird fauna from Stoeneşti settlement, Olt County, registered between 2007 and May 2009. The main purpose of the research was to draw up a provisory list rendering the present bird species and their seasonal dynamics and to establish the phenologic and conservation status. The studied habitat has a great avifaunistic value because of the species' diversity: 93 species grouped in 14 orders and 32 families. Most of the observed species display a secure status at European level. 26 species present in the area are also included on the international lists as having an unfavourable conservation status.

INTRODUCTION

Stoenesti settlement (commune) is located in the eastern part of the Romanaţi Plain, on the right bank of the Olt Valley. From the administrative point of view, it belongs to Olt County and it covers a total surface of 3,531 hectares. There is a railway station on the route Bucharest-Timisoara and it is also a road junction. The settlement is 10 km away from Drăgăneşti-Olt, 12 km from Caracal, and 48 km from Slatina.

Its neighbours are Fărcăşele in the west, Gostavăţ in the south, Pestrea in the north, and the Olt River in the east, which borders the territory of the commune along 3-4 km. There is a long canal (as long as the Olt within the commune) surrounded by paludous vegetation in certain areas.

Between the canal and the road, there are some ponds and permanent pools, which are interrupted by small bridges from place to place. The pools are surrounded by reed and bulrush. There is also an acacia plantation at the periphery of the commune. There are also agricultural fields, waste lands, pastures, as well as an irrigation system the water of which is supplied from the Olt.

There are quite few papers published in the literature in the filed about the birds living along the Olt Valley from the Olt County. Most of the data refer to simple communications about the presence of certain species in the area; these data were gathered during the censuses organized by the Romanian Ornithological Society.

Starting from these facts, I proposed myself to study the Stoeneşti area from the biological point of view. The present paper aims at:- achieving a preliminary list of the species observed between 2007 and May 2009; - phenologically analysing the bird species; - studying the dynamics of the birds community during different seasons; - establishing the endangerment degree of the species in the area.

MATERIAL AND METHODS OF WORK

As work methods I used direct observation method from stationary points, itinerary methods, field data processing method.

The observations started in 2007 with seasonal departures and continued until May 2009. They were made both visually and by means of the binoculars (Norconia 10x50). We took pictures with a FujiFilm FinePix S5700 camera and video recordings with a Panasonic SDR-H20-EP-S video camera.

The birds were identified on the base of certain guides (Peterson R., 1984, Bruun B. & colab., 1999) and literature in the field. The classification used for achieving the taxonomic list was made taking into account the model elaborated by Hagemeijer W.J. & Blair M. J. (1997).

RESULTS AND DISCUSSIONS

The diversity of vegetation and habitats in the area, the location of Stoeneşti Commune on the right bank of the lower course of the Olt positively favoured the richness of the avifauna.

The systematic list of the bird species observed between 2007 and May 2009 includes 93 species grouped in 14 orders and 32 families from the systematic point of view (Tab. 1). The Passeriformes order is well represented as there were noticed 33 species. However, in the area, there predominate aquatic species (including the reed species) with 52 species (Bălescu C., 2009).

From the phenologic point of view, the data are not sufficient in case of some species and this is why their phenologic category is rendered in the table as provisory. The future studies will aim at completing the avifauna list with the classification of the phenologic categories, the breeding/non-breeding status and will also bring new data about the diversity and dynamics of the species within the analysed area.

There generally predominate migratory species we have separated into four categories. We mention 33 species included in summer visitors category. We also included in this category the species that come for food and rest from the neighbouring areas during summer. 10 species are winter visitors, which usually nested in other parts of the country and remain in this habitat for a longer or shorter period during the cold season. 22 species are passage species, which cross the area in spring or autumn on their way towards the reproduction or wintering districts. Two species are accidental and they were observed during certain periods of the year.

Resident species (26 species) do not display a strict phenologic behaviour. Some of them are present during the entire year (Columbidae, Passeridae, Paridae, etc.), while others are resident-erratic; after nesting, they achieve local departures in search of food and shelter at distances of tens of kilometers far from the studied habitat (Picidae, Phasianidae, Corvidae). Other species are partially migratory as most of them leave the territory, but the population remains during winter as they increase their number due to the arrival of certain individuals belonging to northern populations (mallard, coots, starlings, etc.).

The avifauna of the commune undergoes seasonal modifications. Some bird species arrive in spring and breed in the area; others just cross above on their way to the nesting and wintering places in spring and autumn; others remain within the habitat during winter, while some of them stay here permanently.

The periods corresponding to migration are the richest ones from avifaunistic point of view. Thus, during the prevernal season, corresponding to spring migration, there were monitored 75 bird species (including the resident ones). During the serotinal season, which corresponds with the beginning of the autumn, there were noticed 73 species. We mention

some bird populations that regularly cross the studied area during spring and autumn passage: Phalacrocoracidae, Scolopacidae, Upupidae, some Anatidae (*Anas crecca, Anas penelope, Anas clypeata,* etc.), certain Sylviidae (*Sylvia communis, Sylvia atricapilla*) etc. The less numerous species were noticed during the hiemal season, 53, (56.9 percent of the observed avifauna). In this period, we mention especially the Anatidae, which, depending on the meteorological conditions, stop for a longer or shorter period in the area (*Anser albifrons, Anser anser, Anas crecca, Anas acuta, Aythya ferina, Aythya fuligula, Aythya marila, Bucephala clangula)*. At the same time, we noticed other species, such as *Phalacrocorax pygmaeus, P. carbo, Ardea cinerea, Fulica atra, Gallinula chloropus, Larus cachinnans etc.*

The avifauna of the commune supports human pressure due to entertainment activities taking place in the forest, fishing, intensive chemification, reed cutting, burning and destruction, hunting. 27 species observed in the area are hunted as they are included in the annex to hunting and land fund law. The species belong to seven orders: Pelecaniformes 1 species, Anseriformes 12 species, Galliformes 3 species, Gruiformes 2 species, Caradriiformes 1 species, Columbiformes 1 species, and Paseriformes 7 species. Among the most hunted species, we mention ducks, geese, and Phasianidae.

Many identified species are vulnerable or endangered species, undergoing an obvious decline, which are protected by special laws at national and international level (through international conventions).

Among the species noticed in the studied habitat, 26 are included on the international lists as holding an unfavourable conservation status. Thus, 12 species are in decline (the number of hatching individuals is decreasing), 13 are vulnerable (depending on conservation), and one species has a limited area. Most of the species (67) are secure, having a favourable conservation status (their populations maintain, as viable components of the natural habitats and their area do not present an immediate risk of reduction). However, 11 species of them have this status provisory and they can become vulnerable or endangered at any moment.

66 bird species are protected by Law no. 197/ 2007 for the modification of hunting and the protection of game no. 407/ 2006. The new law does not include five species that are considered vulnerable at an international level: the northern pintail (*Anas acuta*), the garganey (*Anas querquedula*), the grey partridge (*Perdix perdix*), the common quail (*Coturnix coturnix*), the skylark (*Alauda arvensis*) and a species with a limited area: the greater scaup (*Aythya marila*).

Table 1.

Avifauna of Stoeneşti locality (Olt)

Nr. crt	Species	Phenological Status	Spec category	Threat status	Law .no 197/2007
1.	*Tachybaptus ruficollis*	SV, RWV		S	*
2.	*Podiceps cristatus*	SV, RWV		S	*
3.	*Phalacrocorax carbo*	P, RWV		S	
4.	*Phalacrocorax pygmaeus*	P, RWV	Spec 2	V	*
5.	*Botaurus stellaris*	SV	Spec 3	(V)	*
6.	*Ixobrychus minutus*	SV	Spec 3	(V)	*
7.	*Nycticorax nycticorax*	SV	Spec 3	D	*
8.	*Ardeola ralloides*	SV	Spec 3	V	*
9.	*Egretta garzetta*	SV		S	*
10.	*Egretta alba*	P, RWV		S	*
11.	*Ardea cinerea*	SV, RWV		S	*
12.	*Ciconia ciconia*	SV	Spec 2	V	*

13.	*Cygnus olor*	SV, RWV		S	*
14.	*Anser albifrons*	WV, P		S	
15.	*Anser anser*	WV, P		S	
16.	*Anas penelope*	P, WV		S	
17.	*Anas crecca*	WV, P		S	
18	*Anas platyrhynchos*	PM		S	
19	*Anas acuta*	P, WV	Spec 3	V	
20	*Anas querquedula*	P, SV	Spec 3	V	
21	*Anas clypeata*	P		S	
22.	*Aythya ferina*	P, WV	Spec 4	S	
23	*Aythya nyroca*	P	Spec 1	V	*
24.	*Aythya fuligula*	WV		S	
25	*Aythya marila*	WV	Spec 3	L	
26	*Bucephala clangula*	WV		S	
27.	*Circus aeruginosus*	SV	Spec 4	S	*
28.	*Accipiter nisus*	WV, P		S	*
29.	*Buteo buteo*	Ac		S	*
30.	*Perdix perdix*	R	Spec 3	V	
31	*Coturnix coturnix*	SV	Spec 3	V	
32	*Phasianus colchicus*	R		S	
33	*Gallinula chloropus*	PM		S	
34	*Fulica atra*	PM		S	
35	*Himantopus himantopus*	P, SV		S	*
36	*Charadrius dubius*	P		(S)	*
37	*Vanellus vanellus*	SV		(S)	*
38	*Calidris temminckii*	P		(S)	*
39	*Gallinago gallinago*	P		(S)	
40	*Gallinago media*	P	Spec 2	(V)	*
41	*Numenius arquata*	P, RWV	Spec 3	D	*
42	*Tringa ochropus*	P, SV		(S)	*
43	*Tringa glareola*	P	Spec 3	D	*
44	*Actitis hypoleucos*	P, SV		S	*
45	*Larus ridibundus*	R		S	*
46	*Larus cachinnans*	R		S	*
47	*Sterna hirundo*	SV		S	*
48	*Chlidonias hybridus*	SV	Spec 3	D	*
49	*Chlidonias niger*	SV	Spec 3	D	*
50	*Columba livia domestica*	R		S	*
51	*Streptopelia decaocto*	R		(S)	
52	*Cuculus canorus*	SV, P		S	*
53	*Athene noctua*	R	Spec 3	D	*
54	*Strix aluco*	Ac		S	*
55	*Merops apiaster*	SV	Spec 3	D	*
56	*Coracias garrulus*	SV	Spec 2	(D)	*
57	*Upupa epops*	P		S	*
58	*Picus viridis*	R	Spec 2	D	*
59	*Dendrocopos major*	R		S	*
60	*Dendrocopos syriacus*	R	Spec 4	S	*
61	*Galerida cristata*	R	Spec 3	(D)	*
62	*Alauda arvensis*	SV	Spec 3	V	
63	*Riparia riparia*	SV	Spec 3	D	*

64	*Hirundo rustica*	SV	Spec 3	D	*
65	*Delichon urbica*	SV		S	*
66	*Anthus campestris*	SV	Spec 3	V	*
67	*Anthus trivialis*	SV		S	*
68	*Motacilla flava*	SV		S	*
69	*Motacilla alba*	SV		S	*
70	*Troglodytes troglodytes*	WV		S	*
71	*Locustella luscinoides*	SV	Spec 4	(S)	*
72	*Acrocephalus schoenobaenus*	SV	Spec 4	(S)	*
73	*Acrocephalus palustris*	SV, P		S	*
74	*Acrocephalus scirpaceus*	SV	Spec 4	S	*
75	*Acrocephalus arundinaceus*	SV		S	*
76	*Sylvia communis*	P	Spec 4	S	*
77	*Sylvia atricapilla*	P	Spec 4	S	*
78	*Parus caeruleus*	P, WV	Spec 4	S	*
79	*Parus major*	R		S	*
80	*Oriolus oriolus*	SV		S	*
81	*Garrulus glandarius*	R		(S)	
82	*Pica pica*	R		S	
83	*Corvus monedula*	R	Spec 4	(S)	
84	*Corvus frugilegus*	R		S	
85	*Corvus cornix*	R		S	
86	*Sturnus vulgaris*	PM		S	
87	*Passer domesticus*	R		S	*
88	*Passer montanus*	R		S	*
89	*Fringilla coelebs*	P	Spec 4	S	*
90	*Carduelis chloris*	R	Spec 4	S	*
91	*Carduelis carduelis*	R		S	*
92	*Emberiza schoeniclus*	WV, P		S	*
93	*Miliaria calandra*	R	Spec 4	(S)	*

LEGEND:

PGENOLOGIC STATUS: SV-summer visitors; WV – winter visitors, RWI – rare winter visitors, P – passaje visitors, R – resident, PM – parțial migrant

THREAT STATUS: S – secure, V – vulnerable, D – declining, E – endangered, L – localized ( ) temporary status

SPEC CATEGORY: SPEC 1 – species of global conservation concern, SPEC 2 – unfavourable conservation status concentrated in Europe, SPEC 3 – unfavourable conservation status not concentrated in Europe, SPEC 4 – favourable conservation status concentrated in Europe, NonSPEC – favourable conservation status not concentrated in Europe

LAW.NO 197/2007: * protected species; the rest are game species

CONCLUSIONS

The avifauna of Stoeneşti is well represented being favoured by its geographical location, on the right bank of the Olt, by the variety of habitats, the presence of pools, the abundance of paludous vegetation, the presence of an acacia plantation and of agricultural fields etc. For birds, the studied habitat is an important passage route, a breeding or wintering place and it can reserve us many ornithological surprises.

The avifaunistic list includes 93 species distributed in 14 orders and 32 families (registered between 2007 and May 2009). Most of them are migratory species: summer visitors -33 species, winter visitors -10 species, passage species-22, and two accidental species.

Aquatic birds predominate in the habitat with 52 species.

The avifauna of the commune presents seasonal modifications. The periods corresponding to migration are the richest ones from avifaunistic point of view.

27 species are of cinegetic interest. Most of them are Anatidae.

26 species are found on the international lists as having an endangerment status: 13 species are vulnerable: *Phalacrocorax pygmaeus, Botaurus stellaris, Ixobrychus minutus, Ardeola ralloides, Ciconia ciconia, Anas acuta, Anas querquedula, Aythya nyroca, Perdix perdix, Coturnix coturnix, Gallinago media, Alauda arvensis, Anthus campestris***;** 12 species are in decline: *Nycticorax nycticorax, Numenius arquata, Tringa glareola, Chlidonias hybridus, Chlidonias niger*, *Athene noctua, Merops apiaster, Coracias garrulus, Picus viridis, Galerida cristata, Riparia riparia, Hirundo rustica*; one species has a limited location area: *Aythya marila*.

The study of the birds of the area has to continue if we want to draw attention to the ornithologists upon certain extremely important species, which breed, are in passage or are resident here.

REFERENCES

1. Bălescu Carmen (2009): Preliminary data regarding the aquatic bird fauna of the Stoenești locality –region of Olt. Sub tipar
2. Botnariuc N. & Tatole Viorica (Eds.) (2005): Cartea Roşie a Vertebratelor din România, Academia Română Bucureşti, pp: 85-172.
3. Bruun B. et al. (1999): Păsările din România şi Europa - determinator ilustrat. Editura Hamlyn Guide (Ediție Românească, adaptată de MUNTEANU D.), 320 pp.
4. Hagemeijer W. J. & Blair M. J. (1997): The EBCC Atlas of European Breeding Birds. Their Distribution and Abundance. Editura T& A.D.Poyser. London, 902 pp.
5. Munteanu D. (2004): Arii de importanţă avifaunistică din România – Documentații, Societatea Ornitologică Română, Ed. Alma Mater, Cluj-Napoca, 307 pp.
6. Peterson R., Mountfort G., Hollom P.A.D. & Geroudet P. (1984): Guide des Oiseaux d'Europe, Ed. Delachaux et Niestlé, Neuchâtel - Paris.
7. *** Legea nr. 197/2007 pentru modificarea şi completarea legii vânătorii şi a protecției fondului cinegetic nr. 407/2006. Publicată în M.Of. nr. 472 din 13/07/2007, Bucureşti.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

TWO AROIDS ANATOMICAL COMPARATIVE FEATURES IN ACCORDANCE WITH THEIR HABIT

Rodica Bercu[1]

KEY WORDS: vegetative anatomy, Anthurium andreanum, Cryptocoryne x willisii, spathe

ABSTRACT

The article comprises anatomical investigation of the vegetative organs of two Araceae species, the first an epiphytic plant Anthurium andreanum *Linden and the second an aquatic perennial herb Cryptocoryne x willisii Reitz (in their native countries).* Anthurium andreanum *spathe anatomy was discussed as well. Anatomically, the adventitious roots of both species exhibit a primary structure but some specific anatomical features are present. It is to be remarked that in the Anthurium andreanum clamping root structure velamen is absent. The blade of Anthurium andreanum has a heterogenous mesophyll. Cryptocoryne x willisii mesophyll is represented by an aerenchyma. The vascular bundles of the veins are well-developed (Anthurium andreanum) and poor-developed (Cryptocoryne x willisii). The petiole of both species is polistelic with regular (Cryptocoryne x willisii) and aleatory arrangement of the vascular bundles, embedded in the basic parenchyma. The petiole cortex is differentiated into two regions (Anthurium andreanum) and represented by an aerenchyma in Cryptocoryne x willisii. The Anthurium andreanum transversal section of the modified leaf - spathe, which subtend the spadix, reveals the usually blade succession of tissues with few delicate vascular bundles. The anatomy of this two Araceae species organs disclose certain features of anatomical and ecological interest.*

INTRODUCTION

Anthurium is a genus of more than 800 or 1000 species found in the New World tropics from Mexico to northern Argentina and Uruguay (Croat 1990; Mayo et al. 1997). This species *Anthurium andreanum* Linden is native to the wet forests on the western slopes of the Andes 400 m to 1300 m in southern Colombia and northern Ecuador where it grows as epiphyte. *Anthurium andreanum* was discovered in Colombia in 1876 by Edouard André. André sent it to Jean Linden in Belgium. From there, it made its way to the Royal Botanic Gardens at Kew, England (Madison 1980). According to Bown (2000), *Anthurium andreanum* was introduced into the Hawaiian Islands in 1889 by Samuel Mills Damon (the minister of finance for the Republic of Hawaii). They were vegetatively propagated and distributed to other growers (Kamemoto 1981). In our country is one of the most beloved ornamental species. The *Cryptocoryne* genus, known as the water trumpet, is composed of about 50-60 species of aquatic monocot plants from the family Araceae (arums). The scientific classification of all *Cryptocoryne* species is very complicated and there are different opinions about it (Alston 1938; de Wit 1969). Being considerate a natural hybrid, in 1976 Niels Jacobsen proposed the change of name of *Cryptocoryne* x *nevillii* Trim. ex Hook. to *C.* x *willisii* Reitz. (Jacobsen 1976) but *C. nevillii* is a name of a species that never

[1] Faculty of Natural and Agricultural Sciences, "Ovidius" University, Constantza

existed. *Cryptocoryne* x *willisii* is known as dwarf cry. In it native country Sri Lanka (Kandy area) it is a well known perennial aquatic herb but in Romania is known as a common aquarium plant. The short green lanceolate leaves have long petioles up to 10-13 cm reaching up to 18-20 cm and the blade has not prominent veins. The inflorescence, which is typical of the arum family, is a spadix (Went 1956; de Graaf, 1987).

The paper purpose is to show the anatomy of the vegetative organs and to exhibit some features of anatomical and ecological interest concerning this two Aroids. In the literature are sporadic and not recent studies concerning the vegetative organs and spathe anatomy of *Anthurium andreanum* (studies between 1900-1960) and as well those concerning the clamping root and the modified leaf (spathe). Anatomical studies of the vegetative organs of *Cryptocoryne* x *willisii* almost lack.

MATERIAL AND METHODS

Athurium andreanum was collected form S.C. IRIS INTERNATIONAL S.R.L. greebhouse and *Cryptocoryne* x *willisii* from the laboratory aquarium of our faculty. Small pieces of the adventitious root, rhizome, leaf and spathe were fixed in FAA (formalin:glaciar acetic acid:alcohol 5:5:90). Cross sections of the vegetative organs were performed with a rotary microtome (Bercu, Jianu 2003). The samples were stained with alum-carmine and iodine green. Histological observations and micrographs were performed with a BIOROM-T bright field microscope, equipped with a TOPICA-6001A video camera.

RESULTS AND DISCUSSION

Cross sections of the advetitious of *Anthurium andreanum* exhibit small circular rizodermal cells whereas those of *Cryptocoryne* x *willisii* are rectangular-shaped cells. The two species root cortex is well-developed and differentiated into two zones. The outer cortex – exodermis – of both species, present below the rhizodermis, is one-layered with slightly suberized cell walls. The inner cortex of *Anthurium andreanum* is a well-developed region of compactly parenchymatous cells with small intercellular spaces whereas those of *Cryptocoryne* x *willisii* are loosely arranged with irregular-shaped cells, enclosing large intercellular spaces (air chambers) (Figs. 1, 2). Characteristically, *Anthurium andreanum* endodermis consists of highly lignified cells such as the pericycle cells (Fig. 3a).

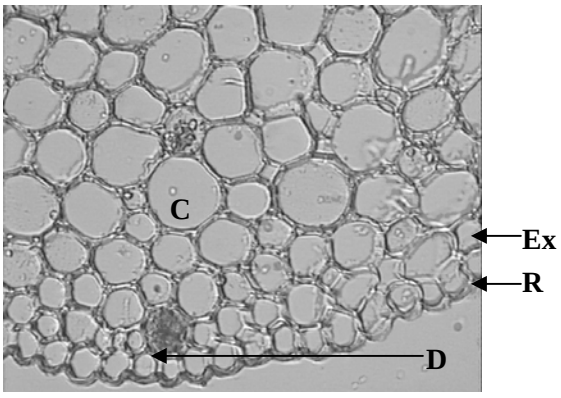


Fig. 1. Cross sections of the adventitious root of *Anthurium andreanum*. Portion with rhizodermis and cortex (x 330): C- cortex; D- druse; Ex- exodermis; R- rhizodermis.

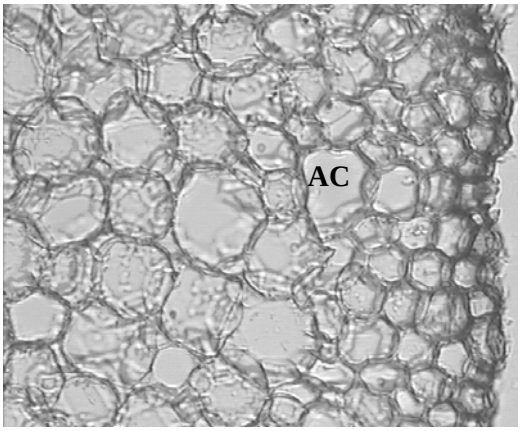


Fig. 2. Cross sections of the adventitious root of *Cryptocoryne* x *willisii*. Portion with rhizodermis and cortex (x 330): AC- air chamber.

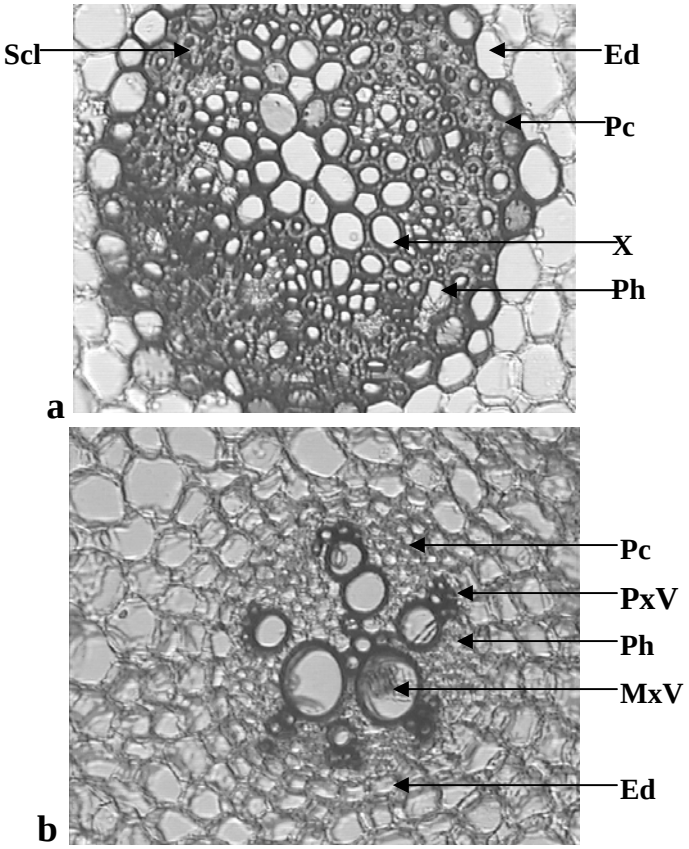


Fig. 3. The stele cross sections of the adventitious root of (A) *Anthurium andreanum* (x 330) and *Cryptocoryne* x *willisii* (B) (x 290): Ed- endodermis; Ex- exodermis; MxV- metaxylem vessel, Pc- pericycle; Ph- phloem; PxV- protoxylem vessels, Scl- sclerenchyma; X- xylem.

The primary one-layered endodermis of *Cryptocoryne* x *willisii* adventitious root consists of suberized cells possessing, at places, passing cells opposite xylem such as (Kroemer 1903).

The vascular system is well developed. The vascular bundles of both species are radial type in an alternative arrangement, numbering nine (*A*. *andreanum*) and more than six for *Cryptocoryne* x *willisii*.

The stele conductive tissues arrangement of *Anthurium andreanum* is more or less a typical monocots roots structure. The vascular elements consist of xylem and phloem surrounded by high lignified conjunctive tissue for *Anthurium andreanum*. The metaxylem vessels are few (one for each bundle) whereas the protoxylem vessels more than six with high lignified cell walls. The phloem consists of mainly sieve cells and companion cells showing exarch condition. The parenchyma tissue of *Cryptocoryne* x *willisii* surrounds the vascular elements, composed of a greater number of metaxylem, to the centre, and protoxylem vessels fancying the pericycle (Fig. 3a, b).

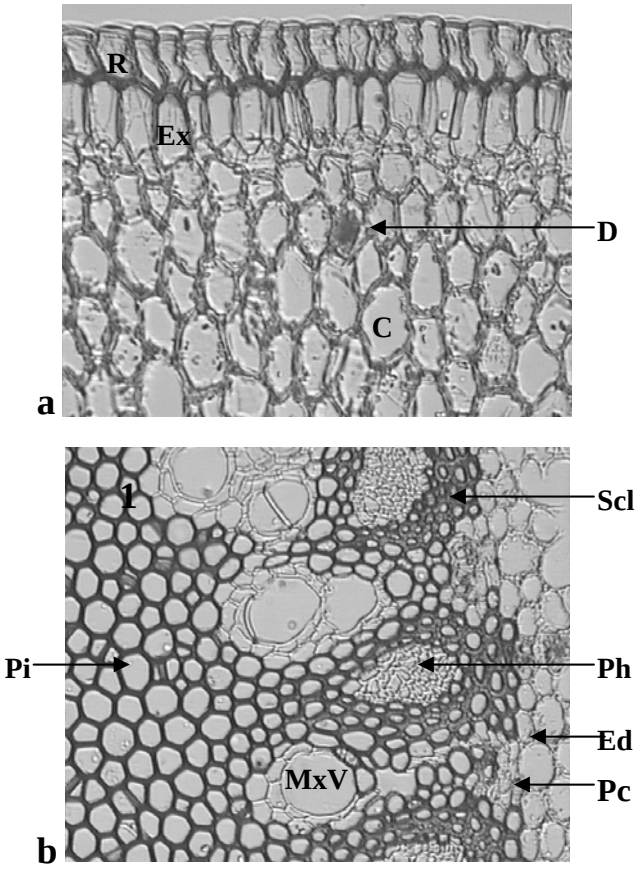


Fig. 4. Cross sections of the clamping root of *Anthurium andreanum*. (A) portion with rhizodermis and cortex (x 270); (B) portion of the stele – detail (x 244): C- cortex; D- druse; Ed- endodermis; Ex- exodermis; MxV- metaxylem vessel; Pc- pericycle; Ph- phloem; Pi- pith; Scl- sclerenchyma; R- rhizodermis.

Cross sections of *Anthurium andreanum* clamping root reveal that the outermost layer of cells – rhizodermis - is composed of slightly radial elongated cells. *Anthurium andreanum* is a tropical epiphyte plant, but velamen tissue is absent such as other Araceae species *Monstera deliciosa*, *Spatyphyllum* sp. (Bavaru, Bercu 2002; Batanouny 1992; Tarnavschi et al. 1974). Exodermis is a single layer of radially elongated cells, present below the rhizodermis. The endodermis cells of *Anthurium andreanum* are uniformly lignified with passage cells opposite xylem poles. The fibres occupy the centre of the stele. As Metcalfe et al. (1960) reported for *Anthurium* species, partitions are usually radiating out from the lignified centre, isolating rounded phloem strands from adjacent xylem files and surrounding phloem distally. Some cortical cells possess druses of calcium oxalate (Fig. 4a). The metaxylem vessels show exarch condition and protoxylem face the pericycle. Phloem is well developed and present among the xylem groups. Presence of chloroplasts in the cortical cells during young condition suggest their probable role in photosynthesis. The central portion of both adventitious roots is occupied by pith made up of compactly arranged thick-walled cells (Fig. 4b).

The rhizome of both species posesses a one-layered epidermis and a parenchymatous cortex and abundant starch granules and druses (*Anthurium andreanum*).

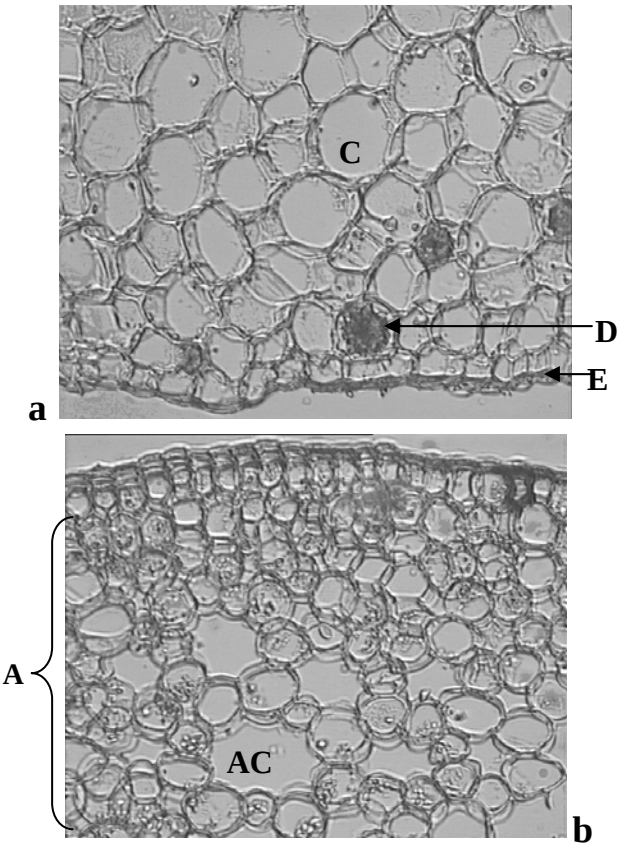
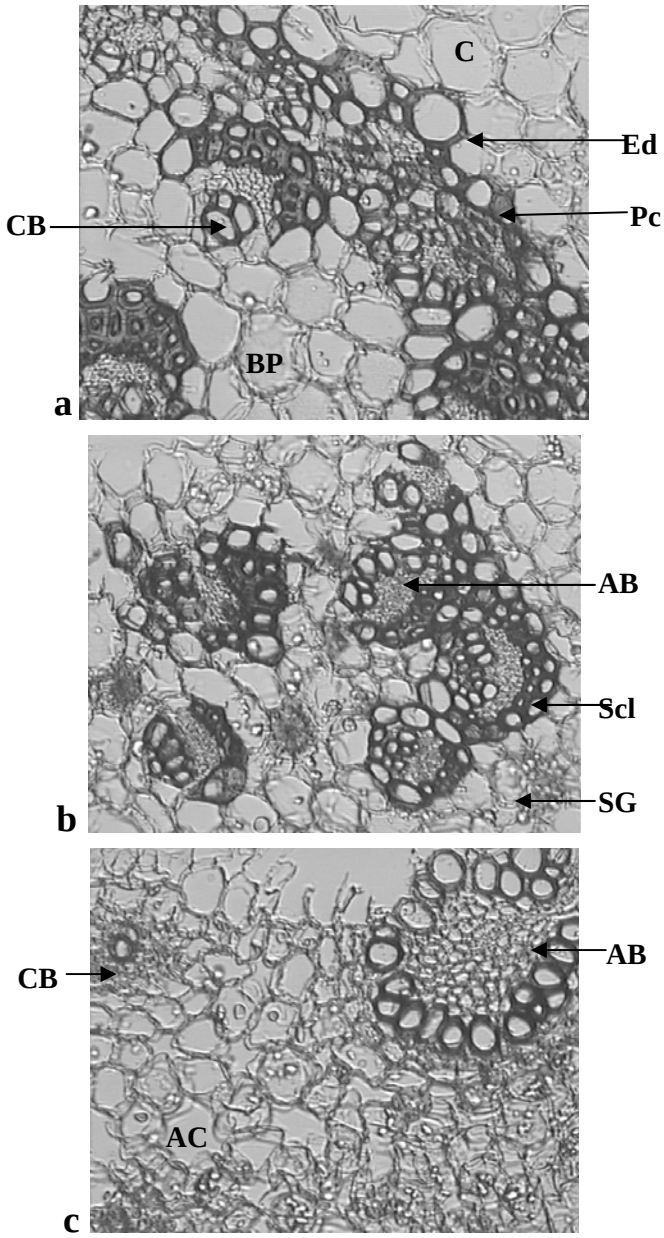


Fig. 5. Cross sections of the rhizome. Portion with epidermis and cortex (A) *Anthurium andreanum*. (x 256) and (B) *Cryptocoryne* x *willisii* (x 268): A- aerenchyma, AC- air chamber, C- cortex, D- druse; E- epidermis.

In the basic parenchyma a number of vascular bundles belonging to the stele occur (Fig. 5a, b). It is to be remarked the peripheral amphivasal bundles with centraly lacated phloem. The rest of vascular bundles are close collateral. The rhizome collateral bundles of *Anthurium andreanum* are protected by sclerenchymatous sheaths (Fig. 6a-c).



Figs. 6. The **c**ross sections of the rhizome stele of (a, b) *Anthurium andreanum* (x 256, x 300) and (c) *Cryptocoryne* x *willisii* (x 280): AB- amphivasal bundle; AC- air chamber, BP- basic parenchyma; C- cortex; CB- collateral bundle; Ed- endodermis; Pc- pericycle; SG- starch granules; Scl- sclerenchyma.

The cross sections of both species blade exhibit the usually succession of tissues, an upper epidermis, a lower epidermis and the mesophyll. The one-layered upper epidermis of *Anthurium andreianum* blade is covered by a thick cuticle formming a large arch whereas the lower one (one layer of cells) forms a crest. Caracteristically, the mesophyll is more or less differentiated into palisade and spongy tissue, the latter composed of large thin-walled cells, interrupted by intercellular spaces. Remarkable are the numerous tanniniferous cells and the presence of druses in between the mesophyll cells (Fig. 7a).

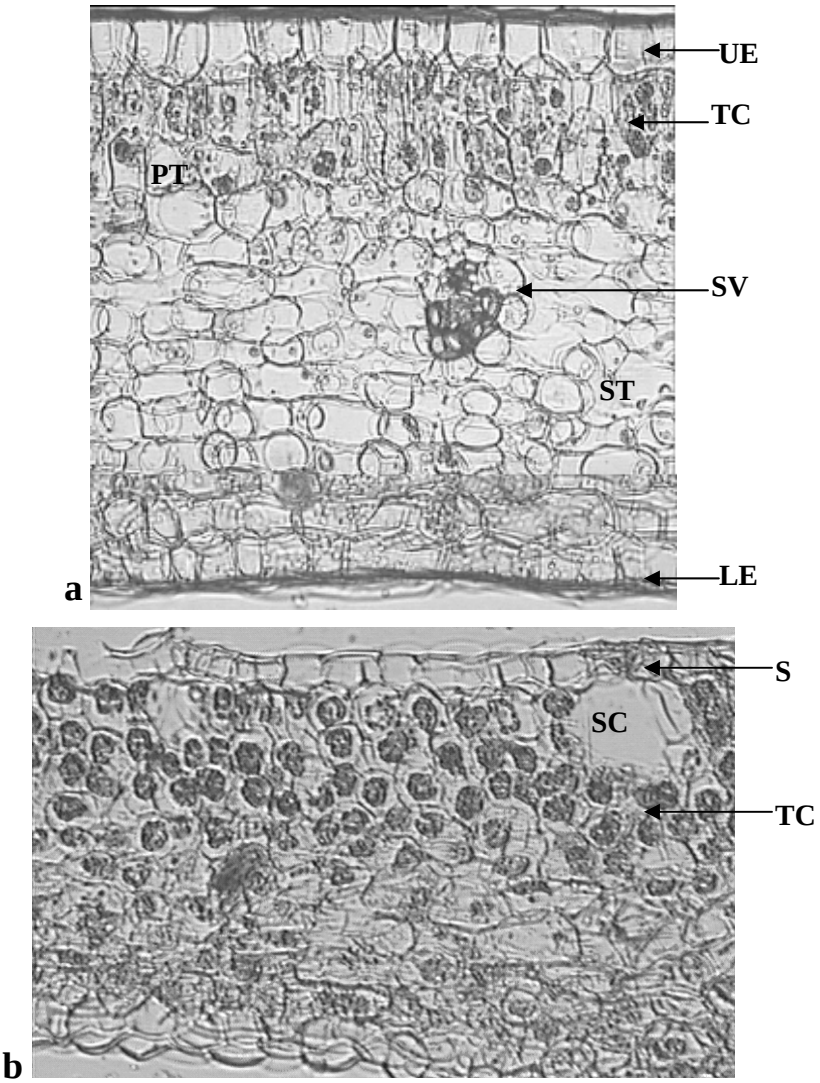


Fig. 7. Cross sections of the blade. Portion with mesophyll of (a) *Anthurium andreanum* (x 255) and (b) *Cryptocoryne* x *willisii* (300): LE- lower epidermis; PT- palisade tissue; S- stoma, SC- substomatal cavity, ST- spongy tissue; SV- secondary vein; TC- tanniniferous cell; UE- upper epidermis.

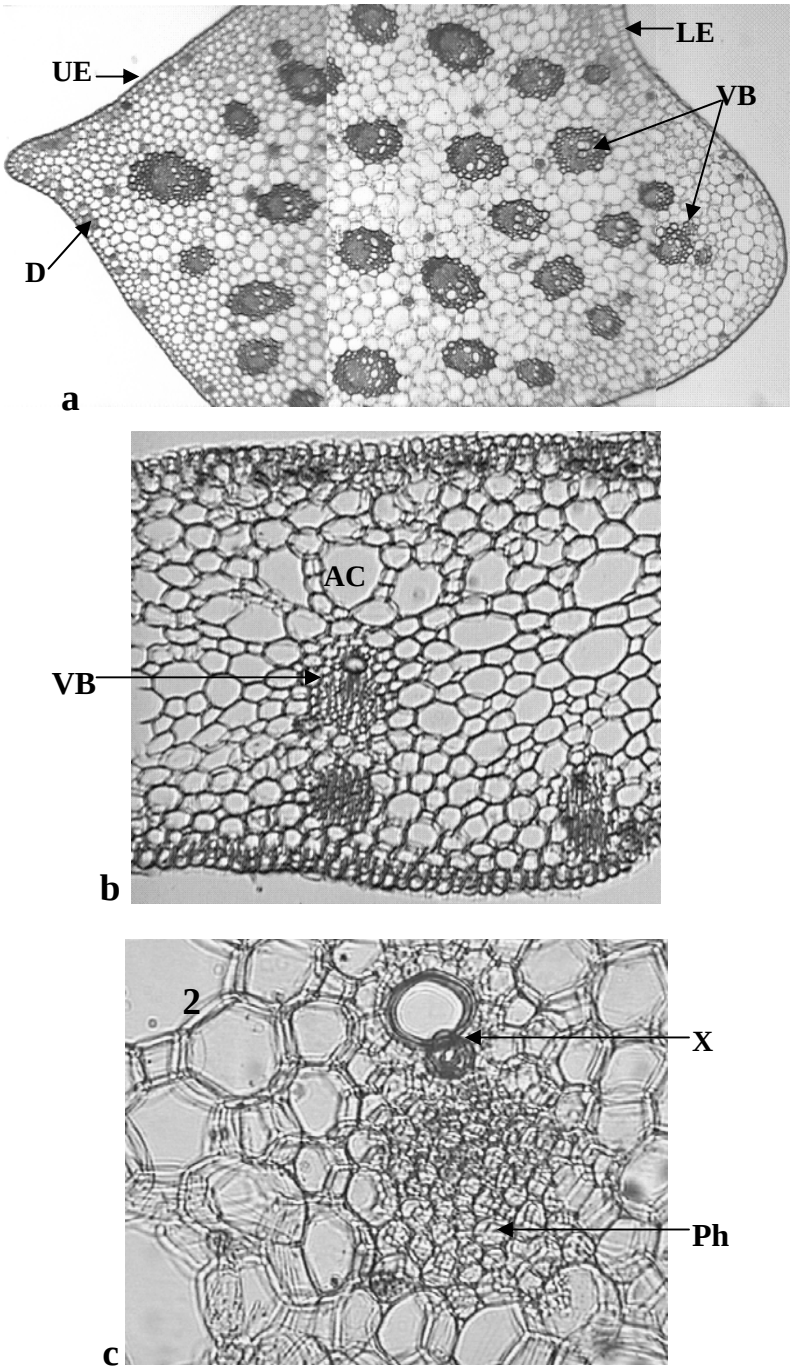


Fig. 8. Cross sections of the blade with the middle vein of (a) *Anthurium andreanum* (x 255) and (b) *Cryptocoryne* x *willisii* (300): AC- air chamber; LE- lower epidermis; Ms- mesophyll; Ph- phloem; S- stoma; SC- substomatal cavity; TC- tanniniferous cell, UE- upper epidermis; VB- vascular bundles; X- xylem.

The *Cryptocoryne* x *willisii* blade, in trasversal section, is homogenous represented by anl aerenchyma tissue (Fig. 7b). To the extremities of the blade air chambers are absent. The vascular system of the mid vein of *Anthurium andreanum* consists of numerous vascular collateral bundles some of them large and other small. Xylem consists of few vessels (3-4) whereas the phloem has a quite normal development. Each vascular bundle is protected by a sclerenchymatous sheath. Collenchymatous cells are present in the arch and crest zones (Fig. 8a). *Cryptocoryne* x *willisii* vascular system of the veins is poor developed represented by few xylem and phloem elements (Fig. 8b, c).

The petiole transections of both species disclose that the outermost layer of cell - epidermis - is covered by a thick cuticle (*Anthurium andeanum*) whereas that of *Cryptocoryne* x *willisii* is missing. The petiole cortex of *Anthurium andreanum* is differentiated into two zones. The external region (hypodermis) is a chlorenchymatous tissue followed by the inner zone represented by a five layers of parenchyma tissue.

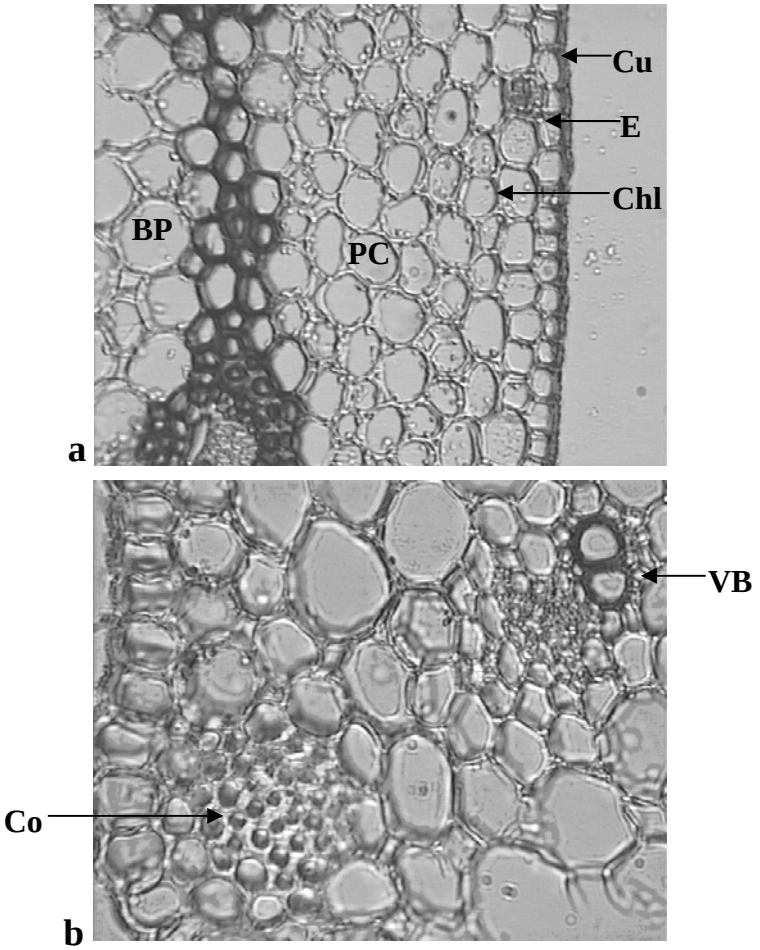


Fig. 9. Cross sections of the petiole,. Portion with epidermis and cortex (a) *Anthurium andreanum* (x 320) and *Cryptocoryne* x *willisii* (x 500): BP- basic parenchyma; Cu- cuticle; Chl- chlorenchyma, Co- collenchyma; E- epidermis; PC- parenchyma cortex; VB- vascular bundle.

It is to be remarked the presence of a sclerenchymatous many-celled pericycle (Figs. 9a; 10a). The undulate-shaped petiole of *Cryptocoryne* x *willisii*, discloses that the cortex, such as the basic tissue, is represented by cortical and medular air chambers. Chloroplasts are present. Peripheral groups of colenchymatous cells occur (Fig. 9b).

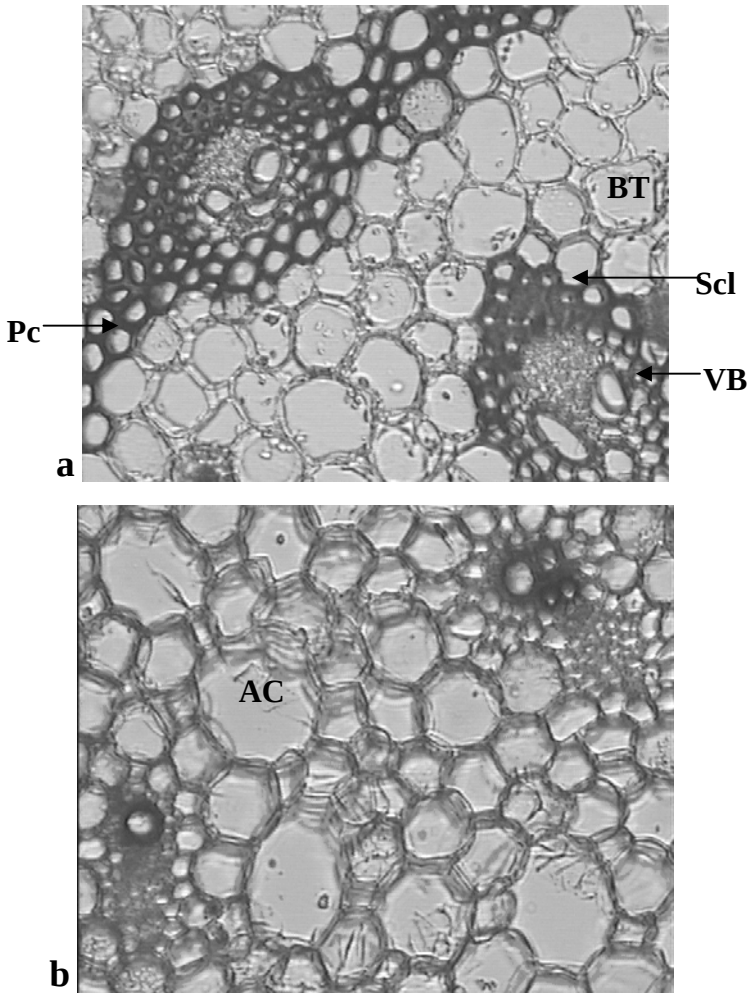


Fig. 10. Cross sections of the petiole. Central portion of the stele of) *Anthurium andreanum* (x 320) of *Cryptocoryne* x *willisii* (x 294): AC- air chamber, BT- basic tissue, Pc- pericycle, Scl- sclerenchyma, VB- vascular bundle.

The *Anthurium andreianum* petiole stele (atactostele) is represented by more or less nine close collateral vascular bundles, aleatory embedded in the basic tissue, with the typical caulinar arrangement of the conductive tissues. Xylem and phloem are represented by 4-5 xylem and more phloem vessels, the latter surrounded by a sclerenchyma sheath (Fig. 10a). The vascular system of *Cryptocoryne* x *willisii* are poor-developed represented by a number of collateral vascular bundles (9-11) embedded in the aerenchyma tissue. Each

vascular bundle possesses a single meta- and phloem vessel and few phloem elements unprotected by bundle sheaths (Fig. 10b). Caracteristically for aquatic plants a diaphragmatic tissue occur in some of the air chambers (Batanouny 1992; Fahn 1990)

The *Anthurium andreanum* transversal section of the spathe reveals the usually succesion of a blade tissues. The upper and lower epidermis is one-layered and large, covered by a thin cuticle. Between them a homogenous mesophyll is present, consisting parenchymatous cells (spongy tissue). Numerous anthocyans and cromoplasts in the mesophyll cells occur, conferring the dark-red color of the bract. Few poor developed vascular bundles occur in the mesophyll, protected by groups of slightly sclerenchymatous cells (Fig. 11).

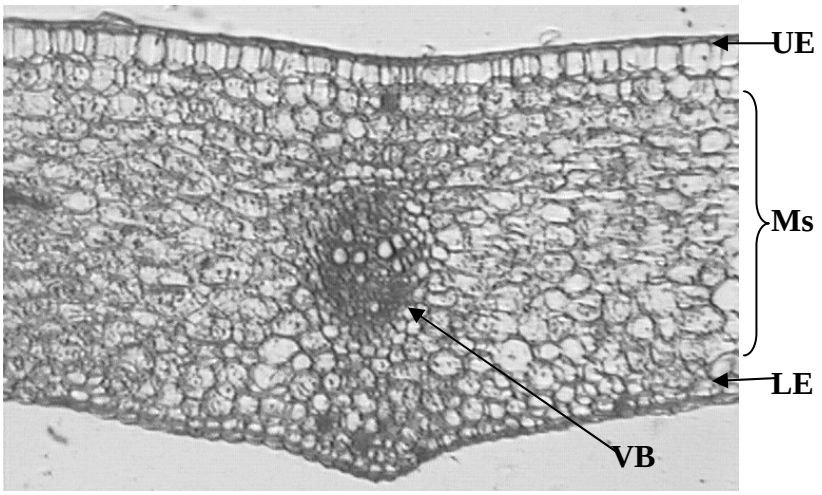


Fig. 11. Cross section of *Anthurium andreanum* spathe (x 143): LE- lower epidermis, Ms- mesophyll, UE- upper epidermis, VB- vascular bundle.

CONCLUSIONS

The cross sections of the vegetal organs of *Anthurium andreanum* and *Cryptocoryne* x *willisii* disclose some features of anatomical interest in accordance with their epyphytic and hydrophytic nature.

Both species adventitious roots exhibit a primary structure. In the aerial root of *Anthurium andreanum* a cutis and velamen (characteristic to epyphytic tropical plants) are absent. The presence of exodermis, secondary modified, provide mechanical support to the pendant root of *Anthurium andreanum*. Well-developed thick-walled parenchyma, present in between vascular elements provide mechanical strength to the outherwise soft and delicate roots.

The root structure of *Cryptocoryne x willisii* exhibits a typical dicots structure with a well-developed aerenchyma.

The rhizome discloses for both species almost the same characteristics excepting *Anthurium andreanum* cortex.

The blade structure is different. The mesophyll is heterogenous for *Anthurium andreanum* and homogenous for *Cryptocoryne* x *willisii*.

The vascular bundles elements of the middle vein are well-developed for *Anthurium andreanum* whereas those of *Cryptocoryne* x *willisii* are represented by few vascular elements.

The petiole cortex is an aerenchyma for *Cryptocoryne x willisii* whereas those of *A. andreanum* is differentiated into two distinct zones.

The petiole of both species is polistelic, represented by a number of vascular bundles aleatory embedded in the basic tissue.

The mechanical tissue is well-developed in all studied organs of *Anthurium andreanum*, represented by sclerenchyma. In *Cryptocoryne* x *willisii* root, rhizome and leaf it almost lack.

REFERENCES

1. Alston, A.H.G., The Kandy Flora. *Cryptocoryne.* Ceylon Government Press, Ceylon, 1938.
2. Bavaru, A., Bercu Rodica, Morfologia şi anatomia plantelor. Ed. Ex Ponto, Constanta, 2002.
3. Batanouny, K.H., Plant Anatomy, Cairo University Press, Cairo, 1992.
4. Bercu Rodica, Jianu Dana Loreley, Practicum de Morfologiea şi anatomia plantelor, Ed. „Ovidius" University Press, Constanța, 2003.
5. Croat, T.B., A comparison of aroid classification systems, Aroideana, 13: 44 –63, 1990.
6. Fahn, A., Plant anatomy. 4th ed., Pergamon Press, New York, 1990.
7. de Graaf, A., The occurrence of *Cryptocoryne* (Araceae) on Sri Lanka, FAMA: 11-87, 1987.
8. de Wit, H.C.D., *Cryptocoryne x willisii* Trim. ex Hook.f., Het Aquarium, 39(11): 242-245, 1969.
9. Jacobsen, N. Notes on *Cryptocoryne* of Sri Lanka (Ceylon), Bot. Notiser, 129: 179-190, 1976.
10. Kamemoto, H., Anthurium breeding in Hawaii, Aroideana, 4(3): 77-80, 1981.
11. Kroemer, K. 1903. Wurzelhaut Hypodermis und Endodermis der Angiospermwurzel, Bibliotheca Botanica, 59: 1–151.
12. Madison, M., Aroid Profile No. 6: *Anthurium andreanum*, Aroideana, 3(2): 58-60, 1980.
13. Mayo, S.J., Bogner J., Boyce, P.C., The Genera of Araceae. Royal Botanic Gardens, Kew, 1997.
14. Metcalfe, C.R., Tomlinson, P. B., Cutler, D. F. Anatomy of the monocotyledons, University Press Oxford, 1960.
15. Tarnavschi, I.Tr., Şerbănescu-Jitariu Gabriela, Rădulescu-Mitroiu Natalia, Rădulescu Didona, Practicum Morfologie si anatomie vegetala, Ed. Universitatii Bucuresti, Bucuresti, 1974.
16. Wendt, A., *Cryptocoryne undulata* Wendt, *Cryptocoryne willisii* Engler ex Baum. Het, Aquarium, 26(9): 207-208, 1956.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

TAXONOMY, CHOROLOGY, ECOLOGY AND PHYTOCOENOLOGY OBSERVATIONS ON THE SPECIES *ALCHEMILLA ACUTILOBA*

Boruz Violeta[1]

KEY WORDS: Alchemilla acutiloba, taxonomy, chorology, ecology, Romania

ABSTRACT

The paper comprends the characterization of the Alchemilla acutiloba microspecies from the taxonomic, chorologic, ecologic, and phytocoenologic point of view. The species of Alchemilla from the Southern Carpathians were highly studied, species found in the Carpathians too, among them being A. acutiloba Opiz,which makes the subject of this research.

INTRODUCTION

In most European countries, but also in Romania, taxonomic research over some smaller or larger groups of vascular plants is taking place continuously over a century and a half. In the last decades of the 20th century, and especially now at the beginning of the 21st century, the taxonomic criteria have diversified. However, for some polymorphic plants genus, with a wide spreading, the identification and recognition of components species is far for being regarded as concluded. One of these genus is *Alchemilla* (fam. *Rosaceae*), with about 1000 species spread across the globe. Among these species in Europe there are 118 (according to Walters & Pawłowski 1968), but in the Atlas Florae Europaeae (Kurtto et al. 2007) are cited 430 species, of wich 31 species would be in the Romanian Carpathians.

For Romania, according to some research carried out by great botanists, beginning with the first half of the 20th century, the number of *Alchemilla* species differs very much. So, A. Borza (1947) enumerates 21 species (included *Aphanes arvensis*); A. Buia (1956) reduces the number to five species, among them three being presented with subspecies and varieties; A. Beldie (1977) describes for the Romanian Carpathians 23 species, and V. Ciocârlan (2000) reduces the number to 20, considering that other 16 species were wrongly introduced in the Romanian flora.

It can be said that the taxonomy of *Alchemilla* species is difficult because: apparently have the same habit; the organ which produces the most diagnems, the leaf, having generally the same form; the flower presents a simplified construction and its components have a low variability; the fruit does not offer qualitative diagnems. Based on these considerations, I started the study of this genus in the Southern Carpathians finallized with the realisation of the doctoral thesis „*Alchemilla* species from the Southern Carpathians, with a special reference to Parâng Massif".

At the beginning the species of this genus from the Southern Carpathians were thoroughly investigated, among them *A. acutiloba*, which makes the subject of this paper.

[1] University of Craiova, "Al. Buia" Botanical Garden

MATERIAL AND METHOD

In order to make a research of the teritory, many reshuffles have been made, from May to October. Parâng, Căpățânii, Lotru, Latoriței, Vâlcan and Ciucaș Mountains have been investigated. There has been established the presence of the following species: *Alchemilla acutiloba*, *A. connivens*, *A. crinita*, *A. flabellata*, *A. glabra*, *A. glaucescens*, *A. incisa*, *A. micans*, *A. mollis*, *A. monticola*, *A. straminea, A. xanthochlora*. For identification we used the modern literature of speciality and the genuine material from collections for a comparison. The authors of the species are written according to the present standardes (Brummitt & Powell 1992).

It was intended the creation of a collection of *Alchemilla* specimens. In a parallel direction with the gathering of samples from the Herbarium of the Botanical Garden „A. Buia" from Craiova, living plants have been transplanted in the Botanical Garden, aiming to follow the behaviour of these species in the new ecologic conditions.

There have been consulted and reviewed the important herbarium collections in the country (BUCA, BUAG, BUCF, CRAI, HBV, CL, I, IAGB, IAAG, SIB), with the purpose of set up the chorology of the species. For the consulted herbariums there have been used the acronyms according with the Index herbariorum (P. K. Holmgren 1990). The chorology is realised on a map type Atlas Florae Europaeae, using the indexes UTM transformed (Lehrer & Lehrer 1990). The counties, with the respective abreviations, are ranged in alphabetical order.

After the study of literature of speciality, of the main herbariums in the country, after the analysing of the collected material, there have been established the *Alchemilla* species from the Southern Carpathians, and among them *Alchemilla acutiloba*.

RESULTS AND DISCUSSIONS

ALCHEMILLA ACUTILOBA Opiz 1838, in Berchtold et Opiz, Oekon.- Techn. Fl. Böhm. (2) **1**: 15, non Steven.

Syn.: - *A.* vulgaris L. 1753, Sp. Pl.: 123, emend. Fröhner 1986, Gleditschia **14**: 65; - *A. acutangula* Buser 1894, Ber. Schweiz. Bot. Ges. **4**: 69; - *A. eu-vulgaris* Asch. et Graebn. subsp. *silvestris* (F. W. Schmidt) Asch. et Graebn. var. *acutangula* (Buser) Asch. et Graebn. 1902, Syn. **6**: 408; - *A. vulgaris* L. subsp. *acutangula* (Buser) Palitz, in A. Buia 1956, Fl. Rep. Pop. Române **4**: 689.

Description: Plant with a medium to very large size (fig. 1 a), dark dirty green, and towards autumn with a reddish colour. The stem is situated lateral in the axil of basal leaves, ascending, rarely procumbent or erect, of 15-85 cm, up to two times longer than the petioles of the basal leaves, with perpendicular-patent hairs (fig. 1 b), hairy from the base to inflorescence, sometimes the entire lenght. The basal leaves with the reniform lamina, rarely circular, flat to slightly funnel, little pleated; adaxially with patent hairs, sparsely hairs, almost nearly glabrous, abaxially hairier, with dense patent hairs. The lamina of the basal leaves is lobed to (1/5) 1/3-1/2; lobes 9-11(-13) almost triangular, with straight sides and narrow, subtruncate apex (lobes of the late summer leaves of well-grown plants often longer than wide); lobes with (13)15–29 teeth acute (fig. 1 c). Petioles with perpendicular-patent hairs. More or less glabrous inflorescence, large flowers of 2-4 mm lenght and 3-4,5 mm wide, green to greenish-yellow colour, long pedicels (fig. 1 e). Pedicels of 0,5-1(3) mm long, glabrous. Mature spherical hypanthium to short bell-shapped, rounded at base, glabrous, rarely some hypanthium nearly glabrous (fig. 1f).

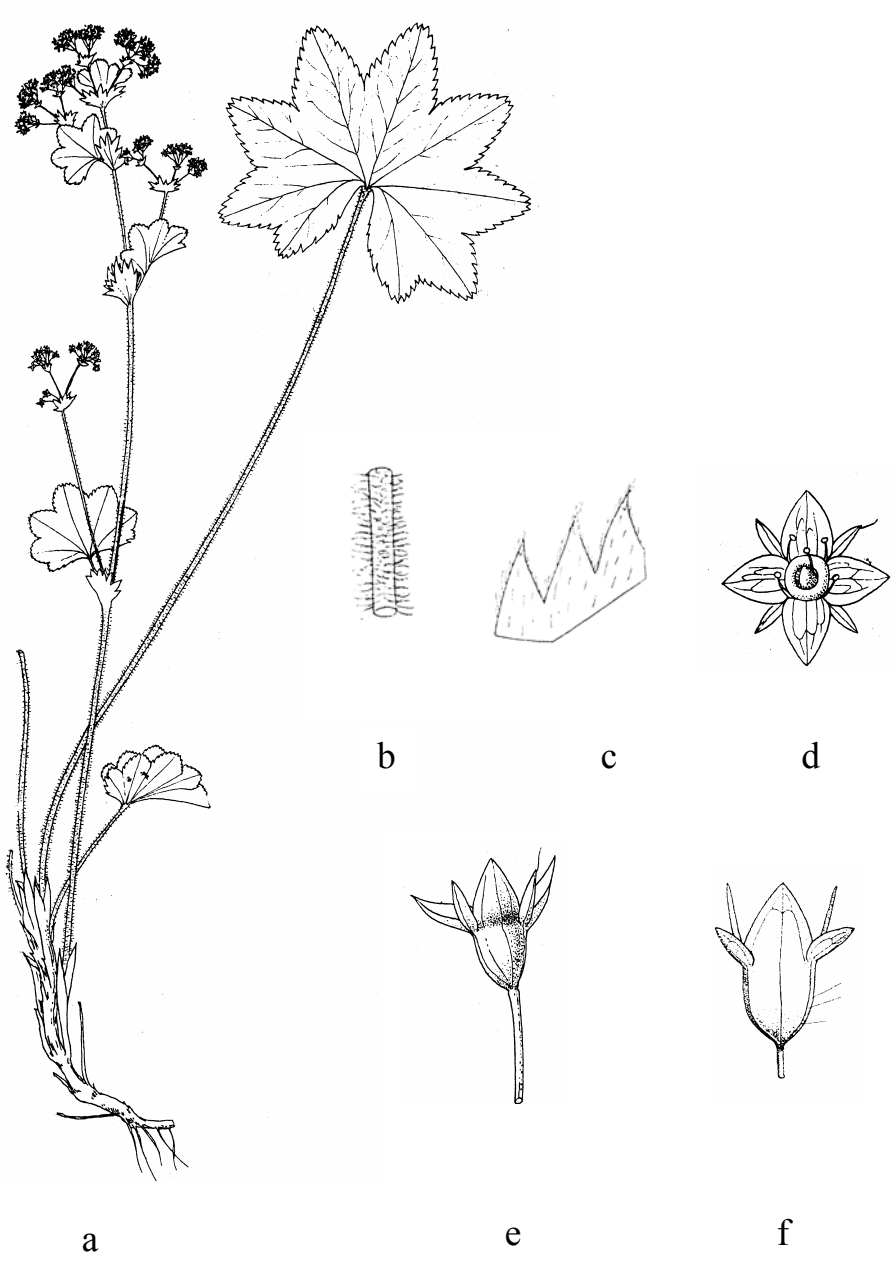


Fig. 1. *Alchemilla acutiloba*: a - general aspect; b – stem fragment; c - detail of the side of foliar lobes (basal leaf); d, e, f - detail of the flower (a, b, c, d, e - after Assenov 1973; f - after Fröhner 1990)

Triangular to semiovate sepals, acute or subacute, equal to the hypanthium or slightly shorter, glabrous; they are erect up to patent in postanthesis. The episepals (fig. 1d) smaller or at most equal in lenght to the sepals and obviously narrower than those, glabrous, rarely with few hairs. The mature achene is equal to the hypanthium, sometimes the achene tip exerted from the disk 25-33 % of its lenght.

Taxonomic specifications: In the Romanian botanical literature it is mentioned either as *A. acutiloba* Opiz (Grecescu 1898, Borza 1947: 145, Beldie 1977: 266), *A. acutangula* Buser (Prodan 1923: 578), *A. vulgaris* L. subsp. *acutangula* (Buser) Palitz (Buia 1956: 694), or as *A. vulgaris* L. emend. Fröhner (Ciocârlan 2000: 324). It could be mistaken with *A. subcrenata* Buser, of which could be differentiate by petioles and stems with perpendicular-patents hairs, basal lobate leaves 1/3-1/2, lobes uniformly sharp teeth, glabrous sepals. *A. subcrenata* has petioles and stems with more or less retrorse hairs, basal leaves higly symetric waved, the lamina of the basal leaves lobed up to 1/4-1/3, lobes irregular and pretty sizable teeth, rather thick teeth, obtuse, sepals often with hairs. It can be also mistaken with *A. micans* which has petioles and stems with erect-patent hairs, basal leaves with adaxial side of the lamina densly hairy, and on the abaxial side sometimes glabrescens and only on nervures joined sericeous hairy.

Ecology: In mesophile meadows up to swampy meadows, ruderal land, beaten path, shrubbery, sides of forests, ditches, on wet rocks, the banks of the lakes. It grows on argillaceous soils, rich or poor calcareous soils, rich in bases, neuter up to poorly acid soils, hummus-like, rich in nutritive substances. It is a mesothermophilous-microthermophilous species; mesophylous-mesohygrophilous; heliophilous.

Chorology: Sporadic from the beech forest floor to subalpine floor (rarely at more than 2,000 m alt.). In the Romanian Carpathians, *A. acutiloba* species is known from the following points (fig. 2):

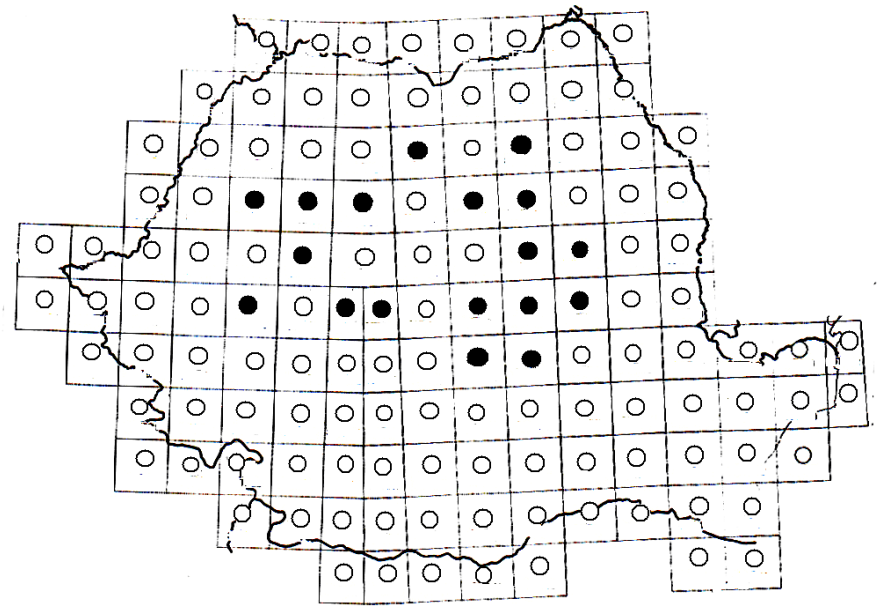


Fig. 2. The chorology of *A. acutiloba* species in Romania (orig.)

AB: Oaşa Mare, Oaşa Mică (Drăgulescu 2003: 135); The meadows, at Oaşa Mare (Borza 1959: 111) - GR 1; Zlatna on Piatra Caprei (Buia 1956: 694) - FS 4.

BC: Bacău County, near Poiana Sărată in „Luptean" Valley, alt. 620 m.s.m., 8.VI.1966, Kovács Andrei under *A. vulgaris* L. subsp. *pastoralis* (Buser) Palitz, revised A. Plocek 1990 [CL 396.255] - MM 4.

BV: Piatra Mare Mountain (Buia 1956: 694) - LL 3; Piatra Craiului Mountain (Buia 1956: 694) - LL 4; Predeal (Grecescu 1898, Buia 1956: 694) - LL 4; Bârsa Valley, through hayfields at the foot of Pietrii Craiului, through meadows of *Festuca rubra*, *Nardus stricta* etc., 26.VIII.2004, M. Danciu [HBV 064.042] - LL 4.

CJ: Feleac in Morii Valley (Buia 1956: 694) - GS 1; at Făget and Dâmbu Craiului (Buia 1956: 694) - FS 3/GS 1; Vlădeasa Mountain (Apuseni Mountains), VII.1968, 1,400 m.s.m., I. Resmeriță under *A. vulgaris* L. subsp. *pastoralis* (Buser) Palitz, revised A. Plocek 1990 [CL 601.178] - FS 1.

CV: Háromszék Counties in meadows, Egerrét near Zágon, 19.VI.1944, Hargitai under *A. vulgaris* L. subsp. *acutiloba* (Opiz) Soó, revised A. Plocek 1990 [CL 593.895] - ML 1.

HD: Băița (Buia 1956: 694) - FR 1.

HR: Toplița (Buia 1956: 694) - LM 3; Bălan on „Öcsém" Mountain (Buia 1956: 694) - MM 1; Tuşnad at "Sf. Ana" Lake (Buia 1956: 694) - MM 2; Harghita Mountains at „Festömalom", Odorhei (Buia 1956: 694) - MM 2; Transylvania, Harghita County, near Tuşnadul Nou, 24.VI.1978, I. Gergely under *A. vulgaris* L. var. *acutangula* (Buser) Palitz, revised A. Plocek 1990 [CL 647.137] - MM 2; Roşu Lake, Neamț County, outside the forest, 12.VI.1969, leg. C. Burduja & I. Sârbu, det. I. Sârbu under *A. vulgaris* L. subsp. *acutangula* (Buser) Palitz [I 42.868] - MM 1.

MS: Deda (Buia 1956: 694) - LN 2.

NT: Ceahlău Mountain on Martin Valley (Buia 1956: 694) - MM 1, MN 2.

PH: Azuga, Buşteni, Sinaia (Grecescu 1898); Bucegi Mountains in Cerbu Valley (Buia 1956: 694) - LL 4; Bucegi Mountains, from coast to Bucşoiul Mălăieşti, alt. 1,700 m, 10.VII.1980, D. Parascan & M. Danciu [HBV 060.036] - LL 4; Ciucaş Mountains (Maria Ciucă & A. Beldie 1989: 61) - ML 2; Ciucaş Mountains, on meadows on Ciucaş Peak, alt. 1,945 m, 18.VII.2007, Violeta Boruz [CRAI] - ML 2.

SB: Poplaca (Buia 1956: 694); Cibin Gorge (Buia 1956: 694) - KL 3; „Gropata Lungă, Iezeru Mare, Iujbea Răşinarului, Sibiu, Şerbota Mare", Frumoasa Peak (Drăgulescu 2003: 135) - KL 3.

VN: Căbălaş Mountain, Vrancea County, 28.VI.1956, leg. M. Răvăruț, det. D. Mititelu under *A. vulgaris* L. subsp. *pratensis* (Schmidt) Camus, revised Violeta Boruz 2006 [IAAG 14.615] - ML 3.

Phytocoenology: In the Romanian Carpathians grows in associations from Ord. *Nardetalia*.

General spreading: Eurasia.

CONCLUSIONS

In the Southern Carpathians, *Alchemilla acutiloba* it is found sporadically from the beech floor until the subalpine floor.

In order to not be mistaken with other relate species it is recommended that the stems, basal leaves and flowers should be carefully checked.

BIBLIOGRAPHY

1. ASSENOV I. *Alchemilla* L. – In: Jordanov D. (ed.). *Fl. Rep. Pop. Bulgaria* 5: 274-329. In Aedibus Acad. Sci. Bulgaricae. Serdicae. 1973.
2. BELDIE A. & DIHORU G. Asociațiile vegetale din Carpații României. Societatea de Ştiințe Biologice. *Comunicări de botanică,* 6: 133-238. 1967.
3. BELDIE A. *Flora României. Determinator ilustrat al plantelor vasculare.* Bucureşti: Edit. Acad. R. S. România. Vol. 1. 412 pag. 1977.
4. BORZA A. *Conspectus florae Romaniae regionumque affinium.* Cluj: Tipografia „Cartea Românească". 360 pag. 1947.
5. BORZA A. *Flora şi vegetația Văii Sebeşului*. Bucureşti: Edit. Acad. Rep. Pop. Rom. 326 pag. 1959.
6. BRUMMITT R. K. & POWELL C. E. *Authors of Plant Names*. Kew: Royal Botanic Gardens. 732 pag. 1992.
7. BUIA A. *Alchemilla* L. – In: Săvulescu T. (ed.), *Fl. Republ. Populare Române* 4: 680-697. Bucureşti: Edit. Acad. R. P. Române. 1956.
8. CIOCÂRLAN V. *Flora ilustrată a României. Pteridophyta et Spermatophyta*. Bucureşti: Edit. Ceres. 1038 pag. 2000.
9. CIUCĂ MARIA & BELDIE A. *Flora Munților Ciucaş. Determinator al plantelor vasculare*: 60-61. Bucureşti: Edit. Acad. Rep. Soc. Rom. 1989.
10. COLDEA G. *Les associations végétales de Roumanie*. Tome 1. *Les associations herbacées naturelles.* Presses Universitaires de Cluj. 261 pag. 1997.
11. DRĂGULESCU C. *Cormoflora Județului Sibiu*. Braşov: Edit. Pelecanus. 2003.
12. FRÖHNER S. *Alchemilla* L. – In: Hegi G. (ed.), *Ill. Fl. Mitteleur*. 4 (Part 2B): 13-242. Berlin und Hamburg: Verlag Paul Parey. 1990.
13. GRECESCU D. *Conspectul Florei României*. *Plantele vasculare indigene şi cele naturalizate ce se găsesc pe teritoriul României, considerate subt punctul de vedere sistematic şi geografic.* Bucureşti: Tipografia Dreptatea. 836 pag. 1898.
14. HOLMGREN PATRICIA K., HOLMGREN N. H. & BARNETT L. C. Index Herbariorum. Part I: The Herbaria of the World. 8 th Ed. *Regnum Veg.* 120: 1-693. Bronx: New York Botanical Garden. 1990.
15. KURTTO A., FRÖHNER S. & LAMPINEN R. (eds.) *Atlas Florae Europaeae. Distribution of Vascular Plants in Europe.* 14. *Rosaceae (Alchemilla and Aphanes)*. Helsinki: The Committee for Mapping the Flora of Europe & Societas Biologica Fennica Vanamo. 200 pag. 2007.
16. LEHRER A. Z. & LEHRER MARIA. *Cartografierea faunei şi florei României (coordonate arealografice).* Bucureşti: Edit. Ceres. 290 pag. 1990.
17. PRODAN I. *Flora pentru determinarea şi descrierea plantelor ce cresc în România* (ed. 1). Cluj: Tipografia „Cartea Românească". Vol. 1: 576-578. 1923.
18. WALTERS S. M. & PAWŁOWSKI B. *Alchemilla* L. – In: Tutin T.G. & al. (eds.). *Flora Europaea* 2: 48-64. Cambridge: Cambridge Univ. Press. 1968.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

TAXONOMY, CHOROLOGY, ECOLOGY AND PHYTOCOENOLOGY DATA ON THE SPECIES *ALCHEMILLA XANTHOCHLORA*

Boruz Violeta[1]

KEY WORDS: Alchemilla xanthochlora, taxonomy, chorology, phytocoenology, Romania

ABSTRACT

The paper consists in a multilateral characterization of the Alchemilla xanthochlora Rothm. microspecies, along with the taxonomy information being presented the chorology, ecology, and phytocoenology of this taxon. The monographic research concerning the Alchemilla species, with polymorphe species, aims founding new characters and criteria for a more precise delimitation of different microspecies. The morphological criteria which must be taken into account to determinate the species, often are not enough to separate relate species. That's why other criteria must be used, especially ecologic, chorological and phytocoenological ones. The species of this genre were highly studied in the Parâng Massif (The Southern Carpathians), and among them A. xanthochlora which makes the subject of this study.

INTRODUCTION

The *Alchemilla* genus is a polymorph one, with a high spreading in Europe and Asia. The taxonomic research carried out within this genus are necessary because sometimes the identification of some species is difficult.

The research conducted over a period of seven years have sought detailed knowledge of the Southern Carpathians *Alchemilla* species and have completed doctoral thesis titled achievement „*Alchemilla* species from the Southern Carpathians, with a special reference to Parâng Massif".

The species of this genus from the Parâng Massif (Romanian Carpathians), and among them *Alchemilla xanthochlora*, were analyzed in detail.

MATERIAL AND METHOD

The research over some *Alchemilla* species was developed on itinerary in the Parâng Mountains, Căpățânii, Lotru, Latoriței, Vâlcan and Ciucaș, but also in stationary in the condition from the Botanical Garden „A. Buia" from Craiova. In the *Alchemilla* species identified, among them is *A. xanthochlora*, there have been made complex stational observations ecological, phytocoenological, but also on the plantlets. The ecology is presented either on the basis of speciality literature data but also on the personal observations over the itinerary research of the species. The chorology is accomplished on the map type Atlas Florae Europaeae, with tetrathes of 50 x 50 km, using the indexes U.T.M. (Universal Transverse Mercator) transformed (Lehrer & Lehrer 1990). After consulting the main Herbariums from the country (BUCA, BUAG, BUCF, CRAI, HBV,

[1] University of Craiova, "Al. Buia" Botanical Garden

CL, I, IAGB, SIB) there have been verified the herbarium materials and corrected the possible errors of identification. For Herbariums were used the abreviations according to Index herbariorum (P. K. Holmgren 1990). The authors of the species are written according to present standards (Brummit & Powell 1992).

RESULTS AND DISCUSSIONS

ALCHEMILLA XANTHOCHLORA ROTHM. 1937, Feddes Repert. **42**: 167.
Syn.: - *A. vulgaris* L. var. *pratensis* F. W. Schmidt 1794, Fl. Bohem. Inchoata Cent. **3**: 88; - *A. pratensis* auct., vix Opiz; - *A. sylvestris* auct. p. p.; - *A. vulgaris* L. subsp. *pratensis* (F. W. Schmidt) Camus em. Gams var. *pratensis* (F. W. Schmidt) Briq. 1899, in Burnat, Fl. Alp. Marit. **3**,1: 155.

Description: Plant (fig. 1 a) of a medium up to high size, up to 15-90 cm, often yellowish-green. Ascendent stalck, procumbent, seldom erect, up to 1,5-3 times longer than the petiols of the basal leaves, up to the ramifications of inflorescences with dense hairs, patent or erecto-patent (fig. 1 b). The basal leaves (fig. 1 c) with long petiols, reniform to orbicular lamina, little funnel shapped to plane, rarely waved, thin, yellowish-green for a long time; adaxially glabrous leaves or with few hairs on teeth, seldom along the folds or along all the surface of the lamina with few hairs, abaxially more or less densely hairy, seldom with hairs only on the side and nervures, divided up to 1/4-1/3 in 7-11 semiorbicular lobes, with acute, subequal teeth. Flowers of 1,5-3 mm lenght, 2,5-4 mm wide. Mature hypanthium of about 2 mm, conical to spherical shapped (fig. 1 d), sharpped or rounded at the base, with the insertion point in front, often having hypanthiums with few hairs. Triangular to semiovate sepals (fig. 1 e), smaller or at least equal to hypanthium, 1-1,5 times longer than wider, more often sharp, glabrous (more than with a few hairs). The episepals more or less equal with the sepals and obviously narrower than these.

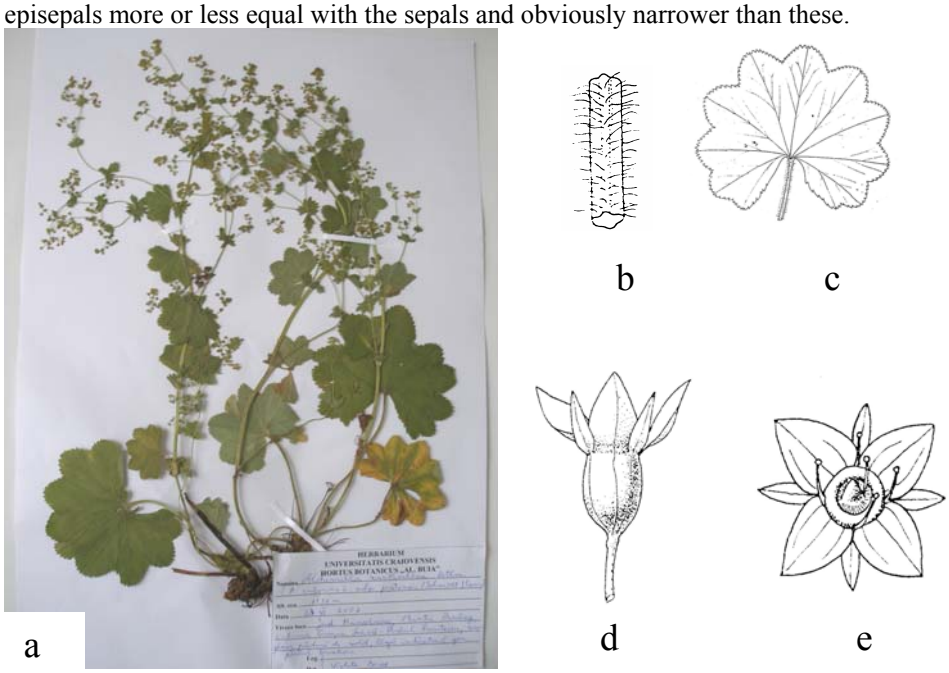


Fig. 1. *Alchemilla xanthochlora*: a - general aspect (orig.); b – stem fragment; c – basal leaves; d, e - detail of the flower (b - e, after Assenov 1973)

The achene is shorter or equal to hypanthium, sometimes exerted in this, about 33 % of its lenght. The plantlet has opposed, glabrous, short petiolated cotyledons, with an elliptic lamina. The protophyle has a lamina with 3-5 lobes, with 5 basal nervure, petioles with patent hairs.

Taxonomic specifications: *A. xanthochlora* is a microspecies which separated from the aggregate species *A. vulgaris* L. In the Romanian botanical literature it is mentioned under the name *A. silvestris* Schm. (Prodan 1923: 578), *A. xanthochlora* Rothm. (Borza 1947: 145, Beldie 1977: 264, Ciocârlan 2000: 322), *A. vulgaris* L. subsp. *pratensis* (Schmidt) Camus em. Gams (Buia 1956: 693).

It is easy to differentiate from other European species, spread on large areas, from the hairy stems and petioles with dense hairs, from glabrous leaves on the adaxial side of the lamina and small flowers. It could be mistaken with *A. acutiloba* Opiz which has leaves on the adaxial side of the lamina sparsely hairs, or can have basal leaves, almost glabrous adaxial. It can be also mistaken with *A. crinita* Buser, but these have leaves more or less densely hairy on both side of the lamina.

Ecology: It can be found in wet meadows, swamps, weedy lands, ditches, often in the glade and forest edges, along the springs, bushes, but it completly disappears on artificially fertilized soils (where animals stationate for longer periods). It grows on argillaceous to sandy soils, without limestone to rich in limestone or bases, rich in nutritive substances, neuter up to acid soils. Mesothermophilous – microthermophilous species; mesophylous – mesohygrophylous. Heliophilous species.

Chorology: Frequent found from the boreal floor up to alpin floor. In the Romanian Carpathians, *A. xanthochlora* it is known from the following points (fig. 2):

AB: Roşia Montana, Roşia Poieni $46^0$18’20’’ N, $28^0$10’25’’ E, alt. 1,000 m, 1997, G. Negrean [BUCA 54.187]-FS 4; Transsylvania, Scărița -Belioara, meadows, 28.V.1994, G. Groza under *A. vulgaris* L., revised Violeta Boruz 2007 [CL 658.230]- FS 2.

BC: Giumalău Mountain, 9.VIII.1966, leg. C. Dobrescu, [I 73.840] - MM 3.

BH: Crişana, Bihor County, Poieni Mountain, Stâna de Vale, 10.VI.1965, O. Rațiu under *A. silvestris* Schm. s. l., revised Violeta Boruz 2007 [CL 613.700, 613. 699] - FS 1.

BV: Bârsa Valley, by meadows, near the Zărneşti, 17.VI.2005, M. Danciu [HBV 064.224] - LL 4; Postăvaru, by meadows, 31.VIII.1980, M. Danciu [HBV 019.744] - LL 3.

BZ: Penteleu locality, 20.VIII.1934, leg. A. Haralamb, det. J. Neuwirth under *A. vulgaris* L., revised Violeta Boruz 2007 [BUCF 1710] - ML 4.

CJ: On Stejăriş, 2.VI.1954, D. Parascan under *A. silvestris* Schm., revised Violeta Boruz 2007 [HBV 001.502] - GS 2.

CS: Țarcu Mountain, Pleşa, Groapa Bistrei - FR 2, Arjana (Boşcaiu 1971: 103) - FQ 1.

GJ: Urdele Peak, Parâng Mountain, alt. 2,100 m, 29.VI.1963, leg. A. Buia, M. Olaru, M. Păun, G. Fulga, L. Casanova under *A. vulgaris* L. subsp. *pratensis* (Schmidt) Camus - GR 2; Parâng Massif, Galbenu rivulet Valley, alt. 1,500 m, 8.VII.2003, Violeta Boruz [CRAI] - GR 2.

HD: Retezat Mountains (Csűrös Şt., Káptalan Cs. M. & Pap S. 1956) - FR 2; Jiețului Valley, Lotru Valley, “Gura Plaiului, Moldovişu, Casa Slivei, Găuri, Obârşia Jiețului, Groapa Mândrii” (Pócs 1962: 92) - FR 4; Parâng Mountains, between the chalet Groapa Seacă and Fometescu rivulet, near the road sign towards Fometescu rivulet, alt. 1,598 m, 23.VI.2007, Violeta Boruz [CRAI]; Parâng Mountains, between the chalet Groapa Seacă and Zănoaga Sliveiului, in the boreal floor, a spring which flows from S-N, in *Chrysosplenio - Cardaminetum amarae*, alt. 1,800 m, 8.X.2006, Violeta Boruz [CRAI]; Parâng Mountains, between “Groapa Seacă” - Gherețului Valley - Roşiile Lake, at Roşiile Sheepfold, alt. 1,925 m, 2.IX.2005, Violeta Boruz [CRAI]; between the Pilot Chalet and

Câlcescu Lake, to the margin of the road in common spruce forest, alt. 1,700 m, 17.IX.2005, Violeta Boruz [CRAI]; Parâng Mountains, „Coasta lui Rus", up to Găuri, swamp – a spring slope, along with *Parnassia palustris, Carex curta, C. flava* ş.a., alt. 2,000 m, 4.VIII.2006, Violeta Boruz [CRAI] - FR 4.

HR: Lower Ciuc Basin (Kovács & Gergely 1979) - MM 1.

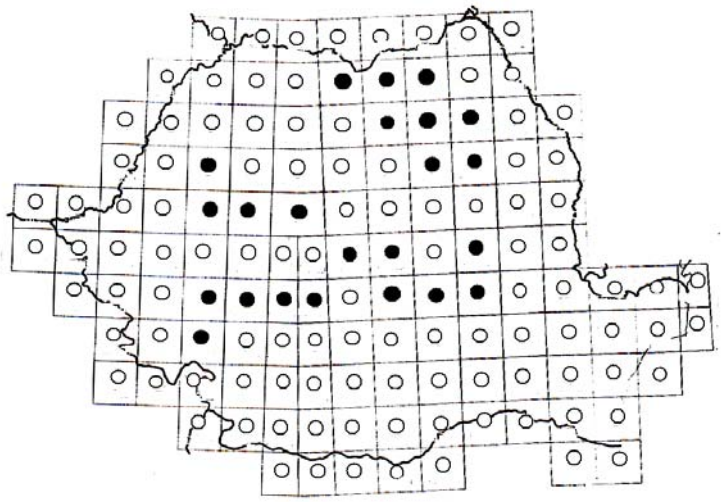


Fig. 2. The chorology of *A. xanthochlora* species in Romania (orig.)

MM: Rodnei Mountains, „Negoiescu Mare" (Coldea 1990: 40)-LN1; Dragomireşti at Dumbrava, Vişeu (Buia 1956: 693 under *A. vulgaris* L. subsp. *pratensis* (Schmidt) Camus emend. Gams) - LN 4.

NT: Ceahlău Mountain, Neamț County, 29.VII.1968, V. Zanoschi under *A. vulgaris* L., revised Violeta Boruz 2006 [IAAG 14.605] - MM 1, MN 2; Piatra Neamț (Pietricica Mountain) - (Mititelu, Barabaş, Ştefan & Mancaş 1987: 251-263) - MM 1, MM 3, MN 4.

PH: Bucegi Mountains, in Mălăieşti Valley, alt. 1,850 m, 10.VII.1980, D. Parascan and M. Danciu [HBV 061.005] - LL 4; Ciucaş Mountains (Maria Ciucă 1984: 40 under *A. palmata* Gilib.) - ML 2.

SB: "Straja Cârței", Arpaşu Peak, Suru Peak (Drăgulescu 2003: 137) - LL 1; Transsylvania, Făgăraş Mountains, Bâlea Lake, alt. 2,100 m, 14.VIII.1936, leg. E. I. & A. Nyárády under *A. pratensis* Schm., revised Violeta Boruz 2007 [SIB 147.269] - LL 1.

SV: Rarău, 5.VI.1935, N. Roman under *A. vulgaris* L. subsp. *silvestris* Schm., revised Violeta Boruz 2006 [IAAG 14.612] - LN 4; Solca locality, hayfields, 8.VII.1969, Sfichi Adrian under *A. vulgaris* L., revised Violeta Boruz [I 21.935] - MN 1; Pojorâta locality, Suceava region, 17.VII.1951, E. Țopa under *A. hybrida* L., revised Violeta Boruz 2006 [IAGB 28.994]- LN 3.

VL: Albu Mountain from Căpățânii Mountains, alt. 1,670 m, 30.VI.2002, Violeta Boruz [CRAI] - KL 4; Lotru Valley in *Carici leporinae-Deschampsietum cespitosae*, alt. 1,600 m, 22.VIII.2004, leg. Violeta Boruz [CRAI] - GR 2.

VN: Vrancea County (Ana-Maria Coroi & M. Coroi 1997: 557) - ML 3.

Phytocoenology: *A. xanthochlora* was identified in some phytocoenosis which belong the association ***Carici leporinae - Deschampsietum cespitosae*** (Borza 1934) Beldie 1967, at Obârşia Lotrului, along with *Alchemilla connivens* and *A. crinita*; in a meadow of ***Agrosti - Festucetum rubrae*** Horv. (1951) 1952, at Vidra Lake; In *Agrosti - Festucem*

rubrae Horv. (1951) 1952, the boreal floor, at Groapa Seacă (Parâng Mountains), near the road sign towards Fometescu spring (fig. 3), with the following floristic composition: *Festuca rubra* 1-2, *Agrostis capillaris* subsp. *capillaris* +-1, *Cynosurus cristatus* +, *Poa annua* +, *Alchemilla xanthochlora* +, *Ranunculus acris* subsp. *acris* +, *Fragaria vesca* +, *Prunella vulgaris* +, *Campanula abietina* +, *Veronica officinalis* +, *Trifolium pratense* +, *T. repens* +, *Galium mollugo* +, *Plantago media* +, *Rumex alpinus* +, *Carex ovalis* +, *Carum carvi* +, *Taraxacum officinale* +, *Rubus idaeus* +.

Fig. 79. *A. xanthochlora* - at Groapa Seacă, Parâng Mountains (orig.)

It was also recorded in ***Festuco rubrae - Nardetum*** Csűrös et Resm. 1960, in the boreal floor, a slope spring on Văleanu Mountain (Căpățânii Mountains); In ***Juncetum conglomerati*** Prodan 1939, along the roadside towards the "Cascada Dracului" (between Pilot Chalet and Câlcescu Lake); In ***Seslerio bielzii - Caricetum sempervirentis*** Puşcaru et al. 1956, on Piatra Mountain (Căpățânii Mountains, the subalpine floor); On Albu Mountain (Căpățânii Mountains), in *open habitats* (the boreal floor), between rocks; In a spruce tree clearings between Groapa Seacă and Slivei Peak, along with *A. connivens*, *A. crinita*, *A. glabra* and *A. micans*; In ***Phleo alpini - Deschampsietum cespitosae*** (Krajina 1933) Coldea 1983 was identified in the subalpine floor at the Roşiile Sheepfold (Parâng Mountains); In ***Chrysosplenio - Cardaminetum amarae*** (Tx. 1937) Maas 1959 was identified towards Zănoaga Sliveiului, the boreal floor (Parâng Mountains). It was also identified in ***Potentillo ternatae - Festucetum supinae*** Boşcaiu 1971, in the juniper tree floor in Parâng Mountains, on Găuri Mountain (along with *Alchemilla flabellata* 1-2 and *A. crinita* +-1).

General spreading: Endemic in Europe.

CONCLUSIONS

But taking into account the entire complex of characters from *Alchemilla xanthochlora*, it can be correctly identified.

In Parâng Massif, *A. xanthochlora* is less common compared with *A. connivens* and *A. crinita*.

BIBLIOGRAPHY

1. ASSENOV I. *Alchemilla* L. – In: Jordanov D. (ed.). *Fl. Rep. Pop. Bulgaria* 5: 274-329. In Aedibus Acad. Sci. Bulgaricae. Serdicae. 1973.
2. BELDIE A. & DIHORU G. Asociațiile vegetale din Carpații României. Societatea de Ştiințe Biologice. *Comunicări de botanică,* 6: 133-238. 1967.
3. BELDIE A. *Flora României. Determinator ilustrat al plantelor vasculare.* Bucureşti: Edit. Acad. R. S. România. Vol. 1. 412 pag. 1977.
4. BORZA A. *Conspectus florae Romaniae regionumque affinium.* Cluj: Tipografia „Cartea Românească". 360 pag. 1947.
5. BOŞCAIU N. *Flora şi vegetația Munților Țarcu, Godeanu şi Cernei*. Bucureşti: Edit. Acad. Rep. Soc. Rom. 494 pag., 40 fig. 1971.
6. BRUMMITT R. K. & POWELL C. E. *Authors of Plant Names*. Kew: Royal Botanic Gardens. 732 pag. 1992.
7. BUIA A. *Alchemilla* L. – In: Săvulescu T. (ed.), *Fl. Republ. Populare Române* 4: 680-697. Bucureşti: Edit. Acad. R. P. Române. 1956.
8. CIOCÂRLAN V. *Flora ilustrată a României. Pteridophyta et Spermatophyta*. Bucureşti: Edit. Ceres. 1038 pag. 2000.
9. CIUCĂ MARIA. *Flora şi vegetația pajiştilor din Munții Ciucaş*. Bucureşti: Edit. Acad. Rep. Soc. Rom. 148 pag. 1984.
10. COLDEA G. *Munții Rodnei. Studiu geobotanic*. Bucureşti: Edit. Acad. Rom. 183 pag. 1990.
11. COROI ANA-MARIA & COROI M. Flora medicinală spontană din jud. Vrancea. *Bul. Grăd. Bot. Iaşi*, 6(2): 557-566. 1997.
12. CSŰRÖS ŞT., KÁPTALAN CS. MARGARETA & PAP S. Contribuții la studiul vegetației zonei de calcar din vecinătatea sudică a Munților Retezat. *Stud. Cercet. Biol.-Biol. Veget.,* 7(1-4): 33-56. 1956.
13. DRĂGULESCU C. *Cormoflora Județului Sibiu*. Braşov: Edit. Pelecanus. 2003.
14. FRÖHNER S. *Alchemilla* L. – In: Hegi G. (ed.), *Ill. Fl. Mitteleur*. 4 (Part 2B): 13-242. Berlin und Hamburg: Verlag Paul Parey. 1990.
15. HOLMGREN PATRICIA K., HOLMGREN N. H. & BARNETT L. C. Index Herbariorum. Part I: The Herbaria of the World. 8 th Ed. *Regnum Veg.* 120: 1-693. Bronx: New York Botanical Garden. 1990.
16. KOVÁCS A. & GERGELY I. Sesleria uliginosa Opiz în Bazinul inferior al Ciucului (jud. Harghita). *Contrib. Bot.*: 155-161. Cluj. 1979.
17. KURTTO A., FRÖHNER S. & LAMPINEN R. (eds.) *Atlas Florae Europaeae. Distribution of Vascular Plants in Europe.* **14**. *Rosaceae (Alchemilla and Aphanes)*. Helsinki: The Committee for Mapping the Flora of Europe & Societas Biologica Fennica Vanamo. 200 pag. 2007.
18. LEHRER A. Z. & LEHRER MARIA. *Cartografierea faunei şi florei României (coordonate arealografice)*. Bucureşti: Edit. Ceres. 290 pag. 1990.
19. MITITELU D., BARABAŞ N., ŞTEFAN N. & MANCAŞ D. Vegetația de pe Valea Bistriței Mijlocii. *Memoriile secțiilor ştiințifice*. Ser. IV, 8(1)/1985/: 251-263. Bucureşti: Edit. Acad. Rep. Soc. Rom. 1987.
20. PÓCS T. Flore du massif du Parâng (Carpathes méridionaux on Roumanie). *Fragm. bot. Mus. Hist. - Nat. Hung.* 2: 90-92. Budapest. 1962.
21. PRODAN I. *Flora pentru determinarea şi descrierea plantelor ce cresc în România* (ed. 1). Cluj: Tipografia „Cartea Românească". Vol. 1: 576-578. 1923.
22. WALTERS S. M. & PAWŁOWSKI B. *Alchemilla* L. – In: Tutin T.G. & al. (eds.). *Flora Europaea* 2: 48-64. Cambridge: Cambridge Univ. Press. 1968.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

A COMPARATIVE SURVEY ON THE PHOTOSYNTHESIS OF SPONTANEOUS PLANTS, TYPE C_3 AND C_4

Luminita Buse- Dragomir[1]

KEY WORDS: photosynthesis, temperature, light, carbon dioxide

ABSTRACT

The hereby survey is the result of a the researches that were taken in May-June 2009 on spontaneous plants, that differ from one another by the way carbon dioxide is fixed.

These plants belong to the photosynthetic types C_4 and C_3. Our determinations pointed out significant differences regarding the productivity of the two types of plants.

The claims on the external factors differ, too, because C_4 plants require higher light intensities and higher temperatures. Under average temperatures and light conditions, C_4 plants can develop photosynthesis at double intensities, in comparison with C_3 plants. Pursuit to this fact, their biomass productivity is double.

INTRODUCTION

For the time being, there are three carbon assimilation paths to be known: the C_3 path, the C_4 path and the acid metabolism of the *Crassulacee (CAM)*.

The C_3 photosynthetic path is characteristic for about 300 000 species of plants, belonging to temperate climate. These plants productivity is low and poor, because of the photorespiration process, which develops exactly in the same time as the photosynthesis develops. At C_4 plants, several cytological, biochemical and physiological changes appear. These changes have several advantages for the plants: in comparison with C_3 plants, photorespiration at the C_4 plants is almost inexistent, 10 times weaker than dark respiration; the assimilated transportation is 3 time higher, the efficiency of the photosynthesis is higher, too, the growth intensity doubles and green substance productivity is rising.

Nowadays, there are to be known about 9000 species of plants that belong to the C_4 photosynthetic path, mostly of tropical origin. But, there are some plats that appear in the spontaneous flora in temperate regions. The CAM type appeared as a reaction to the hydro stress conditions, caused by drought and salinity. Knowing the photosynthetic assimilation paths and of other internal and external factors that influence the process allows breeders to obtain plant types with a higher photosynthetic quality.

MATERIALS AND METHODS

Within the researches in 2009, there was noticed the variety of the intensity of photosynthesis and accumulation of biomass at plants belonging to the photosynthetic types

[1] University of Craiova

$_3$ and C_4. The process was noticed in various conditions, involving light, temperature and carbon dioxide concentration.

The intensity of photosynthesis was determined with the LCi analyzer. Thus, the carbon dioxide in the assimilation room intensity was determined, as well as the active photosynthetic radiation. The value of the net assimilation intensity (IAN) was determined by the method taken by J. Sachs (the rowels method). According to this method, the quantity of dried substance elaborated in a certain period of time on a certain foliage surface (grams of dried substance/m^2/day). The chlorophyll quantity in leaves, in SPAD unities was determined using the Minolta chlorophyll-meter.

As experimental plants, there were used plants from the spontaneous flora, belonging to the photosynthetic C_3 types (Poa pratensis L. in the Poaceae family, and Fragaria vesca, L, Potentilla anserine L., Alchemilla arvensis L. in the Rosaceae L. Familiy) and C_4 type (Amaranthus retroflexus L., Amaranthaceae family, Atriplex tatarica L., Poligonaceae Lindl. family, Cynodon dactylon L., Gramineae Jus. Family, Portulaca oleracea L., Portulaceae Juss family).

RESULTS AND DISCUSSION

Under laboratory conditions, the measures that were taken on the leaves of C_3 and C_4 plants pointed out that at 25ºC, the light intensity of 1800 µmol/m^2/s and a carbon dioxide concentration of 300 µl/l, C_4 plants have a photosynthetic range which is higher than the one of C_3 plants. The highest value of the intensity of photosynthesis was determined at *Amaranthus retroflexus*, while the lowest, at *Poa pratensis*.

Table 1

The intensity of photosynthesis**(** µmol/m^2/s**)** on C_3 and C_4 plants

Photosynthetic type	Plant	Intensity of photosynthesis (µmol/m^2/s)
C_3	Fragaria vesca	11,01
	Alchemilla arvensis	10,19
	Poa pratensis	10,03
	Potentilla anserine	11,37
C_4	Cynodon dactylon	19,17
	Portulaca oleracea	16,51
	Amaranthus retroflexus	20,61
	Atriplex tatarica	18,98

The influence of light intensity on the photosynthesis process on C_3 and C_4 plants

The determinations on the photosynthesis process at C_3 plants, at different light intensities proved the high influence of this factor on the photosynthesis process.

At the C_4 plants, the value of photosynthesis was similar, at low light intensities with the value of photosynthesis of C_3 plants. But, this value significantly rose at 1800 µmol/m^2/s intensity.

The data that were obtained from this experiment point out that C_4 plants require higher light intensities, which they can value with a higher efficiency.

Table 2

The influence of light intensity on the photosynthesis process on C_3 plants

Light intensity ($\mu mol/m^2/s$)	**Intensity of photosynthesis (**$\mu mol/m^2/s$**)**			
	Fragaria vesca	**Alchemilla arvensis**	**Poa pratensis**	**Potentilla anserine**
1510	8,46	8,13	8,03	8,62
1630	9,33	8,74	9,01	9,88
1718	9,78	9,96	9,64	10,34
1800	11,01	10,19	10,03	11,37

Table 3

The influence of light intensity on the photosynthesis process on C_4 plants

Light intensity ($\mu mol/m^2/s$)	**Intensity of photosynthesis(** $\mu mol/m^2/s$**)**			
	Cynodon dactylon	Portulaca oleracea	Amaranthus retroflexus	Atriplex tatarica
1510	9,74	8,44	9,89	8,98
1630	10,08	9,56	10,72	11,07
1718	16,42	12,07	14,00	13,16
1800	19,17	16,51	20,61	18,98

The intensity of photosynthesis at **C_3 and C_4 plants, taking into consideration the atmospheric carbon dioxide concentration**

Measuring the photosynthesis intensity at the leaves of C_3 plants, with a 100µl/l CO_2 pointed out a minimal value of 5,46 $\mu mol/m^2/s$, while at the leaves of C_4 plants, on same atmospheric conditions, there was noticed a 17.34 $\mu mol/m^2/s$. The conclusion is that C_4 plants require very low CO_2 concentrations, due to the fact that these plants can develop photosynthesis by using the gas from the respiration process. The growth of carbon dioxide concentration determines the intensification of the photosynthesis process at the mentioned above plants.

Table 4

The intensity of photosynthesis at C_3 and C_4 plants, taking into consideration the atmospheric carbon dioxide concentration

Photosynthetic type	**Plant**	**Intensity of photosynthesis ($\mu mol/m^2/s$)**		
		100µl/l CO_2	230µl/l CO_2	350µl/l CO_2
C_4	Cynodon dactylon	17,34	18,66	19,63
	Portulaca oleracea	16,98	17,75	19.00
	Amaranthus retroflexus	16.76	18,69	21,17
	Atriplex tatarica	16,88	17,19	18,98
C_3	Fragaria vesca	5,86	7,33	11,64
	Alchemilla arvensis	5,74	8,42	12,01
	Poa pratensis	5,46	7,93	10,78
	Potentilla anserine	6,01	8,01	11,56

C_3 plants that were used in the survey needed higher carbon dioxide concentration, with an average concentration of 350µl/l CO_2 and a minim value of 100µl/l CO_2 .

The influence of temperature on the photosynthesis process on C_3 and C_4 plants

Temperature rise determined the intensification of the photosynthesis process at all plants that are used in the hereby survey. At the C_4 plants, the average temperature was about 40 ºC, and about 30 ºC at C_3 plants.

Table 4

The influence of temperature on the photosynthesis process on C_3 and C_4 plants

Photosynthetic type	**Plant**	**Intensity of photosynthesis(** µmol/m^2/s**)**		
		20 ºC	**30 ºC**	**40 ºC**
C_4	Cynodon dactylon	16,83	18,56	19,28
	Portulaca oleracea	16,22	17,46	18,15
	Amaranthus retroflexus	17,65	20,44	21,13
	Atriplex tatarica	17,01	19,22	20,84
C_3	Fragaria vesca	10,14	10,96	9,43
	Alchemilla arvensis	10,67	11,09	9,76
	Poa pratensis	9,88	10,67	9,51
	Potentilla anserine	10,09	11,21	9,45

C_4 plants have a more efficient circulation system of the assimilated substances. From this respect, substances are deposed around assimilated fascicles, and, if there is the case, they hydrolyzed, and immediately pass in the circulating sap of free blood vessels.

Table 5

The value of the net assimilation intensity (IAN) on C_3 and C_4 plants

Photosynthetic type	**Plant**	**I.A.N**(grams of dried substance/m^2/day).
C_3	Fragaria vesca	1,34
	Alchemilla arvensis	1,35
	Poa pratensis	1,81
	Potentilla anserine	1,96
C_4	Cynodon dactylon	3,17
	Portulaca oleracea	3,84
	Amaranthus retroflexus	3,92
	Atriplex tatarica	3,74

The pigment breeders content at C_3 and C_4 plants

Determining the chlorophyll content with the Minolta chlorophyll-meter did not show significant differences between C_3 and C_4 plants. The highest chlorophyll content was noticed at C_3 plants, *Fragaria vesca* and *Potentila anserine*. There could not be established a correlation between this parameter and the high intensity of photosynthesis at C_4 plants.

Table 6

The pigment breeders content at C_3 and C_4 plants

Photosynthetic type	**Plant**	The pigment breeders content **(SPAD)**
C_3	Fragaria vesca	46
	Alchemilla arvensis	44
	Poa pratensis	42
	Potentilla anserine	48
C_4	Cynodon dactylon	44
	Portulaca oleracea	43
	Amaranthus retroflexus	42
	Atriplex tatarica	40

CONCLUSIONS

- There can be estimated that photosynthetic types adapted to the environmental varying conditions.
- These photosynthetic types have different characteristics, such as: the climate, the leaf structure, the primary compound, average temperature, average CO_2 concentration.
- C_4 plants have a more efficient circulation system of the assimilated substances. From this respect, substances are deposed around assimilated fascicles, and, if there is the case, they hydrolyzed, and immediately pass in the circulating sap of free blood vessels.
- Under appropriate temperature and light conditions, C_4 plants can develop photosynthesis at double intensities, in comparison with C_3 plants. Given this, biomass productivity doubles, too.
- Plant productivity amelioration programs must be orientated towards the characteristics of spontaneous C_4 plants, in order to hybridize them with the cultivated species that are used in agriculture.
- It is recommended for the breeder to select plants with an intense enzymatic activity in assimilating carbon dioxide, with a low photorespiration, in order to obtain high productivity plants.

BIBLIOGRAPHY

1. Atanasiu, L.- Perspective in cercetarea fotosintezei, revolutia biologică, Ed. Academiei, Bucureşti, 1985
2. Boldor, O., Vladeanu, Gabriela, Polescu, Lucia, Voica, C.- Relatiile dintre intensitatea fotosintezei, cantitatea de pigmenţi asimilatori şi rezistenta la pierderile de apa la unele plante de tip C_3 si C_4, St. Cerc. Biol., seria biol. veget.,1987

3. Burzo, I. and colab.- Fiziologia plantelor de cultura, vol. I, Ed, Stiinta, Chisinau, 1999
4. Heichel, G.H.- Response of Respiration of Tobaco leaves in Light and Darkness and the CO_2 compensation Concentration to Prior Illumination and Oxigen, Plant Phisiology, 1971

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

RESEARCHES ON THE INFLUENCE OF CHEMICAL POLLUTION ON THE PHYSIOLOGICAL PROCESSSES AT AQUATIC PLANTS

Luminita Buse- Dragomir[1]

KEY WORDS: Aquatic plants, photosynthesis, respiration, insecticides

ABSTRACT

In the experiments that were taken in the laboratory of Plant Physiology of the University in Craiova, there was noticed the influence of insecticides Mospilan and Fastac on the photosynthesis and respiration processes at the Spirogyra mirabilis and Cladophora glomerata algae, and at the superior plants Ceratophyllum demersum and Elodea canadensis. The intensity of the photosynthetic process was higly damaged by Mospilan, and, among all the superior plants, the most damaged was Elodea canadensis.The respiration process was high at the algae and Ceratophillum demersum, but low at the Elodea canadensis. In the Fastac environment, the intensity of the photosynthetic process at aquatic plants was lower, in comparison with the Mosiplan one. The most sensitive plants to Fastac were Elodea canadensis and Cladophora glomerata.

INTRODUCTION

Producing and using pesticides is a serious threat for the hydrosphere, because wastes from factories, wastes from washing these damaging substances by rain on agricultural areas. Another polluting source of continental and seacoast waters is the airy spraying of insecticides on large areas. All polluting agents can be detected in laboratories, by taking standardized biochemical tests.

From taking these tests, there comes out a level that determines both the degree of pollution, and as well as the purity of water.

It is important that, under water pollution with the above mentioned substances there should be known the limits up to witch these substances 'concentration does not damage the physiologic processes of aquatic plants.

As for pesticides, namely the organ-phosphoric ones, widely used in treating fruit trees they are water soluble. Organ-chlorates, in current and average use can bring several milligrams of damaging substance/l.

MATERIALS AND METHODS

In the experiments that were taken in the laboratory of Plant Physiology of the University in Craiova, there was noticed the influence of some insecticides on the

2 University of Craiova

photosynthesis and respiration processes at the *Spirogyra mirabilis* and *Cladophora glomerata* algae, and also at submersible superior plants *Ceratophyllum demersum* and *Elodea canadensis*.

There were used two widely spread insecticides:

- Mospilan powder, with a leach substance of acetamiprid 20%, in the following concentrations: 0.01mg/l, 0.05mg/l, 0,1mg/l, 0,2mg/l, 0,5mg/l.;
- Fastac solution, with a leach substance of alfa-cipermetrin 10%, in the following concentrations: 0.01ml/l, 0.05ml/l, 0.1ml/l, 0.2ml.l, 0.5ml/l;

Plants were kept in cropping pots, in natural light and on an average temperature of 20°C.

The intensity of the two processes was determined by dosing the water dissolved oxygen, using the analyzer.

RESULTS AND DISCUSSION

As shown in table 1, the intensity of photosynthesis was highly inhibited by the Mosiplan insecticide.

0.2 and 0.5 mg/l concentrations highly inhibited the photosynthesis process at all plants, but, the hghly damaged was *Elodea canadensis.*

Table 1

The influence of Mosiplan insecticide on the photosynthesis process at aquatic plants (ml O_2/g veg. mat../h).

Plant	**Concentration(mg/l)**					
	0,00	**0,01**	**0,05**	**0,1**	**0,2**	**0,5**
Spirogyra mirabilis	10,4	10,5	10,3	8,9	7,5	7,0
Cladophora glomerata	11,2	9,0	8,3	6,3	6,2	5,5
Elodea canadensis	11,5	9,2	7,4	7,0	3,6	3,2
Ceratophyllum demersum	13,1	13,2	12,7	9,2	8,0	7,3

The respiration intensity of the plants that were used in the survey rose 0.1 and 0.5mg/l, except for Elodea, to which a low intensity was notices, beginning with 0.01mg/l (table 2).

Table 2

The influence of Mosiplan insecticide on the respiration process at aquatic plants (ml O_2 /g veg mat./h)

Plant	**Concentrația(mg/l)**					
	M	**0,01**	**0,05**	**0,1**	**0,2**	**0,5**
Spirogyra mirabilis	2,5	3,0	3,2	2,8	1,7	1,5
Cladophora glomerata	2,6	2,9	3,1	2,9	1,4	1,2
Elodea canadensis	2,9	3,3	3,5	1,5	1,0	0,7
Ceratophyllum demersum	2,8	3,2	3,4	3,0	1,2	0,9

Results on the influence of Fastac insecticide on the photosynthesis and respiration of aquatic plants

On the Fastac environment, the intensity of photosynthesis was lower than, comparing it to the Mosiplan environment.

The lowest intensity of photosynthesis was at *Elodea canadensis* and *Cladophora glomerata*, starting from a 0.05ml/l concentration. At *Ceratophyllum demersum*, staring with a 0.01 concentration, up to 0.5mg/l, the intensity of photosynthesis did not change much. The intensity was higher from a 0.2mg/l concentration (table 3).

Table 3

The intensity of photosynthesis (ml O_2 mat.veg./h) at plants on the Fastac environment

Planta	**Concentrația(ml/l)**					
	M	**0,01**	**0,05**	**0,1**	**0,2**	**0,5**
Spirogyra mirabilis	10,4	10,5	9,8	8,2	6,8	7,6
Cladophora glomerata	11,2	10,5	8,9	8,8	7,0	5,9
Elodea canadensis	11,5	11,0	9,0	8,5	6,0	5,2
Ceratophyllum demersum	13,1	13,0	13,2	12,9	9,7	8,2

The intensity of respiration was higher at *Cladophora glomerata*, at a 0.01ml/l concentration, and then it progressively lowered.

At the other three plants, the intensity of respiration lowered, starting from the 0.1ml/l concentration, and the highly damaged was *Elodea canadensis.*

Table 4

The intensity of respiration(ml $O_{2/}$ g veg. mat./h).at plants on a Fastac environment

Planta	**Concentration(ml/l)**					
	M	**0,01**	**0,05**	**0,1**	**0,2**	**0,5**
Spirogyra mirabilis	2,8	2,7	2,3	2,1	1,2	1,4
Cladophora glomerata	2,6	2,8	2,4	2,0	1,4	1,2
Elodea canadensis	2,9	2,5	1,4	1,0	1,0	0,5
Ceratophyllum demersum	2,5	2,5	2,0	1,9	1,4	1,3

CONCLUSIONS

- In case of polluted waters, there should be known the limits p to which the concentration of certain factors does not harm and damage the physiological plant processes;

- Pesticides in water change the intensity of photosynthesis and respiration at submersible plants, inhibiting the development of these physiological processes, taking into consideration the damaging substances concentration;
- Photosynthesis is highly inhibited in comparison with respiration;
- Submersible plants act differently at polluting factors;
- Of all superior plants that were used in the survey, the most sensitive to pesticides was *Elodea canadensis*, and the most damaged, *Cladophora glomerata*
- In the campaign for pollution removal, it is important that we should know how pollution sources are depicted and catalogued, the main polluting factors, the cause and effect of their actions, the allowed concentrations, the identification and measure methods. This way, there develops a realistic and scientific base, so that the biologic balance of nature and mankind is kept.

BIBLIOGRAPHY

1. Ionescu, Al. - Efectele biologice ale poluarii mediului, Ed. Academiei Romane, Bucuresti,1973
2. Ionescu, Al. - Fiziologia plantelor si efectele poluarii, Ed. Academiei, Bucuresti, 1983
3. Ionescu, Al.- Ecologie si protectia ecosistemelor, Ed. Institutului Agronomic Bucuresti, 1988
4. Mohan.Gh., Ardelean D. - Ecologie si protectia mediului, Ed. Scaiul, Bucuresti, 1993
5. Peterfi, ST., Ionescu, Al.- Tratat de algologie, Ed. Academiei, Bucuresti,1976

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

THE SENSIBILITY OF THE *PSEUDOMONAS AERUGINOSA* TO ANTIBIOTIC THERAPY

Daniela Ciupeanu[1]

KEY WORDS: Pseudomonas aeruginosa, resistance, antibiotic

ABSTRACT

Pseudomonas aeruginosa it is the one of the most dangerous germ, producing serious infection, especially to the imunodepressed; being the main condionate pathogene bacteria, determing 5 – 15% of the total nosocomial infections.

The study focused on the isolation of the Pseudomonas aeruginosa strains incriminated as posible ethyologic agent of some infections develop at the hospitalized patients. For this there has been made a case selection, collection of the pathological products, their processing and incubation in order to isolate the germs in pure culture.

The second stage consist in the identification of the isolated germs and their differentiated dyagnostication with the related species, and in the third stage there has been made the differentiation, from the epidemiological point of view of the identified strains.

INTRODUCTION

Pseudomonas aeruginosa is member of the *Gamma Proteobacteria* class of *Bacteria*. It is a Gram-negative, aerobic rod belonging to the bacterial family Pseudomonadaceae *Pseudomonas aeruginosa* it is the one of the most dangerous germ, producing serious infection, especially to the imunodepressed; being the main condionate pathogene bacteria, causing 5 – 15% of the total nosocomial infections.

Pseudomonas aeruginosa is an opportunistic pathogen, meaning that it exploits some break in the host defenses to initiate an infection. In fact, *Pseudomonas aeruginosa* is the epitome of an opportunistic pathogen of humans. The bacterium almost never infects uncompromised tissues, yet there is hardly any tissue that it cannot infect if the tissue defenses are compromised in some manner. It causes urinary tract infections, respiratory system infections, dermatitis, soft tissue infections, bacteremia, bone and joint infections, gastrointestinal infections and a variety of systemic infections, particularly in patients with severe burns and in cancer and AIDS patients who are immunosuppressed.

It is widely spread and in hospital environment, it is isolated frequently from mucus, skin (especially from the axillary and perineal region), nasal, pharinge, faeces, urine, vaginal secretion, in the digestive tractus. In conditions of precarious hygene it is frequently encountered in hospital environment (food, sanitary instalation, medicine solution, disinfectant, medical instrumentary) can generate very serious nosocomial infections.

[1] University of Craiova

Pseudomonas aeruginosa cause infection on surgery wound, urinary infection, enterites, speticemia etc.

Some strains have the capacity to produce a variety of toxins (exotoxins A and S, enterotoxins, endotoxins) and enzymes (hemolisine, lipase, esterase, lecitinase, colagenase, leucocidine etc.), that contribute to the patogenity and vieulence of the germ.

MATERIAL AND METHOD

The study focused on the isolation of the *Pseudomonas aeruginosa* strains incriminated as posible ethyologic agent of some infections develop at the hospitalized patients. For this there has been made a case selection, collection of the pathological products, their processing and incubation in order to isolate the germs in pure culture.

The isolation has been made on usual medium as nutritive stock or peptonated water 1%, nutritive gelose, blood gelose, as well on selective medium as agar Mac Conkey, Istrati-Meitert or selective medium with supplement of nitrate quaternary salts addionated or not with an antibiotic as nalixdic acid (Pyocyanogel-bioMerieux, selective gelose Difco, Pseudogel agar-BBL).

The second stage consist in the identification of the isolated germs and their differentiated dyagnostication with the related species, and in the third stage there has been made the differentiation, from the epidemiological point of view of the identified strains.

The hemoculture samples, has been incubated for 24 hours at 37^0C, after that there has been made native smear, and Gram coloured smear. An icubation at 41°C allow the development of a selective culture of *Pseudomonas aeruginosa* unlike other *Pseudomonas* species that not developed at this temperature.

The microscopical examination has been followed to a prime passing on solide medium. The inseminated medium has been introduce in the thermostate, at 37^0C and incubated for 24 hours. The samples has been checked daily, making subcultures in the days 3, 5, 7, and 14 after collection.

RESULTS AND DISCUSION

This is the report of antibiogram of 121 clinical isolates of *Pseudomonas aeruginosa* from blood, pus and body fluids of patients seeking treatment at some hospital from Dolj county from October 1997 to September, 2008. The isolates were identified as *Pseudomonas aeruginosa* by standard procedures and their antibiogram was studied for amikacin, ciprofloxacin, piperacillin, gentamicin and ceftazidime.

The isolates were from pus (n=75) blood (n=36) and body fluids (n=10); [Male: 68, Female: 53].

Whereas resistance was found in 15%, 18% and 20% of blood isolates against amikacin, ciprofloxacin and piperacillin respectively, it was only 14%, 16% and 13% for the same drugs from pus isolates. Resistance against gentamicin was encountered in 30% of pus and 33% of blood isolates. Resistance to ceftazidime was seen in 18% of pus and 23% of blood isolates. The number (n=10) of isolates from body fluids was too small to comment on.

Many antibiotics inhibit in vitro growth of *Pseudomonas aeruginosa*, but only a minority of these show useful activity at 'in vivo' therapeutic levels.

Table 1

The resistance of the *Pseudomonas aeruginosa* isolates to some antibiotic

Antibiotic	Resistance of *Pseudomonas aeruginosa* isolates		
	bood	pus	body fluides
amikacine	15	14	-
Ciprofloxacine	18	16	-
Piperacilline	20	13	-
gentamicine	30	27	-
ceftazidime	23	18	-

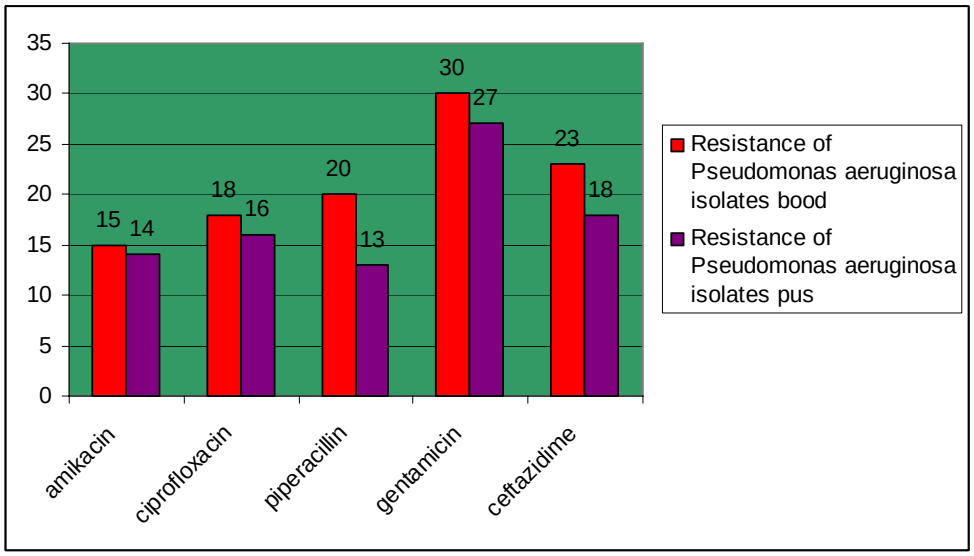


Fig. 1. The resistance of the *Pseudomonas aeruginosa* isolates to some antibiotic

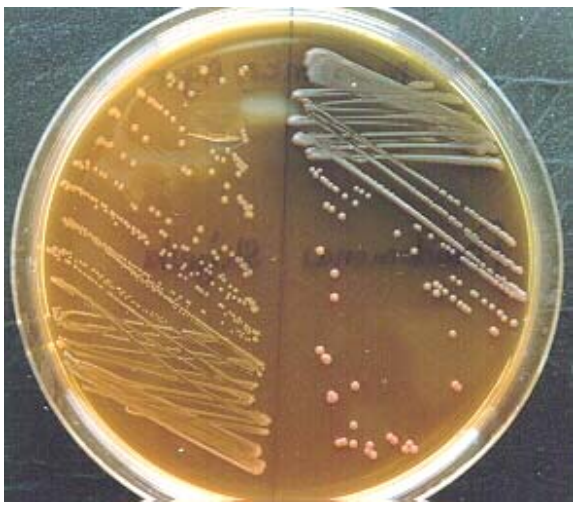


Fig. 2. *Pseudomonas aeruginosa*

In this study, we found amikacin, ciprofloxacin and piperacillin to be the most effective anti-pseudomonal agents.

The resistance levell signalized are increased comparative with a previous study, but this situation can be reversed anytime.

The resistance levell of the Pseudomonas aeruginosa yeasts surpass many international statistics, imposing the limitation of the access to the antibiotics with a large spectrum.

CONCLUSIONS

Following the in vitro response of the *Pseudomonas aeruginosa* to the antibiotics, we can acertain:

It can be observed an increase of the resistance of the *Pseudomonas aeruginosa* to amikacine, cifroploxacine, piperacilline, gentamicine, ceftazidime (ceftazidim, ceftibuten şi ceftriaxon) and colistin.

The aminoglicozide remain one of the antibiotic class toward that the sensibility of the *Pseudomonas aeruginosa* it is statissfied. Their administration in association with other antibiotics like cefalosporine, coninue to represent in many cases a very good solution.

The evolution of the sensibility and avoiding the development of the *Pseudomonas aeruginosa* oblige us to administrate the antibiotic with the narrowed spectrum, using the right dose, respecting the treatment duration.

The bacterial resistance it is a dynamic process and the different terapeutical scheme must be periodically evaluated.

The sensibility and the bacterial sensibility it is different *in vivo* comparative with the one *in vitro.*

Our study reveal the difficulty in establishing the etiology of the bacerial infection, due to the important issues in choosing the right antibioterapy.

REFERENCES

1. Scheetz M.H., Bolon M.K., Zembower T.R. et al, 2005. - Real-Time unit specific antimicrobial susceptibility identifies significant differences among gram negative bacteria. P 472, 43rd IDSA, San Francisco, 6-9 oct..
2. Villegas M.V., Olivera M.R., Correa A. et al, 2005 - High prevalence of carbapenem resistant P aeruginosa and A baumanii from Colombian Hospitals: evidence for nosocomial outbreaks. P492, 43rd IDSA, San Francisco.
3. Schereckenberger P.C., Lolans K., Ristow K.L. et al, 2005 - Impact of test method on carbapenem susceptibilities in P aeruginosa. P489, 43rd IDSA, San Francisco.
4. Jorgensen J.H., Lewis J.S., 2005 - Apparent decrease in fluorquinolones susceptibility of P aeruginosa following change in formulary fluorquinolones not due to increased resistance. P438, 43rd IDSA, San Francisco.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

NOTES ON THE HERPETOFAUNA OF SOUTH-EASTERN PLAIN AREAS FROM ROMANIA

Covaciu-Marcov Severus-Daniel[1], Cicort-Lucaciu Alfred-Ştefan[1], Sas Istvan[1], Filimon Aniela[1]

KEY WORDS: Herpetofauna, plain, south-eastern Romania, geographic distribution

ABSTRACT

In the studied region we encountered 7 species of amphibian (Triturus dobrogicus, Triturus vulgaris, Bombina bombina, Pelobates fuscus, Pelobates syriacus, Epidalea (Bufo) viridis, Pelophylax (Rana) ridibundus) and 4 species of reptiles (Emys orbicularis, Lacerta agilis, Lacerta viridis, Natrix natrix). The herpetofauna of the studied region is one typical for the plain areas from Romania. Pelobates syriacus was recorded for the first time in Ialomiţa County.

INTRODUCTION

In the last few years, studies about the composition and the geographic distribution of Romania's herpetofauna have picked up. However, these studies are limited to only certain regions of the country, mainly to the north-west, Moldova and Dobrudja (e.g. Covaciu-Marcov et al 2002, 2003, 2004, 2005, 2006a,b, 2007, 2008, Strugariu et al 2006, 2007, 2008, 2009a, Gherghel et al 2007, 2008). Unlike these areas, the plain areas from the south-eastern part of the country are very poorly represented. The few studies that took place here were actually focused on the Danube's meadow (Török 2001, Iftime 2005a, Iftime&Iftime 2007).

Sporadic and dissipated data are comprised in the synthesis volumes from the Romanian specialty literature (Fuhn 1960, Fuhn&Vancea 1961, Cogălniceanu et al 2000, Iftime 2005b). But these data are much more reduced than the ones from other regions – for example a common species in Romania like the smooth newt was not indicated in Braila County until 2005 with the exception of the Danube's meadow. Unlike other areas of the country, the plain areas from the south-east and especialy the Danubian floodplain were extremely affected by human activities, a fact that also had a strong negative impact on the herpetofauna (Iftime 2005a).

Thus, the present paper brings new contributions to the knowledge of the composition and the geographic distribution for the herpetofauna of the south-eastern plain areas of Romania.

[1] University of Oradea, Faculty of Sciences, Department of Biology

MATERIAL AND METHODS

The field works were made in the beginning of April, 2008. We used the transect method (Cogălniceanu 1997). This method was recently used in similar studies (Kati et al 2007) and is considered efficient with the exception of the snakes. The animals were not usually captured, because we mostly used the direct observation method (Brown 1997). The investigated habitats were as diverse as possible, in an attempt to reveal a wide gamma of species belonging to the herpetofauna. The animals were captured either by hand or, for the amphibians and more especially the newts, with different types of nets. After determining and photographing, the animals were set free in their own habitat. Were it was necessary, we also determined the animals killed by the locals or by traffic.

The studied region comprises the extreme eastern sectors of the eastern plain areas of Romania, found near the Danube and the Siret rivers. More exactly, we are talking about the far east areas of the Baragan and Buzau Plains. The aspect of the relief is generally flat, being sometimes crossed by rare water courses. To the east, the region is bordered by the higher bank of the Danube. Almost entirely the area is severely affected by human activities, consisting of agricultural fields and pastures. We investigated a total of 19 localities.

RESULTS

In the studied region we've identified 11 species belonging to the herpetofauna. Among these, 7 are amphibians and 4 are reptiles (Table 1). We analyzed the distribution of these 11 species in all the 19 locations investigated. Thus, we identified 65 localities for the encountered species in the 19 field locations (Table 1). Among the amphibians, *Pelobates syriacus* was indicated for the first time for Ialomita County while the common newts are a premiere for the areas of the Braila County outside the Danube's meadow. Amid the reptiles, we are signaling a first ever indication for *Emys orbicularis* in this region.

DISCUSSIONS

The herpetofauna of the studied regions is one typical for the plain areas, being characterized by Danube crested newts, fire-bellied toads and spadefoot toads. Generally, it is a rather poor and uniform herpetofauna.

With the exception of three species (*Bombina bombina*, *Epidalea viridis* and *Pelophylax ridibunda*), all the other species are rare both as a number of localities and as number of encountered specimens. These three mentioned species are generally little demanding. Both *Bombina bombina* and *Pelophylax ridibunda* inhabit in high numbers the waters from the plain areas (Cogăliceanu et al 2000). *Epidalea viridis* is a typical species for the drier and warmer areas, being the best represented amphibian species from the arid areas of southern Romania – like Dobrudja (Covaciu-Marcov et al 2006b). Thus, its presence in large numbers in the investigated territory, also more arid (Mândruț 2006), is expectable.

The spadefoot toad is relatively well represented, being identified in 6 localities (Table1). This fact was predictable, *Pelobates fuscus* being a digging toad and thus favored in the plain areas with light soil (Fuhn 1960). It is likely that it is even more numerous, but it is difficult to observe due to its nocturnal way of life. Its populations are concentrated around water courses, necessary for laying eggs. Also because of its nocturnal way of life, it is less affected by human activities brought to the plain areas, the only time frame when

it's actually vulnerable being its breeding period. The absence of breeding sites is the most important fact that determines the absence of the toad from certain areas of he studied territory.

Much rarer than the above mentioned species is *Pelobates syriacus*, identified in only one locality. However, this is the first indication for this species in Ialomita County. Although apparently surprising, this fact is a normal one, the eastern spadefoot toad being present both to the north-west, in Buzau County, and to the south, in the Danube's meadow, at Oltenita and Giurgiu (Cogălniceanu et al 2000, Iftime 2005 b). Thus the population from Gura Ialomitei is one linking the other two areas, apparently separated until now. This new information suggests a broader distribution of the species in this area and indicates the necessity of further studies in the Danube's meadow in order to establish, more accurately, the distribution of this species, found in Romania at the northern limit of its areal (Džukić et al 2008). *P. syriacus* was identified while breeding, in the canals situated along the abandoned railroads from Țăndărei la Giurgeni, but we also observed dead bodies on the surrounding road.

Table 1

The distribution of the amphibians and reptiles in the locatilities of the studied region.

Td=*Triturus dobrogicus,* **Tv**=*Triturus vulgaris,* **Bb**=*Bombina bombina,* **Pf**=*Pelobates fuscus,* **Ps**=*Pelobates syriacus,* **Ev**=*Epidalea (Bufo) viridis,* **Pr**=*Pelophylax (Rana) ridibundus***,** **Eo**=*Emys orbicularis,* **La**=*Lacerta agilis,* **Lv**=*Lacerta viridis,* **Nn**=*Natrix natrix.*

Locality	**County**	**Td**	**Tv**	**Bb**	**Pf**	**Ps**	**Ev**	**Pr**	**Eo**	**La**	**Lv**	**Nn**
Baldovineşti	Brăila	-	-	X	-	-	-	X	-	X	-	-
Bărăganul – Br	Brăila	-	-	X	X	-	X	X	-	-	-	-
Berteştii de Jos	Brăila	-	-	X	-	-	X	X	-	-	-	-
Călinenii Noi	Vrancea	-	X	-	-	-	X	X	-	-	-	-
Cuza Vodă	Brăila	X	X	X	X	-	X	X	-	-	-	X
Făcăieni	Ilfov	-	-	X	X	-	X	X	-	-	X	X
Grădiştea	Brăila	-	-	-	-	-	-	X	-	-	-	-
Gura Ialomiței	Ilfov	-	-	X	-	X	X	X	-	-	-	-
Însurăței	Brăila	-	-	X	-	-	X	X	-	-	-	-
Luciu	Ilfov	-	-	-	-	-	X	X	-	-	-	-
Mihai Bravu	Ilfov	-	-	X	-	-	X	X	-	-	-	-
Mihail Kogăliceanu	Brăila	X	X	X	X	-	-	X	-	-	-	-
Movila Miresii	Brăila	-	-	X	-	-	-	X	-	-	-	-
Progresu	Ilfov	-	-	-	-	-	X	-	-	-	-	X
Stelnica	Ilfov	-	-	X	X	-	X	X	-	-	X	-
Şuțești	Brăila	-	-	X	-	-	-	X	-	-	-	-
Valea Cânepii	Brăila	-	-	-	-	-	-	X	X	-	-	-
Viziru	Brăila	X	X	X	X	-	-	X	-	-	-	X
Vlădeni	Ilfov	-	-	-	-	-	X	-	-	-	X	-
Total		3	4	13	6	1	12	17	1	1	3	4

Both newt species are rare in the area, the Danube crested newts being even less frequent than the smooth newts. This fact is suggested by the reduced number of localities in which they were identified, but also by the effort their capturing demands. All the identified newt populations are retreated in the canals and ditches from alongside the roads or between agricultural fields. This fact can lead to the disappearing of the newts, which are generally negativeky affected by the presence of fish (Joly et al 2001, Denoël et al 2005). In the canals that are inhabited by fish, we only found common smooth newts. In all habitats in which we found newts, the average working time was 0.5 hours with two people in the water. Despite this fact, we only managed to find one *T. dobrogicus* and 6 *L. vulgaris* in each habitat, very little in comparison with other areas of the country. Further more, the number of investigated habitats is about double the one in which we actually found newts. Thus, the rarity is not caused by the lack of aquatic habitats but by the absence, almost entirely, of terrestrial ones. In all the cases, the aquatic biotopes inhabited by the newts are isolated from one another and surrounded by agricultural fields. Therefore, despite the fact that the newts have places to breed, they don't have where to live their terrestrial life. This is an even more limiting factor for the Danube crested newt, due to their bigger size. Similar situations were also signaled in other areas of Romania (Covaciu-Marcov et al 2009).

The reduced number of localities and species of reptiles must be looked at differently, probably being a consequence of the unfavorable period for them since the beginning of April 2008 was cold and windy. The green lizards are present in higher and steeper areas that flank the Danube or on bushy road sides.

The human impact is, presently, represented mainly by road kills. Practically, all the amphibian species except for the newts plus the grass snakes fall victim to this phenomenon. In the case of *P. fuscus*, we found stretches of roads of some few meters with more than 20 dead toads. Further more, many aquatic habitats are polluted with sewer water. It is problematic the survival itself of some of many of these species, due to the global impact over this region which is in fact completely transformed in agricultural fields.

REFERENCES

1. Brown L. J. An Evaluation of Some Marking and Trapping Techniques Currently Used in the Study of Anuran Population Dynamics. Journal of Herpetology, Vol. 31, No. 3, 410-419, 1997.
2. Cogălniceanu D. Practicum de ecologie a *Amfibienilor* - metode şi tehnici în studiul ecologiei *Amfibienilor*. Ed. Universităţii din Bucureşti, 1-122, 1997.
3. Cogălniceanu D., Aioanei F., Bogdan M. Amfibienii din România, Determinator. Ed. Ars Docendi, Bucureşti, 1-99, 2000.
4. Covaciu-Marcov S. D., Telcean I., Cupşa D., Cadleţ D., Zsurka R. Contribuţii la studiul herpetofaunei din regiunea Marghita (jud. Bihor, România). Analele Univ. din Oradea, Fasc. Biol., Tom IX, 47-58, 2002.
5. Covaciu-Marcov S. D., Cupşa D., Telcean I., Sas I., A. Cicort. Contribuţii la cunoaşterea herpetofaunei din regiunea cursului mediu şi inferior al Crişului Negru (Judeţul Bihor, România). Oltenia, Studii şi Comunicări, Ştiinţele Naturii, Vol. XIX, 189-194, 2003.
6. Covaciu-Marcov S. D., Ghira I., Sas I. Contribuţii la studiul Herpetofaunei zonei Oaşului (Judeţul SM, România). Mediul cercetare, protecţie şi gestiune, 2, Cluj – Napoca, 107-112, 2004.

7. Covaciu-Marcov S. D., Cicort-Lucaciu A. Şt., Sas I., Ile R. D. The herpetological fauna of "Culmea Codrului" (Satu - Mare county, Romania). Analele Univ. din Craiova, Vol XLVI, 163-168, 2005.
8. Covaciu-Marcov S. D., Sas I., Kiss A., Bogdan H., Cicort-Lucaciu A. Şt. The herpetofauna from the Teuz River hydrographic basin (Arad County, Romania). N. West. J. Zool., 2 (1): 27-38, 2006 a.
9. Covaciu-Marcov S. D., Ghira I., Cicort-Lucaciu A.-Şt., Sas I., Strugariu A., Bogdan H. V. Contributions to knowledge regarding the geographical distribution of the herpetofauna of Dobrudja, Romania. North West. J. Zool., 2 (2): 88-125, 2006 b.
10. Covaciu-Marcov S.-D., Cicort-Lucaciu A.-Şt., Sas I., Groza M., Bordaş I. Contributions to the knowledge regarding the herpetofauna from the Maramureş county areas of "Măgura Codrului", Romania. Biharean Biologist, Vol. I, 50-56, 2007.
11. Covaciu-Marcov S. D., Bogdan H. V., Paina C., Toader S., Condure N. The herpetofauna of the north-western region of Bihor County, Romania. Biharean Biologist Vol. II, 5-13, 2008.
12. Covaciu-Marcov S.-D., Sas I., Cicort-Lucaciu A.-Şt., Kovacs E.H., Pintea C. Herpetofauna of the Natural Reserves from Carei Plain: zoogeographical significance, ecology, statute and conservation. Carpathian Journal of Earth and Environmental Sciences. 4, 1, 69-80, 2009 a.
13. Covaciu-Marcov S.-D., Cicort-Lucaciu A.-Şt., Gaceu O., Sas I., Ferenţi S., Bogdan H. V. The herpetofauna of the south-western part of Mehedinţi County, Romania. North Western Journal of Zoology, 5 (1), 142-164, 2009 b.
14. Denoël M., Džukić G., Kalezić M. Effect of widespread fish introductions on paedomorphic newts in Europe. Conservation Biology 19, 162-170, 2005.
15. Džukić G., Beškov V., Sidorovska V., Cogălniceanu D., Kalezić M. Contemporary chorology of the spadefoot toads (*Pelobates spp*.) in the Balkan Peninsula. Zeitschrift für Feldherpetologie 15: 61-78, 2008.
16. Fuhn I. "Fauna R.P.R.", vol. XIV, fascicola I, Amphibia. Editura Academiei R.P.R., Bucureşti, 1-288, 1960.
17. Fuhn, I., Vancea, Şt. "Fauna R.P.R.", vol. XIV, Fascicola II, Reptilia. Editura Academiei R.P.R., Bucureşti. 1-352, 1961.
18. Gherghel I., Strugariu A., Ghiurcă D., Roşu S., Hutuleac-Volosciuc M.V. (2007): The composition and distribution of the herpetofauna from the Valea Neagră river basin (Romania). Herpetologica Romania Vol. 1, 70-76.
19. Gherghel I., Strugariu A., Ghiurcă D., Cicort-Lucaciu A.-Şt. The herpetofauna from the Bistriţa river basin (Romania): geographical distribution. North West. J. Zool., 4, Suppl. 1: S71-S103, 2008.
20. Iftime A. Herpetological observations in the Danube Floodplain sector in the Giurgiu county (Romania). Travaux du Museum Natioal d'Histoire Naturelle «Grigore Antipa», Vol. XLVIII, 339-348, 2005 a.
21. Iftime Al. Amfibieni şi Reptile. În: Cartea Roşie a Vertebratelor din România, editori: Botnariuc & Tatole. Ed. Acad. Române, 1-325, 2005 b.
22. Iftime A., Iftime O. Some records of the Herpetofaua of the Danube Floodplain in the Balta Ialomiţei area (Romaia). Travaux du Museum Natioal d'Histoire Naturelle «Grigore Antipa», Vol. L, 273-281, 2007.
23. Joly P., Miaud C., Lehmann A., Grolet O. Habitat Matrix Effects on Pond Occupancy in Newts. Conservation Biology, Vol. 15, No. 1. 23-248, 2001.

24. Kati V., Foufopoulos J., Ioannidis Y., Papaioannou H., Poirazidis K., Lebrun P. Diversity, ecological structure and conservation of herpetofauna in a Mediterranean area (Dadia National Park, Greece). Amphibia-Reptilia 28: 517-529, 2007.
25. Mândruţ, O. (2006): Mic Atlas de Geografie a României. Ed. Corint, Bucureşti, 1-48.
26. Posea, G., Badea, L. România, Harta Unităţilor de relief (Regionarea geomorfologică). Ed. Ştiinţifică şi Enciclopedică, Bucureşti, 1984.
27. Strugariu A., Gherghel I., Volosciuc-Hutuleac M.V., Săhlean T.C., Sas I., Puşcaşu C.M. Preliminary data concerning the distribution of amphibian fauna in Suceava County (Romania). Analele Univ. din Oradea, Fasc. Biol., 39-47, 2006.
28. Strugariu Al., Gherghel I., Puşcaşu C. M., Săhlean T. C. The current status of the herpetofauna and the important herpetofaunal areas from Suceava County (Romania). Analele Ştiinţifice ale "Al. I. Cuza" Iaşi, s. Biol. anim. Tom. LIII, 167-174, 2007.
29. Strugariu A., Zamfirescu Ş. R., Nicoară A., Gherghel I., Sas I., Puşcaşiu C. M., Buceac T. Preliminary data concerning the distribution ad status of the herpetofauna in Iaşi Couty (Romania). North-Wester Journal of Zoology, Vol. 4, Suppl. 1, S1-S23, 2008.
30. Török Z. Herpetological investigations in the lower Danube area (Calafat-Călăraşi sector). Studii şi cercetări Biologie, Bacău, 6, 115-119, 2001.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

CONCERNING A CASE OF DELAY OF THE METAMORPHOSIS AT *SALAMANDRA SALAMANDRA* (AMPHIBIA) FROM THE NORTH-WESTERN PART OF ROMANIA

Covaciu-Marcov Severus-Daniel[1], Cicort-Lucaciu Alfred-Ştefan[1]

KEY WORDS: *Salamandra salamandra, larvae, delay of metamorphosis*

ABSTRACT

We identified on March 2007 in Maramureş County five Salamandra salamandra larvae, which did not metamorphose in the previous year. The larvae had different sizes, the largest one reaching 6.9 cm in length, while the gills measured 5 mm. The larvae passed winter in this stage due to the higher temperatures registered in the previous winter, which prevented the freezing of the puddles. Meanwhile, the precipitation from the previous summer was abundant, thus maintaining the water level high. Therefore, the cause of the delay of the larvae metamorphosis is identical to the one that determined the appearance of the phenomenon in 2007 at several salamandride species from Romania.

INTRODUCTION

Amphibians have a complex, well-defined life cycle, presenting an aquatic larvae stage and an adult terrestrial one (Cogălniceanu et al 2000). Thus, the adults breathe in the terrestrial medium through the lungs and tegument, even if some species are also present in this stage in the water. In the same time, there are terrestrial species with the exception of the egglaying period (Fuhn 1960). On the contrary, the larvae are gilled and breathe oxygen dissolved in water, being obviously aquatic (Cogălniceanu et al 2000). The egglaying of the amphibians from Romania takes place in the spring, at the beginning of the activity period (Fuhn 1960), with the exception of the populations from the thermal habitats at which reproduction occurs during the whole year, not presenting a hibernation period (Covaciu-Marcov et al 2006). The larvae metamorphose at the end of summer or at the beginning of autumn (Cogălniceanu et al 2000). There are also deviations from this normal cycle. Thus, on the one hand the larvae development can be completely stopped, the animal developing under a gilled aquatic larvae form until it reaches the dimensions characteristic of the adult, in some cases even becoming capable of reproducing in this stage. Paedomorphs are large-sized individuals, with gills, their reproductive capacity not being known, while paedogens represent such individuals at which the reproductive capacity has been demonstrated (Andreone et al 1993). Thus, paedogenesis is considered a particular form of paedomorphosis (Litvinchuk et al 1996). On the other hand, the larvae can sometimes remain in this stage during a cold season, the metamorphosis being thus delayed or

[1] University of Oradea, Faculty of Sciences, Department of Biology

postponed (Nečas 1997, Covaciu-Marcov & Cicort-Lucaciu 2009). The diversions from the normal development cycle can be caused by multiple factors (Semlitsch 1987, Semlitsch et al 1990, Ryan & Semlitsch 2003, Denoël et al 2005).

Salamandra salamandra is a strictly terrestrial species, at which including the reproduction takes place in this medium, just the larvae being deposited in the water. It is a well-represented species in Europe, being spread in deciduous and more rarely coniferous forests (Veith 1997). In Romania, it is common in hilly and mountainous areas with altitudes of over 200 m (Cogălniceanu et al 2000). The larvae are mainly present in running waters (Fuhn 1960). The aim of the present study is to record in a premier for north-western Romania the identification of some nonmetamorphic *Salamandra salamandra* larvae.

MATERIALS AND METHODS

The study took place in March 2007. In the interval, we performed in the region investigations upon the composition and geographic distribution of the herpetofauna of the western region of Maramureş County (Covaciu-Marcov et al 2008). The area is situated in the north-western part of Romania, at the level of the southern slope of Igniş Mountains. During such investigations, we accidentally encountered several nonmetamorphic *Salamandra salamandra* larvae. We captured them from an aquatic habitat, using a net that was fixed on a 2 m long metallic rod. After capturing, the most developed larva was photographed in an aquarium, afterwards all of the individuals being released in their habitat.

RESULTS AND DISCUSSIONS

We captured five *Salamandra salamandra* larvae of different sizes on 15 III 2007 near Cicârlău locality from the western part of Maramureş County (47°42’89”N / 23°25’04”E). The smallest had 4.2 cm in length while the largest reached 6.9 cm. The different measures and the capturing period in relation with the dimension of the largest larva prove that they were laid in the previous year and passed in this stage through winter. The conclusion is also strengthen by the fact that salamanders lay their larvae during spring (Fuhn 1960, Cogălniceanu et al 2000), while we identified larvae with dimensions characteristic to the metamorphosis in a period in which they should have just barely been laid. Regarding the largest individual, it already presented the pattern on the body. Its gills measured 5 mm in length in the case of the longest pair. At the smaller individuals, the gills were longer in connection to the body. The largest individual had dimensions similar to the ones described in the literature for the larvae of this species, which reach maximum 7 cm before metamorphosis (Fuhn 1960, Cogălniceanu et al 2000), in comparison to 6.9 cm registered in our case.

The habitat is represented by a bogging area of approximately 3 m², formed at the level of a stream with a low but constant flow. The water depth reaches maximum 50 cm, at the level of the substratum being present pebbles, dead leaves and few silt. Normally, the water has a low turbidity degree. The habitat lies at an altitude of 356 m, being bordered on one side by a beech forest, and on the other one by a meadow. Together with *Salamandra salamandra* larvae, in the habitat there were also present *Rana dalmatina* and *Rana temporaria* egglaying, and *Lissotriton montandoni* individuals, species found in the area at unusually low altitudes (Covacu-Marcov et al 2008).

Figure no. 1 The studied *Salamandra salamandra* individuals

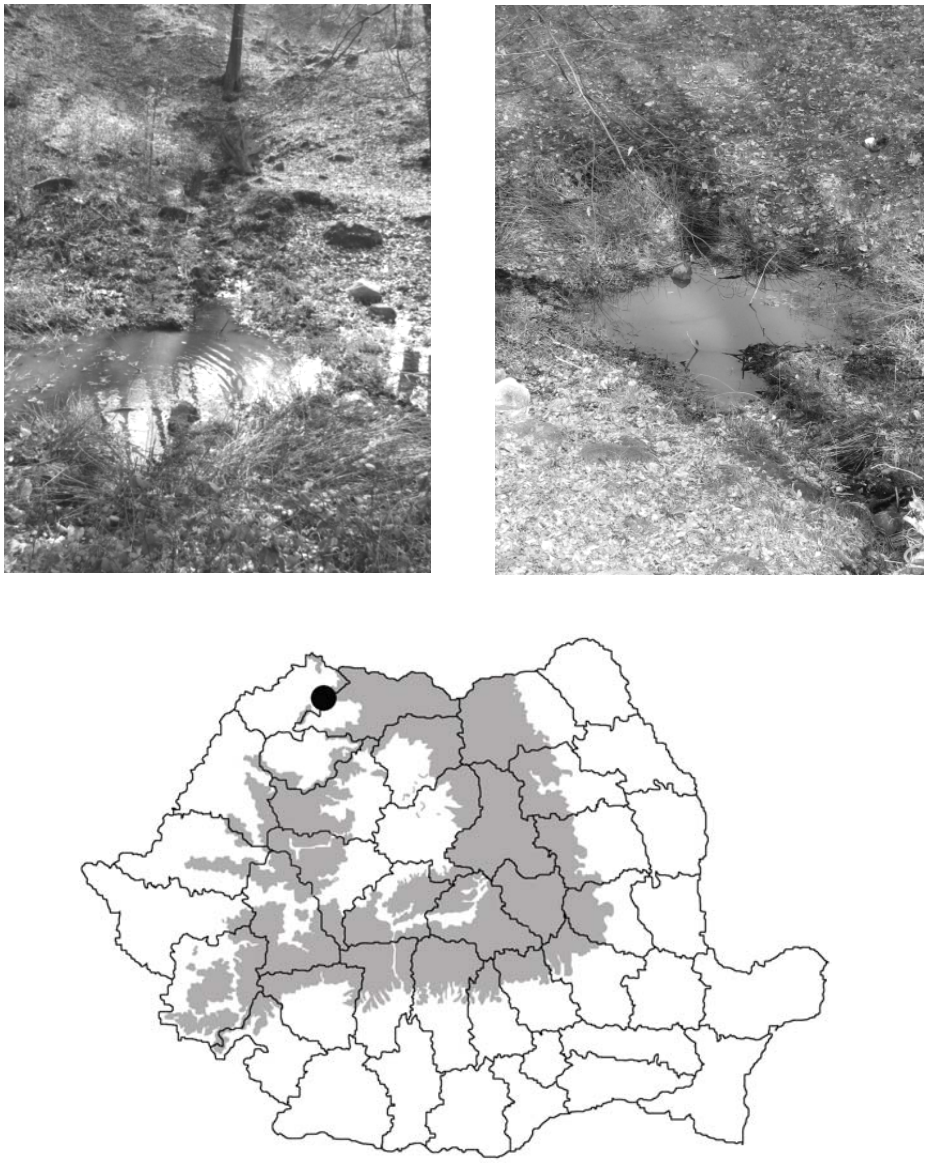


Figure no. 2. The location of the studied habitat

The recorded phenomenon represents a slowing down or even an interruption of the metamorphosis at the salamanders, but not an installation of paedomorphosis. Such cases of interrupted or delayed metamorphosis have been previously signalled both at this species and at other salamandride species from other sectors of their area (Nečas 1997, Covaciu-Marcov & Cicort-Lucaciu 2009). At Cicârlău, the phenomenon affected several individuals from a reduced-sized habitat, having thus a populational valence. On the other hand, the phenomenon had different speeds, affecting at a distinct scale various individuals from the population, fact indicated by the samples with different sizes.

Generally, metamorphosis appears together with the modification of some parameters of the aquatic medium, its delay and the establishment of the paedomorphosis being possible in the case in which the conditions from the aquatic medium are more favourable than the ones from the terrestrial one (Whiteman 1994). In 2006 and during the winter between 2006 and 2007, the climatic conditions were of such nature that they promoted the aquatic medium. Thus, it is known that the drying out of the puddles is one of the most important factors that trigger metamorphosis (Denoël 2003). The summer of 2006 was an extremely rainy one. As a consequence of this fact, the water level from the habitat was constant, which stopped the normal starting of the metamorphosis. Meanwhile, the following winter was extremely gentle, with few days with negative temperatures. Thus, the water did not freeze during winter, which allowed the survival of the larvae that did not metamorphose. The phenomenon was strengthened by the habitat particularities, which is not a typical stream, therefore characteristic for the *Salamandra salamandra* larvae, but is a bogging area, thus a habitat closer to a static one. Due to these particularities, the larvae were more susceptible of being influenced by the climatic conditions that would have been less noticeable regarding a proper stream. This phenomenon was also described in 2007, at two different newt species (Covaciu-Marcov & Cicort-Lucaciu 2007, 2009), although previously it had not been recorded in western Romania. In both cases, the explanation is the same, identical with the one described above. Thus, these parameters acted upon a habitat close to the ones normally used by newts, determining the delay of the metamorphosis also in the case of the salamanders and underlining the degree of dependence of these amphibians towards different environmental factors.

CONCLUSIONS

At the beginning of March 2007, we captured near Cicârlău locality from Maramureş County several *Salamandra salamandra* larvae that remained over winter in the aquatic habitat in the respective development stage. The larvae had different dimensions, the largest one surpassing the normal sizes of the larvae that reached metamorphosis. The larvae passed over winter in this stage due to the climatic conditions from the previous year. Thus, summer being a rainy one, allowed a constant maintenance of the water level, and the gentle winter prevented the water freezing and the death of the larvae. Similar situations were signalled in western Romania twice at two different species also in 2007, although previously they were not mentioned in the region, underlining the validity of the explanation.

REFERENCES

1. Andreone F., Dore B., Usai P., Paraninfo A. Skin morphology in larval, paedomorphic and metamorphosed alpine newts, *Triturus alpestris apuanus*. Alytes,11 (1): 25-35, 1993.
2. Cogălniceanu D., Aioanei F., Bogdan M. Amfibienii din România, Determinator. Ed. Ars Docendi, Bucureşti, 1-99, 2000.
3. Covaciu-Marcov S.-D., Sas I., Cicort-Lucaciu A.-Şt. Amfibienii apelor termale din vestul României. Ed. Univ. din Oradea, 1-159, 2006.
4. Covaciu-Marcov S.-D., Cicort-Lucaciu A.-Şt., Sas I., Moşu A. G., Toth B. Contributions to the knowledge of the composition and geographical distribution of the Western Maramureş County herpetofauna. Herpetologica Romanica, 2: 27-36, 2008.

5. Covaciu-Marcov S.-D, Cicort-Lucaciu A.-Ş. Notes on the presence of facultative paedomorphosis in the smooth newt *Lissotriton vulgaris* (Linnaeus, 1758) in western Romania. North Western J. Zool., 3 (1): 53-57, 2007.
6. Covaciu-Marcov S.-D., Cicort-Lucaciu A.-Şt. Big and nonmethamorphic *Triturus cristatus* larvae from north-western Romania. Biharean Biologist, 3 (1): 87-89, 2009.
7. Denoël, M. How do paedomorphic newts cope with lake drying ? Ecography, 26: 405-410, 2003.
8. Denoël M., Joly P., Whiteman H. H. Evolutionary ecology of facultative paedomorphosis in newts and salamanders. Biol. Rev, 80: 663-671, 2005.
9. Fuhn I. "Fauna R.P.R.", vol. XIV, Fascicola I, Amphibia. Editura Academiei R.P.R., Bucureşti, 1-288, 1960.
10. Litvinchuk S. N., Rudyk A. M., Borkin L. J. Observation of paedomorphic newts (*Triturus vulgaris*) from the former Soviet union. Russian Journal of Herpetology, 3 (1):39-48, 1996.
11. Nečas P., Modrý D., Zavadil V. Czeh Recent and Fossil Amphibians and Reptiles. Ed. Chimaira, 1-94, 1997.
12. Ryan T. J., Semlitsch R. D. Growth and the expression of alternative life cycles in the salamander *Ambystoma talpoideum* (Caudata: Ambystomatidae). Biological Journal of the Linnean Society, 80: 639-646, 2003.
13. Semlitsch, R. D. Paedomorphosis in *Ambystoma talpoideum*: effects of densizy, food and pond drying. Ecology, 68: 994-1002, 1987.
14. Semlitsch R. D. Harris R. N., Wilbur H. M. Paedomorphosis in *Ambystoma talpoideum*: maintenance of population variation and alternative life-history pathways. Evolution, 44: 1604-1613, 1990.
15. Veith M. *Salamandra salamandra* (Linnaeus 1758). In: Gasc J. P., (ed.). Atlas of Amphibians and Reptiles in Europe, 68-69. Museum National D'Histoire Naturelle, Paris. 1997.
16. Whiteman H. H. Evolution of facultative paedomorphosis in salamanders. Quarterly Review of Biology, 69: 205-221, 1994.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

THE TROPHIC SPECTRUM OF A *Pelophylax* kl. *esculentus* (AMPHIBIA) POPULATION FROM HINOVA AREA, MEHEDINȚI COUNTY, ROMANIA

David Anamaria[1], Cupşa Diana[1], Sas Istvan[1], Dimancea Nicoleta[2], Nagy Denisa[1]

KEY WORDS: Pelophylax kl. *esculentus, feeding, juveniles.*

ABSTRACT

The study took place in 2007, on 12th April, near Hinova locality, Mehedinți County. We analysed the stomach contents of 90 individuals, identifying a total of 452 preys. Coleoptera and Diptera Nematocera represented the most important categories. The samples presented beside animal prey, vegetal fragments and shed-skin. From the 452 preys, 96.57% have a terrestrial origin, the analysed Pelophylax kl. esculentus individuals feeding mostly on land.

INTRODUCTION

Pelophylax kl. *esculentus* is a natural hybrid between *P. lessonae* (genome LL) and *P. ridibundus* (genome RR), usually with a diploid set of chromosomes LR which is dependent on gametes from one or the other parental species (Christiansen 2009). The taxonomy of the edible frog was long discussed in the scientific literature, being clarified only in the '70 (Berger 1973), after that numerous genetic studies concerning the status of the green frogs from the *Pelophylax esculentus* complex appeared (Graf & Muller 1979; Holenweg 2001; Borkin et al., 2006).

There are few studies regarding the feeding of this frog (Ferenți et al., 2007; Sas et al., 2007, 2009), most of the papers analysing together the three species, referring to them as the *Pelophylax esculentus* complex (Cogălniceanu et al., 2000; Kovács & Török 1995). Several studies about the trophic spectrum of the parental species were realized in the last years both at *P. ridibundus* (Covaciu-Marcov et al., 2003, 2005; David et al., 2008), and at *P. lessonae* (Sas et al., 2005). *P.* kl. *esculentus* is more abundant in the studied area than *P. lessonae,* in the plain sector it can be found in swamp areas or near the forests, while in the higher zones it occurs in the vicinity of the streams that flow into the Danube (Covaciu-Marcov et al., 2009).

Taking into account that Amphibian populations are in decline all over the world (Lips et al., 2004) due to pollution, anthropogenic activities, parasites, climatic changes or the disappearance of breeding and feeding habitats, a series of measurements are necessary for their protection as well as data referring to the ecology of different Amphibian populations (Bisa et al., 2007).

[1] University of Oradea, Faculty of Sciences, Department of Biology
[2] University of Oradea, Faculty of History and Geography, Environmental Geography

MATERIALS AND METHODS

The samples were collected on 12th April 2007 near Hinova locality, situated in the western part of Mehedinți County. In this habitat we also found some *P. ridibundus* and *P. lessonae* individuals, but because of their reduced number we couldn't use them in our study. The habitat is represented by a swampy area, having large dimensions, the vegetation being abundant (bulrush, *Juncus*), this habitat offers the necessary conditions for both the feeding and the breeding of the frogs.

Stomach contents were collected using the stomach-flushing method (Sole et al., 2005). This method has the advantage that one can perform feeding studies without killing the individuals. The samples were preserved in a 4% formaldehyde solution and stored in airtight test tubes.

The aim of the study was to determine the differences that appear related to the ontogenetic stage of development, the weight and the frequency of the prey taxa, the intensity of the feeding and also the amount of aquatic and terrestrial preys. The food diversity was estimated with the Shannon-Wiener index (1949).

RESULTS AND DISCUSSIONS

In the stomach contents of the females we identified 108 preys, grouped in 21 categories, while the juveniles consumed 344 preys belonging to 28 prey taxa categories.

Table no.1

The number of analysed individuals. The amount of stomachs with vegetal and shed skin The total, maximum and average number of preys. The amount of aquatic and terrestrial preys. The feeding diversity.

	Females	***Juveniles***	***Total***
No. of analyzed individuals	23	67	90
% vegetal remains	30.4	40.4	37.8
% shed skin	8.7	5.7	6.67
Total no. of prey	108	344	452
Max. no. of prey/individual	12	15	15
Aver. no. of prey /individual	4.69	5.13	5.02
% terrestrial prey	96.16	99.81	96.57
% aquatic prey	3.84	0.19	3.43
Feeding diversity (H)	2.49	2.58	2.62

From the 90 captured individuals, 23 were females and 67 were juveniles, in this habitat we didn't find any males.

The vegetal fragments found in the stomach contents were accidentally swallowed together with the animal preys (Sas et al., 2009), the plant remains having no nutritional value for the Amphibian adults. The amount of the stomachs with vegetal remains is 37.8% at this population (Table no. 1), but in other studies concerning the feeding of the edible frog the amount of the vegetal exceeds 60% (Ferenți et al., 2007) or it reaches 80% (Sas et al. 2007, 2009). The shed skin fragments have a low amount in the food of the analysed frogs, 8.7% of the females using this type of resources, while in the case of the juveniles the percent is 5.7. At some Amphibian species it was observed that the frequency of shed skin consumption was higher in unfavourable periods, when the animal preys were not enough (Cicort-Lucaciu et al., 2007

One of the most important animal preys are the Coleoptera. At the females this group represents 26.9% from the total number of preys, while at juveniles the percent drops at 20.9. The Coleopteras were consumed by the majority of the individuals, the frequency of consumption is 64.4%, the preys being accessible for a large number of frogs. At the *P.* kl. *esculentus* population from Foieni (Sas et al., 2009), it can be observed that also in April, the Coleoptera represent an important category of prey taxa, their frequency being 78.95%.

Regarding the juveniles, the Diptera-Nematocera register the same weight value (20.9%) as the Coleoptera do, while the frequency surpasses 50% (Table no. 2). Their weight is lower in the case of the females, which use the "*sit and wait*" hunting strategy, eating large sized preys (Coleoptera, Anelida), thus attacking when it enters in their visual field. The presence in the food of the juveniles of some small preys (Nematocera, Collembola, Afidina) and of some with reduced mobility (Lepidoptera larvae) indicates the fact that they use a different feeding strategy than the one used by the adults. In comparison, the small preys are missing or have a lower value, in the case of the females. Thus the juveniles have an active way of feeding, unlike the females which sit and wait for the prey. The Nematocerans were identified in the trophic spectrum of some previous studied populations, being found in both the imago stage and the larvae form (Ferenți et al., 2007, Sas et al., 2007, 2009).

Regarding the terrestrial Heteroptera, the weight and frequency values have approximately the same percentage in both the females' and juveniles' diet (Table no. 2). There is a noticeable difference between the amount and frequency value, this fact indicates that the preys are accessible for a great number of frogs, 37.8% of the population, but their quantity is reduced.

The spiders were mostly consumed by the females, registering an amount of 11.1% and a frequency of 34.8%, unlike the juveniles where the amount of this prey category is 6.69%. The Araneids were also found in many stomach contents at the population from Igneşti, Arad County (Ferenți et al., 2007). This prey category is widespread in nature and can be consumed by the frogs regardless of the environmental conditions.

Regarding the feeding intensity, we can observe that in the case of the juveniles the average number of preys is higher than the one registered at the females. This is due to the fact that juveniles eat many small sized preys (Nematocera, Afidina), which leads to bigger quantities of consumed preys.

The feeding diversity is higher at the juveniles (2.58) than at the females (2.49). The juveniles need higher amounts of energy for the growing period, thus their feeding is more intense. After the results of Cogălniceanu and collaborators (2000) the juveniles from the green frog complex have a wider trophic niche, than the adults do.

The terrestrial preys represented 96.57% from all of the preys identified in the stomach contents of the analysed frogs, because they hunt in areas where the water level is reduced, the preys being captured from the surface of the vegetation. The majority of the aquatic preys were consumed by the females, being represented by the Gasteropoda and Heteroptera.

Tabele no. 2

The amount (%A) and the frequency (%f) of the prey taxa in the analysed stomach contents

	Females		***Juveniles***		***Total***	
Prey taxa	**%A**	**%f**	**%A**	**%f**	**%A**	**%f**
Anelida-Oligocheta	0.93	4.35	0.29	1.49	0.44	2.22
Gasteropoda-snails (a)	1.85	4.35	2.33	8.96	2.21	7.78
Gasteropoda-Limax	3.7	17.4	1.45	7.46	1.99	10
Crustaceea-Izopoda(t)	0.93	4.35	0.29	1.49	0.44	2.22
Arahnida-Araneida	11.1	34.8	6.69	26.9	7.74	28.9
Collembola	-	-	0.87	4.48	0.66	3.33
Odonata	1.85	4.35	-	-	0.44	1.11
Ortoptera	1.85	8.7	0.29	1.49	0.66	3.33
Heteroptera(a)	1.85	8.7	0.87	4.48	1.11	5.56
Heteroptera(t)	11.1	39.1	10.8	37.3	10.8	37.8
Homoptera-Afidina	-	-	1.74	7.46	1.33	5.56
Homoptera-Cicadina	1.85	8.7	0.29	1.49	0.66	3.33
Lepidoptera (L)	-	-	0.29	1.49	0.22	1.11
Lepidoptera	-	-	0.58	2.99	0.44	2.22
Coleoptera-Dytiscidae	-	-	1.45	5.97	1.11	4.44
Coleoptera-undet.	26.9	65.2	20.9	64.2	22.3	64.4
Coleoptera-Carabida	2.78	13	1.16	5.97	1.55	7.78
Coleoptera-Cryzomelida	-	-	1.74	8.96	1.33	6.67
Coleoptera-Coccinelida	0.93	4.35	0.87	4.48	0.88	4.44
Coleoptera-Curculionidea	0.93	4.35	4.36	19.4	3.54	15.6
Coleoptera-Scarabeidea	2.78	13	2.03	8.96	2.21	10
Coleoptera-Elaterida	1.85	8.7	-	-	0.44	2.22
Coleoptera-Stafilinida	-	-	2.33	11.9	1.77	8.89
Coleoptera-Cantarida	-	-	0.87	4.48	0.66	3.33
Diptera-Nematocera	10.2	43.5	20.9	56.7	18.4	53.3
Diptera-Brahicera (L)	-	-	0.58	2.99	0.44	2.22
Diptera-Brahicera	6.48	26.1	6.98	28.4	6.86	27.8
Hymenoptera-undet.	0.93	4.35	3.78	14.9	3.1	12.2
Hymenoptera-Formicida	7.41	26.1	4.07	11.9	4.87	15.6
Hymenoptera-Apida	1.85	8.7	1.16	2.99	1.33	4.44

The relation between the body size and the number of consumed preys shows that the frogs which have 30-40 mm, eat a large number of preys. The small frogs are restrained to eat only small sized preys, only sometimes consuming bigger preys like Anelida, thus for satisfying the energetic necessities they have to eat a large number of preys. The size of the mouth limits the utilization of the trophic resources, but the small preys can be captured both by big and small fogs (Lőw et al., 1990).

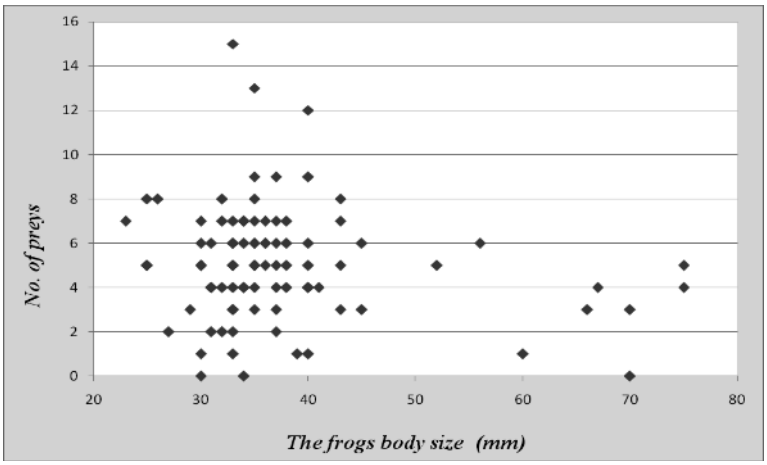


Figure no. 1
The relation between the consumed number of preys and the body size of the analysed individuals.

CONCLUSIONS

The analysis of the trophic spectrum reveals the fact that the population consumes the preys which are most abundant in the habitat, their presence being conditioned by the environmental conditions which can influence the development of the potential preys as well as their life cycle. The most important prey taxa are represented by the Coleoptera, Nematocera, Heteroptera and Araneida.

The feeding intensity and diversity is higher in the case of the juveniles than in that of the females, which eat many small sized preys. The frogs use different hunting strategies, depending on the ontogenetic stage of development, thus the females use the "*sit and wait*" strategy, while the juveniles have an active way of feeding.

The low number of individuals that didn't present stomach contents (3) and also the high value of the feeding diversity indicate optimal survival conditions for the analysed population in this habitat.

REFERENCES

1. Berger, L. Systematics and hybridization in European green frogs of *Rana esculenta* Complex. Journal of Herpetology 7:1-10, 1973.
2. Bisa, R., Sfenthourakis, S., Fraguedakis-Tsolis, S., Chondropoulos, B. Population density and food analysis of *Bombina variegata* and *Rana graeca* in mountainous riverine ecosystems of northern Pindos (Greece). Journal of Biological Research-Thessaloniki 8: 129 – 137, 2007.
3. Borkin, L.J., Lada, G.A., Litvinchuk, S.N., Melnikov, D.A., Rosanov, J.M. The first record of mass triploidy in hybridogenic green frog *Rana esculenta* in Russia (Rostov Oblast). Russian Journal of Herpetology 13: 77 – 82, 2006.
4. Christiansen, D.G. Gamete types, sex determination and stable equilibria of all-hybrid populations of diploid and triploid edible frogs (*Pelophylax esculentus*). BMC Evolutionary Biology 9:1-16, 2009.

5. Cicort-Lucaciu, A. Şt., David, A., Covaci, R., Toader, S., Diaconu, I., 2007. Feeding of some *Triturus cristatus populations* in Turţ area (Oas Mountains, Romania). Herpetologica Romanica 1: 30-37, 2007.
6. Cogălniceanu, D., Palmer, M.W., Ciubuc, C. Feeding in Anuran comunities on islands in the Danube floodplain. Amphibia-Reptilia 22: 1-19, 2000.
7. Covaciu-Marcov, S.D., Cicort-Lucaciu, A.Ş., Gaceu, O., Sas, I., Feren□i, S., Bogdan, H.V. The herpetofauna of the south-western part of Mehedinţi County, Romania. North-Western Journal of Zoology 5: 142-164, 2009.
8. Covaciu-Marcov, S.D., Cupşa, D., Sas, I., Zsurka, R., Cicort-Lucaciu A.Ş. Spectrul trofic al unei populaţii nehibernante de *Rana ridibunda* (Amphibia) din apele termale de la Chişlaz, Judeţul Bihor. Analele Universităţii din Oradea, Fascicula Biologie 10: 97–109, 2003
9. Covaciu-Marcov, S.D., Sas, I., Cupşa, D., Bogdan, H., Lukacs, J. The seasonal variation of the food of a nonhibernated *Rana ridibunda* Pallas 1771 population from the thermal lake 1 Mai Spa, Romania. Analele Universităţii din Oradea, Fascicula Biologie 12: 77–85, 2005.
10. Ferenţi, S., Sas, I., Kovacs E.H., David, A., Laza, A. The trophic spectrum of two populations of *Pelophylax* kl. *esculentus*, Linnaeus 1758 from the Teuz River Valley. Analele Universită□ii din Craiova, s. Biologie 12: 175-180, 2007.
11. Graf, J.-D., Muller, W.P. Experimental gynogenesis provides evidence of hybridogenetic reproduction in the Rana esculenta complex. Experientia 35, 1574–1576, 1979.
12. Holenweg, A.-K. Survival in adults of the water frog Rana lessonae and its hybridogenetic associate *Rana esculenta*. Cananadian. Journal of Zooogy 79, 652–661, 2001.
13. Kovács, T., Török, J. Dietary responses by edible frog (*Rana esculenta* complex) to wetland habitat change in Hungary. In: Giesen W. (eds.) Wetlands, Biodiversity and Development. Proceedings of Workshop 2 of the International Conference on Wetlands and development held in Kuala Lumpur, Malaysia, 9-13 October, 1995.
14. Lips, KR, Mendelson, JR, Munoz-Alonso, A, Canseco-Marquez, L, Mulcahy, D.G. Amphibian population declines in montane southern Mexico: resurveys of historical localities. Biological conservation 119: 555-564, 2004.
15. Lőw, P., Török, J., Sass, M., Csörgő, T., 1990. Kétéltűek táplálkozásökológiája a Kis-Balaton természetvédelmi területén. Állattani Közlemények, 76: 79-89
16. Sas, I., Kovács, E.H., Covaciu-Marcov, S.D., Strugariu, A., Covaci, R., Ferenţi, S. Food habits of a *Pelophylax lessonae – Pelophylax* kl. *esculentus* population from North-Western Romania. Biota 8:71-78, 2007.
17. Sas, I, Covaciu-Marcov, S.D., Cupşa, D., Cicort-Lucaciu, A.Şt. & Antal, B. Food habits of *Rana lessonae* and *Rana arvalis* in Covasna county (Romania). Environment & Progress, Cluj-Napoca 5: 359-367, 2005.
18. Sas, I., Covaciu-Marcov, S.-D., Strugariu, A., David, A., Ilea, C. Food habit of *Rana (Pelophylax) kl. esculenta* females in a new recorded E-System population from a forested habitat in North-Western Romania. Turkish Journal of Zoology 33: 1-5, 2009.
19. Shannon, C. E., Wiener, W. The mathematical theory of communication. Univ. Illinois Press, Urbana, 1949.
20. Sole, M., Beckmann, O., Pelz, B., Kwet, A., Engels. Stomach flushing for diet analysis in anurans: an improved protocol evaluated in a case study in Araucaria forests, southern Brazil. Studies on Neotropical Fauna and Environment 40: 23-28, 2005.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

THE TROPHIC SPECTRUM OF A *BUFO BUFO* POPULATION (AMPHIBIA) FROM IEZER MOUNTAIN, ARGEŞ COUNTY, ROMANIA

Dimancea Nicoleta[1], Covaciu Marcov Severus Daniel[2]

KEY WORDS: *Bufo bufo, trophic spectrum, Formicida, Coleoptera*

ABSTRACT

Studies regarding the feeding of Bufo bufo are very rare abroad. The analysis of 35 common toads from Voina chalet, Arges County was realised in a premier for our country. All of the analysed individuals presented stomach content fact that suggests the presence of optimum feeding conditions in the habitat. The results indicate extremely high differences between the weight and the frequency of the same prey taxa. Formicida and Coleoptera dominated the diet of the toads. There are very interesting variations between the prey size, which suggests different hunting techniques. The stomach contents also determined in a high proportion vegetales, which were followed by minerals and shed-skin. The trophic spectrum highlights the exclusive presence of terrestrial preys.

INTRODUCTION

Global studies on amphibians have highlighted that they have been declining primarily due to the anthropogenic interventions in their habitats (Stuart et al 2004). Researchers have stated that amphibians can reveal information regarding the environmental conditions and the changes that affect the biotope (Hopkins 2007). Therefore, because of their connection to both the aquatic and terrestrial medium, they can be regarded as important ecological indicators, which as a result can contribute to the conservation of the ecosystem and its species (Inger & Colwell 1977). One parameter that can suggest interesting relations between the environment and amphibians is provided by the feeding habits (Beebee 1996, Kennett & Troy 1996). The characteristics of the different prey taxa that comprise the stomach contents can underline certain modifications, such as climatic ones, that have occurred in the habitat, can express the hunting strategies, the type of feeding (opportunistic, selective), the way in which the frog uses the trophic resources, the quality of the environment (Perry et al 1990). *Bufo bufo* (Linnaeus 1758) is a species that has a wide distribution both in Romania and in Europe, being encountered in different habitats (Fuhn 1960). Despite the fact that amphibians are situated towards the top of the trophic pyramid (Cogălniceanu et al 2000), feeding studies regarding the common toad are very rare (Angelov & Batschwarov 1972, Gittins 1987, Kuzmin 1990). Because of the scarce data regarding the feeding of the common toad *B. bufo*, this paper aims to offer a deeper insight into the diet of this terrestrial species.

[1] University of Oradea, Department of Geography
[2] University of Oradea, Department of Biology

MATERIALS AND METHODS

A feeding analysis was performed at 35 *B. bufo* individuals in a coniferous forest from Iezer Mount. The samples were taken in august 2008 near Voina chalet, Argeş County, at approximately 930m altitude. The habitat is situated in an area where the anthropogenic influence can be noticed through the presence of the chalet and the camping zone. However, despite the changes made by human contact, the common toads still manage to find an optimum connection between them and the environment.

The toads were captured by hand in the morning, when they were found taking shelter under rocks, leaves, logs. To recover the stomach contents, we used a harmless and improved technique, the stomach-flushing method (Solé et al 2005), thus avoiding a negative impact that our study might have had. After the application of the treatment, the specimens were released in their habitat. The stomach contents were stored in airtight test tubes and conserved with formaldehyde. Afterwards, the preys were determined using a binocular magnifying glass.

The data were statistically processed and several parameters were analysed. Thus, we discussed the feeding activity rate, the feeding intensity, the frequency of the vegetals, minerals, shed skin and the prey origin, which are presented in the first table. We also analysed the weight and frequency of the most important prey items.

RESULTS AND DISCUSSIONS

The feeding intensity and the feeding activity rate can be connected to suggest the presence of favourable environmental factors that provide an ecologically healthy habitat for the different communities. Concerning the first parameter, we focused on the total, maximum and average number of prey/individual. Thus, the analysed population revealed 560 preys in their stomach contents. This number is very high in comparison to other amphibian species (Covaciu Marcov et al 2003, Cicort-Lucaciu et al 2003). Moreover, the maximum number of preys was 54 and the average one was 10,56/toad, values that also surpass the ones registered at other amphibian species (Sas et al 2007, Szeibel Balint et al 2008). This difference between the other amphibian species and the analysed one, can be explained by the fact that Bufo communities generally consume large amounts of ants, which as a result will increase the number of prey items.

In our case, the climatic parameters (temperature, humidity) registered at the moment of study were optimum for the development of the preys and suitable for the feeding activity of the toads. As a result, all of the analysed individuals presented stomach contents. Favourable feeding conditions have also been noticed at other Bufo populations (David et al 2008, Ferenți et al 2009, Santana & Juncá 2007). The feeding activity rate is highly influenced by the climatic changes that occur throughout the seasons. Therefore, the weight of the stomachs without contents increases at the beginning (early spring) and at the end (late autumn) of the animal's activity period, because of the harsh environmental conditions (Covaciu Marcov et al 2002, Yu et al 2009).

The trophic spectrum of the *B. bufo* population highlighted four types of contents: animal, vegetal, mineral and shed skin. Vegetal fragments were encountered at over half of the analysed population (60%). These plant matters were probably accidentally ingested together with the followed preys (Whitaker et al 1977). Other feeding studies have shown that vegetals are frequently found in amphibian stomachs (Sas et al 2005, Cicort-Lucaciu et al. 2003). Moreover, the connection between the high vegetal and mineral frequency (25,71%) can be explained through the fact that these elements are believed to help crush

the exoskeleton of the Gastropods, or the elytra of beetles or other preys that present a hard exterior (Evans and Lampo 1996). The presence of shed skin (17,14%) in the stomach contents of this population is very interesting because previous studies upon the Bufo genus have rarely mentioned this fact (Gittins 1987, Yu et al 2009). Probably, the few data regarding this element is a consequence of the scarce studies regarding the feeding of the Bufo communities.

According to the feeding habits of the amphibians, Toft (1980) grouped the Bufonidae family into a category that shows a distinct preference to some arthropods, especially ants. Moreover, the foraging strategy is connected with the type and size of the prey. Ant specialists tend to secrete irritating substances and actively search for prey, while generalists use a „sit and wait" technique. In our case, the population optimally combines the two foraging behaviours in order to increase its changes of survival.

Thus, the active one is used to capture small, gregarious taxa that often present chemical defences, being consumed in large quantities. While the second one is used to ingest smaller amounts of prey that have a larger size, which can assure a higher energetic resource. The preys that occupy a valuable role in the diet of this population are the Formicidae, Coleoptera, Brahicera, Aranea, Chilopoda, Gasteropoda, Diplopoda.

The most important preys are the Hymenoptera Formicidae and the Coleoptera, which reveal two different foraging techniques. There are very high differences concerning the weight and frequency of the prey taxa, mostly due to the size variation of the various prey taxa. This association between smaller preys and larger ones increases its changes of survival in the environment because the exclusive consumption of small sized preys will not cover its energetic needs, and therefore the toads have to combine these prey types.

The Hymenoptera Formicidae occupy first place regarding the weight of the prey taxa, registering a value of 60% from the total amount of consumed preys. Populations from the Bufo genus (Angelov & Batschwarov 1972, Kidera et al 2008, Hirai & Matsui 2002, Solé et al 2005, Santana & Juncá 2007) generally consumed high proportions of ants. Their formic acid is used to secrete the venom of the toads (Bonansea & Vaira 2007). In the case of the frequency with which they were eaten, more than half of the population consumed them, thus occupying only second place, being surpassed by the Colepterans. Because of their gregarious life, ants can be eaten in large numbers, in our case two individuals having consumed 49 ants. This diet type can be connected to an active foraging strategy, in which the toad selectively searches for its prey. Toft (1980) also observed this specialisation to notice small preys that form groups and can therefore be consumed large quantities.

The Coleopterans are also very valuable prey items in the stomach contents, suggesting a different type of foraging strategy than the one used to capture the Formicidae. Therefore, because of their large sizes their weight is usually low in comparison to the one registered by ants. In the case of the studied population, the beetles occupied almost 10% of the total amount of consumed preys.

However, approximately 75% of the population captured this type of taxa. As a result of their large size, they do not have to be eaten in large quantities in order to satisfy the energetic needs of the toads. Thus, the ants, which assure the toads' defence system, are combined with the larger sized beetles that increase their changes of development. The „sit and wait" strategy is applied in the case of the bigger preys which are consumed in smaller amounts. Several feeding studies upon Bufo species have also noticed this variation between the weight and frequency of these two different preys (Covaciu-Marcov et al 2005, David et al 2008, Ferenți et al 2009).

Beside ants and beetles, there are other preys that were found in a high number of stomachs, most of which are typical forest taxa that prefer humid conditions (Chilopoda, Diplopoda, Gastropoda, Isopoda. From these preys, the ones that secrete venom occupy an important role in the diet of the toads.

Thus, the Aranea and Chilopoda were frequently consumed, registering high values. These taxa were also regarded as valuable preys at other Bufo populations (Ferenți et al 2009, Tesio & Teodorescu 1999, David et al 2008).

The Brahicera were found in 40% of the stomach contents, registering high values in other studies that deal with the diet of Bufo species (Ferenți et al. 2009). The snails also registered a low value in the total amount of consumed preys, but were eaten by approximately 29% of the population. This difference between the weight and the frequency value can also be explained by the fact that the snails are large items that are consumed in low proportions.

Table no. 1.

The weight (A%) and frequency (F%) of the prey taxa

	A%	**F%**		**A%**	**F%**
Lumbricidae	0.18	2.86	Coleoptera –undet.	2.32	22.86
Gasteropoda-snail (t.)	3.21	28.57	Coleoptera - Carabidae	3.04	34.29
Gasteropoda-Limax	0.54	5.71	Coleoptera - Elateridae	0.18	2.86
Pseudoscorpionida	0.36	5.71	Coleoptera - Curculinoidae	2.5	37.14
Arachnida-Opiliones	1.79	20	Coleoptera - Chrysomelidae	0.18	2.86
Arachnida – Araneae	3.57	42.86	Coleoptera - Staphylinidae	1.61	8.57
Arachnida Acarina	0.54	8.57	Panorpata	0.18	2.86
Crustacean-Isopoda (t.)	0.18	2.86	Lepidoptera	0.54	8.57
Myriapoda – Diplopoda	3.21	22.86	Lepidoptera (L.)	0.54	5.71
Myriapoda-Chilopoda	2.68	37.14	Nematocera undet.	2.5	14.29
Collembola	1.07	5.71	Nematocera Typulidae	0.89	5.71
Dermaptera	0.18	2.86	Brahicera (adults)	3.57	40
Heteroptera	0.89	14.29	Brahicera (L.)	0.54	2.86
Homoptera -Cicadas	1.07	11.43	Hymenoptera- undet.	1.79	14.29
Homoptera-Aphids	0.18	2.86	Hymenoptera - Formicidae	60	57.14

If we compare a number of studies regarding the feeding of the Bufo species, we can observe that they present similar diet habits, several basic prey taxa appearing in the stomach contents of the toads: ants, beetles, spiders, millipedes, centipedes and other prey taxa (Evans and Lampo, 1996, Kidera et al. 2008, Strusmann et al 1984, Suazo-Ortuño et al. 2007). The stomach contents revealed the exclusive presence of terrestrial preys. Stomachs that revealed a majority of the terrestrial preys were found at other Bufo populations as well (David et al. 2008, Santana & Juncá 2007, Yu et al. 2009, Hirai & Matsui 2002).

CONCLUSIONS

The common toad is an opportunistic predator that favourably combines two different foraging strategies, which involve the presence of different sized preys. Thus, the feeding diet of this population focuses both on small preys, represented especially by ants, and on larger ones, such as beetles, millipedes, centipedes, snails. Because of the size variation, the weight and frequency of the preys do not correspond. The high numbers of ants registered in the stomach contents are a characteristic feature of the common toad's diet. The large amounts of small preys necessary for the secretion of venom is compensated by the larger preys that ensure the energetic resources of the toads. The population consumed exclusively terrestrial preys.

REFERENCES

1. Angelov P., Batschwarov G. Die Nahrung der Amphibien in Bulgarien. II. Über die Nahrung Einiger Amphibia – Ecaudata. – Natura, 5 (1): 115–119, 1972.
2. Beebee, T.J.C. Ecology and conservation of amphibians. Chapman and Hall, New York. 1996.
3. Bonansea M. I., Vaira M. Geographic Variation of the Diet of Melanophryniscus rubriventris (Anura: Bufonidae) in Northwestern Argentina. Journal of Herpetology. 41 (2): 231-236, 2007.
4. Cicort-Lucaciu A.-Şt., David A., Covaci R., Toader S., Diaconu I. Feeding of some *Triturus cristatus* population in Turț area (Oas Mountains, Romania). Herpetologica Romanica 1: 30-37, 2003.
5. Cogălniceanu D., Aioanei F. & Bogdan M. Amfibienii din România, Determinator. Ed. Ars Docendi, Bucureşti, 2000.
6. Covaciu-Marcov S.D., Cupşa D., Sas I., Telcean I., Zsurka R. Studiul spectrului trofic al unor populații de *Rana arvalis* Nils. 1842 (*Amphibia, Anura*) din zona Cherechiu (Jud. Bihor, România). Analele Univ. Oradea, Fasc. Biologie, 9: 79-93, 2002.
7. Covaciu–Marcov S.D., Cupşa D., Sas I., Zsurka R., Cicort-Lucaciu A.Şt. Spectrul trofic al unei populații nehibernante de *Rana ridibunda* (A*mphibia*) din apele termale de la Chişlaz, județul Bihor. Analele Univ. Oradea, Fasc. Biologie, 10: 97-109. 2003.
8. Covaciu-Marcov S.-D., Sas I., Cupşa D., Rois R., Bogdan H.The trophic spectrum of a population of *Bufo viridis (Amphibia*) from the campus of the University of Oradea, Romania. Biota 5: 5-12, 2005.
9. David A., Ancău M., Dimancea N., Toth G., Aszalós Á. The trophic spectrum of a B*ufo viridis* population from Vodița Valley, Mehedinți County, Romania. University of Craiova. 13 (49): 65-70, 2008.
10. Evans M., Lampo M. Diet of Bufo marinus in Venezuela. J. Herpetol. 30 (1): 73-76, 1996.
11. Ferenți S., Cupşa D., Dimancea N., Bogdan H. V., Filimon A. Data upon the feeding of two E*pidalea viridis* population from Dobrudja, Romania. Oltenia – Studii şi comunicări, in press 2009.
12. Fuhn I. "Fauna R.P.R.", vol. XIV, Fascicola I, Amphibia. Editura Academiei R.P.R., Bucureşti, 1-288, 1960.
13. Gittins S.P. The diet of the common toad (*Bufo bufo*) around a pond in mid-Wales. Amphib-Rept, 8:13-17, 1987.
14. Hirai T. & Matsui M. Feeding Ecology of *Bufo japonicus formosus* from the Montane Region of Kyoto, Japan. Journal of Herpetology 36(4):719-723, 2002.

15. Hopkins W.A., Amphibians as models for studying environmental change, International League of Associations for Rheumatology Journal, 48 (3): 270-277, 2007.
16. Inger R. F., Colwell R. K. Organization of contagious communities of amphibians and reptiles in Thailand. Ecological Monographs, 47: 229-253, 1977.
17. Kenett R. & Troy O. Diet of Two Freshwater Turtles, *Chelodina rugosa* and *Elseza dentate* (*Testudines: Chelide*) from the Wet – Dry Tropics of Northern Australia. Copeia 2: 409-419, 1996.
18. Kidera N., Tandavanitj N., Oh D., Nakanishi N., Satoh A., Denda T., Izawa M., Ota H. Dietary Habits of the Introduced Cane Toad *Bufo marinus* (Amphibia: Bufonidae) on Ishigakijima, Southern Ryukyus, Japan. Pacific Science 62(3):423-430, 2008.
19. Kuzmin S. L. Trophic niche overlap in syntopic postmetamorphic amphibians of the Carpathian Mountains (Ukraine: Soviet Union), Wien, Herpetozoa 3 (1/2): 13-24, 1990.
20. Perry G., Lampl I., Lerner A., Rothenstein D., Shani N., Silvan N., Werner Y.L. Foraging mode in Lacertid lizard : variation and correlates. Amphibia-Reptilia 11: 373-384, 1990.
21. Santana AS. and Juncá FA. Diet of *Physalaemus* cf. *cicada* (Leptodactylidae) and *Bufo granulosus* (Bufonidae) in a semideciduous forest. Braz. J. Biol., 67(1): 125-131, 2007.
22. Sas I., Covaciu Marcov S. D., Pop M., Ile R. D., Szeibel N., Duma C. About a closed hybrid population between *Bombina bombina* and *Bombina variegata* from Oradea (Bihor county, Romania). North – Western Journal of Zoology. 1:41–60, 2005.
23. Sas I., Kovács É.-H., Covaciu-Marcov S.-D., Strugariu A., Covaci R., Ferenți S. Food habits of a *Pelophylax lessonae – Pelophylax* kl. *esculentus* population from North-Western Romania. Biota 8/1-2: 71- 78, 2007.
24. Solé M., Beckmann O., Pelz B., Kwet A., Engels W. Stomach-flushing for diet analysis in anurans: an improved protocol evaluated in a case study in *Araucaria* forests, southern Brazil. Studies on Neotropical Fauna and Environment. 40 (1): 23 – 28, 2005.
25. Strusmann C., Vale M.B.R., Meneghini M.N. and Magnusson N.C. Diet and Foraging Mode of *Bufo marinus* e *Leptodactylus ocellatus*. J. Herpetology, 18(2): 138-146,1984.
26. Stuart S. N., Chanson J. S., Cox N. A., Young B. E., Rodrigues A. S. L., Fischmann D. L., Waller R. W. Status and trends of amphibian declines and extinctions worldwide. Science 306: 1783-1786, 2004.
27. Suazo-Ortuño I., Alvarado-Díaz J., Raya-Lemus E., Martinez-Ramos M. Diet of the mexican marbled toad (*Bufo marmoreus*) in conserved and disturbed tropical dry forest. The Southwestern Naturalist 52 (2):305-309, 2007.
28. Szeibel Balint N., Citrea L., Memetea A., Jurj N., Condure N. Feeding Ecology of the *Pelophylax ridibundus* (Anura, Ranidae) in Dobromir, Romania. Biharean Biologist 2: 27-37, 2008.
29. Tesio C. & Teodorescu I. Food analysis in *Bufo viridis viridis* adults. Review Roumain. Biologie, Biologie Animale 44: 19-26, 1999.
30. Toft, C. A. Feeding Ecology of Thirteen Syntopic Species of Anurans in a Seasonal Tropical Enviroment. Oecologia (Berl.), 45 (1): 131-141, 1980.
31. Yu T. L., Du J. and Lu X. Seasonal variation and ontogenetic change in the diet of a population of *Bufo gargarizans* from the farmland, Sichuan, China. Biharean Biologist, 3 (2): 98-103, 2009.
32. Whitaker J., Rubin O.D., Munsee J.R. Observations on food habits of four species of spadefoot toads, genus *Scaphiopus*, Herpetologica, 33: 468-475, 1977.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

RESEARCH UPON THE BIOLOGY AND ECOLOGY OF SOME NEWT SPECIES (AMPHIBIA) FROM THE JIU RIVER GORGE NATIONAL PARK

Dobre Felicia[1], Cicort-Lucaciu Alfred Ştefan[2], Dimancea Nicoleta[3], Boroş Andrea[2], Bogdan Horia-Vlad[4]

KEY WORDS: *Lissotriton vulgaris, Triturus cristatus, population, sex ratio*

ABSTRACT

In this study we analyzed the variation in time of the number of individuals in the aquatic stage of two sintopic newt populations - Lissotriton vulgaris (Linnaeus, 1758) and Triturus cristatus (Laurenti, 1768) – after which we calculated the size of each population and their sex ratios.

The common newt population is about 5 times greater than that of the crested newt. The sex ration is about 3F:2M for the common newt and 4F:3M for the crested newt.

The breeding period for the two populations overlaps perfectly in time. However, by comparing it to the common newt, the crested newt exits its habitat in masses. Also, the females of the common new dominate numerically their males in the beginning of their aquatic period.

INTRODUCTION

The most important non-biotic factors the control the activity of amphibians are the humidity and the temperature (Cogălniceanu, 2000). The influence of the temperature on the amphibians is manifested from the cellular level all the way to the population level (Rome et al, 1992).

After exiting their winter stage, the newts belong to the aquatic ecosystems only in the first part of their active state, after which they have a terrestrial life (Fuhn, 1960). Their presence in the aquatic or terrestrial environments is a consequence of their trophic and reproduction activities (Cicort-Lucaciu et al, 2008).

There is only one study on newts in Romania that monitored the repopulation and depopulation of an aquatic habitat (Cicort-Lucaciu et al, 2008). Observations have been made on two newt populations from a plain habitat: *L. vulgaris* and *T. dobrogicus*.

In this case, we set off to analyze two newt populations from a mountain habitat: one of *L. vulgaris* and another of *T. cristatus*. Along with the number of individuals of each species, we also followed their sex, in order to establish their sex ratio.

[1] Jiu River Gorge National Park
[2] University of Oradea, Faculty of Sciences, Department of Biology
[3] University of Oradea, Faculty of History and Geography, Environmental Geography
[4] Oradea, Romania

MATERIALS AND WORKING METHODS

The study took place in spring 2009, summing up three field trips to the selected habitat: on the 1st, 18th and 28th of April. We analyzed a total of 1517 newt specimens, out of which 1309 were *L. vulgaris* and 208 *T. cristatus*.

The studied newts were captured with round metallic nets on top of long poles. We established the species and sex for each captured specimen and then released them all back to their habitat.

The habitat from near the abbey from Lainici is situated in the Parang Mountains. It is found at the southern limit of the Jiu River Gorge National Park, at an altitude of 900m, in a location known as Comanda. The habitat is a quasi-permanent pond, about 7 m long, which is reduced very much in the droughty years.

The water level has an average of 40-50 cm while the maximum depth is over 1 m. The aquatic vegetation is rich and the mud stratum is quite thick as well. The banks of the pond are bordered with *Juncus* sp. bushes. The habitat is anthropogenically-affected since it's used as drinking and bathing puddle for cattle.

Picture no. 1. The habitat from Comandă

As objectives, we wanted to establish the size of each population, the sex ratio and to analyze the variation in time of the number of specimens present in the habitat. We determined the size of the populations using the specimens' elimination method (Cogălniceanu, 1997), practically counting all the individuals of these populations.

RESULTS AND DISCUSSIONS

In the first study period (April 1st 2009) the biotope was at its greatest, with the newt found mostly near its banks, under clubrush bushes, due to the low temperatures from the deeper waters. At our second visit to the habitat (April 18th 2009), the size of the pond was about half than the first time, and the newts were present in all sectors of the water.

The warming and the reduction of the biotope to about a third of its initial size left us to capture a much smaller number of newts at our third field trip (April 28th 2009). The analyzed populations fluctuated numerically and from the sex ratio's point of view during our entire study period. The temperature and humidity conditions caused these variations, their optimum level being reached during our second study period.

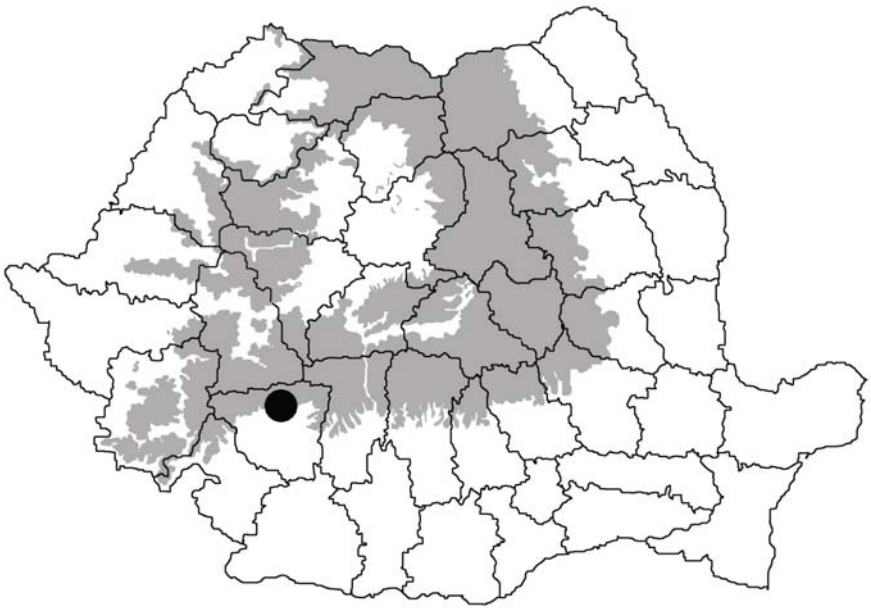


Figure 2. The studied area: Jiu Gorge National Park

The harsh environment conditions, due to the mountain character of the habitat, with the great temperature fluctuations in the beginning and with great water level fluctuations towards the end, shortened the aquatic period of the newts. Generally, the aquatic stage of these two species is stretched across a few months (Fuhn, 1960; Cogălniceanu et al, 2000).

The population sizes of the two newt species are of 486 individuals for the common newt and of 89 for the crested newt (Tab. 1.).

The crested newt population is about a fifth of that of the common one. The is partially because of the larger size of the crested newt and the limited size of the habitat and partially because of the water level variation in time (Cicort-Lucaciu et al, 2008).

Table 1.

The Number (*N*) of captured specimens, separated on sex and periods

Species	Sex	April 1st 2009	April 18th 2009	April 28th 2009
Lissotriton vulgaris	total	400	486	423
	M	216	289	256
	F	184	197	167
Triturus cristatus	total	80	89	39
	M	46	50	16
	F	34	39	23

The sex ratio is 59.46 % M / 40.53 % F for the common newt and 56,17 M % / 43,82 % F for the crested newt (Tab. 2.). In the case of both the populations, the balance of the sexes is slightly tilted in favor of the females. Some studies have shown that low temperature values, under a certain optimum interval, favor, in the larval stage of the crested newt, a growth in the number of females (Wallace et al, 1999; Wallace & Wallace, 2000; Kinne, 2006). Other studies state that the winter mortality for the adult common newts is more frequent for males (Bell, 1977; Kinne, 2006).

Table 2.

Sex Ratio (*R*)

Species	Sex	April 1st 2009	April 18th 2009	April 28th 2009
Lissotriton vulgaris	M / F	54% / 46%	59,46% / 40,53%	60,52% / 39,47%
Triturus cristatus	M / F	42,50% / 57,50%	56,17% / 43,82%	41,02% / 58,97%

The newt's breeding activity varies as length and frequency from one species to another and from one population to another (Duellman & Trueb, 1986). In our case, the breeding periods of the two populations overlap in time and the only differences that occur are as quantity. While immigrating in the habitat, the differences are small (P_{Tc} = 89,88%, P_{Lv} = 82,30%), but there is another situation for the emigration (Tab. 3.). The common newt drops back in opposition to the crested one when it comes to depopulating the biotope (P_{Tc} = 43,82%, P_{Lv} = 87,03%). The decrease in size of the habitat toward the end of the aquatic period represents a disadvantage for the crested newt, because of its larger size.

Table 3.

The variation quota (in percents) (*P*) of the number of individuals and their sex

Species	**Sex**	**April 1st 2009**	**April 18th 2009**	**April 28th 2009**
Lissotriton vulgaris	total	82,30	100	87,03
	M	74,74	100	88,58
	F	93,40	100	84,77
Triturus cristatus	total	89,88	100	43,82
	M	92	100	32
	F	87,17	100	58,97

Among the sexes, the differences between the percentage of specimens present from the entire size of the population, in the beginning of the aquatic period, are small for the crested newt (under 5%). In the case of the common newt, the females were present in the habitat on April 1st in much larger numbers ($P_{Lv\text{-}f}$ = 93,40%, $P_{Lv\text{-}m}$ = 74,74%). It has been observed that the males of more species of Urodela go into the water before the females (Halliday, 1998; Gill, 1978; Semlitsch et al, 1993; Douglas, 1979; Scott, 1993). In the case of the species we investigated, it is considered that the males reach the aquatic habitat together with the females (Verrell and Halliday 1985, Halliday 1998). There are however studies that shown that among the crested newt males there is a competitive territorial behavior that determines them to be present in the water before the females (Jalbă, 2008), even if this delay isn't as big as with other species. On the other hand, for both the species that we analyzed, there are studies that demonstrate a competition for ensuring a supplementary semen supply for the females, competition that takes place in the beginning of their aquatic period (Verrell & Halliday, 1985; Baker, 1992; Halliday, 1998).

This behavior, that makes the females dominate the males numerically, also explains the differences between the sexes for our common newt population.

CONCLUSIONS

The sizes of the two populations are: 486 specimens for the common newts and 89 specimens for the crested newts. The breeding period for the two investigated populations was shortened by the harsh environment conditions and therefore took place in April. The number of newts present in the habitat varied in time. Thus, in the beginning and the end of the month there were fewer newts in the pond than in the middle of our study period, when the peak of the reproduction period was reached. Occupying the entire aquatic habitat had more stages, depending on the warmth of the water.

The sex ratio (F:M) is slightly tilted in favor of the females, being of about 3:2 in the case of the common newt and of about 4:3 for the crested one. The action of some environment factors determined the sex ratio to be slightly in favor of the females.

There are no differences between the lengths of the aquatic periods of the two species. The only dissimilarities observed were quantitive and took place when depopulating the habitat. This is when the crested newt left the biotope in masses, due to the habitat drying out and to its larger size. For the common newt, we observed a larger amount of females present in the habitat in the beginning of its aquatic period.

REFERENCES

1. Baker J. M. R. Egg production in the smooth newt (*Triturus vulgaris*). Herpetological Journal, 2: 90 – 93, 1992.
2. Bell G. The life of the smooth newt (*Triturus vulgaris*) after metamorphosis. Ecol Monogr., 47: 279 – 299, 1977.
3. Cicort-Lucaciu A. Șt., Covaciu-Marcov S.-D., Paina C., Radu N. R., Toth A. Studies regarding the Biology and Ecology of *Triturus dobrogicus* and *Triturus vulgaris* species from Câmpia Cermeiului, Arad County, Romania. Analele Univ. din Craiova, 13 (49): 135 – 141, 2008.
4. Cogălniceanu D. Practicum de ecologie a amfibienilor – Metode şi tehnici în studiul ecologiei amfibienilor. Ed. Universității din Bucureşti, Bucureşti, 1 – 122, 1997.
5. Cogălniceanu D., Aioanei F., Bogdan M. Amfibienii din România*, Determinator*. Ed. Ars Docendi, Bucureşti, 1 – 99, 2000.
6. Douglas M. E. Migration and sexual selection in *Ambystoma jeffersonianum*. Can. J. Zool., 57: 2303 – 2310, 1979.
7. Duellman W. E. & Trueb L. The Biology of Amphibians. McGraw-Hill, New York, 1 – 670, 1986.
8. Fuhn I. Fauna Republicii Populare Române. Amphibia. Ed. Acad. R.P.R., Bucureşti, 1 – 289, 1960.
9. Gill D. E. Effective population size and interdemic migration rates in a metapopulation of red-spotted newt, *Notophtalmus viridescens* (Rafinesque). Evolution 32 (4): 839 – 849, 1978.
10. Jalbă L. Particularităţile bilogo-ecologice şi comportamentul specie *Triturus cristatus* Laur. (Amphibia, Caudata) în Codrii Centrali – Teză de doctorat, 1 – 150, 2008.
11. Halliday T. R. Sperm competition in Amphibians. In Sperm competition and sexual selection. Academic press: 465 – 502, 1998.
12. Kinne O. Successful re-introduction of the newts *Triturus cristatus* and *T. vulgaris*. Endang Species Res, 4:1 – 16, 2006.

13. Rome L. C., Stevens D. E., John-Alder H. B., The influence of temperature and thermal acclimation on physiological function**.** Cap. 8, In: Environmental physiology of the Amphibians (Ed.: Feder M.E., Burggren W.W.). The University Of Chicago Press, 183 – 205, 1992.
14. Scott D. E., Timing of reproduction of paedomorphic and metamorphic *Ambystoma talpoideum*. Am. Midl. Nat. 129: 397 – 402, 1993.
15. Semlitsch R. D., Scott D. E., Pechmann J. H. K., Whitfield Gibbons J. Phenotipic variation in the arrival time of breeding salamanders: individual repetability and environmental influences. Journal of Animal Ecology 62: 334 – 340, 1993.
16. Verrell P. & Halliday T., Reproductive dynamics of a population of smooth newt, *Triturus vulgaris*, in southern England. Herpetologica, 41: 386 – 395, 1985.
17. Wallace H.W. & Wallace B.M.N. Sex reversal of the newt *Triturus cristatus* reared at extreme temperatures. Int J Dev Biol, 44 (7): 807 – 810, 2000.
18. Wallace H., Badawy G. M. I., Wallace B. M. N. Amphibian sex determination and sex reversal. Cell. Mol. Life Sci., 55: 901 – 909, 1999.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

THE FOOD COMPOSITION OF A *TRITURUS DOBROGICUS* POPULATION (AMPHIBIA) FROM THE NORTHERN PART OF THE WESTERN PLAIN, ROMANIA

Ferenți Sára[1], Cicort-Lucaciu Alfred-Ştefan[1], Gabor V. Gelu[2], Sárközi Krisztina Csilla[3]

KEY WORDS: Triturus dobrogicus, feeding, aquatic preys

ABSTRACT

Our study took place in April 2007, near Livada Oaş, Satu Mare County. This is the first feeding study from this area realised at Triturus dobrogicus. We analysed the stomach contents of 38 individuals, in which we identified both animal prey, vegetal and shed-skin fragments. There are differences in the trophic spectrum depending on the onthogenetic development stage, the juveniles feeding more intensely. The feeding of these newts is not selective, the individuals feeding on the preys that are more accessible. The preys are exclusively aquatic.

INTRODUCTION

Attempts in order to prevent the destruction of nature have been realised all over the world (e.g.McNeely et al. 2009, Ceballos et al. 2009, Pullin et al. 2009). These include developing new sources of funding for the forest conservation; identifying a potential impact of the alternative energy on the conservation of the biodiversity; curbing the trade in endangered species of plants and animals; a special focus on the conservation of mountain biodiversity; enhancing relevant research; ensuring that conservation biology contributes to major international conventions and funding mechanisms (McNeely et al. 2009).

Amphibians are considered to be extremely sensible to environmental changes, thus providing indications regarding the quality of the environment (Diamond 1996), their conservation being important to protect their habitats (Young et al. 2001). It is necessary for those studying amphibian population declines (and other types of species loss) to develop methods that embrace context dependency (Blaustein & Kiesecker 2002). One of these methods can be analyzing their trophic spectrum. The trophic spectrum is concluded to be a useful indicator describing and comparing systems in time and space, detecting phase shifts linked to natural or anthropogenic perturbations, and revealing differences in ecosystem functioning (Gascuel et al. 2005).

There are few studies in the scientific literature concerning the feeding of *Triturus dobrogicus*, in our country existing only three articles with this theme (Cicort-Lucaciu et al.

[1] University of Oradea, Faculty of Sciences, Department of Biology, Oradea, Romania
[2] Samuil Vulcan Highschool, Beiuş, Romania
[3] Szent László Highschool, Oradea, Romania

2005, 2009, Kovács et al. 2006), the most of studies referring to the distribution of this species (Covaciu-Marcov et al. 2003, 2005, 2008). The objective of our study was to analyze the trophic spectrum of a *Triturus dobrogicus* population from one of the protected areas of Romania, respectively from Livada Forest.

MATERIAL AND METHODS

Our study took place in the spring of 2007, on 27th of April. We analyzed 38 *Triturus dobrogicus* individuals, from which 12 were males, 18 females and 8 juveniles.

The investigated habitat is located near Livada, in a forest, the area being found in Satu Mare County, Romania. This habitat is represented by a system of temporary puddles, situated on a forest road. These have a surface of some tens of cm2, the maxim depth being 20 cm. The puddles are in connection both with each other and with a bigger one situated near the road. The smaller puddles from the road do not present vegetation, only their substratum being consisted of leaves. The larger, single puddle presents reed and bulrush on its banks, and as a result of the position in the forest, its substratum is formed of dead leaves.

We used the stomach flushing method, which is recommended by many authors (Solé et al. 2005, Sole & Pelz 2007, Legler & Sullivan 1979), in order to draw the stomach contents of the individuals. The advantage of this technique is provided by the possibility of taking stomach contents without killing the analyzed samples. The stomach contents were preserved in a 4% formaldehyde solution. We identified the preys in the laboratory, using the specialized scientific literature (Radu & Radu 1967, Steinbach et al. 2000) and a binocular magnifier.

These results were statistically analyzed, the most important parameters pursued being: the weight and frequency of the preys, the origin of the preys, the feeding intensity, the rate of feeding activity and the food diversity. These parameters were analysed in a comparative manner, regarding the sexes and the ontogenetic stage development of the samples.

RESULTS AND DISCUSSION

The reliance of many amphibians on both aquatic and terrestrial habitats places them in "double jeopardy" because a disturbance to the quality or availability of either habitat can disrupt their life cycle and affect populations (Dunson et al. 1992). In our case the feeding activity rate was 100%, all of the individuals presented stomach content. This fact suggests optimum feeding conditions concerning the humidity or the preys` availability. This phenomenon was also registered in the case of a *T. cristatus* population from Turt area (Cicort-Lucaciu et al. 2007), and in the case of other *T. dobrogicus* populations (Cicort-Lucaciu et al. 2009, Kovacs et al. 2006).

Beside animal preys, in the stomach contents we also identified vegetal fragments and shed skin. In the scientific literature, many authors consider that vegetal fragments are accidentally eaten, adult Amphibians being considered carnivores, herbivore ones occurring only in the case of few species (Duellmann & Trueb, 1986).

Dermatophagy at newts was considered in some cases to be a completion of their food in unpropitious feeding conditions (Cicort Lucaciu et al. 2007). On the other hand, shed skin eating might be a habit for epidermal protein recycling (Weldon et al. 1993). The relation between the weight of the animal preys, plant fragments and shed skin suggests that they were accidentally swallowed together with the mobile preys (Zimka 1966).

It is interesting the occurrence of vegetal fragments only in the case of the females and juveniles, respectively the negative relation between shed skin eating and plant material swallowing. This fact suggests that there are differences between the feeding behaviour of the males and females. Because males use an "active foraging" hunting strategy, they have a higher possibility to swallow shed skin from the water. As females use the "sit and wait" method, they can easily swallow plant fragments, on which potential preys are standing.

Regarding the animal preys, we identified 157 preys belonging to 6 taxonomical categories. Concerning the feeding intensity, we calculated the medium number of preys / individual and the maximum number of preys. In the case of the females and juveniles, both of these values are high. This fact can be explained by the higher energetic needs used for the egg laying, in the case of the females, and for the more intense growth in the case of the juveniles. The preys` size influences these values. In the case of the juveniles, where the medium number of the preys was maxim, we can observe a higher consumption of small sized preys like Cladocera and Collembola.

Table 1.

The feeding intensity, the frequency of plant material fragments and shed skin, the feeding diversity, the weight and frequency of animal preys

	Males	**Females**	**Juveniles**	**Total**
The max. no. of prey / sample	11	26	35	35
The medium no. of prey / sample	4.66	9.22	23	9.23
Plant material fragments	-	55.55	50	35.29
Shed skin	33.33	11.11	50	23.52
Diversity	0.76	0.98	0.57	1.39
Weight of animal preys				
Collembolans	0	39,75	-	21,01
Coleopterans - Dytiscide aq.	3,57	1,20	-	1,27
Coleopterans - Dytiscide larvae	-	1,20	2,17	1,27
Cladoceras	-	-	84,78	24,84
Dipterans- Nematocere larvae	32,14	6,02	8,69	11,46
Isopods (aq.)	64,28	51,80	4,34	40,12
The frequency of the animal preys				
Collembolans	-	22,22	-	11,761
Coleopterans - Dytiscide aq.	16,66	11,11	-	11,76
Coleopterans - Dytiscide larvae	-	11,11	50	11,76
Cladoceras	-	-	100	11,76
Dipterans- Nematocere larvae	33,33	22,22	100	35,29
Isopods (aq.)	83,33	88,88	50	82,35

The identified taxonomical categories were: Collembolans, Cladocera, Isopods (aq.), Coleopterans Dytiscida (adults), Coleopteran Dytiscida (larva), Dipterans Nematocera (larva). We can observe very high differences between the size of these preys. This fact suggests that the Danube Crested newts` feeding is not selective, the individuals capturing all the preys from the area, which have optimal size for consumption.

Regarding the weight of the preys, the Isopoda register the maximum value in all of the cases, being are followed by the Cladoceras, Collembolans, Diptera larvae and

Dytiscida (larvae and adult). The Cladoceras` maximum weight is presented in the case of the juveniles. The more intensive feeding is explained by their raised energy needs for growing. On the other hand, Cladoceras are small sized preys with a gregarious life, which are captured in larger numbers to acquire the same quantity of energy, comparing with larger preys. This phenomenon was also observed in the case of other newt populations (David et al. 2007, Cicort Lucaciu et al. 2005).

The presence of larvae (Nematocera, Dytiscida) is beneficial for these species, being richer in lipids, thus having raised nutrient value (Brooks et al. 1996). This fact appears especially in the case of the females and juveniles, which have increased energy needs.

Regarding the differences between sexes, we can observe a higher amount of Nematocera larvae in the case of the males. This fact is a consequence of the different hunting strategy used by them. Males use the `active foraging` method that enables them to capture preys with small size and gregarious life, while females, using the `sit and wait` strategy, capture preys with large size and mobility (Perry & Pianka 1997).

The frequency values vary in parallel with the weight ones, which suggests a homogenous feeding of these newts. There is one exception in the case of the Dytiscidae, which register a relatively low weight, but a higher frequency. This fact can be explained by the size of these preys, being sizeable, the newts are not constrained to consume them in a large number in order to cover their energy needs. The increased value of the frequency shows that they are `preferred` by a larger number of individuals, becoming thus an important element of their trophic spectrum.

Some authors consider that capturing a certain prey is influenced by the size of the predator (Fraser 1976), so the consumption of different prey sizes can be related to the ontogenetic development stage (Lőw & Török 1998). This fact can be observed in our case, Dityscidae appearing only in the feeding spectrum of the adults, the maximum weight of the small preys being observed at the juveniles.

Regarding the diversity, we can observe a bigger value in the case of the females. This fact is in parallel with their increased feeding intensity, swallowing all the preys that have optimum size for consumption. In the case of the juveniles, it is interesting the lower value of the diversity, if we compare it with their raised feeding intensity. This fact is influenced by the consumption of a certain prey in large numbers (Cladocerans). Secondary, while the energy necessities are not satisfied, other behavioural models have no adaptive value (Avery, 1976).

CONCLUSIONS

The feeding spectrum of the *Triturus dobrogicus* population is influenced by the environmental conditions, these being optimum in our case.

The parallelism between the values of the weight and frequency shows a homogenous feeding, that is occasionally influenced by the size of the predator and prey.

There are differences between the feeding of the males and females. Males use the active foraging strategy, capturing small preys like Cladocerans, while females use the sit and wait method in order to swallow larger preys. On the other hand, the females` feeding spectrum is influenced by their increased energy necessities, higher amounts of larvae (Diptera, Dytiscida) appearing in their trophic spectrum.

The capturing of different sized preys suggests that the newts` feeding is not selective, capturing all mobile preys that have optimal size for swallowing.

REFERENCES

1. Avery R. A., Thermoregulation, metabolism and social behavior in *Lacertidae*. In: Morphology and Biology of Reptiles, Bellairs, A. d.' A., Cox, C. B., Eds., London, Linnean Society Symposium Series No. 3, Academic Press, 245 – 259, 1976.
2. Blaustein A. R., Kiesecker J. M., Complexity in conservation: lessons from the global decline of Amphibian populations. Ecology Letters 5: 597-608, 2002.
3. Brooks J.S., Calver C.M., Dickman R.C., Meathrel E.C., Bradley S.J., Does intraspecific variation in the energy value of a prey species to its predators matter in studies of ecological energetics? A case study using insectivorous vertebrates, Ecoscience, 3 (3): 247-251, 1996.
4. Ceballos G., Vale M. M., Bonacic C., Calvo-Alvarado J., List R., Bynum N., Medellin R. A., Simonetti J. A., Rodriguez J. P., Conservation Challenges for the Austral and Neotropical America Section. Conservation Biology 23(4): 811-817, 2009.
5. Cicort-Lucaciu A. Şt., Cupşa D., Ghira I., Bogdan H., Pop A., Food composition of some *Triturus dobrogicus* Kir. 1903 populaţtion from north – western Romania, Analele Universităţii din Oradea, Fascicula Biologie, 12: 71 – 76, 2005.
6. Cicort-Lucaciu A. Şt., David A., Covaci R., Toader S., Diaconu D., Feeding of some *Triturus cristatus* population in Turț area (Oas Mountains, Romania), Herpetologica Romanica, 1: 30-37, 2007.
7. Cicort-Lucaciu A. St., Dimancea N., Blaga-Lungulescu R. M., Hodisan O., Benko A., The diet composition of a *Triturus dobrogicus* (Amphibia) population from Arad County, western Romania, Biharean Biologist 3(1): 77-82, 2009.
8. Covaciu-Marcov S. D., Cupşa D., Telcean I., Sas I., A. Cicort., Contribuţii la cunoaşterea herpetofaunei din regiunea cursului mediu şi inferior al Crişului Negru (Judeţul Bihor, România). Oltenia, Studii şi Comunicări, Ştiinţele Naturii, 19: 189-194, 2003.
9. Covaciu-Marcov S-D., Sas I., Cicort-Lucaciu A. St., Achim A., Andritcu A., The herpetofauna of Tasnad hills (Satu-Mare County, Romania), Analele Stiintifice ale Universitatii "Al. Ioan Cuza" Iasi, s. Biologie animala, 51: 159 – 168, 2005.
10. Covaciu-Marcov S. D., Bogdan H. V., Paina C., Toader S., Condure N., The herpetofauna of the north-western region of Bihor County, Romania, Biharean Biologist, 2: 5-13, 2008.
11. David A., Cicort-Lucaciu A. Şt., Szabo A., Ciuca A., Cservid K., Hrănirea unei populaţii de *Triturus vulgaris* din regiunea Văii Teuzului, jud. Arad, Romania, Biharean Biologist, Oradea, 1: 57-61, 2007.
12. Diamond J. M., A-Bombs against amphibians. Nature 383: 386-387, 1996.
13. Duellman W.E., Trueb L., Biology of Amphibians, McGraw-Hill Brook Co., New York, 1986.
14. Dunson WA, Wyman RL, Corbett ES. A Symposium on Amphibian Declines and Habitat Acidification. Journal of Herpetology 26:349-352, 1992.
15. Fraser D. F., Coexistence of salamanders in the genus Plethodon: a variation of the Santa Rosalia theme. Ecology, 57: 238 – 251, 1976.
16. Gascuel D., Bozec Y. M., Chassot E., Colomb A., Laurans M., The trophic spectrum: theory and application as an ecosystem indicator, ICES Journal of Marine Science: Journal du Conseil, 62 (3): 443 – 452, 2005.
17. Kovács E. H., Cicort Lucaciu A. Şt., Cupşa D., Food of the danube crested newt, *Triturus dobrogicus* in a forest habitate (Livada, Satu Mare county, Romania), Satu Mare, Studii şi Comunicări, Seria Ştiinţe Naturale, 6: 61 – 67, 2006.

18. Legler J. N., Sullivan L. J., The application of stomach – flushing to lizzards and anurans. Herpetologica, 35: 107 – 110, 1979.
19. Lőw P., Török J., Prey size selection and food habits of Water Frogs and Moor Frogs from Kis – Balaton, Hungary (*Anura*: *Ranidae*). Herpetozoa, 11 (1/2): 71 – 78, 1998.
20. McNeely J. A., Kapoor-Vijay P., Zhi L., Olsvig-Whittaker L., Sheikh K. M., Smith A. T., Conservation biology in Asia: The Major Policy Challenges. Conservation focus. Conservation Biology 23(4): 805-810, 2009.
21. Perry G., Pianka E. R., Animal foraging: past, present and future. TREE. 12 (4): 360 – 364, 1997.
22. Pullin A. S., Baldi A., Can O. E., Dieterich M., Kati V., Livoreil B., Lovei G., Mihok B., Nevin O., Selva N., Sousa-Pinto I., Conservation Focus on Europe: Major Conservation Policy Issues That Need to Be Informed by Conservation Science. Conservation Biology 23(4): 818-824. 2009.
23. Radu, Gh. V., Radu, V. V., Zoologia Nevertebratelor, vol. 2 Ed. Did şi Ped. Bucureşti, 1 – 708, 1967.
24. Solé M., Beckmann O., Kwet A., Engels W., Stomach-flushing for diet analysis in anurans: an improved protocol evaluated in a case study in *Araucaria* forests, southern Brazil, Studies on Neotropical Fauna and Environment, 40 (1): 23 – 28, 2005.
25. Solé M., Pelz B., Do male tree frogs feed during the breeding season? Stomach flushing of five syntopic hylid species in Rio Grande do Sul, Brazil, Journal of Natural History, 41 (41-44): 2757 – 2763, 2007.
26. Steinbach G., Wendler F., Rovarok. Természetkalauz sorozat, Magyar Könyvklub, Budapest. 2000.
27. Weldon P. J., Demeter B. J., Rosscoe R., A survey of shed skin-eating (dermatophagy) in amphibians and reptiles. J. Herpetol. 27, 219 – 228, 1993.
28. Zimka, J. R., The predacy of the field frog (*Rana arvalis* Nills.) and food levels in communities of soil macrofauna of forest habitats. Ekol. Pol. A, 14, 589 – 605. 1966.
29. Young B. E., Lips K. R., Reaser J. K., Ibanez R., Salas A. W., Cedeno J. R., Coloma L. A., Ron S., La Marca E., Meyer J. R., Munoz A., Bolanos F., Chaves G., Romo D., Population Declines and Priorities for Amphibian Conservation in Latin America, Conservation Biology. 15(5):1213-1223, 2001.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

VARIATIONS REGARDING THE SEX AND PERIOD OF THE FEEDING OF A *LISSOTRITON VULGARIS* (AMPHIBIA) POPULATION FROM ARAD COUNTY, ROMANIA

Hodişan Oana[1], Sas Istvan[1], Ancău Maria[1], Pal Adrian[1], Coman Cristina[1]

KEY WORDS: *Lissotriton vulgaris, feeding, prey categories*

ABSTRACT

The study was realised in 2007, in a habitat situated near Igneşti locality, Arad County. We analysed the stomach contents of 120 Lissotriton vulgaris individuals, and following the analysis of the trophic spectrum, we identified 2216 preys, belonging to 18 prey taxa. The Crustacean Copepoda, respectively Cladocera were the most important prey categories. We also noticed the presence of vegetal and shed-skin fragments, beside the contents in animal prey. All of the analysed stomachs presented contents, the habitat presenting optimum feeding and survival conditions.

INTRODUCTION

Newts are a group of amphibians that occupy a special position in the trophic chain. In spring, during the breeding period they act in aquatic ecosystems, while later, in early summer they migrate to wet terrestrial habitats (Fuhn, 1960). Regarding newts, and also all amphibians, catching prey requires a long period from the life of an animal and is the key factor of their ecology (Perry et al 1990). To understand the amphibians' position in the trophic networks is extremely important because the food composition is an indicator of the habitat quality in which they live (Gunzburger, 1999).

Among the newt species of the genus *Triturus*, *Lissotriton vulgaris* (Linnaeus 1758) is the most widespread species in the country (Cogălniceanu et al 2000), being encountered from the plain areas to mountainous ones, not being pretentious for water quality. The first data on the trophic spectrum of the newts in the aquatic period appeared in Europe (Dolmen & Koksvik 1983; Denoel & Andreone 2003, etc). There are recent data in Romania regarding the food composition of *Lissotriton vulgaris* (Cicort-Lucaciu et al 2004; David et al. 2008). Our study aimed to analyse the food composition of a *Lissotriton vulgaris* population in a hilly region, during the aquatic period. We followed the identification of the taxonomic affiliation of the consumed preys and respectively the differences that appear according to the sex and period of sampling.

MATERIALS AND METHODS

The study was conducted in the spring of 2007, between March 25 and April 21, the samples were taken from a habitat near Igneşti locality, Arad County. We investigated the

[1] University of Oradea, Faculty of Science, Department of Biology

habitat on three occasions, and stomach contents were taken from 120 individuals of *Lissotriton vulgaris*, 58 females and 62 males. The studied habitat is a pond, with a specific aquatic vegetation and amphibious vegetation situated on the banks. We captured the newts using a metallic dredger, or some round nets set on a long metallic rod.

The stomach contents were extracted with the stomach flushing method (Solé et al 2005), which were taken immediately after capture, amphibians digesting food very fast. The method has the advantage that it does not harm the animals. After collecting the samples, the newts were released in their habitat. For this method, we used a syringe equipped with a thin perfusion tube. The stomach contents were stored in airtight test tubes and preserved using a 4% formaldehyde solution, being accompanied by labels with information regarding the sex of the analysed newts. The identification of the prey categories found in the stomach contents was realised in the laboratory under the binocular microscope. The determination of the prey taxa was realised up to the Order and Family levels using the scientific literature (Ionescu et al 1971).

RESULTS AND DISCUSSIONS

Temperature and humidity greatly affect the feeding activity of Amphibians (Cogălniceanu et al 2000). The trophic composition depends on the biological cycle of the invertebrates, which constitute the primary food source. The feeding activity rate is estimated as the percentage of stomachs that present content and the total number of analysed stomachs (Sala & Ballesteros 1997). In the case of our study, all of the 120 individuals presented stomach contents, reaching a value of 100%. The fact that all individuals presented food in their stomachs before they were captured indicates optimum feeding and hunting conditions, which is connected to both the environmental conditions and the presence in the respective habitat of a high number of potential preys (Sas et al 2009). The lowest number of preys was recorded at the beginning of our study (645), while in the end we registered a value of 947 preys. In March and early April, the average number of preys / individual is 16.12, this amount increasing gradually, towards the end of the study reaching 23.09, which explains that the elevated temperatures determined the activity of the prey taxa that were sensitive to low temperatures.

Beside the consumed animal preys, we also identified vegetal fragments and shed-skin in the stomach contents of the analysed newts. Vegetals were consumed in all of the three study periods, 40% of the individuals presenting in their stomach vegetal fragments (Tab.1). The consumption of vegetal matter is considered to be accidental, these being swallowed together with the followed prey. Plant fragments were also frequently identified in the stomach contents of *Lissotriton vulgaris* in other studies (Cicort-Lucaciu et al 2004).

Regarding the shed-skin consumption, this was also identified in the trophic spectrum of other Amphibians (Sas et al. 2005). In our study, the frequency of this element was reduced 12.5%, shed-skin consumption being regarded as a way of recycling the epidermal proteins (Weldon, 1993), which have a high nutritional value. Moreover, this element floats on the water surface, thus being an accessible food source (David et al. 2008).

We also identified laying of eggs in the trophic spectrum, being a significant food source in the periods when the prey animals are reduced in number and are also easy to capture (Covaciu-Marcov et al 2002). The frequency of the individuals that consumed laying of eggs decreases as submitted to the warm season. Thus, in the first period of study the frequency of laying of eggs is 35%, which coincides with the period of egglaying at the

frogs, and towards the end of our study the frequency of laying of eggs decreased to 0 %. This can be explained by the egg hatching and their transformation in tadpoles.

We identified 2216 preys in all of the 120 stomach contents during all the study periods. The majority of the consumed preys are aquatic 99.27%, during the study period the newts being in the reproductive period. Only 0.72% of the preys have a terrestrial origin. The 2216 preys belong to 18 prey taxa (Grid no. 1). The Crustacean Copepoda, registering the highest frequency (81.66%) and weight value (45.85%), represented the most important category of prey taxa recorded during all of the study. The maximum weight value was recorded in the second period of the study. The Copepoda presented high weights at both the females and males, however the weight was higher in the case of the females.

The Crustacean Cladocera (Grid no. 1) presented high weight and frequency values in the last two study periods, being surpassed by the Copepoda during the third period of our study. The high value of the weight of the Copepoda, respectively the Cladocera is due to their small size and gregarious life. Therefore, the newts have to consume a larger number of individuals in order to satisfy their energy needs (David et al 2008). The consumption of small-sized preys, shows the fact that the individuals feed by actively searching for the prey, using the "active foraging" strategy (Perry & Pianka 1997). High values of the Copepoda were also recorded at other populations of *Lissotriton vulgaris* in Hungary (Kovacs & Torok 1992).

The amphibian egglaying and Trichoptera larvae register significant frequency and weight values, which are consumed especially at the beginning of the study. The amphibian egglaying recorded a high frequency (65%) in the first period of our study, but a lower weight value. The high frequency demonstrates that they are homogenously spread in the habitat. This moment may coincide with the egg hatching in the case of the Amphibians. The high value of Trichoptera larvae in early spring, is explained by the fact that they are less sensible to low water temperatures, proof being the high frequency value 45%. At the end of the study, these two trophic categories had very low values.

CONCLUSIONS

All of the 120 individuals presented stomach content, which reveals the food abundance from the habitat. The Crustacean Copepoda, followed by the Crustacean Cladocera, which registered the highest frequency and weight values throughout the study, represent the most important category of prey taxa identified in the stomach contents. The high frequency value indicates a homogenous food distribution in the analysed habitat. The consumption of small-sized preys indicates the fact that newts feed through the active searching of their prey, using the "active foraging" strategy. From all of the analysed preys, 99.27 % are aquatic ones, the newts being in a reproductive period. During all of the three study periods, we noticed that females had a higher feeding process than males. Beside animal preys, we also identified in the stomach contents vegetable remains, shed-skin and egglaying, which were accidentally ingested.

REFERENCES

1. Cicort–Lucaciu A.–Şt., Covaciu–Marcov S. D., Cupşa D., Purgea I., Romocea M. Research upon the trophic spectrum of a *Triturus vulgaris* (Linnaeus 1758) population of the Beiul depression area (Romania). Universitatea din Bacău, Studii şi Cercetări Ştiinţifice, Biologie 9: 201 – 206, 2004.

2. Cogălniceanu D., Aioanei F., Bogdan M. Amfibienii din România, Determinator. Ed. Ars Docendi, Bucureşti, 1-99, 2000.
3. Covaciu–Marcov S. D., Cupşa D., Cicort-Lucaciu A. Şt., Telcean I., Sas I. Contribuţii la cunoaşterea spectrului trofic al speciei *Triturus cristatus* (*Amphibia*, *Urodela*) din regiunea Marghita şi Munţii Pădurea Craiului (Jud. Bihor, România). Analele Univ. din Oradea, Fasc. Biol., 9: 95 – 108, 2002.
4. David A., Cicort-Lucaciu A. Şt., Lazăr O., Boros A. M., Indrei C. Food composition of a common newt (*Lissotriton vulgaris*) population from Prunişor region (Arad County, Romania). Biharean Biologist, 2: 38–42, 2008.
5. Denoël M., Andreone F. Trophic habits and aquatic microhabitat use in gilled immature, paedomorphic and metamorphic Alpine newts (*Triturus alpestris apuanus*) in a pond in central Italy. Belg. J. Zool., 133 (2): 95-102, 2003.
6. Dolmen D. & Koksvik J. I. Food and feeding habits of *Triturus vulgaris* (L.) and *T. cristatus* (Laurenti) (*Amphibia*) in two bog tarns in central Norway. Amphibia – Reptilia, 4: 17-24, 1983.
7. Fuhn I. E. Fauna R.P. Române, Amphibia, vol. XIV, fascicola I. Ed. Acad. R.P.R., Bucureşti, 1-288, 1960.
8. Gunzburger, M. S. Diet of the Red Hills Salamander *Phaeognathus hubrichti.* Copeia 2: 523-525, 1999.
9. Ionescu M. A., Lăcătuşu M. Entomologie. Ed. Did. şi Ped., Bucureşti, 1–416, 1971.
10. Kovács T., Török J. Nyolc kétéltű faj táplálkozásökológiája a Kis-Balaton természetvédelmi területén. – Állattani Közlemények, 78: 47-53, 1992.
11. Perry G., Lampl I., Lerner A., Rothenstein D., Shani N., Sivan N., Werner Y. L. Foranging mode in lacertid lizards: variation and corellates. Amphibia – Reptilia 11: 373-384, 1990.
12. Perry G., Pianka E. R. Animal foraging: past, present and future, TREE. 12 (4): 360 – 364, 1997.
13. Sala E., Ballesteros E. Partitioning of space and food resources by three fish of the genus *Diplodus* (Sparidae) in a Mediterranean rocky infralittoral ecosystem. Mar. Ecol. Prog. Ser., 152: 273-283, 1997.
14. Sas I., Covaciu-Marcov S. D., Pop M., Ile R. D., Szeibel N., Duma C. About a closed hybrid population between *Bombina bombina* and *Bombina variegata* from Oradea (Bihor County, Romania). N. West. J. Zool., 1: 41-60, 2005.
15. Sas I., Covaciu-Marcov S.-D., Strugariu A., David A., Ilea C. Food habit of *Rana* (*Phelophylax*) *kl. esculenta* females in a new recorded E-System population from a forested habitat in north-western Romania. Turk. J. Zool., 33: 1-5, 2009.
16. Solé M., Beckmann O., Pelz B., Kwet A., Engels P. Stomach flushing for diet analysis in anurans: an improved protocol evaluated in a case study in *Araucaria* forests, southern Brazil. Studies on Neotropical Fauna and Environment, 40 (1): 23-28, 2005.
17. Weldon P. J., Demeter B. J., Rosscoe R. A survey of shed skin eating (dermatophagy) in amphibians and reptiles. J. Herpetol., 27: 219-228, 1993.

Grid no. 1

The weight of the prey categories regarding the sex and period. The frequency of the prey categories identified in the stomach contents of the individuals. The frequency of other elements: egglaying, shed-skin, vegetal fragments.

	25 March			05 April			21 April			Total
	F	M	T	F	M	T	F	M	T	
No. of individuals	19	21	40	19	20	39	20	21	41	120
Total no. of preys	212	433	645	213	411	624	397	560	947	2216
Max. no. of preys/ individual	25	45	45	20	56	56	46	59	59	59
Average no. of preys / individual	11.15	20.61	16.12	11.21	20.55	16	19.35	26.66	23.09	18.46
% Aquatic Preys	98.11	99.6	99.22	99.06	98.78	98.87	100	99.28	99.57	99.27
% Terrestrial preys	1.88	0.23	0.77	0.93	1.21	1.12	0	0.71	0.42	0.72
Weight (%)										
Crustacean-Isopoda (t)	0.47	0.69	0.15	-	-	-	-	-	-	0.04
Crustacean-Ostracod a	5.18	59.81	2.17	2.81	4.38	3.84	2.84	0.53	1.47	2.34
Crustacean-Copepoda	52.35	20.55	57.36	83.09	67.88	73.07	23.77	17.5	20.06	45.84
Crustacean-Cladocera	3.30	1.15	14.88	4.22	22.63	16.34	70.80	80.53	76.55	41.65
Diptera-Nematocera (L)	7.07	-	3.1	-	-	-	1.29	0.17	0.63	1.17
Diptera-Brahicera (L)	-	0.69	-	0.46	0.24	0.32	-	-	-	0.09
Diptera-Brahicera (t)	-	-	-	-	0.24	0.16	-	-	-	0.04
Coleoptera (t)	0.94	3.00	0.46	0.46	0.73	0.64	-	0.35	0.21	0.4
Coleoptera-Dytiscida (L)	1.41	0.23	0.93	1.40	0.24	0.64	-	-	-	0.45
Odonata (L)	0.47	1.61	0.15	0.93	0.24	0.48	-	-	-	0.18
Oligocheta-Lumbricida	0.47	-	0.15	-	-	-	-	-	-	0.04
Ephemeroptera-(L)	-	-	-	-	-	-	0.51	-	0.21	0.09
Hymenoptera-Formicida	-	-	-	-	-	-	-	0.17	0.1	0.04
Amphibian (L)	17.45	12.24	13.95	1.87	0.24	0.80	-	-	-	4.28
Arahnida-Araneida	-	-	-	0.46	0.24	0.32	-	0.17	0.1	0.13
Trichoptera (L)	7.54	-	3.56	2.81	1.21	1.76	0.51	0.17	0.31	1.66
Gasteropoda aq.	3.30	-	3.1	1.40	1.70	1.60	0.25	0.35	0.31	1.48

	25 March			05 April			21 April			Total
	F	M	T	F	M	T	F	M	T	
Frequency (%)										
Crustacean-Isopoda (t)	-	5.26	2.5	-	-	-	-	-	-	0.83
Crustacean-Ostracoda	4.76	15.79	10	15.78	15.78	20.51	5	4.76	4.87	11.66
Crustacean-Copepoda	90.47	73.68	82.5	89.47	89.47	87.17	80	71.42	75.60	81.66
Crustacean-Cladocera	38.09	5.26	22.5	15.78	15.78	30.76	95	95.23	95.12	50
Diptera-Nematocera (L)	14.28	42.11	27.5	-	-	-	20	4.76	12.19	13.33
Diptera-Brahicera (L)	-	-	-	5.26	5.26	5.12	-	-	-	1.66
Diptera-Brahicera (t)	-	-	-	-	-	2.56	-	-	-	0.83
Coleoptera (t)	4.76	10.53	7.5	5.26	5.26	10.25	-	9.52	4.87	7.5
Coleoptera-Dytiscida (L)	14.28	15.79	15	15.78	15.78	10.25	-	-	-	8.33
Odonata (L)	-	5.26	2.5	10.52	10.52	7.69	-	-	-	3.33
Odonata	-	-	-	-	-	-	-	-	-	0
Oligocheta-Lumbricida	-	5.26	2.5	-	-	-	-	-	-	0.83
Ephemeroptera-(L)	-	-	-	-	-	-	5	-	4.87	0.83
Hymenoptera-Formicida	-	-	-	-	-	-	-	4.76	2.43	0.83
Amphibian (L)	76.19	52.63	65	15.78	15.78	10.25	-	-	-	25
Arahnida-Araneida	-	-	-	5.26	5.26	5.12	-	4.76	2.43	2.5
Trichoptera (L)	28.57	63.16	45	26.31	26.31	25.64	10	4.76	7.31	25.83
Gasteropoda aq.	33.33	21.05	27.5	15.78	15.78	17.94	5	9.52	7.31	17.5
% Egglaying	36.84	33.33	35	10.52	15	12.82	0	0	0	15.83
% Shed-skin	0	23.80	12.5	10.52	10	10.25	20	9.25	14.63	12.5
% Vegetal	36.84	38.09	37.5	47.36	40	43.58	25	52.38	39.02	40

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

STUDIES REGARDING SOME POPULATIONS OF *BOMBINA VARIEGATA* (AMPHIBIA) FROM ALMĂŞ-AGRIJ DEPRESSION, SĂLAJ COUNTY, ROMANIA

Kovacs Irina[1], Covaciu Marcov Severus Daniel[2],

KEY WORDS: Bombina variegata, Almăş-Agrij depression, belly pattern

ABSTRACT

All of the 9 Bombina variegata populations, studied in Almăş-Agrij Depression also present characters of the Bombina bombina species. Their weight varies regarding the population, the purest B. variegata population from the region presenting 68,9% from the characters of the congenera species, while the impurest registers 69,3%. The values are framed in the limits established for other B. variegata populations from western Romania, the situation appearing to be a general one in the region.

INTRODUCTION

Bombina genus is represented in Europe through two species, *Bombina bombina* and *Bombina variegata* (Cogălniceanu et al 2000). They are both present in Romania (Cogălniceanu et al 2000), *B. variegata* being specific for the hills and mountains, while *B. bombina* for the plains (Fuhn 1960). A particularity of the two species is the fact that they are not reproductively isolated and they hybridise in the contact areas (Szymura 1993). The hybridisation area is situated at the crossing between plains and hills.

As in the case of the rest of the area, the two species also hybridise in Romania, being recently signalled numerous hybrid populations in different areas of the country (Ghira et al 2003, Covaciu-Marcov et al 2003a, 2004, 2005, 2006, 2009, Sas et al 2005, Ferenți et al 2008).

However, outside of the hybridisation area and at great distances of it, there are present populations of a species that also present characters of its congenera, although it is missing from the region (Stugren 1980, Covaciu-Marcov et al 2002, 2003 b, 2007 a). Studies upon the two species of the Bombina genus have not been previously performed in Sălaj County. Only *B. variegata* is present in the central sectors of the county (Covaciu-Marcov et al 2009).

The present study aimed to analyse some *B. variegata* populations from Almăş-Agrij Depression from Sălaj County, in order to establish the presence of certain *B. bombina* features.

[1] Reformed Theological Highschool, Zalău
[2] University of Oradea, Faculty of Sciences, Department of Biology

MATERIALS AND METHODS

The study took place in the year 2009. We analysed 249 *B. variegata* individuals from 9 localities situated in Almăş-Agrij Depression, in Sălaj County. The toads were captured by hand, being released in their habitats after the activity was finished. The method used for the establishing of the population affiliation implies the analysis of the main morphologic and chromatic features of the two species, which are grouped in two grids (table no. 1).

Table 1.

The two Grids of differentiation of the European species of Bombina

Character		*Bombina bombina*	*Bombina variegata*
	Grid 1 (the characteristic of the belly pattern)		
1	Chin – chin	Separated	United
2	Chin – chest	Separated	United
3	Chest – chest	Separated	United
4	Chest – shoulder	Separated	United
5	Shoulder – arm	Separated	United
6	Chest – abdomen	Separated	United
7	Abdomen – abdomen	Separated	United
8	Abdomen – basin	Separated	United
9	Basin – basin	Separated	United
10	Basin – thigh	Separated	United
	Grid 2 (after Stugren, Ghira & Mara, modified)		
1	Colour of light ventral spots	Red, orange, yellowish	Yellow
2	Colour of the top of fingers	Black	Yellow
3	Dorsal colour	Black	Pale grey
4	Relation between tarsal and plantar light spots	Separated	United
5	Ventral colour	Orange spots on black background	Black spots on yellow background
6	Relation between the head length and width	Length > width	Length < width
7	The drawing of the lateral and ventral parts	White spots around the verrucae	Without white spots around the verrucae
8	Aspect of the dorsal black tubercles	Regulated	Scattered or absent
9	The aspect of the dorsal verrucae	Lens-shaped, squatted	Sharp, rough
10	Ratio of tibia-tarsian joints when the legs segments are parallel	Not touching	Touching

The characteristics used are the most important diagnose characteristics of the two species and several authors used them (Stugren 1980, Ghira & Mara 2000, Ghira et al 2003, Gollmann et al 1993). The first grid analysed the morphology, the dimension and the ratios of light ventral spots, coloured in red at *B. bombina* and in yellow at *B. variegata*. The degree of confluence or separation of different ventral spots is scored for 10 chromatic groups (table no. 1). If the light spots are separated among them by black pigment, the character belongs to *B. bombina*. When the spots are united among them and the light pigment on the body appears uniform, the character belongs to *B. variegata*. The second grid analyses 10 features as well and was used by Stugren (1980) and modified by Ghira & Mara (2000). Both of the grids use a binary system (0, 1). For both grids, each feature

receives a mark: 1 if it is expressed like *B. variegata* and 0 if it is expressed like *B. bombina*. Summing the marks obtained for each characteristic, a certain individual can receive on each grid a score ranging from 0 to 10; the score equal to 0 means a pure *B. bombina*, the score equal to 10 means a pure *B. variegata*. After assessing the score for each individual, we calculated the average score of all individuals of each population for each grid and then the average of the two grids. This method allows the transfer of the features into percentages and their statistical interpretation. The final mark indicates the amount of *B. variegata* species features.

RESULTS AND DISCUSSIONS

All of the populations studied from Almăş-Agrij Depression belong to *B. variegata* species, meeting most of the characters of this species. The fact is in relation with the previous data regarding the presence in the area of just this species (Covaciu-Marcov et al 2009), but also with the altitude of the area and the aspect of the habitats. However, none of the populations is a pure *B. variegata* one, but also present characters of the congenera species *B. bombina*, despite the fact that they were not identified in the region (Covaciu-Marcov et al 2009), and the closest population can be found at several tens of km (Covaciu-Marcov et al 2006, 2007 a). The weight of the *B. variegata* characters is different between the 9 populations (grid no. 2).

Table 2.

The affiliation of the studied populations (1: Mesteacănu; 2: Gâlgăul Almaşului; 3: Poic (Satu Hurez); 4: Ciglean; 5: Jebucu; 6: Gălpâia; 7: Ciumârna; 8: Brebi; 9: Dragu)

Locality	1	2	3	4	5	6	7	8	9
No. of studied individuals	28	30	30	20	30	30	25	26	30
Altitude (m.)	508	250	610	300	557	287	293	278	390
average grid 1	67.5	72.16	63.5	68	68.33	72.66	78.4	69.8	74.16
average grid 2	79.1	75.66	75.16	71.5	79.5	77.33	79.4	74.8	78.33
grids' average	73.3	73.91	69.33	69.75	73.91	74.99	78.9	72.3	76.24

Normally, the transition between the two species in hybrid populations is realised once with the increase of the altitude. Thus, together with this, the weight of the *B. variegata* characters also increases (Covaciu-Marcov et al 2004, 2005, 2006, 2007 a, 2009). In the present case, this fact is not valid, the differences between the populations not appearing to be influenced by altitude. Therefore, the population from Poic presents with 5 % lesser *B. variegata* characters than the one from Gălpâia, although it is situated with 323 m altitude upwards. On the lack of the altitudinal case, the only explanation for the differences between the populations is offered by the habitats' morphology. In the hybridisation areas, the characteristics of the habitats greatly affect the aspect of the hybrid populations (MacCallum et al 1998). However, in the studied area, generally all of the habitats are close to the requirements of the *B. variegata* species, which is attached to the reduced-sized habitats (Cogălniceanu et al 2000). There are also certain subtle differences between these habitats, which are generally favourable to the species. Thus, the purest *B. variegata* populations are present in temporary puddles of reduced sizes and lack vegetation, in many cases being formed on country roads (Ciumârna, Dragu). The larger and permanent habitats are found at the opposite corner, such as the bogging areas formed on streams (Poic).

Despite the fact that all of the populations largely resemble *B. variegata*, some characters are expressed in all of the cases as *B. bombina* (Table 3). The characters are the same that are expressed in the same manner in the cases of other *B. variegata* populations from western Romania (Covaciu-Marcov et al 2002, 2003b, 2007 a, 2009). These data once more underline the homogeneity of the *B. variegata* populations from north-western Romania.

Table 3.

The features' ratio in two grids (1: Mesteacănu; 2: Gâlgăul Almaşului; 3: Poic (Satu Hurez); 4: Ciglean; 5: Jebucu; 6: Gălpâia; 7: Ciumârna; 8: Brebi; 9: Dragu)

Locality	1	2	3	4	5	6	7	8	9
Feature	GRID 1								
1	100	100	100	100	100	100	100	100	100
2	0	13,33	1,66	0	1,66	8,33	14	11,53	15
3	14,28	10	0	5	3,33	13,33	32	11,53	33,33
4	62,5	90	55	80	66,66	90	88	71,15	75
5	100	98,33	100	100	100	100	100	100	100
6	19,64	13,33	11,66	7,5	16,66	28,33	52	19,23	21,66
7	100	100	91,66	100	100	100	100	96,15	100
8	92,85	96,66	85	92,5	95	93,33	98	94,23	96,66
9	85,71	100	90	95	100	96,66	100	96,15	100
10	100	100	100	100	100	96,66	100	98,07	100
Feature	GRID 2								
1	100	96,66	100	100	100	100	100	100	100
2	100	100	100	100	100	100	100	100	100
3	100	100	100	90	100	100	100	80,76	100
4	73,21	60	41,66	55	55	43,33	82	44,23	56,66
5	100	100	100	100	100	100	100	100	100
6	25	23,33	36,66	15	56,66	50	44	34,61	43,33
7	21,42	10	6,66	0	6,66	3,33	0	0	6,66
8	78,57	83,33	86,66	55	93,33	90	84	100	96,66
9	100	100	100	100	100	100	100	100	100
10	92,85	83,33	80	100	83,33	86,66	84	88,46	80

It is important that it is maintained in the same limits, the weight of the characters once the altitude decreases. Thus, on the one hand, this indicates homogeneity as an origin of the *B. variegata* populations from Almăş-Agrij Depression, and on the other hand, it underlines the lack of the congenera species at the level of Someş passage, at least from the studied sector and from the neighbouring ones. The homogeneity of the populations and their resemblance with others from the surrounding area of Apuseni Mountains, suggest that they have the same origin, come from the same group, had the same route and history of the postglacial colonisation of the territory presently occupied north-westwards of Apuseni Mountains.

Concerning the existence of some *B. bombina* populations in the lower areas surrounding Someş, the weight of the characters of this species should have risen once with the approaching of Someş, while this fact does not occur. The situation should have also been valid in the case of the existence of some populations or of a residual hybridisation area, which eventually had afterwards disappeared due to different reasons. The total absence of them indicates that the present populations of *B. variegata* from the studied

region did not present contact in this area with *B. bombina* as it descended towards Someş, and therefore had no possibility of taking its features. In this case, a colonisation of the region starting downwards near Someş can also be speculated, or at least it cannot appear improbable. Meanwhile, the absence of *B. bombina* species from the region and the fact that this absence is prior to the entering of *B. variegata* in the region, raises questions regarding the migration routes of the *B. bombina* populations, situated upstream of Someş, at Dej or Cluj (Fuhn 1960, Ghira et al 2003). Thus, either *B. bombina* migrated in the region at a moment prior to the entering of *B. variegata*, fact suggested by the identification of the populations from Maramureş County from Ulmeni (Covaciu-Marcov et al 2007 b), or the migration in Transylvania was univocal alongside Mureş, which however seems less likely.

CONCLUSIONS

Only *B. variegata* populations are present in Almăş-Agrij Depression from Sălaj County. However, they also present *B. bombina* features in various amounts. The differences between the populations are not determined by altitude, but are influenced by the habitat particularities. The weight of the *B. bombina* characters is similar to the ones registered in other populations of *B. variegata* from north-western Romania. Moreover, the characters that are expressed at most of the individuals in the same manner, as at the sister species are identical to the ones described before. These facts underline the homogeneity of the *B. variegata* populations from the north-western part of the Apuseni Mountains.

REFERENCES

1. Cogălniceanu D., Aioanei F., Bogdan M. Amfibienii din România, Determinator. Ed. Ars Docendi, Bucureşti, 1-99, 2000.
2. Covaciu-Marcov S.-D., Telcean I., Cupşa D., Schircanici A., Sas I. Cercetări asupra populațiilor de *Bombina bombina* (Amphibia, Anura) din nordul județului Bihor (România). Analele Univ. din Oradea, Fasc. Biol., 9: 59-69, 2002.
3. Covaciu-Marcov S.-D., Sas I., Pusta C., Cadleț D., Antal B. Research about the hybridization area between *Bombina bombina* and *Bombna variegata* of the middle course of Barcău river (Bihor county, Romania). Analele Univ. din Oradea, Fasc. Biol., 10: 65-79, 2003 a.
4. Covaciu-Marcov S.-D., Sas I., Sala G., Cicort-Lucaciu A.-Şt., Puie T. Studiul unor populații de *Bombina variegata* din Depresiunea Beiuşului (Jud. Bihor, Romania). Analele Univ. din Oradea, Fasc. Biol., 10: 119-130, 2003 b.
5. Covaciu-Marcov S.-D., Vesea L., Peter V., Kovacs E. H., Lazăr V. Studies on the hybridation area between *Bombina bombina* and *Bombna variegata* in Derna Hill region (Bihor region, Romania). Analele Univ. din Oradea, Fasc. Biol., 11: 55-60, 2004.
6. Covaciu-Marcov S.-D., Bogdan H., Peter V.-I., Groza M., Diaconu D. Analiza zonei de hibridare dintre *Bombina bombina* şi *Bombna variegata* din nord-vestul dealurilor Tăşadului. Oltenia, Studii şi Comunicări, Ştiințele Naturii, 21: 153-156, 2005.
7. Covaciu-Marcov S.-D., Groza M., Toth A., Radu N., Szabo A. Dates upon the hybridation area between *Bombina bombina* and *Bombna variegata* from the natural reservation of the inferior course of the Tur river (Satu-Mare County, Romania). Analele Univ. din Craiova, 11 (47): 163-168, 2006.

8. Covaciu-Marcov S.-D., Toth A., Ile R. D., Iaba I., Lazăr O. Research on some populations of *Bombna variegata* from south-west of Mehedinți county (Romania). Analele Univ. din Craiova, 12: 277-282, 2007 a.
9. Covaciu-Marcov S.-D., Cicort-Lucaciu A.-Şt., Sas I., Groza M. I., Bordaş I. Contributions to the knowledge regarding the herpetofauna from the Maramureş County areas of "Măgura Codrului", Romania. Biharean Biologist, I: 50-56, 2007 b.
10. Covaciu-Marcov S.-D., Ferenți S., Bogdan H. V., Groza M., Bata Z. Ş. On the hybrid zone between *Bombina bombina* and *Bombna variegata* in Livada Forest, north-western Romania. Biharean Biologist, 3 (1): 5-12, 2009.
11. Ferenți S., Groza M. I., Toth G., Ancău M. Date asupra unor populații hibride între *Bombina bombina* şi *Bombna variegata* (Amphibia) din județul Arad, vestul României. Biharean Biologist, 2: 23-49, 2008.
12. Fuhn I. "Fauna R.P.R.", vol. XIV, Fascicola I, Amphibia. Editura Academiei R.P.R., Bucureşti, 1-288, 1960.
13. Ghira I., Mara G. Using the allelomorphic feature in identifying two species belonging to genus *Bombina* (Anura Discoglossidae) from Transilvania. Studia Univ. Babes-Bolyai, 45: 85-95, 2000.
14. Ghira I., Marinescu I. E., Domşa C. Habitat preferences of different hybrid categories between *Bombina bombina* (L.) and *Bombna variegata* (L.) in Transsylvanian Plain. Studii şi Cercetări, Biologie, Bacău, 8 (3 – 5): 211-215, 2003.
15. Gollmann G., Borkin L. G., Roth P. Genic and morfological variation in the fire-bellied toad, *Bombina bombina* (Anura, Discoglossidae). Zool. Jb. Syst. 120: 129-136, 1993.
16. MacCallum C., Nurnberger B., Barton N. H., Szymura J. M. Habitat preference in the *Bombina* hibrid zone in Croatia. Evolution 52 (1): 227-239, 1998.
17. Sas I., Covaciu-Marcov S.-D., Pop M., Ile R. D., Duma C. About a closed hybrid population between *Bombina bombina* and *Bombina variegata* from Oradea (Bihor County, Romania). N. West. J. Zool., 1: 41-60, 2005.
18. Stugren, B. Geographical variation of the fire - bellied toad (*Bombina bombina* (L.)) in the USSR. (Amphibia, Anura, Discoglossidae). Zool. Abh. Mus. tierk. Dresden, 36 (5): 101-115, 1980.
19. Szymura, J. M. Analysis of hybrid zones with *Bombina*. In Hibrid zones and the evolutionary process (ed R. G. Harrison), Oxford University Press, 261-289,1993.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

PHYSIOLOGICAL MODIFICATIONS PRODUCED BY THE *SPHAEROTHECA PANNOSA* IN SOME VARIETIES OF ROSES

I. Nicolae[1], Mariana Nicolae[2]

KEY WORDS: attacked plants, healthy plants, pathogen, roses.

ABSTRACT

The research regarding several physiological modifications produced by Sphaerotheca pannosa was made at some varieties of roses cultivated in N. Romanescu Park, Craiova. In connection with the climatic conditions, as a result of the action pathogen on the contaminated rose plants one can also observe that the diurnal dynamics of the photosynthesis and of transpiration follows a unimodal curve which presents a minimum in the morning, a maximum after lunch and a minimum toward the evening, with specific variations in the plants attacked. The plants attacked by the pathogen present a decrease of chlorophyll content as a result of the blockage of its biosynthesis and the decrease of the total water contents as a result of lesion of the defense tissues, malfunctioning of the closing and opening mechanisms of stomates, which is manifested by the withering and premature drying of the plants.

INTRODUCTION

The rose mildew is the most common disease that occurs in cultures of field roses and protected areas.

MATERIAL AND METHOD

Research regarding some physiological modifications produced by *Sphaerotheca pannosa* var. rosae was made at varieties of roses *Rosagold* and *Kosmos* cultivated in Nicolae Romanescu Park of Craiova, in 2009. Variety of roses *Rosagold* presents a height of 80 cm, cream-colored flowers with a diameter of 7-8 cm, and the variety of roses *Kosmos* presents a height of 100 cm diameter, yellow flower with a diameter of 6-7 cm.

For the estimate of the attack was made using the calculation formulae (Săvescu A., Rafailă C.). The diurnal dynamics of photosynthesis and transpiration was established non-destructive method with the analyzer LCi (Ultra Compact Photosynthesis Measurement System). The total water contents and of dry substance were determined by the help of the drying stove - gravimetric method. The contents of the chlorophyllian pigments was estimates by Minolta SPAD 502 chlorophyll meter.

[1] University of Craiova
[2] "Transporturi Auto" Schoolar Group, Craiova

RESULTS AND DISCUSSIONS

Sphaerotheca pannosa var. *rosae* presents ectoparazit mycelium, filamentous. On the mycelium can be noticed short conidiophores and conidia unicellular, hialine, cylindrical. In blocks on branches, in autumn cleistothecia are distinguished in the form of small points. In cleistothecia it forms a single ovoid asca with 8 ascospores unicellular.

The rose mildew is done on leaves, on young branches, and even on the rosebud and on fruit during the growing season of the host plant. On both sides of the attacked leaves, there appear spots, different in shape and size, white, powdery-looking, as a result of forming conidiospores and fungus conidia. As the disease progresses, spots cover part or all garrulous leaves that turn yellow, then necrosis and fall (Fig. 1. and Fig. 2.)

The young branches attacked are covered by a thick micelianã felt, compact, whitish at first, then yellow. In the mycelium on branches, in autumn cleistothecia fungus, take the form of small points, brown. Branches are not contested and not fully lignify resist frosts of winter. The flower buds affected are covered by whitish mycelium remains small and does not form flowers. The disease is favored by the location of plants unaires areas with low light, high temperature variations, wet and hot weather, dry soils, etc.

Fig. 1. The rose plants *Rosagold* attacked by the *Sphaerotheca pannosa*.

Fig. 2. The rose plants *Kosmos* attacked by the *Sphaerotheca pannosa.*

The estimation of the attack caused by the *Sphaerotheca pannosa* at varieties of roses *Rosagold* and *Kosmos* is presented in Fig. 3.

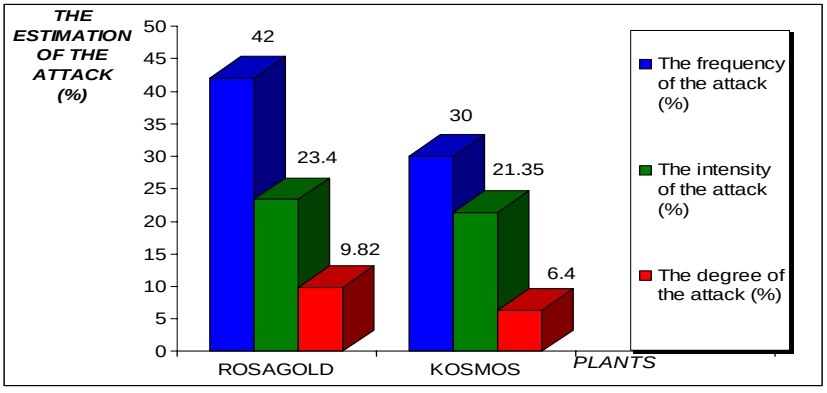


Fig. 3. The estimate of the attack produced by *Sphaerotheca pannosa* in the rose plants.

The diurnal dynamics of the physiological processes at the rose plants was established, according to the frequency, the intensity and the degree of attack, but also by the climatic conditions, on July 22th 2009.

The diurnal dynamics of photosynthesis and transpiration presents a minimum in the morning, a maximum after lunch and a minimum toward the evening with specific variations in the plants attacked.

The diurnal dynamics of photosynthesis in the attacked plants is similar to that in healthy plants but the recorded values are lower in comparison with these as a result of the reduction of the assimilation surface through the deterioration of the chlorophyll as well as the inhibition of several biochemical reactions of the photosynthesis (Fig. 4 and Fig. 5).

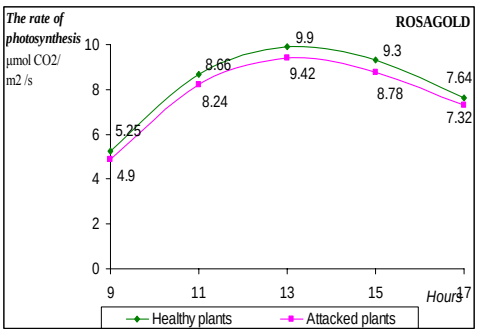


Fig. 4. The diurnal dynamics of photosynthesis at the *Rosagold* rose plants.

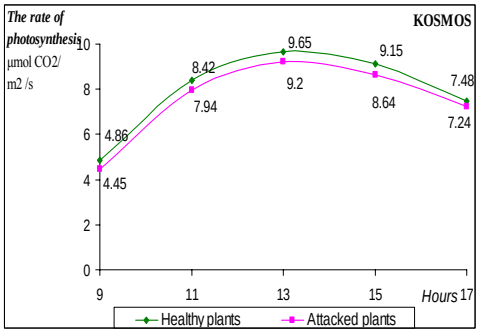


Fig. 5. The diurnal dynamics of photosynthesis at the *Kosmos* rose plants.

The diurnal dynamics of transpiration in the attacked plants is similar to that in healthy plants, but the recorded values are lower in comparison with these as a result of the reduction of the transpiration surface, the occlusion of the stomates by the mycelium of the fungus and the malfunctioning of the stomatic apparatus (Fig. 6 and Fig. 7).

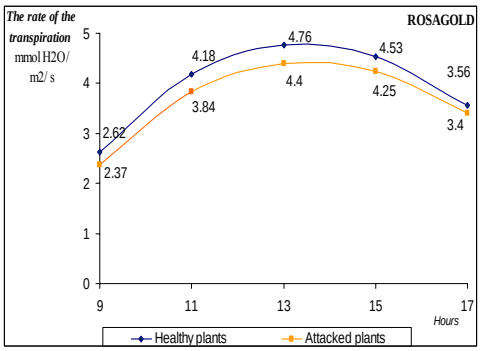


Fig. 6. The diurnal dynamics of transpiration at the *Rosagold* rose plants.

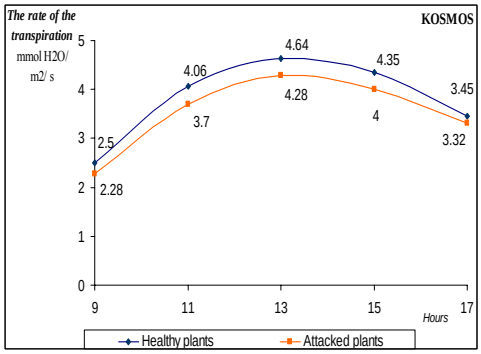


Fig. 7. The diurnal dynamics of transpiration at the *Kosmos* rose plants.

Among the climatic factors with importance upon photosynthesis and transpiration, there were analysed the photosynthetic active radiation incident on the surface of the leaf and leaf temperature.

The intensity of photosynthesis and transpiration varies depending on the light radiation received by leaves, which are dependent on the position of leaves on plants.

At the *Rosagold* plants one can notice an intensification of the photosynthetic active radiations present on the surface of the leaves starting with the early hours of the morning (9 a.m.) when one can record values of 1285 µmol/m^2/s for the healthy plants and of 1240 µmol / m^2 /s for the attacked plants, their growth up until after lunch (1 p.m.) when one record 1572 µmol/m^2 / s for the healthy plants and 1540 µmol / m^2 / s for the attacked plants, and towards evening (5 p.m.) one can notice a gradual decrease, recording values of 1368 µmol / m^2 / s for the healthy plants and of 1328 µmol / m^2 / s for the plants attacked.

At the *Kosmos* plants one can notice an intensification of the photosynthetic active radiations present on the surface of the leaves starting with the early hours of the morning (9 a.m.) when one can record values of 1254 µmol / m^2 / s for the healthy plants and of 1220 µmol / m^2 / s for the attacked plants, their growth up until after lunch (1 p.m.) when one record 1554 µmol / m^2 / s for the healthy plants and 1514 µmol / m^2 / s for the attacked plants, and towards evening (5 p.m.) one can notice a gradual decrease, recording values of 1350 µmol / m^2 / s for the healthy plants and of 1310 µmol / m^2 / s for the plants attacked.

The diurnal increase of the photosynthetic active radiations correlate with the increase of the photosynthesis and transpiration, but present different values in the attacked plants, in comparison with the healthy ones, as a result of several structural modifications appeared in the host plants under the damaging action of the pathogen (Fig. 8, 9, 10, 11).

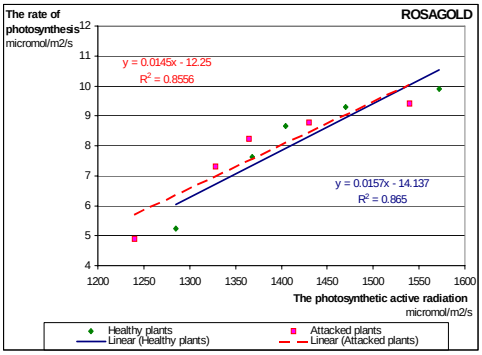


Fig. 8. The correlation between the rate of photosynthesis and the photosynthetic active radiation at the *Rosagold* rose plants.

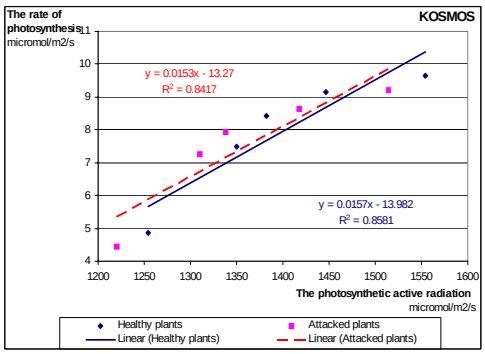


Fig. 9. The correlation between the rate of photosynthesis and the photosynthetic active radiation at the *Kosmos* rose plants.

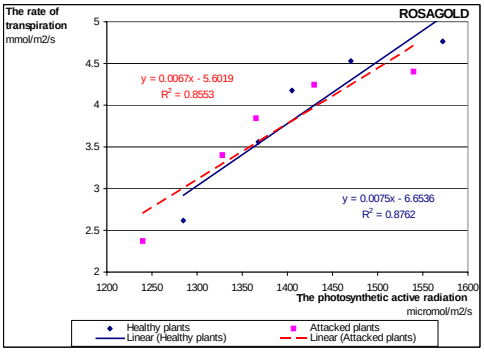


Fig. 10. The correlation between the rate of transpiration and the photosynthetic active radiation at the *Rosagold* rose plants.

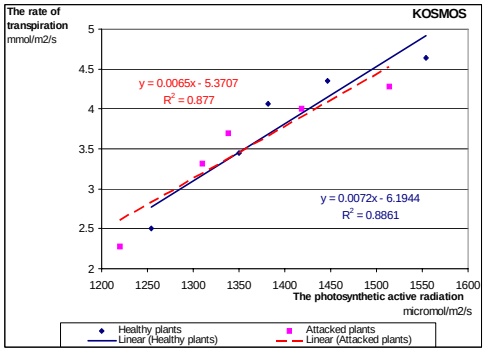


Fig. 11. The correlation between the rate of transpiration and the photosynthetic active radiation at the *Kosmos* rose plants.

The intensity of photosintesis and the intensity of transpiration varies depending on the temperature. The air temperature does correlate with the relative humidity.

At the *Rosagold* plants one can notice an increase of the leaf temperature starting with the early hours of the morning (9 a.m) when values of 35.4 ^{o}C are recorded in the healthy plants and 35.6 ^{o}C in the plants attacked, the increase of the temperature up until after lunch (1p.m) when one record 38.7 ^{o}C in the healthy plants and 38.8 ^{o}C in the attacked plants, and towards the evening (5 p.m) the gradual decrease of the temperature, recording values of 36.8 ^{o}C in the healthy plants and 37.1 ^{o}C in the plants attacked.

At the *Kosmos* plants one can notice an increase of the leaf temperature starting with the early hours of the morning (9 a.m) when values of 35.2 ^{o}C are recorded in the healthy plants and 35.4 ^{o}C in the plants attacked, the increase of the temperature up until after lunch (1p.m) when one record 38.4 ^{o}C in the healthy plants and 38.6 ^{o}C in the attacked plants, and towards the evening (5 p.m) the gradual decrease of the temperature, recording values of 36.5 ^{o}C in the healthy plants and 36.7 ^{o}C in the plants attacked.

The diurnal increase of the temperature starting with the early hours of the morning is correlated with the increase of the photosynthesis and transpiration (Fig. 12, 13, 14 and 15).

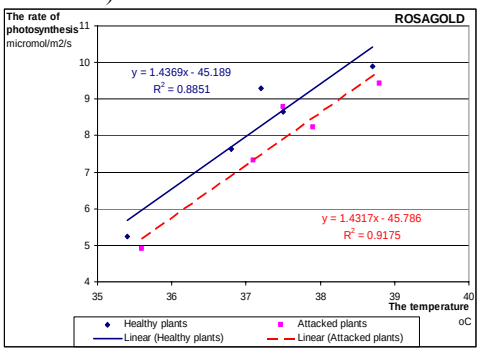


Fig. 12. The correlation between the rate of photosynthesis and the leaf temperature at the *Rosagold* rose plants.

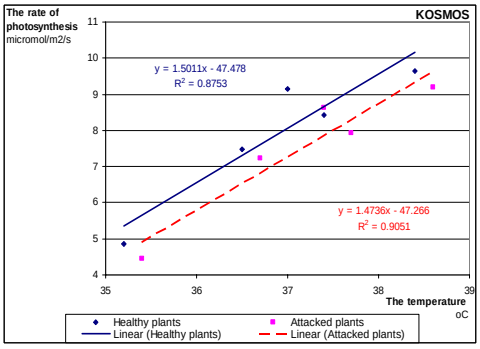


Fig. 13. The correlation between the rate of photosynthesis and the leaf temperature at the *Kosmos* rose plants.

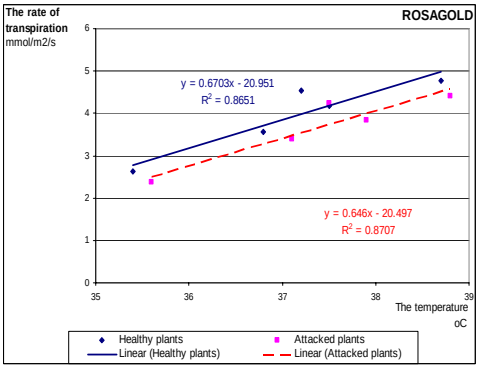


Fig. 14. The correlation between the rate of transpiration and the leaf temperature at the *Rosagold* rose plants.

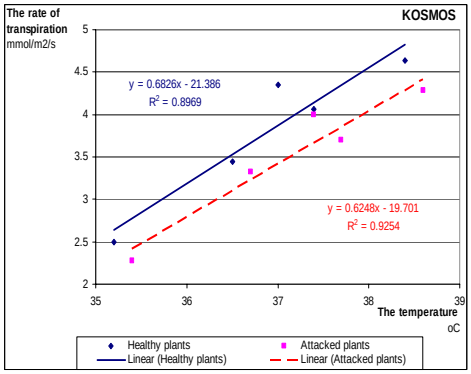


Fig. 15. The correlation between the rate of transpiration and the leaf temperature at the *Kosmos* rose plants.

The total water contents and the dry substance contents. At the attacked plants there can be seen a decrease of the total water contents and an increase of the dry substance contents, as a result of the the malfunctioning of the closing and opening mechanisms of the stomates, which is manifested by the decrease of the cellular turgor (Fig. 16 and Fig. 17).

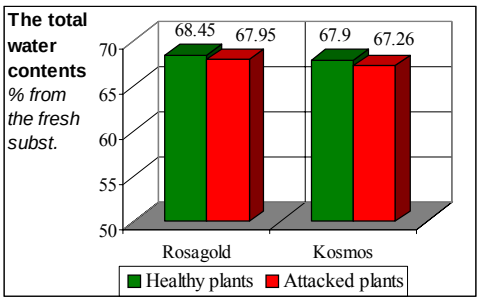


Fig. 16. The total water contents.

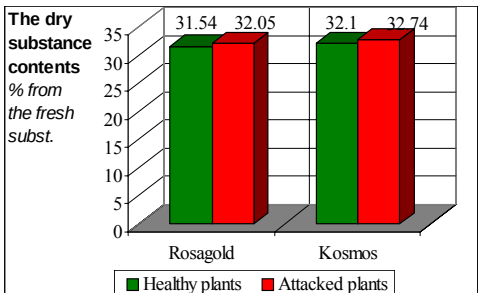


Fig. 17. The dry substance contents.

The chlorophyll content. The plants attacked by the pathogen present a decrease of the chlorophyll content as a result of the blockage of its biosynthesis, the deterioration of the chlorophyllian pigments (Fig. 18).

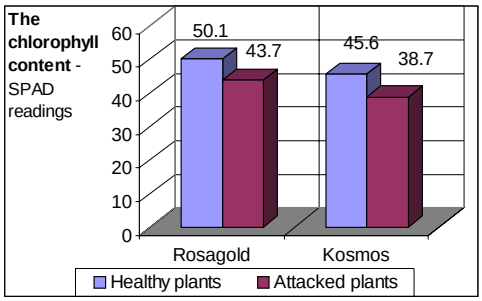


Fig. 18. The chlorophyll content.

CONCLUSIONS

At the analized plants can be observed: the diurnal dynamics of the photosynthesis and of transpiration presents a minimum in the morning, a maximum after lunch and a minimum toward the evening, with specific variations in the plants attacked; the decrease of the total water contents wich determines of the withering and premature drying of the plants; the decrease of the contents in chlorophyllian pigments because of the intensification of the chlorophylases and deterioration of the chloroplasts.

The physiological modifications produced in the attacked rose plants determine several metabolic unbalances, with implications on the growth plants.

REFERENCES

1. Burzo I. and colab. - Fiziologia plantelor de cultură, vol. IV, Întrepr. Editorial - Poligrafică Ştiinţa, Chişinău, 2000.
2. Manoliu Al., Mititiuc M., Petcu I., Georgescu T. - Bolile şi dăunătorii plantelor ornamentale. Editura „Ceres", Bucureşti, 1993.
3. Marinescu G., Costache M., Stoenescu A. - Bolile plantelor floricole, Ed. Ceres, Bucureşti, 1988.
4. Nicolae I. - Fiziologia plantelor, Editura Sitech, Craiova, 2008.
5. Pîrvu M. - Ghid practic de Fitopatologie, Ed. Presa Univ. Clujeană, Cluj-Napoca, 2000.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

PHYSIOLOGICAL MODIFICATIONS IN *MALUS DOMESTICA* AS A RESULT OF THE ATTACK PRODUCED BY *PODOSPHAERA LEUCOTRICHA*

Mariana Nicolae[1], I. Nicolae[2]

KEY WORDS: apple, attacked plants, healthy plants, pathogen.

ABSTRACT

The research regarding physiological modifications produced by Podosphaera leucotricha have been made on „Generos" apple varieties cultivated in the Didactic Resort Banu Mărăcine, Dolj.

In the attacked plants, one can observe the diurnal dynamics of the photosynthesis and of transpiration presents a minimum in the morning, a maximum after lunch and a minimum toward the evening, in connection with the climatic conditions. At the attacked plants one can also observe a decrease of chlorophyll content by 4.63 % as result of the blockage biosynthesis of the chlorophyllian pigments. These plants present a decrease of total water content by 1.72 % as a result of malfunctioning of closing and opening mechanisms of the stomates, which is manifested by the decrease of the cellular turgor, the withering and premature drying of the plants.

INTRODUCTION

The apple mildews one of the most important diseases that frequently attack apple.

The researches materialized in the presentation of some physiological modifications produced by *Podosphaera leucotricha* was made made at varietie of apple *Generos* cultivated in cultivated in the Didactic Resort Banu Mărăcine, Dolj.

MATERIAL AND METHOD

The apple variety *Generos* is originally from Romania. It is a variety with average resistance to mildew. Tree of medium-large effect, with rare crown, airy, it is a productive species. Fruits are large (180g), yellow-green background color and the cover colour is red.

At the attacked plants for the estimate of the attack was made using the calculation formulae of the Săvescu A., Rafailă C. The physiological processes was established with the ultra compact photosynthesis measurement system LCi. The total water contents and of dry substance were determined by the help of the drying stove - gravimetric method. The chlorophyll content was estimates by Minolta SPAD 502 chlorophyll meter.

[1] "Transporturi Auto" Schoolar Group, Craiova
[2] University of Craiova

RESULTS AND DISCUSSIONS

Podosphaera leucotricha (Ell. et Everh.) Salm presents hyaline mycelium, septal and truncated, which differentiate spherical haustorium, entering into epidermal cells and simple conidospores, long, shedding single conidia, oval-shaped, truncated at the ends. The Oidium farinosum of conidian form ensure spreading of fungus throughout the period of vegetation. The perfect fungus form is represented by cleistothecia (perithecia) which are spherical, with appendix 3-11**,** often with dichotomic branched peaks, located at the top. Each perithecia distinguishes each asca contains 8 ascospores ellipsoidal, unicellular. The fungus goes through winter as mycelium of resistance in germs and sprouts, cleistothecia on twig sor on attacked leaves, conidia from the previous year remaining on the branches - insertions and attacked germs. The disease is manifested on germs, leaf inflorescenses, twigs and fruit. At the beginning of unburgeon both flower buds, and the vegetative ones on the formations of the infected fruit in the previous year, present rose mildew**.** They stop growing normally, are covered with a opasla pulverulenta, with a white powdery appearance, and ultimately turn red, dry and fall. The flowers attacked by fungus present oblong petals, greenish color, are sterile, dry and fall (Fig. 1). Leaves with mildew are less deformed, easily become brownish, are breakable and ultimately fall (Fig. 2).

The twigs attacked do not grow normally, the wood is not maturing and there is a risk of winter freeze. Attack on the fruit is very rare and is manifested in the form of irregular cracks more or less deep, covered with whitish thick felt, characteristic to species.

Fig. 1. The flowers plants *Generos* attacked by the *Podosphaera leucotricha.*

Fig. 2. The leaves plants *Generos* attacked by the *Podosphaera leucotricha.*

The estimation of the attack produced by the *Podosphaera leucotricha* at the apple plants *Generos* is presented in Fig. 3.

The diurnal dynamics of the physiological processes at the peach plants was established, according to the frequency, the intensity and the degree of attack, but also by the climatic conditions, on May 23th 2009.

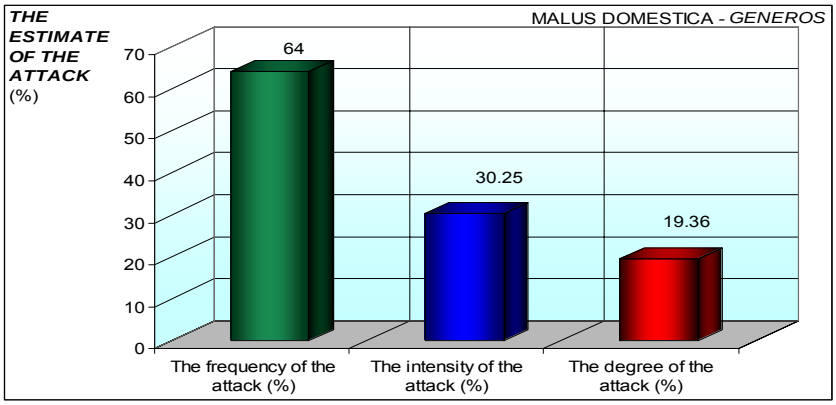


Fig. 3. The estimate of the attack produced by *Podosphaera leucotricha* in the apple plants

The diurnal dynamics of the rate of photosynthesis in the attacked plants is similar to that in healthy plants but the recorded values are lower in comparison with these as a result of the reduction of the assimilation surface, as well as the inhibition of several biochemical reactions of the photosynthesis (Fig. 4).

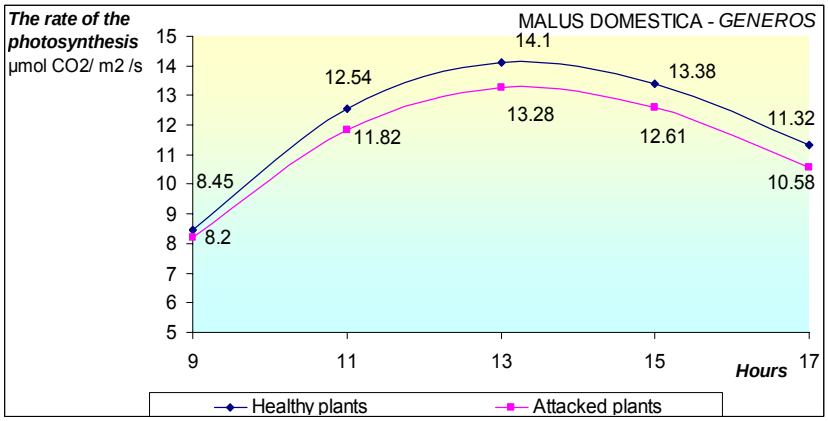


Fig. 4. The diurnal dynamics of photosynthesis at the *Malus domestica*.

The diurnal dynamics of transpiration in the attacked plants is similar to that in healthy plants, but the recorded values are lower as a result of the the modification of the permeability of the cellular membranes and the malfunctioning of the closing and opening mechanisms of the stomates (Fig. 5).

The intensity of photosynthesis and the intensity of transpiration depending on the light radiation received by leaves, which are dependent on the position of leaves on plants.

The diurnal increase of the photosynthetic active radiations starting with the early hours of the morning is correlate with the increase of the photosynthesis and of the transpiration, but present different values in the attacked plants as a result of several structural modifications appeared in the host plants under the damaging action of the pathogen.

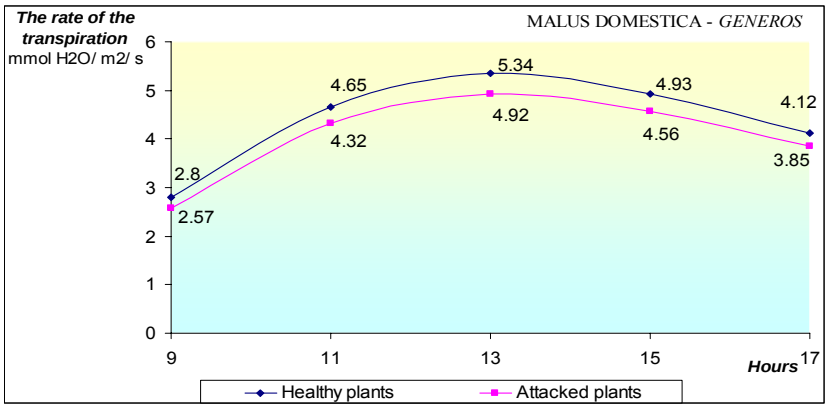
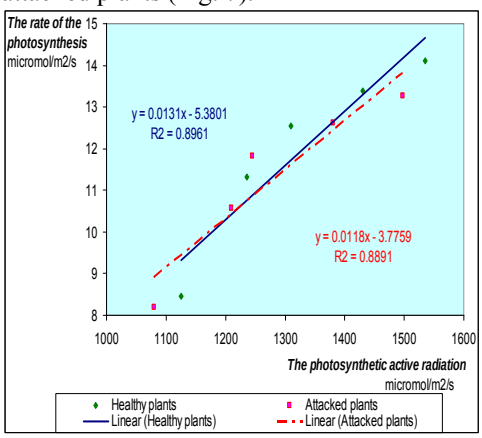


Fig. 5. The diurnal dynamics of transpiration at the *Malus domestica*.

At the *Malus domestica* plants one can notice an intensification of the photosynthetic active radiations present on the surface of the leaves starting with the early hours of the morning (9 a.m.) when one can record values of 1125 µmol / m^2 / s for the healthy plants and of 1080 µmol / m^2 / s for the attacked plants, their growth up until after lunch (1 p.m.) when one record 1535 µmol / m^2 / s for the healthy plants and 1497 µmol / m^2 / s for the attacked plants, and towards evening (5 p.m.) one can notice a gradual decrease, recording values of 1236 µmol / m^2 / s for the healthy plants and of 1210 µmol / m^2 / s for the plants attacked.

Regression made between the rate of photosynthesis and photosynthetic active radiations show a good correlation between the two factors analyzed, the coefficient of determination of the sample (R^2) was 0.89 for the healthy plants and 0.88 for the attacked plants (Fig. 6). Regression made between the rate of transpiration and photosynthetic active radiations show a good correlation between the 2 factors analyzed, the coefficient of determination of the sample (R^2) was 0.88 for the healthy plants plants and 0.85 for the attacked plants (Fig. 7).



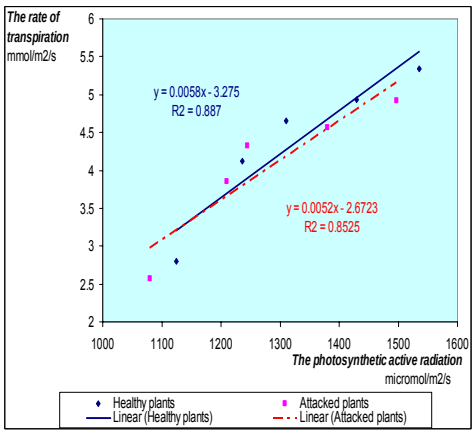


Fig. 6. The correlation between the rate of photosynthesis and the photosynthetic active radiation at the *Generos* apple plants.

Fig. 7. The correlation between the rate of transpiration and the photosynthetic active radiation at the *Generos* apple plants.

The intensity of photosynthesis and the intensity of transpiration depending on the temperature air does correlate with the relative humidity. Thus, by wavelength, increasing air temperature, relative air humidity decreases, the difference between the vapor pressure of water from the environment and that in the room increase, which causes intensification of transpiration.

At the *Malus domestica* plants one can notice an increase of the leaf temperature starting with the early hours of the morning (9 a.m) when values of 25.7 ^{o}C are recorded in the healthy plants and 25.8 ^{o}C in the plants attacked, the increase of the temperature up until after lunch (1p.m) when one record 29 ^{o}C in the healthy plants and 29.2 ^{o}C in the attacked plants, and towards the evening (5 p.m) the gradual decrease of the temperature, recording values of 26.1 ^{o}C in the healthy plants and 26.3 ^{o}C in the plants attacked.

The diurnal increase of the temperature starting with the early hours of the morning is correlate with the increase of the photosynthesis and of the transpiration, but present different values in the attacked plants as a result of the action of the pathogen (Fig. 8 and 9).

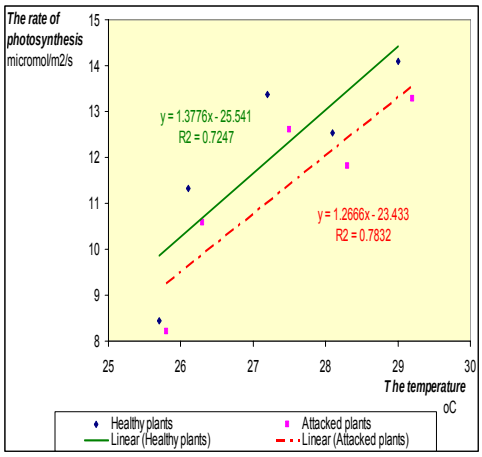


Fig. 8. The correlation between the rate of photosynthesis and the leaf temperature at the *Generos* apple plants.

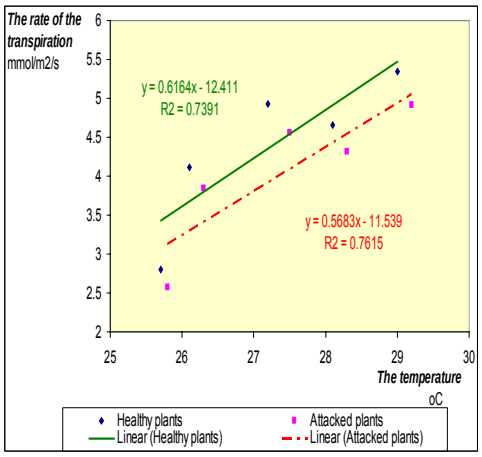


Fig. 9. The correlation between the rate of transpiration and the leaf temperature at the *Generos* apple plants.

Along side the diurnal analysis of the photosynthesis and transpiration, there were also determined the total water content, the dry substance content and the chlorophyll content and the obtained resulted are presented in the charts below:

The total water contents and the dry substance contents. At the attacked plants there can be seen a decrease of the total water content by 1.72 % and an increase of the dry substance content by 3.51 %, as a result of the malfunctioning of the closing and opening mechanisms of the stomates, which is manifested by the decrease of the cellular turgor, the withering and premature drying of the plants (Fig. 10).

The chlorophyll content. The plants attacked by the pathogen present a decrease of the chlorophyll content by 4.63 % as a result of the blockage of its biosynthesis, the deterioration of the chlorophyllian pigments and the destruction of the chloroplasts (Fig. 11).

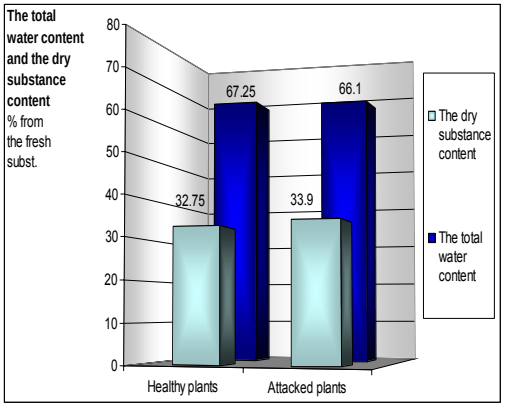


Fig. 10. The total water contents and the dry substance content.

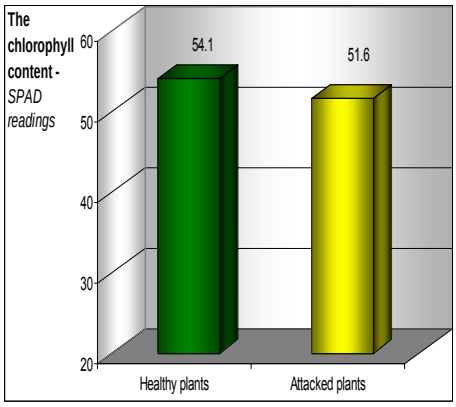


Fig. 11. The chlorophyll content.

CONCLUSIONS

At the analized plants one can observe: the diurnal dynamics of the photosynthesis and of transpiration presents a minimum in the morning, a maximum after lunch and a minimum toward the evening, with specific variations in the plants attacked; as a result of the action pathogen on the attacked plants one can observe a decrease of the chlorophyll content by 4.63 % because of the intensification of the chlorophylases and deterioration of the chloroplasts and the decrease of the total water content by 1.72 %, wich determines of the withering and premature drying of the plants.

In the attacked plants present of the physiological modifications, wich manifested of the several metabolic unbalances, with implications on the production.

REFERENCES

1. Burzo I. and colab. - Fiziologia plantelor de cultură, vol. IV, Întrepr. Editorial - Poligrafică Ştiinţa, Chişinău, 2000.
2. Cociu, V., Oprea, St. - Metode de cercetare în ameliorarea plantelor pomicole, Ed. Dacia, Cluj-Napoca, 1989.
3. Drăgănescu E., Mihuţ E. - Cultura speciilor pomicole, Editura Waldpress, 2005.
4. Eliade Eugenia, Crişan Aurelia, Volcinschi A. - Biologia paraziţilor vegetali, Ed. Did. şi Ped., Bucureşti, 1979.
5. Nicolae I. - Fiziologia plantelor, Editura Sitech, Craiova, 2008.
6. Nicolae I. - Practicum de fiziologie vegetală, Editura Sitech, Craiova, 2008.
7. Pîrvu M. - Ghid practic de Fitopatologie, Ed. Presa Universitară Clujeană, Cluj-Napoca, 2000.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

RESEARCH REGARDING THE DIURNAL DYNAMICS OF PHYSIOLOGICAL PROCESSES IN *FICUS CARICA* (MORACEAE)

I. Nicolae[1]

KEY WORDS: plants, physiological, photosynthesis, transpiration.

ABSTRACT

Research regarding the diurnal dynamics of physiological processes were performed on Ficus carica plants cultivated in the Botanical Garden of Craiova.

At the analized plants, at a month days after of the fructification, there can be seen a decrease of the total water content by 1.09 % and an increase of the dry substance content by 8.1 % which is manifested by the decrease of the cellular turgor. These analized plants present a decrease of chlorophyll content by 7.88 % as result of the deterioration of the chlorophyllian pigments.

At the analized plants one can also observe that the diurnal dynamics of photosynthesis and of transpiration presents a minimum in the morning, a maximum after lunch and a minimum toward the evening, in connection with the climatic conditions.

INTRODUCTION

Figs is a shrub of the *Moraceae* family and is one of numerous species of *Ficus* genus. It is originally from the Middle East and Mediterranean basin. It is grown on large areas in the Mediterranean countries (Central and Minor Asia) and in California. World production can reach 1120 tons. Although part of vegetation specific regions warm figs can be grown in Romania, in regions where temperatures are very low in winter. Grow with us especially in the south of the country. In the terms of our country, figs produce two crops per year, one in July and another in September-October, but fruit of autumn do not all come all at maturity. On the same plant or even on the same twig, the fruit form, grow and spread from the base of the twig towards its top. Fruits are used for medicinal purpose and food, because they contain sugar, vitamins and enzymes, etc.

MATERIAL AND METHOD

Research regarding the diurnal dynamics of physiological processes were performed in plants of *Ficus carica*, at the beginning of the fructification and at a month days after of the fructification, the plants grown in the Botanical Garden of Craiova, 2009.

The diurnal dynamics of photosynthesis and transpiration was established non-destructive method with the analyzer LCi (Ultra Compact Photosynthesis Measurement System). The total water contents and of dry substance were determined by the help of the drying stove - gravimetric method. The content of the chlorophyll pigments was estimates

[1] University of Craiova

by Minolta SPAD 502 chlorophyll meter (the use of the chlorophyll meter SPAD is non-destructive method and permits repeated measurements).

RESULTS AND DISCUSSIONS

Ficus carica L. (Moraceae) is a shrub of medium size (maximum 10 m), with smooth and gray bark. Long-petiolate leaves are palmate-lobate, consisting of 3-5 lobbies, piliferous on both sides (Fig. 1).

The flowers and the individual fruits are immersed in the conical shape receptacle, with a terminal orifice. After pollination and fertilization there are formed numerous achenes, implanted in the receptacle, which, together with perigon of flower becomes fleshy. The formed fleshy fruit is called sicona (Fig. 2).

It is a light and heat loving species, prefers clayey soils and well drained. It does not multiply easily, either vegetatively or through suckers, cuttings and seedlings or by seed.

Fig. 1. Palmate-lobate leaves at *Ficus carica.*

Fig. 2. Conical fruits (sicona) at *Ficus carica.*

The diurnal dynamics of the physiological processes at the plants was established according to the climatic conditions, on June 1st 2009 and July 1st 2009.

The diurnal dynamics of photosynthesis and transpiration follows a unimodal curve which in the morning presents a minimum in the morning, a maximum after lunch and a minimum toward the evening with specific variations depending on environmental factors.

At the *Ficus carica* plants one can notice an intensification of the rate of photosynthesis increase starting with the early hours of the morning (9 a.m) when one can record values of 6.5 μmol CO_2 / m^2 / s at the beginning of the fructification and of 5.82 μmol CO_2 / m^2 / s at a month days after of the fructification, their growth up until after lunch (1 p.m.) when one record values of 12.2 μmol CO_2 / m^2 / s at the beginning of the fructification and 10.95 μmol CO_2 / m^2 / s at a month after of the fructification, and towards evening (5 p.m.) one can notice a gradual decrease, recording values of 8.15μmol

CO_2 / m^2 / s at the beginning of the fructification and of 7.56 µmol CO_2 / m^2 / s at a month after of the fructification (Fig. 3).

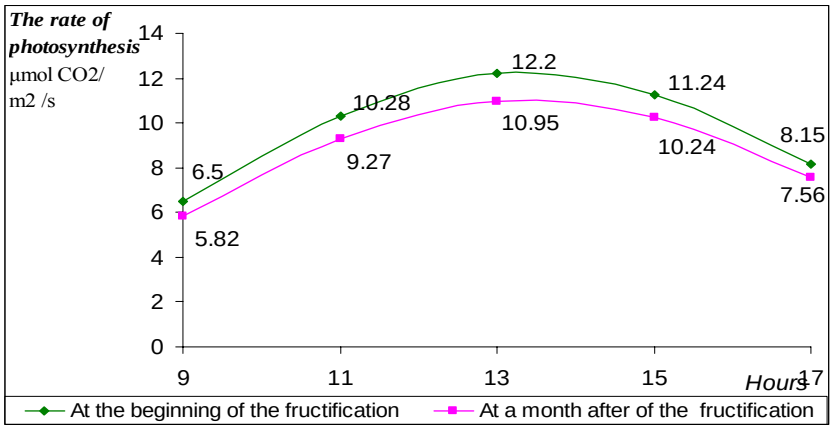


Fig. 3. The diurnal dynamics of photosynthesis at the *Ficus carica* plants.

The rate of transpiration increase starting with the early hours of the morning (9 a.m) when one can record values of 3.12 mmol H_2O / m^2 / s at the beginning of the fructification and of 2.84 mmol H_2O / m^2 / s at a month days after of the fructification, their growth up until after lunch (1 p.m.) when one record values of 4.9 mmol H_2O / m^2 / s at the beginning of the fructification and 4.45 mmol H_2O / m^2 / s at a month after of the fructification, and towards evening (5 p.m.) one can notice a gradual decrease, recording values of 3. 62 mmol H_2O / m^2 / s at the beginning of the fructification and of 3.42 mmol H_2O / m^2 / s at a month after of the fructification (Fig. 4).

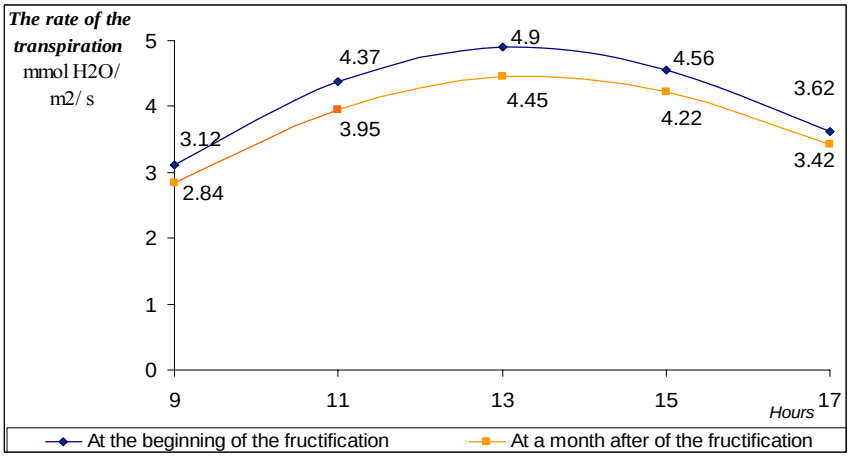


Fig. 4. The diurnal dynamics of transpiration at the *Ficus carica* plants.

Among the climatic factors with importance upon photosynthesis and transpiration, there were analysed: the light influence, by analysing the photosynthetic active radiation incident on the surface of the leaf and the influence of the temperature, by analysing the leaf temperature.

The intensity of photosynthesis and of the transpiration varies depending on the light radiation received by leaves, which are dependent on the position of leaves on plants.

Photosynthetic active radiations represent the region of the electromagnetic spectrum that induces photosynthesis and includes radiation the wavelength 400 - 700 nm (Kubon, 1973).

At the *Ficus carica* plants one can notice an intensification of the photosynthetic active radiations present on the surface of the leaves starting with the early hours of the morning (9 a.m.) when one can record values of 1324 µmol / m^2 / s at the beginning of the fructification and of 1290 µmol / m^2 / s at a month days after of the fructification, their growth up until after lunch (1 p.m.) when one record values of 1610 µmol / m^2 / s at the beginning of the fructification and 1580 µmol / m^2 / s at a month after of the fructification, and towards evening (5 p.m.) one can notice a gradual decrease, recording values of 1370 µmol / m^2 / s at the beginning of the fructification and of 1362 µmol / m^2 / s at a month days after of the fructification.

The diurnal increase of the photosynthetic active radiations correlate with the increase of the photosynthesis and transpiration, but present different values for the plants at the beginning of the fructification, in comparison with the second phase - at a month after of the fructification.

Regression made between the rate of photosynthesis and photosynthetic active radiations show a good correlation between the 2 factors analyzed, the coefficient of determination of the sample (R^2) was 0.94 for the plants at the beginning of the fructification and 0.90 for the plants at a month days after of the fructification (Fig. 5.).

Regression made between the rate of transpiration and photosynthetic active radiations show a good correlation between the 2 factors analyzed, the coefficient of determination of the sample (R^2) was 0.93 for the plants at the beginning of the fructification and 0.89 for the plants at a month days after of the fructification (Fig. 6.).

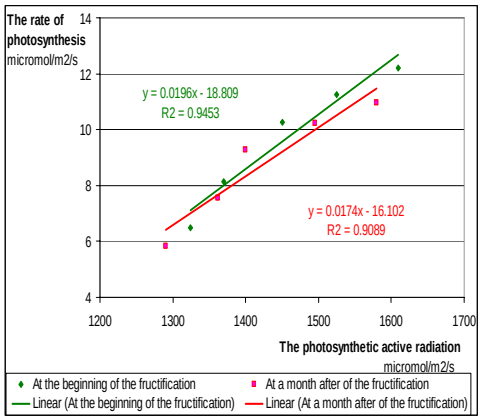


Fig. 5. The correlation between the intensity of photosynthesis and the photosynthetic radiation.

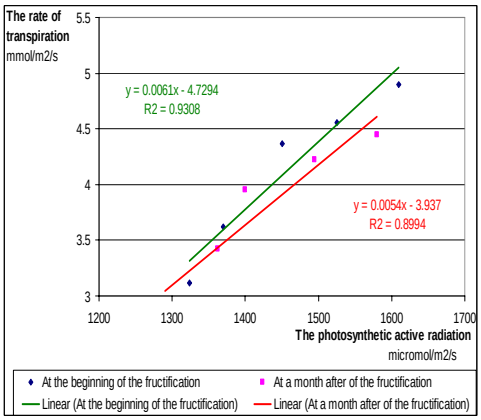


Fig. 6. The correlation between the intensity of transpiration and the photosynthetic radiation.

The air temperature does correlate with the relative humidity. Thus, by wavelength, increasing air temperature, relative air humidity decreases, the difference between the vapor pressure of water from the environment and that in the room increase, which causes intensification of transpiration.

At the *Ficus carica* plants one can notice an increase of the leaf temperature starting with the early hours of the morning (9 a.m) when one can record values of 24.7 ^{o}C at the beginning of the fructification and of 29.2 ^{o}C at a month days after of the fructification, their growth up until after lunch (1 p.m.) when one record values of 28.3 ^{o}C at the beginning of the fructification and 34.5 ^{o}C at a month days after of the fructification, and towards evening (5 p.m.) one can notice a gradual decrease, recording values of 26.5 ^{o}C at the beginning of the fructification and of 31.6 ^{o}C at a month days after of the fructification.

The diurnal increase of the temperature starting with the early hours of the morning is correlated with the increase of the photosynthesis and transpiration (Fig. 7 and Fig. 8).

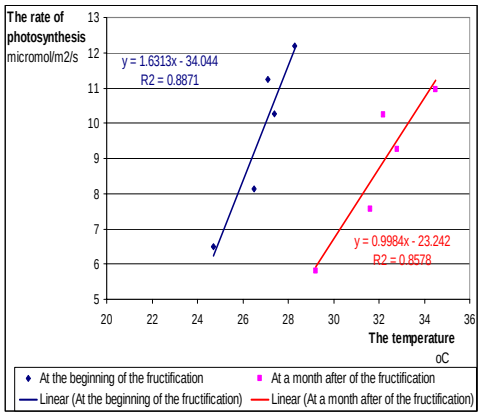


Fig. 7. The correlation between the intensity of the photosynthesis and the leaf temperature**.**

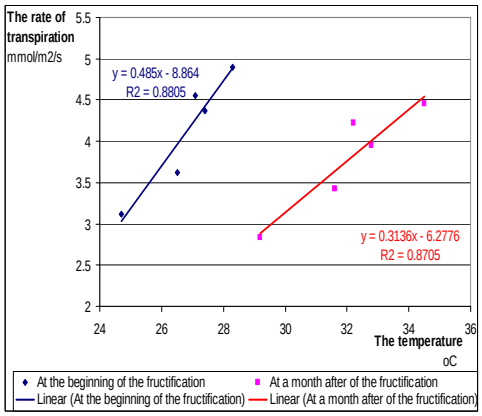


Fig. 8. The correlation between the intensity of the transpiration and the leaf temperature.

Along side the diurnal analysis of the photosynthesis and transpiration, there were also determined the total water content, the dry substance content and the chlorophyll content and the obtained resulted are presented in charts below:

The total water content and the dry substance content. In analyzed plants is found that the total water content of 76.58 % from the fresh substance and the dry substance content of 33.42 % from the fresh substance at the beginning of the fructification and the total water content of 74.86 % from the fresh substance and total water content of 36.14 % from the fresh substance at a month days after of the fructification (Fig. 9).

At the analized plants at a month days after of the fructification there can be seen a decrease of the total water contents by 1.09 % and an increase of the dry substance contents by 8.1 % which is manifested by the decrease of the cellular turgor.

The chlorophyll content. In the *Ficus carica* analyzed plants is found that a content of the chlorophyll by 43.2 units SPAD at the beginning of the fructification and a content of the chlorophyll by 39.8 units SPAD at a month days after of the fructification (Fig. 10).

At the analized plants at a month days after of the fructification present a decrease of the chlorophyll content by 7.88 % a result of the deterioration of the chlorophyllian pigments.

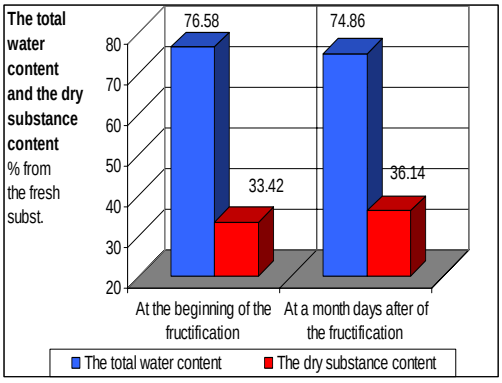


Fig. 9. The total water content and the dry substance content.

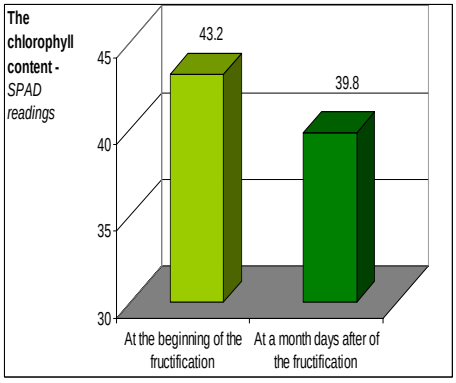


Fig. 10. The chlorophyll content.

CONCLUSIONS

In the analized plants of *Ficus carica* can be observed the diurnal dynamics of the photosynthesis and of transpiration presents a minimum in the morning, a maximum after lunch and a minimum toward the evening, with specific variations depending on environmental factors.

At the *Ficus carica* analized plants at a month days after of the fructification there can be seen a decrease of the total water content by 1.09 % and an increase of the dry substance content by 8.1 % which is manifested by the decrease of the cellular turgor.

The chlorophyll content present a decrease by 7.88 % as a result of the deterioration chlorophyllian pigments on the leaves.

REFERENCES

1. Burzo I. and colab. - Fiziologia plantelor de cultură, vol. IV, Întrepr. Editorial - Poligrafică Ştiinţa, Chişinău, 2000.
2. Cepoiu N., Păun C., Spiţă V. - Pomicultura practică, Editura Ceres, 2005.
3. Ciocârlan V.- Flora ilustrată a României - Pteridophyta et Spermatophyta, Editura Ceres, Bucureşti, 2000.
4. Drăgănescu E., Mihuţ E. - Cultura speciilor pomicole, Editura Waldpress, 2005.
5. Nicolae I. - Fiziologia plantelor, Editura Sitech, Craiova, 2008.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

PHYSIOLOGICAL MODIFICATIONS IN *PRUNUS PERSICA* AS A RESULT OF THE ATTACK PRODUCED BY *TAPHRINA DEFORMANS*

Mariana Nicolae[1], Rodi Mitrea[2]

KEY WORDS: attacked plants, healthy plants, pathogen, peach.

ABSTRACT

The researches materialized in the presentation of some physiological modifications produced by Taphrina deformans at varieties of peach „Superba de toamnă" cultivated in the Didactic Resort Banu Mărăcine, Dolj. At the analised peach plants one can also observe that the diurnal dynamics of the photosynthesis and of transpiration presents a minimum in the morning, a maximum after lunch and a minimum toward the evening, with specific variations in the plants attacked. On the attacked plants one can observe a decrease of the total water content by 1.87 % as a result of the malfunctioning of the closing and opening mechanisms of the stomates, which is manifested by the withering and premature drying of the plants and a decrease of chlorophyll content by 53.62 % as result of the blockage of its biosynthesis and the deterioration of the chlorophyllian pigments.

INTRODUCTION

This paper includes some of the results of the research which makes the subject of the doctoral thesis entitled „Physiological changes undergone by some horticultural plants on account of the natural attacks produced by pathogens". Peaches are originally from China. The peach tree is a small tree, reaching only up to eight meters high. Leaves are oblong, lanceolate and sharp. Flowers appear in early spring before the leaves have pink colour and are weakly fragrant. Fruit is a juicy drupe, having a hard core, deeply wrinkled.

The area is favorable to peach culture in southern, eastern and south western Romania, and the best peach cultivation favors the emergence and evolution of the fungus *Taphrina deformans*. The disease is frequently encountered in the peach crop in our country, symptoms have developed at the end of April to early May.

MATERIAL AND METHOD

The research regarding of the physiological changes produced by the *Taphrina deformans* were performed in the peach varieties *Superba de toamnă* cultivated in the Didactic Resort Banu Mărăcine, Dolj. The peach varieties *Superba de toamnă* is originally from Romania. It is a semiviguros and very productive species. Fruits are large (200 g) are spherical, white to yellow or red on the sunny side. The pulp is white of high quality. It matures at the end of September. The physiological processes was established with the ultra

[1] "Transporturi Auto" Schoolar Group-Craiova
[2] University of Craiova

compact photosynthesis measurement system LCi. The total water contents and of dry substance were determined by the help of the drying stove - gravimetric method. The chlorophyll content was estimates by Minolta SPAD 502 chlorophyll meter. For the estimate of the attack was made using the calculation formulae (Săvescu A., Rafailă C.).

RESULTS D DISCUSSIONS

Taphrina deformans presents mycelium**,** septal and truncated and grows intercellular. On both sides of the leaf is formed ovoid or cylindrical asca, and each asca contains 8 ascospores, spherical, yellowish or hyaline**.** After aging, ascospores are made freely. By germination it produces a haploid mycelium, living on bark saprophytes on the bark of branches, stage under which the fungus goes through winter. On this uninuclear mycelium are formed in the spring flush of cells, which come on young leaves, copulate, resulting in binuclear cells, which by germination produce filaments of infection entering through Stoma or epidermis in the intercellular tissue spaces. The fungus goes through winter as mycelium haploid as secondary mycelium in twig or in the form of ascospores on branches.

Fungus attacks the leaves, young twigs and in the favorable fruits, too. On the leaf the first symptoms appear at the end of April early May. Parenchyma between stems increases stronger than ribs.The leaves are hipertrofiate and have a characteristic pink color, then become violet, presenting on both sides a dirty-white powder, consisting asca of the fungus (Fig. 1. and Fig. 2).

After several days, the leaves acquire a brown coloration, and the second decade of May they can fall. In section, it is found that a leaf sick presents mezophil as a nearly homogeneous tissue without palisade and lacunar tissue. Very young twigs attacked by *Taphrina deformans*, thicken, remain still short, bend, present squash leaves, and at the base are entirely naked. The affected flowers present hipertrofiate petals. On fruit the attack is done in May, when reddish spots appear, slightly prominent, with irregular edges. As the fruits grow, the tissues are attacked, become brownish and crack.

Fig. 1. The peach plants *Superba de toamnă* attacked by the *Taphrina deformans*

Fig. 2. The peach leaves *Superba de toamnă* attacked by the *Taphrina deformans*

The diurnal dynamics of the physiological processes at the peach plants was established, according to the frequency, the intensity and the degree of attack, but also by the climatic conditions, on May 3rd 2009.

The estimation of the attack caused by the *Taphrina deformans* at the peach plants *Superba de toamnă* is presented in Fig. 3.

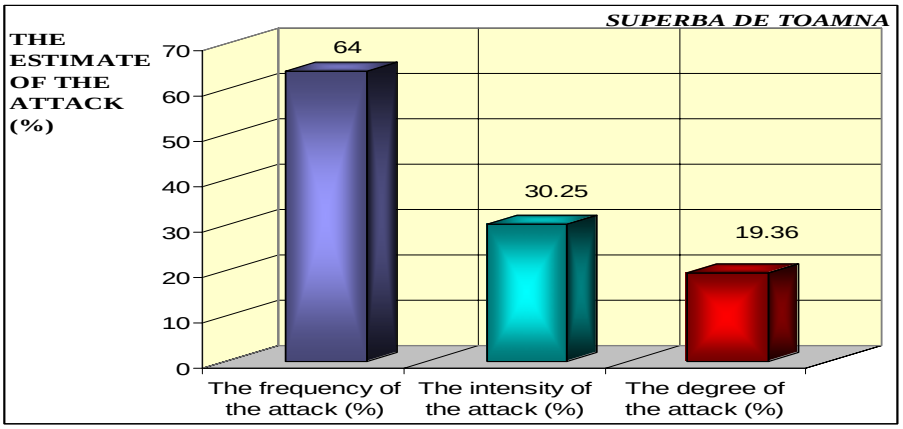


Fig. 3. The estimate of the attack produced by *Taphrina deformans* in the peach plants.

The diurnal dynamics of photosynthesis and transpiration presents a minimum in the morning, a maximum after lunch and a minimum toward the evening.

The diurnal dynamics of the rate of photosynthesis in the attacked plants is similar to that in healthy plants but the recorded values are lower in comparison with these as a result of the reduction of the assimilation surface through the deterioration of the chlorophyll, as well as the inhibition of several biochemical reactions of the photosynthesis (Fig. 4).

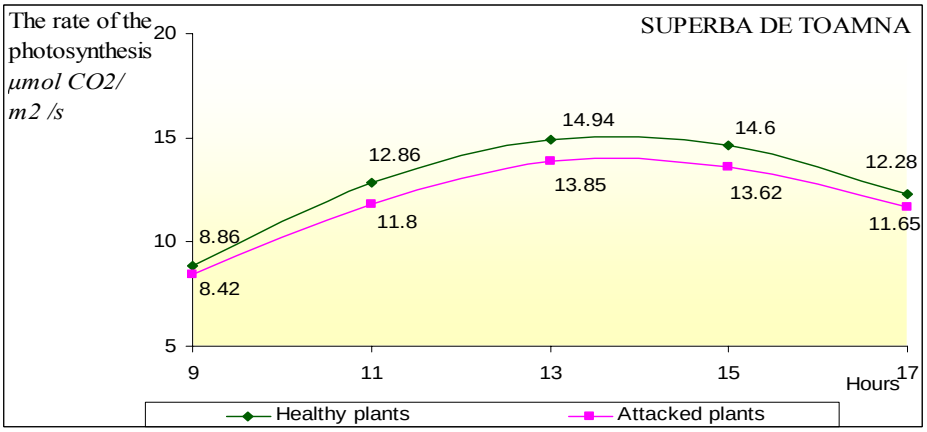


Fig. 4. The diurnal dynamics of photosynthesis at the *Prunus persica* plants.

The diurnal dynamics of transpiration is similar to that in healthy plants, but the recorded values are higher as a result of the lesion of the integrity of the defense tissues, the modification of the permeability of the cellular membranes and the malfunctioning of the stomatic apparatus (Fig. 5).

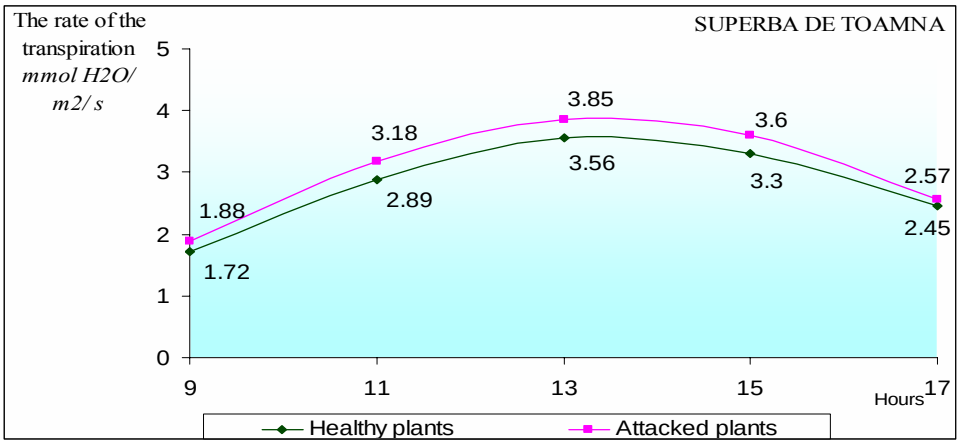


Fig. 5. The diurnal dynamics of transpiration at the *Prunus persica* plants.

The intensity of photosynthesis and the intensity of transpiration depending on the light radiation received by leaves, which are dependent on the position of leaves on plants.

Photosynthetic active radiations represent the region of the electromagnetic spectrum that induces photosynthesis and includes radiation the wavelength 400 – 700 nm (Kubon, 1973).

At the *Prunus persica* plants one can notice an intensification of the photosynthetic active radiations present on the surface of the leaves starting with the early hours of the morning (9 a.m.) when one can record values of 924 µmol / m^2 / s for the healthy plants and of 885 µmol / m^2 / s for the attacked plants, their growth up until after lunch (1 p.m.) when one record 1375 µmol / m^2 / s for the healthy plants and 1345 µmol / m^2 / s for the attacked plants, and towards evening (5 p.m.) one can notice a gradual decrease, recording values of 1124 µmol / m^2 / s for the healthy plants and of 1078 µmol micromoles / m^2 / s for the plants attacked.

The increase of the photosynthetic active radiations correlate with the increase of the photosynthesis and transpiration, but present different values in the attacked plants, in comparison with the healthy ones, as a result of several structural modifications appeared in the host plants under the damaging action of the pathogen.

Regression made between the rate of photosynthesis and photosynthetic active radiations show a good correlation between the two factors analyzed, the coefficient of determination of the sample (R^2) was 0.97 for the healthy plants and 0.96 for the attacked plants plants (Fig. 6).

Regression made between the rate of transpiration and photosynthetic active radiations show a good correlation between the two factors analyzed, the coefficient of determination of the sample (R^2) was 0.98 for the healthy plants and 0.97 for the attacked plants plants (Fig. 7).

The intensity of photosyntesis and transpiration depending on the temperature. The air temperature does correlate with the relative humidity. Thus, by wavelength, increasing air temperature, relative air humidity decreases, the difference between the vapor pressure of water from the environment and that in the room increase, which causes intensification of transpiration.

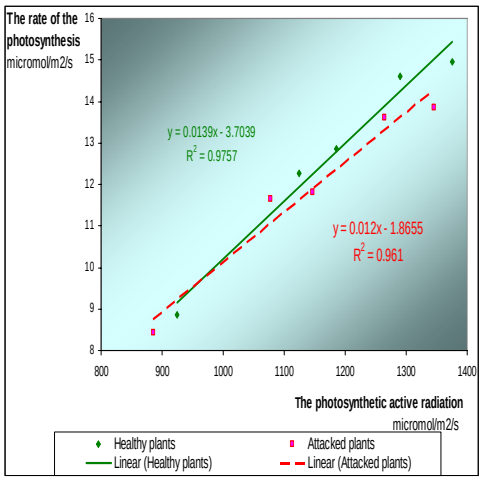


Fig. 6. The correlation between the rate of photosynthesis and the photosynthetic active radiation at the *Superba de toamnă* peach plants.

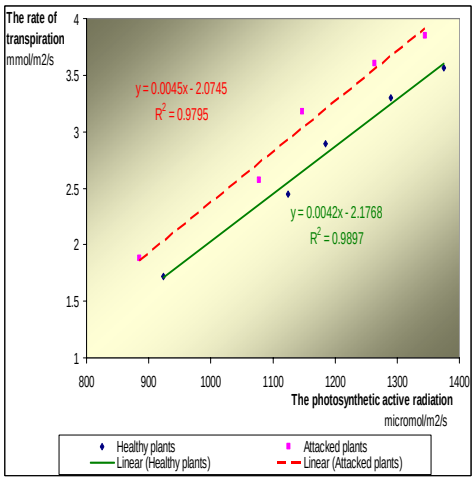


Fig. 7. The correlation between the rate of transpiration and the photosynthetic active radiation at the *Superba de toamnă* peach plants.

At the *Prunus persica* plants one can notice an increase of the leaf temperature starting with the early hours of the morning (9 a.m) when values of 22.8 ^{o}C are recorded in the healthy plants and 22.9 ^{o}C in the plants attacked, the increase of the temperature up until after lunch (1p.m) when one record 26.9 ^{o}C in the healthy plants and 27.2 ^{o}C in the attacked plants, and towards the evening (5 p.m) the gradual decrease of the temperature, recording values of 23.3 ^{o}C in the healthy plants and 23.6 ^{o}C in the plants attacked.

The diurnal increase of the temperature starting with the early hours of the morning is correlated with the increase of the photosynthesis and transpiration (Fig. 8 and Fig. 9).

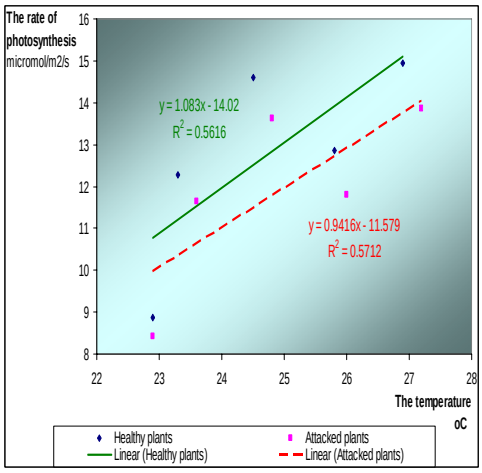


Fig. 8. The correlation between the rate of photosynthesis and the leaf temperature at the *Superba de toamnă* peach plants.

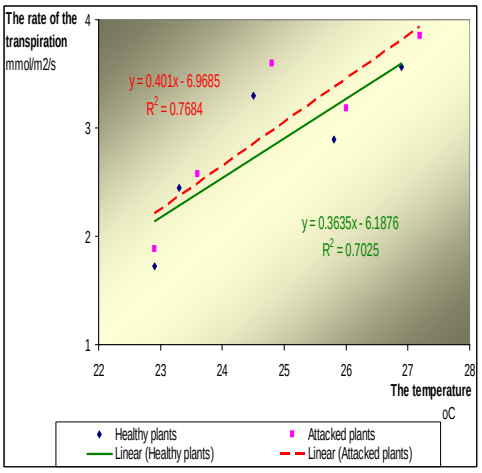


Fig. 9. The correlation between the rate of transpiration and the leaf temperature at the *Superba de toamnă* peach plants.

The total water content and the dry substance content. At the attacked plants there can be seen a decrease of the total water content by 1.87 % and an increase of the dry substance content by 6.53 %, which is manifested by the decrease of the cellular turgor, the withering and premature drying of the plants (Fig. 10).

The chlorophyll content. The attacked plants present a decrease of the chlorophyll content by 53.62 % as a result of the blockage of its biosynthesis and the deterioration of the chlorophyllian pigments (Fig. 11).

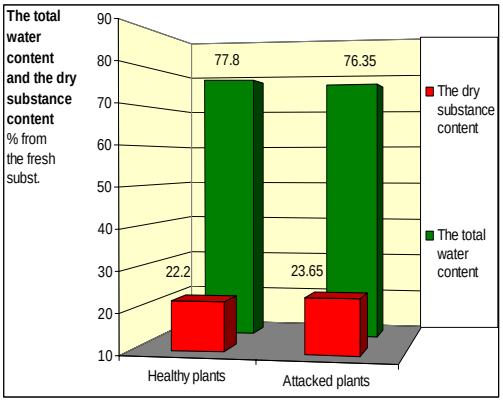


Fig. 10. The total water content and the dry substance content.

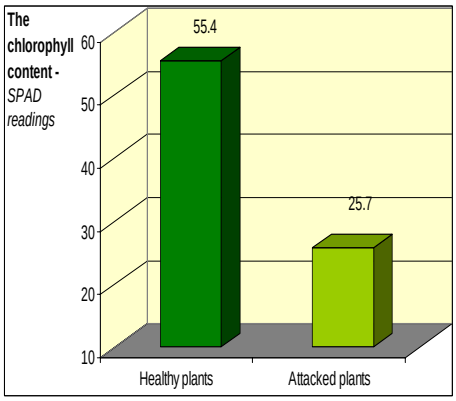


Fig. 11. The chlorophyll content.

CONCLUSIONS

At the analized plants can be observed: the diurnal dynamics of the photosynthesis and of transpiration presents a minimum in the morning, a maximum after lunch and a minimum toward the evening, with specific variations in the plants attacked; one can also observe at the attacked plants a decrease of the total water content by 1.87 % wich determines of the withering and premature drying of the plants and the decrease of the chlorophyll content by 53.62 % because of the intensification of the chlorophylases and deterioration of the chloroplasts.

The action of the pathogen produced in the attacked plants physiological modification with implications on the growth and development.

REFERENCES

1. Burzo I. and colab. - Fiziologia plantelor de cultură, vol. IV, Întrepr. Editorial - Poligrafică Ştiinţa, Chişinău, 2000.
2. Cociu, V., Oprea, St. - Metode de cercetare în ameliorarea plantelor pomicole, Ed. Dacia, Cluj-Napoca, 1989.
3. Drăgănescu E., Mihuţ E. - Cultura speciilor pomicole, Editura Waldpress, 2005.
4. Eliade Eugenia, Crişan Aurelia, Volcinschi A. - Biologia paraziţilor vegetali, Ed. Did. şi Ped., Bucureşti, 1979.
5. Nicolae I. - Fiziologia plantelor, Editura Sitech, Craiova, 2008.
6. Nicolae I. - Practicum de fiziologie vegetală, Editura Sitech, Craiova, 2008.
7. Pîrvu M. - Ghid practic de Fitopatologie, Ed. Presa Universitară Clujeană, Cluj-Napoca, 2000.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

THE ASSOCIATION OF CYTOPLASMIC CHANGE WITH HYPERPLASIA IN THE MUCOSA OF THE UTERUS

Diana Olimid, D. A. Olimid[1]

KEY WORDS: endometrium, hyperplasia, metaplasia

ABSTRACT

The aim of this study was to evaluate the association of metaplasia (cytoplasmic change) with hyperplasia and to recognize the various types of cellular change. These changes by themselves have no neoplastic potential, but may be associated with all grades of endometrial carcinoma. This association suggests that metaplasia are induced by chronic estrogen stimulation.

INTRODUCTION

Metaplasia is defined as replacement of one type of adult tissue by another type that is not normally found in that location. In the endometrium, most of the changes that are designated as metaplasia represent a variety of cytoplasmic alterations or forms of differentiation that are not found in normal proliferative endometrium but do not qualify as true metaplasia. In contrast to hyperplasia, which is a proliferative response to estrogenic stimulation, metaplasia represents cytoplasmic differentiation. The morphologic response of the endometrium to hormonal stimulation is complex and is reflected by architectural, nuclear and cytoplasmic alterations.

Cytoplasmic changes are generally found in endometria that show signs of estrogenic stimulation, especially hyperplasia and endometrial carcinoma. They also may be associated with trauma, polyps or inflammation.

There are five general types of cytoplasmic transformation that occur in the endometrium. These are squamous, ciliated cell, eosinophilic, mucinous and secretory (clear cell and hobnail cell) change.

MATERIAL AND METHODS

The material used in this study was represented by 624 endometrial biopsy specimens obtained thorough dilation and fractional curettage of the uterus. All specimens were fixed in formalin and embedded in parafin.

The fragments of the endometrium were microscopically evaluated after performing the several sections and colouring with hematoxylin-eozin.

We included in this study only cases diagnosed with endometrial hyperplasia.

[1] University of Craiova

We evaluated the frequencies of cytoplasmic changes and which type it was the most common.

RESULTS AND DISCUSSIONS

In our study we observed the presence of all variety of metaplasia associated with each form of the endometrial hyperplasia. Most metaplastic endometria was of mixed type and it is likely that many of the patterns overlap.

We have found 62 cases with eosinophilic change, 49 cases with ciliated change (tubal metaplasia), 11 cases with squamous differentiation, 2 cases with mucinous change and 16 cases with hobnail change (table 1).

Table 1

Classification of endometrial cellular changes

Various Types of Metaplasia	No. of Cases	Percentage
Eosinophilic	62	44,28%
Squamous	11	7,86%
Ciliated cell (tubal)	49	35,00%
Secretory and clear cell	16	11,43%
Mucinous	2	1,43%
Total	140	100%

Metaplasia was present in 140 of 624 cases with endometrial hyperplasia (22,43%).

Eosinophilic change was the most common cytoplasmic alteration.

The variety was associated with each type of hyperplastic lesion, but especially with atypical hyperplasia.

Endometrial glands were partially or completely lined by eosinophilic cells. Eosinophilic cells have shown considerable variation in shape. They were columnar when associated with atypical hyperplasia, rounded when associated with ciliated cells or polygonal, forming pavement-like aggregates, when they merged with cells that showed squamous differentiation. Often, the aggregates of eosinophilic cells formed intraglandular papillary tufts and bridges, thus simulating carcinoma (fig. 1).

Eosinophilic (pink) cells contain variable amounts of cytoplasm that at times can be partially vacuolated.

The nuclei tended to be round and stratified. In most instances, they were smaller, more uniform and lack the irregular nuclear membrane, chromatin condensation along the membrane and proeminent nucleoli that characterize cells with true cytologic atypia. Occasionally, the nuclei were enlarged, with a single proeminent nucleolus. Mitotic figures were extremely rare. Luminal cell borders were sharply demarcated. In some cases, eosinophilic cell change showed interspersed cells with a small amount of cytoplasmic mucin, suggesting overlap with mucinous cell change.

In several studies this cellular alteration has been termed “papillary syncitial metaplasia”, “surface syncitial change”, or an “early” form of squamous metaplasia.

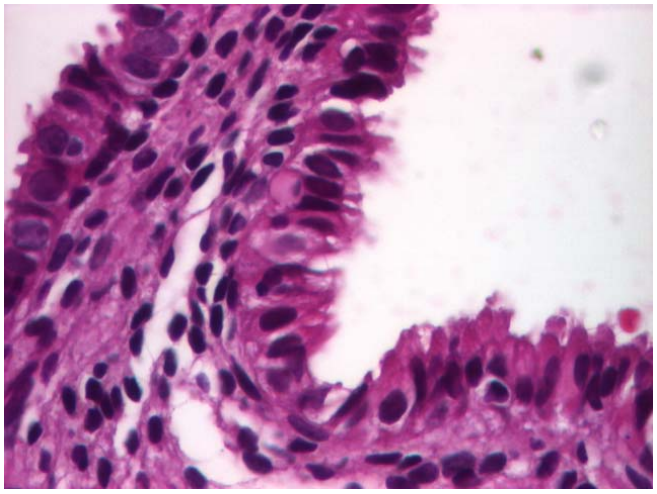


Fig. 1. Simple hyperplasia with eosinophilic change (HE, x 200)

On the endometrial surface, cells with eosinophilic cytoplasm tipically merge into a syncytium that either can be flat or more commonly form papillary processes. The classification of these eosinophilic cells as a metaplastic phenomenon is attributable to the fact that the syncytial aggregation of eosinophilic cells in this change superficially resembles the cells in squamous metaplasia. The term eosinophilic syncytial change is prefered. The constant association of eosinophilic syncytial change with breakdown and bleeding indicates that this change is degenerative and regenerative rather then metaplastic. Syncytial change is recognized by its proeminent localization along surface epithelium, although it may also occur in glands. Usually it is accompanied by karyorrhectic debris, neutrophils and adjacent glandular and stromal breakdown with stromal collapse. Furthemore, in this change, nuclei have a haphazard distribution, whereas with the other cytoplasmic changes, nuclei generally have an uniform distribution.

Squamous differentiation occurred in 11 cases, associated with all forms of endometrial hyperplasia (fig. 2). It was common in the atypical endometrial proliferations and it was rare in simple or complex hyperplasias. Also, it is rare in normally cycling endometrium. The squamous cells were usually citologically bland. The degree of nuclear atypia, when presents generally parallels that of the glandular cells. The squamous cells showed a moderate amount of eosinophilic cytoplasm and were surrounded by a well-defined cell membrane. The cells tented to be rounded or polygonal, but, also, spindle shaped, forming a circumscribed nest within the gland lumen (squamous morule – so called because of their three-dimensional resemblance to mulberries). Morules reflect immature or incomplete squamous differentiation. The cells were smaller and the cytoplasm was less prominent than in more completely differentiated squamous cells. Rarely, we observed central keratinization and necrosis. The squamous epithelium is rarely keratinized in hyperplasia, keratinization occurring more frequently in adenocarcinom with squamous differetiation. Necrosis has no effect on the diagnosis or prognosis of the lesion.

Squamous change predominantly occurs within gland lumens, and in most cases surface epithelium shows minimal involvement. Occasionally, it is observed secondary to inflammation.

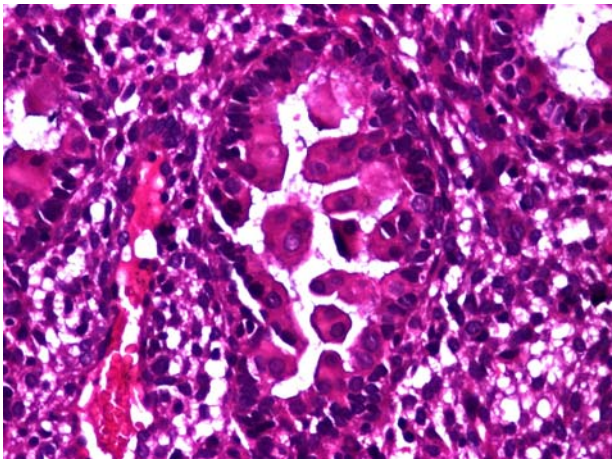


Fig. 2. Simple hyperplasia with scuamous differentiation (HE, x 200)

In a longterm follow-up study of endometrial hyperplasia, 5 of 11 patients with atypical hyperplasia and associated squamous metaplasia eventually developed carcinoma, indicating that atypical hyperplasia with squamous metaplasia has malignant potential.

Ciliated cell change (tubal metaplasia) was present in 49 cases, especially associated with simple hyperplasia (fig. 3). It is not a true metaplasia, as ciliated cells are normally present along the surface epithelium, being most numerous in proliferative endometrium. Ciliated cells occasionally are observed in isolated glands in atrophic or inactive endometrial or in polyps. The presence of a significant number of ciliated glandular cells is referred to as “ciliated cell change” or “tubal metaplasia” because of the resemblance to the epithelium of the fallopian tube.

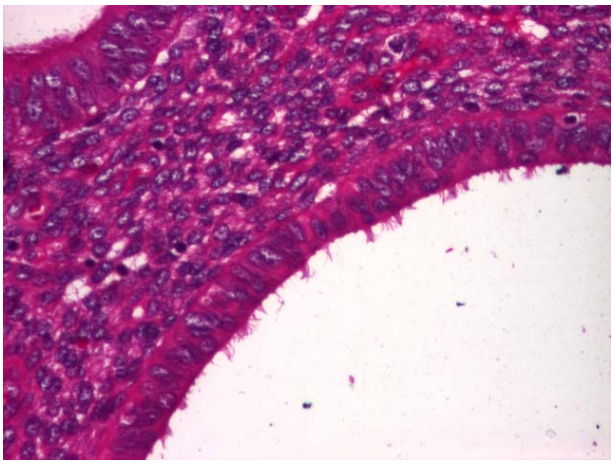


Fig. 3. Simple hyperplasia with ciliated cell change (HE, x 100)

These cells often were interspersed in small groups among nonciliated columnar cells, but sometimes they were extensive and lined most of the gland. Ciliated cells had pale

to eosinophilic cytoplasm. The nuclei were mildly stratified, with round to oval shapes, an even chromatin distribution and small nucleoli. The rounding and slight nuclear enlargement that occurs should not be considered.

Secretory and clear cell change is very infrequent. We observed this cytoplasmic change in 16 cases associated with simple hyperplasia, as well as with atypical complex hyperplasia. It was a focal alteration, limited to scattered glands. As the names imply, the cells contain clear, glycogen-rich cytoplasm and resembled those found in secretory or gestional endometrium. In one case the cells developed a hobnail pattern with nuclei that protrude into the gland lumen, resembling the Arias-Stella reaction. The secretory/clear cell change usually occurs in endometrium that shows estrogenic effects that range from a proliferative pattern to carcinoma. Sometimes, secretory endometrium shows extensive cytoplasmic clear cell change that exceeds the amount of vacuolization seen during normal luteal phase of the menstrual cycle.

Diffuse secretory changes sometimes occur in hyperplasia and this has been called “secretory hyperplasia”. This process can be seen in the premenopausal or perimenopausal patient with hyperplasia who has sporadic ovulation or who has been treated with progestins. Regardless of the cause, in secretory hyperplasia the glands maintain the disordered architecture of hyperplasia, but they also show secretory changes. Atypia is difficult to recognize in these cases, because the secretory change result in differentiation of the gland cells that creates a rather bland appearance. In such cases, rebiopsy may be necessary to assess the endometrium after the secretory change has resolved.

Mucinous change was present in only 2 cases, associated with complex atypical hyperplasia (fig. 4). It is characterized by mucinous epithelium resembling that of the endocervix. It is one of the least commonly encountered cytoplasmic alterations and is seen more often in association with atypical hyperplasia or carcinoma.

The mucinous epithelium tented to be distributed focally and it was composed of tall columnar cells with bland, basally nuclei and clear granular cytoplasm. At times, mucinous change was accompanied by a papillary proliferation. The papillary processes contained normal and compressed stromal cells and were lined by nonstratified columnar epithelium which is mucinous in area. Mitotic figures were rare.

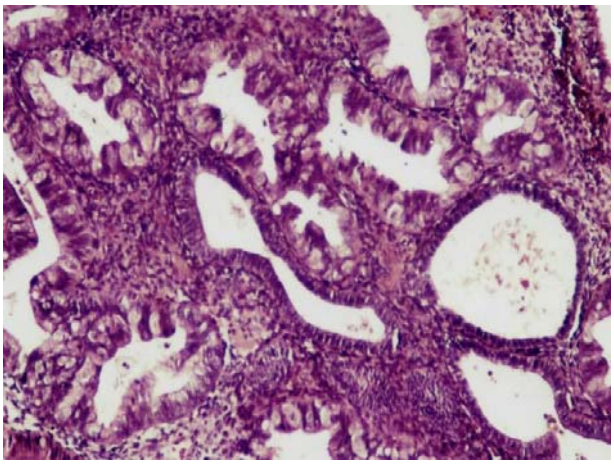


Fig. 4. Complex hyperplasia with mucinous change (HE, x 100)

The aspect of the cytoplasm is clear in hematoxylin-eosin (HE) stains because it contains mucin, which is periodic acid-schiff (PAS) positive and diastase resistant and stains with mucicarmine, toluidine blue and alcian blue.

The nuclei were small and uniform, sometimes with small nucleoli.

Several studies of endometrial mucinous proliferations found that mucinous change occurs across a morphologic spectrum from bland cytoplasmic change in simple mucinous proliferations to mucinous carcinoma.

The absence of cytologic atypia and architectural complexity in simple muncinous proliferations was associated with a low risk of neoplasia. Lesions showing architectural complexity or cytologic atypia but not clearly neoplastic were associated with the concurrent or subsequent presence of well-differentiated adenocarcinoma. When a lesion is encountered that shows worrisome architectural or cytologic features, the abnormality could be termed “complex atypical endometrial mucinous proliferation with a comment that there is a high risk of well-differentiated carcinoma in the uterus.

Sometimes in biopsy specimens, small fragments of tissue may contain areas of eosinophilic, squamous or mucinous change that are suggestive of a more significant lesion, even in the absence of glands with identifiable atypia. This aspect is important when it occurs in postmenopausal women, as their endometrial should be atrophic. The presence of metaplasia may reflect the presence of a significant glandular abnormalities, including atypical hyperplasia or adenocarcinoma, that has not been adequately sampled.

CONCLUSIONS

It is important to recognize the various cytoplasmic changes because they are benign and can be confused with hyperplasia.

The most important aspect of the evaluation of the various metaplasias is not to confuse them with hyperplasia or carcinoma, which is best accomplished by evaluating the glandular architecture and cytological features.

The cytoplasmic changes by themselves have no prognostic significance. The lack of hyperplastic glandular architecture is helpful in recognizing these alterations as incidental processes with no biologic significance.

The management of endometrial cytoplasmic changes depends entirely on the nature of the associated proliferative lesions. Endometrial cytoplasmic changes without hyperplasia do not require treatment.

The presence of the metaplasia in the absence of the cellular or nuclear atypia should not be considered to agravate the prognosis of the lesion, but may increase the complexity of the glandular architecture and may determinate a overvaluation of the diagnosis. Also, it can be the cause of the failure of the hormonal treatment because the change of estrogen and progesterone receptors and the lack of sensibility of the metaplastic epithelium.

BIBLIOGRAPHY

1. Mazur M.T., Kurman R.J. Endometrial Hyperplasia, Endometrial Intraepithelial Carcinoma and Epithelial Cytoplasmic Change. In : Diagnosis of Endometrial Biopsies and Curettings. Springer : New York. pp. 178-248, 2005.
2. Vang R., Tavassoli F.A. Proliferative mucinous lesions of the endometrium : Analysis of existenting criteria for diagnosing carcinoma in biopsies and curettings. Int J Surg Pathol ; 11: 261-270, 2003.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

OVERWEIGHT AND OBESITY - RISK FACTORS FOR UTERINE CANCER

Diana Olimid, D. A. Olimid[1]

KEY WORDS: obesity, body mass index, uterine cancer

ABSTRACT

Uterine cancer is the most common cancer that originates in female reproductive system. Substantial epidemiologic data implicate obesity, fat distribution and nutritional lifestyle factors in the etiology of this disease. Obesity increase from 2 to 5 times the risk for the development of uterine corpus cancer.

In the present study we followed to identify this risk factor in a cohort of 171 women with a diagnosis of endometrial cancer.

The overall incidence of endometrial cancer likely will increase in the future secondary to increasing obesity and the aging of the population.

INTRODUCTION

Uterine cancer develops in the body of the uterus, or womb, which is a hollow organ located in the lower abdomen. The wall of the uterus is comprised of an inner lining (called the endometrium) and an outer layer of muscle tissue (called myometrium).

Endometrial cancer, which originates in the inner lining of the uterus, accounts for about 90% of uterine cancers.

According to the National Cancer Institute (NCI) uterine cancer is the most common type of gynecologic cancer. In the United States approximately 37.000 cases are diagnosed and about 6000 women die from the disease each year.

A number of risk factors have been identified and most appear to be related to estrogenic effects. Among these factors are obesity, high-fat diet, reproductive factors such as nulliparity, early menarche and late menopause.

Incidence of uterine cancer increases after menopause and approximately 75% of cases are diagnosed in postmenopausal women.

Incidents rates of endometrial cancer are up to 10 times higher in industrialized countries and that shows that endometrial cancer has strong environmental, nongenetic risk factors. This environmental risk factors include low level of physical activity and obesity.

Obesity has been associated with a 2-5-fold increase in endometrial cancer risk in both premenopausal and postmenopausal women and has been estimated to account for ~40% of endometrial cancer incidence in affluent societies.

[1] University of Craiova

MATERIAL AND METHODS

This study includes 171 women from 40 to 69 years of age, with a histologic diagnosis of endometrial cancer.

Height and weight information for each women was obtained and was used to calculate patient basal metabolic index (BMI) using the formula:

BMI = [weight (kg) / height $(cm)^2$] x 10^4

A BMI category 25-29.9 kg/m^2 corresponds of being overweight and a BMI of 30 kg/m^2 or greater correspond to obesity.

A normal-weight women has a BMI < 25 kg/m^2.

The cases were divided in four categories by the value of the BMI: underweight women, normal-weight women, overweight women and obese.

RESULTS AND DISCUSSIONS

The repartition of cases showed that the majority (69,01%) were overweight and obese women. 61 patients (table 1, fig. 1) represented 35,67% of all cases, had a BMI between 25-29,9 kg/m^2.

Obese women (BMI > 30 kg/m^2) represented 33,34% (57 cases). 18 women showed the first degree of obesity (10,53%); 24 women showed the second degree of obesity (14,04%) and 15 women showed the third degree of obesity. Women with normal-weight represented 28,07% of all cases.

5 patients were underweight. They had a BMI < 20 kg/m^2 and represented only 2,92% of cases.

Tabel 1

The repartition of cases conform to the BMI

	Underweight	Normal-weight	Overweight	Obesity		
				1-th degree	2-nd degree	3-rd degree
BMI	< 20 kg/m^2	20-24,9 kg/m^2	25-29,9 kg/m^2	30-34,9 kg/m^2	35-39,9 kg/m^2	≥ 40 kg/m^2
No. of cases	5	48	61	18	24	15
Percentage %	2,92%	28,07%	35,67%	10,53%	14,04%	8,77%

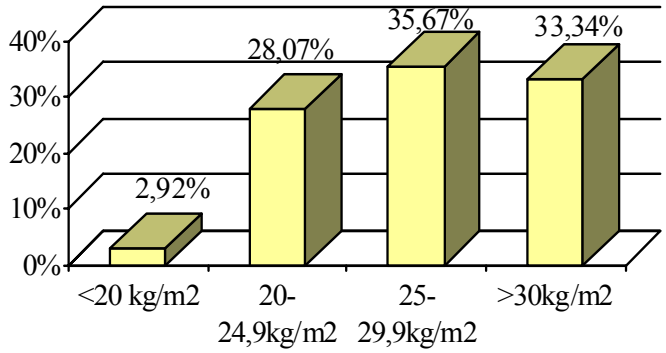


Fig. 1. The repartition of cases conform to the BMI

A study made by the National Institutes of Health – AARP Diet and Health Study (published by American Cancer Society in 2007) reported that women who were overweight (BMI 25-29 kg/m^2) or obese (BMI ≥ 30 kg/m^2) contributed > 50% of the total persontime. Endometrial cancer was associated positively with BMI and later age at natural menopause. 34,24% of cases were represented by women with excess weight and 41,33% by women with obesity.

Among women who never used menopausal hormone therapy, the incidence of endometrial cancer was 6 times higher in obese women than in normal-weight woman. Most endometrial cancers among estrogen-plus-progestin users occurred in women who were not obese, but most endometrial cancer among nonusers occurred in obese women.

Another study published by Oxford University Press on behalf of the International Epidemiological Association suggest that weight gain and lack of weight stability are associated with risk of endometrial cancer. The analysis was performed with information on each woman's weight (recent, lowest and highest weight since age 20). Weight and BMI were strongly related to increased endometrial cancer risk. Women with BMI over 29 kg/m^2 represented 42,30% of all cases. Increasing BMI was associated with increased risk. Women in the top quartile of BMI (> 29 kg/m^2) had a 3-fold greater risk of endometrial cancer compared with women in the lowest quartile (< 23 kg/m^2).

Weight gain since the lowest adult weight was associated with increased risk; for each 5 kg weight gain, risk of endometrial cancer increased by 21%.

When categorized by approximate quartile cut-points, women with fourth quartile weight gain (≥ 21 kg) had 2.56 times the risk of cancer compared with women who gained 0-7 kg. Women who reported sustained weight loss, defined as at least 5 years at a weight that is less than their highest weight since age 20 had a reduced risk. The study did not observe an association between magnitude of weight loss and endometrial cancer risk.

More then 25 reports published over the past two decades have confirmed the association of greater BMI and increased risk of endometrial cancer, primarily among post-menopausal women, but the relationship is also evident to a lesser degree among premenopausal women. Others studies did not identify an association between weight gain and endometrial cancer risk.

In obese postmenopausal women, androgens are converted into estrogens in peripheral fat tissues. Because serum levels of sex-hormone binding globulin are decreased in obese women, the proportion of free estradiol also increases. Therefore, women with higher BMIs due to fat accumulation may have higher levels of estrogen that those who have less body fat. Whereas in many studies risk rose approximately linearly with increasing Body Mass Index (BMI), a few studies showed a threshold effect, with an increase only among obese women with a BMI of ~ 30 kg/m^2 or higher.

It is estimated that around 36% of cases of endometrial cancer in the United Kingdom are caused by excess body weight in women. Prospective studies, mainly among postmenopausal women report a significant association with BMI at enrolment, but also suggest that women's BMI in younger adulthood is significant and that the increase in risk begins at a relatively modest raised BMI.

CONCLUSIONS

Obesity is an established independent risk factor for endometrial cancer.

Appreciating the incidence of obesity within the casuistry, we noticed that 35,67% of patients diagnosed with endometrial cancer were overweight and, respectively 33,34% were obese.

It is important to identify women at risk in order to provide them with appropriate screening. They should be counseled about their long-term risk of endometrial cancer and modalities available for prevention.

The nutrition and lifestyle factors favoring the development of obesity may increase endometrial cancer risk via effects on endogenous hormone and growth factor levels.

BIBLIOGRAPHY

1. Bray F., Dos Santos Silva, I., Moller H., Weiderpass E. Endometrial Cancer Incidence Trends in Europe : Underlying Determinants and Prospects for Prevention ; Cancer Epidemiol Biomarkers Prev ; 14(5): 1132-1142, 2005.
2. Informations Resources Centre: UK. Uterus Cancer. Incidence Statistics. http://info. cancerresearchuk.org/Cancerstats/types/uterus/incidence/, 2008.
3. Kaaks R., Lukanova Annekatrin, Kurzer S. M. Obesity, Endogenous Hormones and Endometrial Cancer Risk : A Synthetic Review. Cancer Epidemiology, Biomarkers & Prevention ; 11: 1531-1543, 2002.
4. Lacey Jr. J.V., Leitzmann M.F., Chang S. et. al. Endometrial Cancer and Menopausal Hormone Therapy in the National Institutes of Health-AARP Diet and Health Study Cohort. Cancer ; 109: 1303-1311, 2007.
5. Schouten L.I., Goldbohm A., Van den Brandt P.A. Anthropometry, Physical Activity and Endometrial Cancer Risk: Results From The Netherlands Cohort Study. Journal of the National Cancer Institute ; 96(21): 1635-1638, 2004.
6. Trentham-Dietz A., Nichols H.B., Hampton J.M., Newcomb P.A. Weight change and risk of endometrial cancer. International Journal of Epidemiology; Oxford University Press; 35: 151-158, 2006.
7. Weiderpass E., Persson I., Adami H.O., Magnusson C., Lindgreen A., Baron J.A. Body size in different period of life, diabetes mellitus, hypertension and risk of postmenopausal endometrial cancer (Sweden). Cancer Causes Control ; 11: 185-92, 2000.
8. World Health Organization. Obesity. Preventing and managing the global endemic. WHO Technical Report Series no. 894. Geneva : World Health Organization, 2000.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✔*Biologie*
✔*Horticultură*
✔*Tehnologia prelucrării produselor agricole*
✔*Ingineria mediului*

Vol. XIV (XLX) - 2009

ALCOHOL - *PRIMARY* RISK FACTOR FOR ORAL CANCER

D. A. Olimid, Diana Olimid[1]

KEY WORDS: carcinomas, alcohol, oral epithelium.

ABSTRACT

This case-control study investigates the role of alcohol as a primary risk factor in the development of oral cancer. Alcoholic beverages may contain carcinogens, procarcinogens or congeners, more responsible for oral cancer than is pure alcohol. Ethanol is metabolized by alcoholdehydrogenase to acetaldehyde which may be carcinogenic. That relationship, however, has been complicated by the habits associated with alcohol consumption. The target of this study was to explore the relationship between alcohol consumption history versus never drinking history and to establish some connection with the quality of drink and oral squamous cell carcinoma. Data collected included age, gender, drinking history .

INTRODUCTION

Oral cancer's relationship to alcohol consumption has been well documented. The role of alcohol has been clearly established in the pathogenesis of carcinoma arising from oral epithelium. Large epidemiologic studies continue to confirm the role of alcohol in cancers of the head and neck. Although 95% of cancers in the head and neck region are squamous cell carcinomas (SCC) and have identical histological features. This study evaluates the oral cavity as a single site and look at oral cavity from the perspective of a first line facing to the risk of alcohol.

MATERIAL AND METHODS

Detailed data on drinking and smoking histories of oral cancer patients and controls were obtained by trained interviewers and clinical records. All patients who presented at the Emergency Hospital in Craiova , with a biopsy-proven oral SCC between 2003 and 2007 were reviewed. Data collected included age, gender, drinking history, and stage at presentation. Drinking history was evaluated based on 4 types: never drinkers, occasional drinkers, moderate drinkers (2-3 times weekly) and daily drinkers. We search for association between type of alcohol beverage and age of beginning.

[1] University of Craiova

RESULTS AND DISCUSSIONS

A total of 167 patients were reviewed, if diagnosed histologically with squamous cell carcinoma, they were entered into the study. The average age of the patients was 64.2 years (age range, 20 to 86 years). Table 1 shows the distribution of drinking histories of cases and controls. Among the cases, 8,38% never drink, 25,74% were occasional drinkers, 30,54% moderate drinkers and 35,34 daily drinkers.

Table 1

The distribution of drinking histories

Drinking type	Never drink	Occasional	Moderate weekly	Daily
No. cases	14	43	51	59
Percentage %	8,38	25,74	30,54	35,34

Approximately two third of patients with oral SCC have been drinking regular, in fact this kind of distribution, provide important information about the role of the alcohol in carcinogenesis.

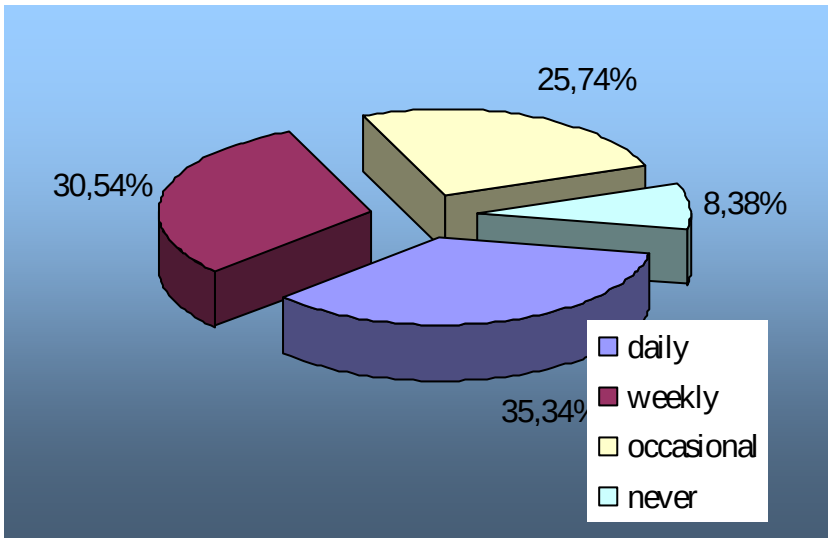


Fig 1. Alcohol consomption

When fermentation products are distillate, the result is a higher density alcoholic drinks. The alcohol can also be synthetically produced. Studies that have attempted to estimate a difference between wine, beer and hard liquors generally indicate that heavy consumption of all types of alcoholic beverage confers risk, the differences in risk estimates being largely due to socio-cultural correlates of drinking patterns in various populations.

Table. 2

The quality of the alcohol

Quality	Distilated	Natural fermentation	Both
No. cases	41	23	46
Percentage %	37,27	20,91	41,82

As a standard for drinking,: standard beer contains 3 g of alcohol per 100 ml, vodka, gin, bourbon contains 36,57g of alcohol per 100ml, and the average 12 percent dry wine contains 10,1g of alcohol per 100ml. Sweet wines or liqueurs were not an important factor in this study, since most patients drank dry wines.

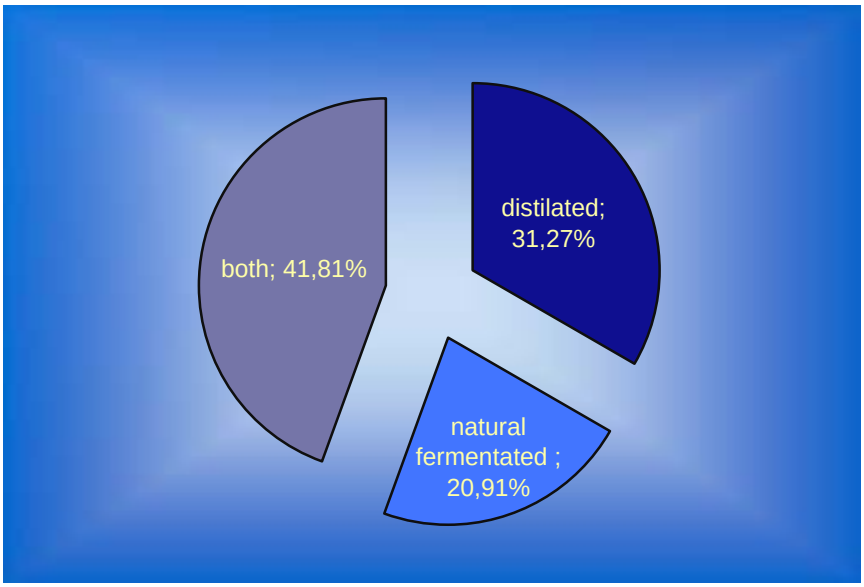


Fig. 2 The quality of the alcohol

CONCLUSIONS

The results of this study made on a number of 167 oral squamous carcinomas selected in an interval of time of 4 years between 2003-2007 shows an alarming increase of the frequency of oral malignant neoplasias especially in the last year.

We noted the plurifactorial etiology of oral malignant neoplasias, by distinguishing the association of risk factors, especially alcohol.

This study demonstrates that approximately two third of patients with oral squamous cell carcinoma report that they have drink regulated.

Heavy consumption of all types of alcoholic beverage confers risk, the differences in risk estimates being largely due to socio-cultural correlates of drinking patterns in various populations.

The frecvent use of mouthwashes containing alcohol, over prolonged periods cannot be incriminated in oral cancer due to the small number of patients.

REFERENCES

1. Barnes L., Evenson J., W., Reichert P., Sidransky D. (2005). World Health Organization Classification of Tumors, Pathology & Genetics, Head and Neck tumors; IARC press: Lyon , pp. 164-181
2. Greene FL, American Joint Committee on Cancer and American Cancer Society (eds): AJCC Cancer Staging Manual (ed 6). New York, NY, Springer-Verlag, 2002.
3. Keller AZ, Terris M: The association of alcohol and tobacco with cancer of the mouth and pharynx. Am J Public Health Nations Health 55:1578, 1965.
4. Kurumatani N, Kirita T, Zheng Y, et al: Time trends in the mortality rates for tobacco- and alcohol-related cancers within the oral cavity and pharynx in Japan, 1950-94. J Epidemiol 9:46,1999.
5. Llewelyn J, Mitchell R: Smoking, alcohol and oral cancer in south east Scotland: A 10-year experience. Br J Oral Maxillofac Surg 32:146, 1994.
6. Moreno-Lopez LA, Esparza-Gomez GC, Gonzalez-Navarro A, et al: Risk of oral cancer associated with tobacco smoking, alcohol consumption and oral hygiene: A case-control study in Madrid, Spain. Oral Oncol 36:170, 2000.
7. Wynder EL, Bross IJ, Feldman RM: A study of the etiological factors in cancer of the mouth. Cancer 10:1300, 1957.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

PRECANCEROUS LESIONS AND CARCINOMA "IN SITU"- A HISTOPATHOLOGICAL STUDY

D. A. Olimid, Diana Olimid[1]

KEY WORDS: precancerous lesions, dysplasia, basal layer.

ABSTRACT

Aim of present study was to evaluate the incidence of precancerous lesions of oral mucosa, their potential to evolve in relation to grade of dysplasia, and the most appropriate treatment. The study is based on the review of a series of 67 patients 41 male (61,2%), 26 female(38,8%).

Clinical suspicion is needed to diagnose small oral lesions. The diagnosis of oral precancerous lesions and cancer remains a challenge to the dental profession, particularly in the detection, evaluation and management of early phase alterations or frank disease. The majority of cases present no difficulty in diagnosis.

In this study we analyzed 67 patients with precancerous lesions from a histopathological point of view. The various histopathological aspects analyzed are subsequently compared to the results from literature, obtained in other studies; in the final of this study, we underlined the results with relevant aspects.

INTRODUCTION

Analyze a case series of patients with precancerous lesions of the lip and oral cavity. Clinical suspicion is needed to diagnose small lesions, especially if the patients have smoke tobacco, sunlight exposure and alcohol habits. Patients presented red lesions (erytroplasia), white plaques (leukoplakia) or mixed red and white lesions.

Almost 20% of cancers are associated with chronic infections, the most significant ones being hepatitis viruses (HBV, HCV), papillomaviruses (HPV) and Helicobacter pylori. There is increasing recognition of the causative role of lifestyle factors, including diet, physical activity, and alcohol consumption.

Genetic susceptibility may significantly alter the risk from environmental exposures. Early detection, followed by prompt excision, should thus prevent the development of invasive tumours requiring far more destructive and debilitating surgery. The recognition of the earliest stages of invasion can be problematic so the deepest layers of the epithelium and the interface between the epithelium and the lamina propria need to be examined in detail.

[1] University of Craiova

MATERIALS AND METHODS

All precancerous lesions have been chirurgical removed and sent to Department of Pathology for further analysis. The formalin-fixed, paraffin-embedded blocks were retrieved from the surgical pathology archives of the Department of Pathology from Emergency Hospital of Craiova. Serial thick sections were cut from the tissue blocks and mounted on silanized slides. One section was stained with hematoxylin-eosin and examined to confirm the original diagnosis and tumor grade. All tumors were classified according to the International Union Against Cancer (UICC) TNM classification. Histological grading was done according to WHO classification. Clinicopathological information on each case, was obtained from patient record files. From the risk factors we investigated smoking and alcohol intake history, oral status.

RESULTS AND DISCUSSION

The studied cases were represented in 6 cases from carcinoma "in situ"and in 61 cases from pre-cancerous lesions (dysplasias of different degrees) (table 1).

Table 1.

Distributions according to invasions depth

Tumor type	**Carcinoma „in situ"**	***Pre-cancerous lesions***
No. cases	6	61
Percentage %	9%	91%

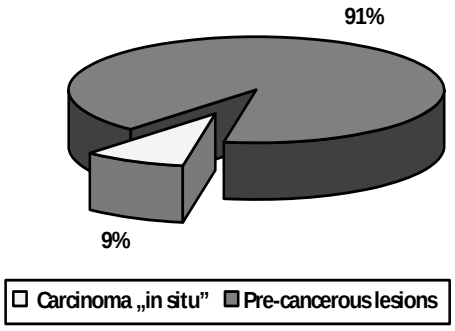


Fig. no. 1 Distributions according to invasions depth

All six cases diagnosed histopathologicaly with carcinoma "in situ" have precancerous lesions located almost exclusively on the lower lip and lingual . We notices changes of basal layer regarding morphology and disturbed architecture of the basal layers of the epithelium, particularly the replacement of basal cells by larger irregular cells with completely loss of polarity. The degree of cytological atypia and mitotic feature suggest malignancy, but these are not always present.

Neoplasic cells with different shape and size, were present in the basal layer, cytoplasmic volume was reduce, basophilic, with hipercromatic nucleus (fig. no.2,3).

We notices abnormal variation in nuclear size and shape, increased nuclear size, increased number and size of nucleoli, abnormal variation in cell size and shape, increased nuclear- cytoplasmic ratio. Atypical mitotic figures, abnormal superficial mitoses and irregular epithelial stratification are commonly seen in carcinoma in-situ.

Basal layer was not disrupted, but atypical mitosis have been frequently present in the mass of the epithelium, even in the superficial layer. (fig. no. 4).

In the subjacent lesion layer we notices the presence of an abundant inflammatory lymfo-plasmocitar infiltrate. In both cases, adjacent epithelium presents associated changes of dysplasia. Epithelial dysplasia is the term used to describe microscopic alterations. Epithelial dysplasia is believed to be an important indicator of malignant potential. The malignant change is directly related to the severity of dysplasia. Malignancy can develop from any grade of dysplasia or even from morphologically normal epithelium (5,6,7).

Association between, precancerous lesions and carcinoma "in situ" have been notices frequently in literature. Similar study confirm that five percent from oral precancerous lesions in the absence of treatment, can progress to a carcinoma 'in situ' and invariable to an invasive carcinoma (1,4).

CONCLUSIONS

- The most encountered macroscopic aspect in the case of oral premalignant lesions at the beginning, as well as in the status period was the aspect of erythroplasia.
- The oral premalignant lesion were frequently localized at the level of lips, tongue.
- The presence of *pre-cancerous lesions* (dysplasia of various degrees) at the level of adjacent epithelium was distinguished in a number of 61 cases.
- Epithelial dysplasia is believed to be an important indicator of malignant potential.
- Architectural abnormalities in the viable cellular layers and pronounced cytologic atypia.
- Abnormal variation in nuclear size and shape, increased nuclear size, increased number and size of nucleoli.
- Abnormal variation in cell size and shape, increased nuclear- cytoplasmic ratio.
- Atypical mitotic figures and abnormal superficial mitoses are commonly seen in carcinoma in-situ, irregular epithelial stratification.
- Loss of polarity of basal cells and premature keratinization in single cells.

REFERENCES

1. Abbey L. M., Kaugars G. E., Gunsolley J. C. et al. (1998). The effect of clinical information on the histopathologic diagnosis of oral epithelial dysplasia. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 85:74-77
2. Bouquot J. E. (1991). Reviewing oral leukoplakia: clinical concepts for the 1990s. J Am Dent Assoc 122: 80-82
3. Fischer D. J., Epstein J. B., Morton T. H., Schwartz S. M. (2004). Interobserver reliability in the histopathologic diagnosis of oral pre-malignant and malignant lesions. J Oral Pathol Med 33: 65-70.
4. Karabulut A., Reibel J., Therkildesn M. H. et al. (1995). Observer variability in the histologic assessment of oral premalignant lesions. J Oral Pathol Med 24: 198-200.
5. Onofre M. A., Sposto M. R., Navarro C. M. et al. (1997). Potentially malignant epithelial oral lesions: discrepancies between clinical and histopathologic diagnosis. Oral Dis 3: 148-152.
6. Tsubochi H., Suzuki T., Suzuki S. et al. (2000). Immunohistochemical study of basaloid squamous cell carcinoma, adenoid cystic and mucoepidermoid carcinoma in the upper aerodigestive tract. Anticancer Res. 20(2B): 1205-1211.
7. Velly A. M., Franco E. E. L., Schlecht N. et al. (1998). Relationship between dental factors and risk of upper aerodigestive tract cancer. Oral OncoI 34: 284-29l.

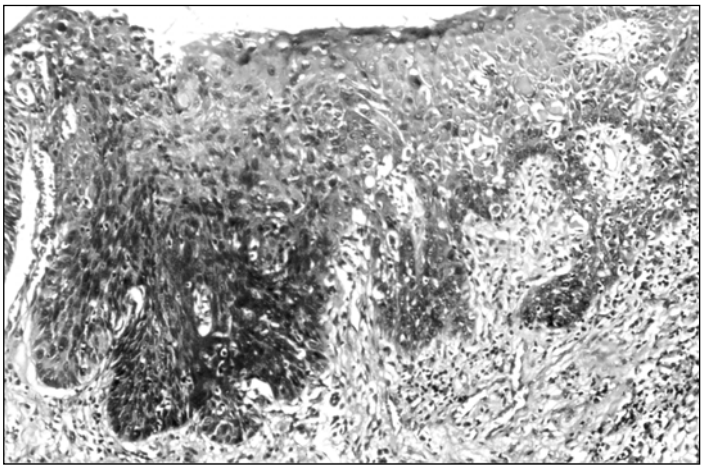


Fig. no. 2
Carcinoma „in situ”
lingual . Col HE Ob. 40

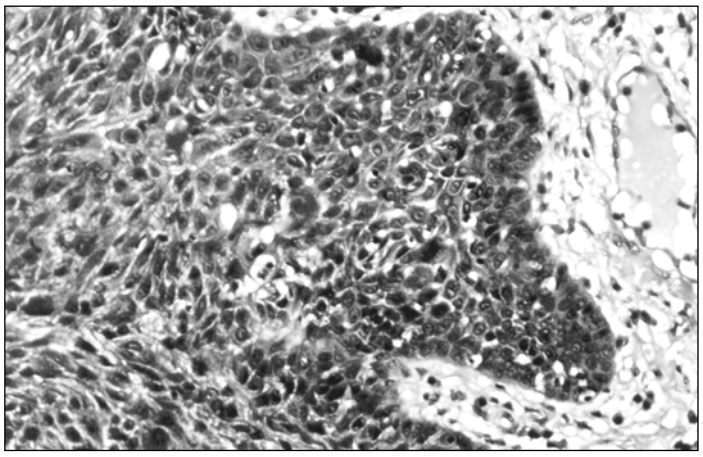


Fig. no. 3
Carcinoma „in situ”
lingual. Col HE Ob. 100

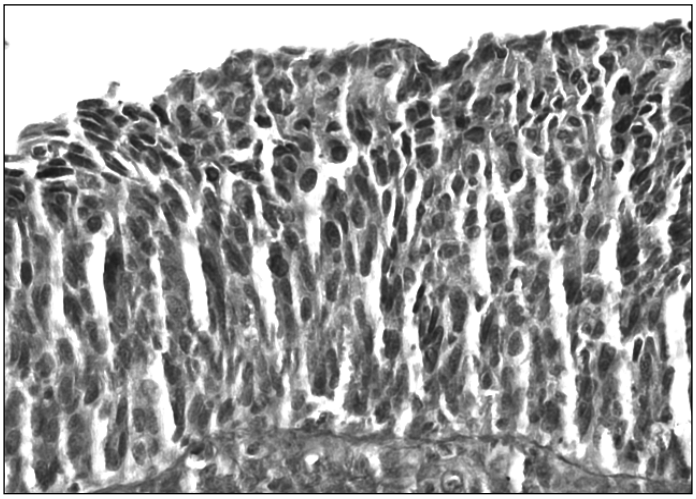


Fig. no. 4
Carcinoma „in situ”, Col
PAS, Ob. 100

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

MORPHOLOGY AND ANATOMY OF THE VERONICA POLITA SPECIES FROM THE SCROPHULARIACEAE FAMILY

Rădutoiu Amira[1]

KEY WORDS: Veronica polita, anatomy.

ABSTRACT

The present paper makes part of a more ample study regarding the morphology, taxonomy, anatomy, corology and the economic importance of Veronica species with solitary flowers of România. In this paper there are presented data about the morphology and anatomy of the vegetative organisms to Veronica polita Fries. If data regarding the morphology of this specie are known, those ones about anatomy are totally sporadic. Anatomically speaking we may say that to this specie there can be observed a secondary structure to the level of the central cylinder and a primary one to the binding level.

INTRODUCTION

Veronica species which are being studied are mostly annually, only *Veronica filiformis* Sm. being evergreen. Knowing the morphological, anatomical and corrological features helps to the taxonomy of these species and to a better understanding of their home.

Although in some of the specialty determiners, some taxona are mentioned as frequent (CIOCÂRLAN, 2000), still, after analyzing the herbarium material (BELDIE, 1977,1979), (GHI□A, 1960)), we can say that the statute of sporadic species characterizes them better. (eg. *Veronica opaca* Fries).

Through the anatomy studies it is tried to find new features to contribute to an evident differentiation of some taxona among themselves.

MATERIAL AND METHOD

The working method consisted of traveling from a land to another in order to collect and afterwards preserve the material to be studied. After preservation, the material was analyzed morphologically and structurally speaking. There have been made cross-cuts to the level of the vegetative organisms and skinning the epidermis. In order to make the photos a Nikon microscope was used.

[1] Secondary School "Gh. Bibescu" nr. 36, Craiova

RESULTS AND DISCUSSION

The root is short, thin and branched. It has a secondary structure in the central cylinder and a primary one in the bark. It has a thickness of 945μm . Rhizoderma is not obvious. The primary bark consists of 2-3 layers of cells which represent the thin and rippled walls. The bark's thickness is of 135 μm. The central cylinder has a diameter of 675 μm and has both elements of free secondary and those of the secondary wood arranged in radial lines. The free cell walls are slightly thickened and the pithy rays are evident only in the secondary wood.

The ligneous vessels have a diameter between 9-27 μm, diameter which increases from the central area towards the free one (fig. 1).

The strain is procumbent or ascending, hairy disperse, richly branched from the base. Is thick of 1440 μm and shows a secondary structure at the central cylinder (fig. 2).

The epidermis is unistratified, has an average thickness of 27 μm and has a thick cuticle of 0.9 ìm.

The bark is pluristratified, consists of spheroidal or ovoid cells, with spaces between them. The first layer under the epidermis has collenchyma walls. Bark's thickness is of 247.5 μm.

The amilipherous sheath, composed of oblong cells in tangential way. The central cylinder has a secondary structure and an average thickness of 153 μm. The free secondary space is 67.5 μm thick and shows liberian vessels ordered compact and randomly. The diameter of the liberian vessels has values between 4,50-11,25 μm and increases from cambium outwards.

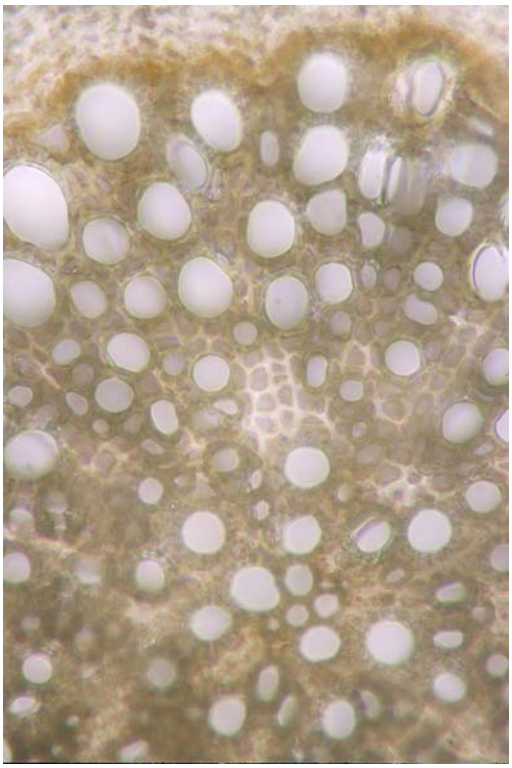


Fig. 1. Detail with the ligneous and liberian vessels

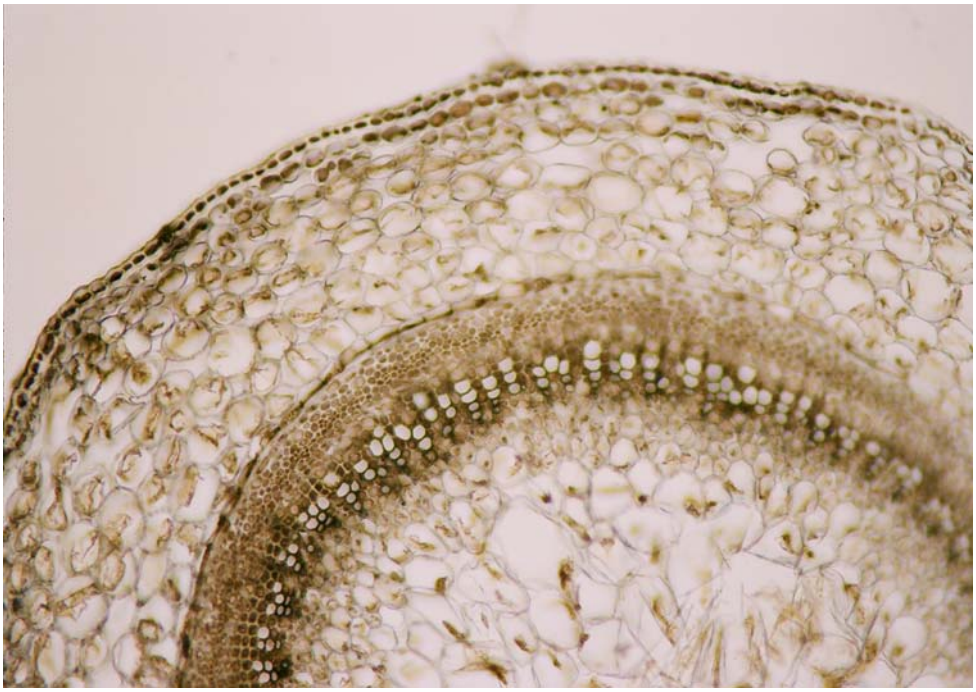


Fig. 2. Anatomy stem to *Veronica polita*

The cambium is made of 2-3 layers of oblong cells in tangential way.

The ligneous vessels are ordered in radial lines and tied among them through a ligneous parenchyma. The diameter of the ligneous vessels has values among 6,75-15,75 μm and increases from the medular parenchyma towards the cambium.

The central area of the stalk is occupied by the medular parenchyma whose diameter is of 270 μm. The medular parenchyma cells have thin side walls, are high, usually less spheroidal and ovoid with spaces between them.

You can not distinguish between primary wood and secondary one. Stoma is arranged above the epidermis.

Leaves are bifacial type and thick of 33.75 μm. The lower ones are opposite and the upper ones alternate. They are glabra or hairy disperse, glossy, oval, semi-round or almost triangular, longer than wide (5-11 x 4-9 mm).

The upper epidermis is unistratified and has an average thickness of 33.75 μm. On the outside it has thick cuticle of 1,125 μm (fig. 3). The upper epidermis cells have straight walls, thick and covered with numerous punctuation. The length of the upper skin cells is between 60,75-130,50 μm and the width between 29,25-58,50 μm. Stomata are anomocytic type, have a length between 22,50-27 μm and a density of 0.0471 - 0.1884 / mm^2.

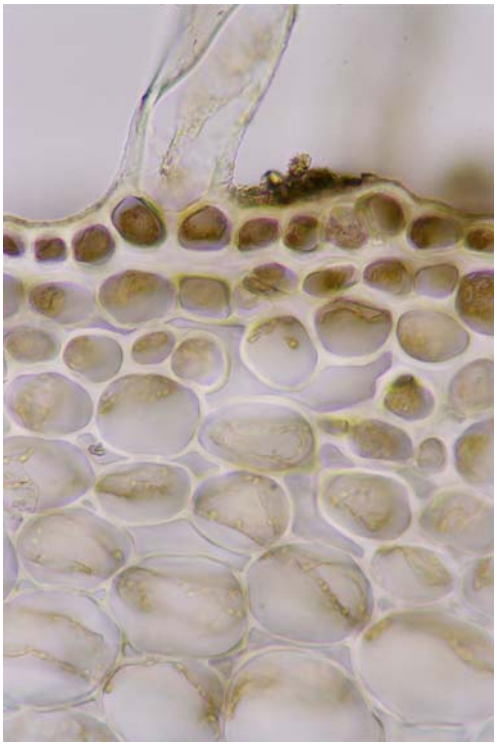


Fig. 3. Epidermis and the bark/Epidermă □i scoar□ă

The epidermal trichomas are multicellular elongated, have lengths of 135-450 μm and the last cell has a sharp peak. Palisade parenchyma consists of 3-4 layers of cells and has an average thickness of 168,75 μm (Fig. 4).

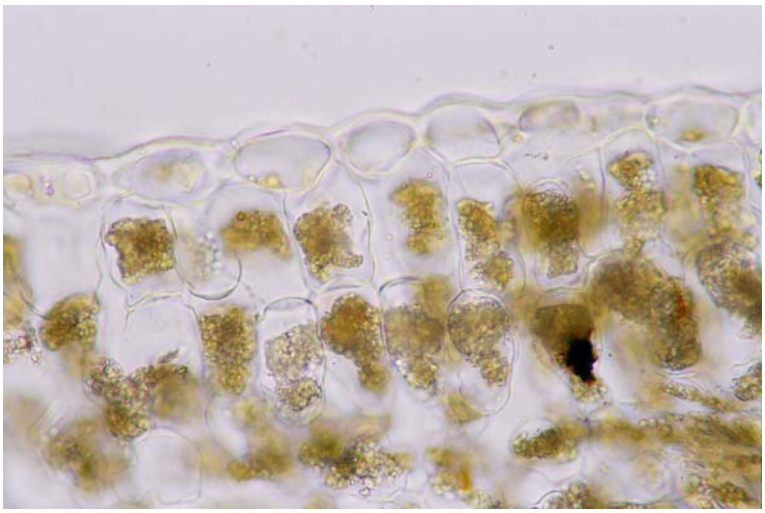


Fig. 4. The upper epidermis and palisade parenchyma to leave from *Veronica polita*

The empty parenchyma is composed of spheroid or ovoid cells, with spaces between them. It has an average thickness of 146,25 μm (fig. 5). The lower epidermis is unistratified has a thickness of 20.25 μm and a cuticle of 0.675 μm. The cells have thin side walls, sinuous and without punctuation in the top one.

The length of the lower epidermis cells is between 40,50-56,25 μm and the width between 11.25 μm and 22.50 μm. The density of the stomata the lower epidermis is higher compared with the upper epidermis: 0,6123-1,1775 / mm2.

The epidermal brushes are multicellular with the top bludgeon and variable sizes 225-360 μm. The density of the epidermal brushes is between 0.5094 - 0.8940 μm.

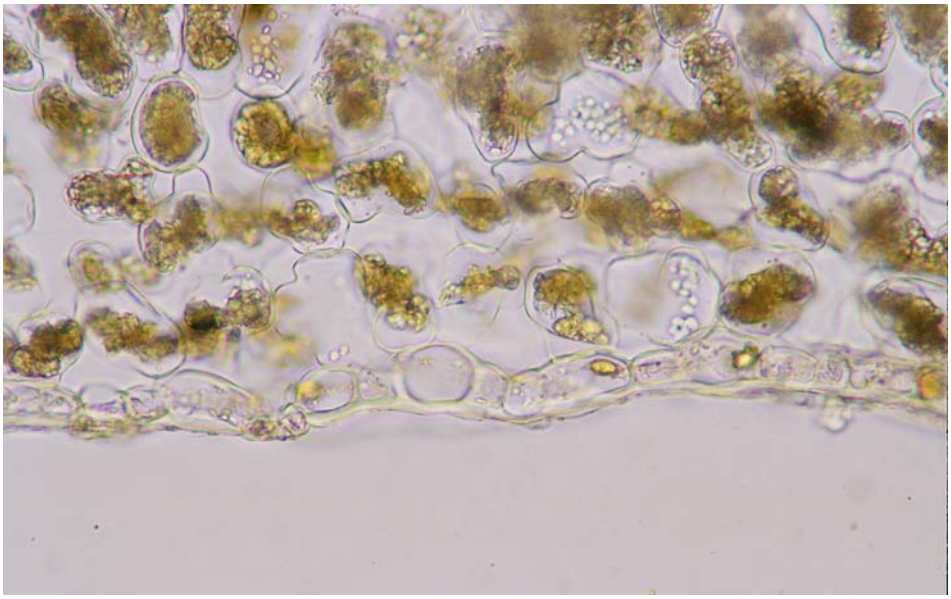


Fig. 5. The lower epidermis and empty parenchyma to leave from *Veronica polita*

CONCLUSIONS

After analyzing the material we can say that structurally speaking, the root and the stalk from *Veronica polita* are alike other Veronica species with solitary flowers (Eg. *Veronica persica* Poiret, *V. hederifolia* L.). They have a primary structure to the bark's level and a secondary one to the central cylinder.

The leaf has a bifacial structure as well as the bracteant leaves.

BIBLIOGRAPHY

1. Andrei M. & al. *Lucrări practice de biologie vegetală*. Edit. Did. Ped. Bucureşti. 1981.
2. Beldie Al. *Flora României - determinator ilustrat al plantelor vasculare.* Bucureşti: Edit. Academiei Române. (1: 1-412 + fig. 1-845, 1977; 2: 1-406 + fig. 846-1439, 1979). 1977, 1979.
3. Brummitt R.K. & Powell C.E. *Authors of plant names*. Royal Botanic Gardens, Kew. (EDS.) 732 pp. 1992.

4. Ciocârlan V. *Flora ilustrată a României*. *Pteridophyta et Spermatophyta.* Edit. Ceres, Bucureşti. 1038 pp. 2000.
5. Ghişa E. *Veronica*. In Tr. Săvulescu & al. (ed.). *Flora României.* **VII**: 505-565 Edit. Academiei Române.. Bucureşti. 1960.
6. Metcalfe C.R. & Chalk L. Anatomy of the Dicotyledons. Vol. I-II. Ed. Clarendon Press, Oxford. 1950.
7. Tutin T. G., Heywood V. H., Burges N. A., Moore D. M., Valentine D. H., Walters S. M., Webb D. A. & al. *Flora Europaea*. **III**. Cambridge University Press. Cambridge: 242-251. 1972.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✔*Biologie*
✔*Horticultură*
✔*Tehnologia prelucrării produselor agricole*
✔*Ingineria mediului*

Vol. XIV (XLX) - 2009

ANATOMICAL STUDIES OF THE VEGETATIVE ORGANS OF SCILLA AUTUMNALIS

Rădutoiu Maria Ionela[1]

KEY WORDS: Scilla autumnalis, anatomy.

ABSTRACT

This paper presents the results obtained after the anatomically analysis of Scilla autumnalis breed. From the analysis of the material it is noticed that the root has a primary structure, observing at its level 5 leading wood beams and 5 liberian ones. The woody ones go up to the center of the root. The aerial strain has a primary structure and edges. The leading strands are closed collateral type. The leaf is of ecvifacial type and the stomata are of amaryllidaceae type; the stomatal device is of aperigenous type.

INTRODUCTION

Scilla autumnalis is a perennial species, which presents a subterranean ovoidal bulb, coated in brown-reddish or grey tunics. It can be distinguished through its long, narrow leaves, which form after the appearance of the first flowers or towards the end of the latter (Fig. 1). The seeds pair two per locule and have no ariliform appendix.

Fig. 1. General aspect with *Scilla autumnalis* L.

[1] Secondary School "Radu Selejan" nr. 17 Sibiu

MATERIAL AND METHOD

The plants which have reached full blooming, considered mature at this point, were collected from salinized meadows, in Călugăreni, Giurgiu County. A part of the plants were preserved in a mixture composed of equal parts of absolute ethyl alcohol, glycerine and distilled water, whereas the remaining plants were analysed in a fresh state.

The anatomy of the vegetative organs was studied in transversal sections, with the caution that the organs are healthy and unaffected by diseases or pests.

Mechanical methods were used(peeling) for the study of the foliar epidermis and its products. The measurements of microscopic elements were performed with the aid of an eyepiece micrometer, adapted to the MC-3 microscope.

The photographing was carried out with a Nikon system adapted to a Nikon microscope. For each analysed element, one hundred tests were carried out.

RESULTS AND DISCUSSION

As a result of the numerous sections performed on the vegetative organs of Scilla Autumnalis, the following observations were made:

The **root** has a primary structure and a 432 μm thickness. The rhizodermis is unistratified and the outer layer is composed of spaced polygonal cells.

The endodermis is also unistratified, it presents tangetially elongated cells and has evenly and subtly thickend walls.

The pericycle is unistratified and made up of smalls cells in comparison with those of the endodermis.

Xylem conducting bundles reach the core of the root, the central area being occupied by a large metaxylem vessel.

Phloem conducting bundles have an 18 μm average thickness.

Phloem vessels have a smaller diameter (between 2.25-6.75 μm) compared to that of xylem vessels(between4.5-18 μm)..

The number of phloem conducting bundles is 5 and it coincides with that of xylem conducting bundles.

The **aerial stem** has a primary structure, it is ribbed and presents an 855 μm thickness.

The epidermis is formed of a single layer, has an 18 μm thickness and presents an 0.9 μm thick cuticle.

The outer layer is composed of large , spaced ovoidal cells. The thickness of the outer layer is of 45 μm. The endodermis and pericycle are not evident.

The central cylinder presents several layers of small cells on the exterior, with highly sclerenchymatised walls, under which fundamental parenchyma can be found.

The sclerenchyma layer measures an average thickness of 90 μm.

The conducting bundles are of a closed collateral type, disposed in the medullar locule and attached to the fundamental parenchyma through the liber. The latter has a 45 μm thickness. The wood is disposed in a V-shape.

The diameter of the woody vessels varies between 6.75 μm – 15.75 μm.

The **leaf** is equifacial and presents a 504 μm thickness.

The superior epidermis is unistratified, with almost isodiametrical cells, and cuticled walls. The average thickness of the epidermis is 22.5 μm and that of the cuticle – 3.375 μm.

The epidermic cells have slightly thickened, straight lateral walls and are orderly disposed in longitudinal rows. The lenght of the epidermic cells varies between 90-175.5 μm and their width between 13.5-22.5 μm.

The types of stomata and the stomatic apparatus are amaryllidaceous, respectively aperigenous. Similar to the epidermic cells, the stomata are orderly disposed in longitudinal rows. The lenght of the stomatic cells varies between 22.5-29.25 μm and their width between 0.6123 μm-0.7536 μm.

Beneath the superior epidermis lie 3 layers of elongated cells, with numerous chloroplastes in the interior, orderly disposed in radial rows, presenting spaces between the rows pertaining to the palisade parenchyma.

The locular parenchyma is well-developed, composed of large, spaced ovoidal or spheroidal cells.

The palisade parenchyma, situated above the lower epidermis, contains 4 layers of cells which present chloroplastes in the interior and are orderly disposed in spaced radial rows.

The conducting bundles in the leaf have are of a closed collateral type.

The diameter of phloem conducting vessels is slightly smaller than that of woody(xylem) vessels. The phloem vessels hold values ranging from 2.25 – 6.75 μm and xylem vessels from 6.75-9 μm.

The lower epidermis is unistratified, 22.5 μm thick, with almost isodiametrical cells, cuticled walls and a 2.7 μm thick external cuticle.

The cells have slightly thickened, straight lateral walls and are orderly disposed in longitudinal rows. The lenght of the epidermic cells is greatly higher (112.5-315 μm) than their width b (13.5-18 μm).

CONCLUSIONS

The following conclusions can be drawn from the analysis of the vegetative organs of the Scilla Autumnalis species:

The root has a primary structure and presents a large metaxylem vessel at the centre of it.

The subterranean root is represented by a bulb , whereas the aerial one is green with violaceous shades. The aerial root has is ribbed and has a primary structure.

The leaves present an equifacial structure, conducting bundles at this level being of a closed collateral type. The types of stomata and the stomatic apparatus are amaryllidaceous, respectively aperigenous.

BIBLIOGRAPHY

1. Andrei M. & al. *Lucrări practice de biologie vegetală*. Edit. Did. Ped. Bucureşti. 1981.
2. Beldie Al. *Flora României - determinator ilustrat al plantelor vasculare.* Bucureşti: Edit. Academiei Române. (1: 1-412 + fig. 1-845, 1977; 2: 1-406 + fig. 846-1439, 1979). 1977, 1979.
3. Brummitt R.K. & Powell C.E. *Authors of plant names*. Royal Botanic Gardens, Kew. (EDS.) 732 pp. 1992.
4. Ciocârlan V. *Flora ilustrată a României*. *Pteridophyta et Spermatophyta.* Edit. Ceres, Bucureşti. 1038 pp. 2000.

5. Ghişa E. *Veronica*. In Tr. Săvulescu & al. (ed.). *Flora României.* **VII**: 505-565 Edit. Academiei Române.. Bucureşti. 1960.
6. Metcalfe C.R. & Chalk L. Anatomy of the Dicotyledons. Vol. I-II. Ed. Clarendon Press, Oxford. 1950.
7. Tutin T. G., Heywood V. H., Burges N. A., Moore D. M., Valentine D. H., Walters S. M., Webb D. A. & al. *Flora Europaea*. **III**. Cambridge University Press. Cambridge: 242-251. 1972.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

THE TECHNOLOGY OF MAKING OF NATURAL PINK SEMI-SWEET AND EFFERVESCENT WINES

Vacarciuc Liviu

KEY WORDS: pink wines, grapes, processing, juice, pressure, extraction, antocyanes, colour

SUMMARY

The method of making of natural pink semi-sweet and effervescent (perlant) wines. The main principles are provided of making high-quality pink semi-sweet wines using red and white grapes accoding to the first scheme with stopped fermentation due to multiple filtration of fermentation media at the MMS Handtmann installation. The cost price of production may be lowered 2-4 times due to 10-fold filter system regeneration. On the basis of selective termo-vinification of whole bunches of grapes of red varieties delicate pink wine raw materials and then unique slightly sparkling frizanti wines may be produced that are of great demand on the foreign market. At the final stage of frizanti production the steril product filtration may be reached using MMS Handtmann installation that surely guarantees its storage during not less than 6 months.

INTRODUCTION

Wines with residual sugar are often solicited in the markets of different countries. For instance, semisweet Georgian, French and Romanian wines, prepared by cessation of fermentation were known in the middle of XIX century. Later in Moldova white and red wines were elaborated: Primavara, Noroc, Izvoras, Victoria, Leana, which are searched today by the consumers of wine markets from the East [1].

The tendency of production of natural semisweet wines are kept constant, as a proof, near those old one, there were added new marks of pink semisweet wines as: Flamingo, Nostalgie, Roze Onesti, Muscat VDC, Traminer VDO Acorex, Lacrima roze semisweet etc. Today it is necessary to elaborate more new types with reduced consumption and loss like: pink semi-sweet effervescent wines directly from the must (juice) – by scheme nr.1.

In this context, we can conclude that the widely spread technology on preparing semisweet wines with the application of scheme nr.2 of blending with sweetening components, being easy and with reduced energetic consumption, is disadvantaged by low quality of product.

Another problem about wines with residual sugar- large quantities of SO_2 used on their biological stabilization, including, wine bottling in hot causes a great reduction of quality, so, the attention was focused on this technological aspects. The current publication pursues the order to enhance some deficiencies about the technology of production of pink effervescent wines (frizanti).

STUFF AND METHOD

In the micro-winemaking conditions, were used variants of the main experiences were made, as much in primary winemaking as in secondary- filtration and sterile bottling. From vineyard plantations of central part certificated species were tried: Aligote, Muscat basarabean and Pinot noir (2:1:1) with full maturation (sugar: 190-210 g/dm^3), in view of their behavior for pink effervescent wines. In the Stauceni factories - CNVV (1998 y.), INVV (2001 y.) the bioecological factor was evoluate – grapes, the technological factor: from the same match of raw, crushed and material separate of clusters, variants of extraction of marc through dynamic maceration of different temperatures were modeled.[2;3].

1. the juice and mark of white varieties was trained in enzymatic maceration(6-12h) at 120° C with light plasmolise of the cells and the release of aromatic compounds- tied terpenoids, protecting them from supraoxidation, despite of minimal doze of sulphur dioxide(20 mg/l), as a result of substitution of air by CO_2, and as an added inhibitor a reducer was administrated- the dihidroxifummaric acid(DFH4) or a sodium salt (DFH3Na) in dozes 60-80 mg/dm^3, which reduces Eh and preserve flavonoids, which are responsible the intensity of colour [4]. After pressing, the must of these 3 species, being processed on modern lines, used to ferment in fractions through association (blended), a regulated process with the view of stopping the alcoholic fermentation.
2. the grapes of red species were processed byselective thermo-winemaking on the level of the skin that follows the same purpose- deactivation of oxidative enzymes, as the extraction of color through reduced energetic loss. Studies made on red grapes treated with dry vapors in fine regime: 60 C on the skin surface for 6 min, if the temperature of the middle will not reach 30 C, it would ensure the momentary dissolution of pigmented agglomerates [5]. The hydraulic installation buncher-pres VPG-30(50) from Republic of Moldova, endowed with this treatment cause the cells thermoplasmolize which increases the yield of must from 1 t of raw material, that is a very good fact on the first stage of preparation of semisweet pink aerated wines.

RESULTS AND DISCUSSIONS

Fresh white and red must, obtained after pressing (60-65 dal/t) is chilled and clarified with bentonite or kaolin (trepel) during 6-12 hours with the purpose of absorption of nitrogenous compounds and to reduce activity of o- dipheniloxydaze and pyroxidaze, which are responsible for the browning of must, and for the reduction of administrated doze of SO_2.

The behavior of minerals from deposits of RM: Larguta, Iaroovo-A, Prodanesti-A, Naslavcea-A, studied by M. Kerdivarenco, 1975 and L. Carelin, 1980, demonstrate that those minerals have the same activity as ascangel and traditional bentonyte, as a result, there were proposed the optimal regimes of practical use of them: dozes 1..2 g/dm^3, temperature 10° C and pH about 3,0..3,3.

For the variants of experiences (tab.1) for pink wine, conditions of producing were kept the same: in the must of aligote specie with the suspension content of 8% were trained kaolin “Larguta”, tried in relation to ascangel (Georgia) and bentonyte (Romania). Their efficiency was analyzed as indices: consumed time for the stratification of floculants**,**

clarifying speed, the volume of sediment and residual part of suspension in must after settling.

In comparison, the kaolin "Larguta" gives a fast stratification, but the obtained flakes are with a low flocculation activity and the sediment has anamorphous structure, and it complicates separation of must from shakable powder.

As about the trepel "Kamenca-2', this one has a better speed of flocculation, but a more reduced degree of absorption and aggregation of flakes, so they use to combine the active properties of autochthon materials, which will substitute the imported deficit materials. So, the experience continued in the tendency of choosing the optimal doses: bentonite "Larguta" - 0,6 g/l and treplel "Kamenca-2", both with a concentration 10%, in variable proportion – 1:0,4; 1:0,6: 1:0,8: 1;1; 1;1,2.

Table 1

Compared data of bentonyte and trepel mineral action in clarifying of grapes juice

Floculants	Dose g/dm^3	Stratifi-cation, minute	Clarifying speed, m/h	Volume of sediment, %	Residual suspension, %	Outside
Must (control)	-	27	0,3	40	4,2	cloudy, fast fermentation
Ascangel	0,6	13	0,89	21	1,5	opalescent
Bentonyte	0,6	15	0,76	24	0,5	cristaline clarity
Lărguța	0,6	14	0,68	30	1,0	clear sediment-powder

The pink must clarified in the presence of bentonyte(first control) and of kaolin+trepel(2..6 variants), which kinetic action is represented graphic (fig.1), developed the purity degree (optical density) in dependence of time and the superiority of last variants.

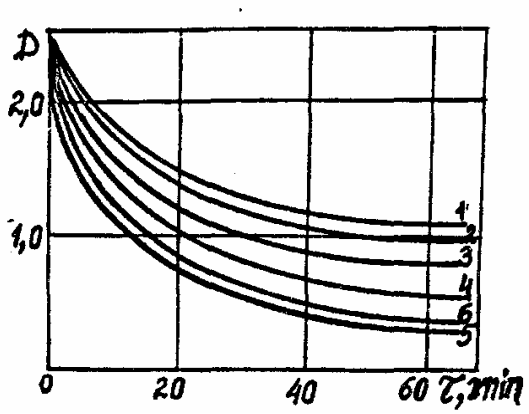


Fig.1. the kinetic of sedimentation of suspension
on must clarifying with bentonyte (B)
and trepel(T) in different proportions(B, g/dm3+ T, g/dm^3):
Ist-control (B – 0,6); 2. – 0,6+0,24; 3. – 0,6+0,36; 4.- 0,6+0,48; 5. – 0,6+0,6; 6. – 0,6+0,72.

The common actions of bentonyte with trepel in proportion 1:1 (4th &5th variant) hurry and enhance the clarifying of the must. The prephermentative phase is realized in the minimal regime of activity of o-polyphenoloxydaze, at 10° C temperature and SO_2/DFH4 dose=30/100mg/l.

On the prefermentative stage the must is already blended, by the necessity there could be administrated max 30 g/dm^3 of grape juice, having as a purpose obtaining of standard VERD pressure and mellitus: 9,5 – 11,55v of endogen alcohol and sugar 15-25 g/dm^3(semidry). In the cylinders of aerated product at 20° C it's provided minimal pressure of 50kPa, for which will be fermented 0,7 – 1,0% sugar in hermetic acrotofors with automatically relay.

On the alcoholic fermentation stage of must were used 2 options- with 1 or 2 coarse filtration during the biochemical process with the purpose of exhaustion of nitrogen content. After the first assimilation of mineral nitrogen from the fermentation beginning - 30-40%, after filtration the repeated incubations of yeasts begins with a better assimilation of nitrogenous substances 40-50%, in such a way that for the semidry wine with prolonged fermentation biological stabilization takes place.

For semisweet wine with the process stopped earlier, are needed 2 filtrations and a more nitrogenous exhaustion – 60-70%, using regenerative materials. So, during the must fermentation at 16° C (after 5-7% of fermented sugar), it is effectuated the coarse fermentation on the MMS installation (or Zeta plus with kiezelgur or pressed cardboard, pores 1-1,5 mk). The fermentation restoration and nitrogen exhaustion of the environment reduce the energy loss on the stopping of fermentation of exaggerated doses of SO_2 for biological conservation.

The settling was done through multifunctional filter elements MMS. From filter regenerative materials there could be applied: micro porous ceramics, micro porous titanium "Titan 5" and "Titan 7" with the pores diameter 100, 50, 20 μm and the organic polysaccharide MMS.

They are hard membranes which don't need filtrating support or an another adjuvant material, have a big filtrating surface, are resistant at temperature and pressure variations, because of their mechanic hardness. Such membranes could be used in technological schemes where a 150° C temperature exists, pressure until 5 MPa, variation of pH index from extragents or disinfectants. In order that they don't have sterilized properties, they are used for repeated filtration and in the self ceasing fermentation process.

Their regeneration is made with cold and hot water and for necessities- with weak solutions of soda ash or through backpressure (150 KPa) each 2-3 operational hours of the filter with CO_2, followed by water flux.

After the right choice of filtrating set, the sterilized service of MMS installation is made through exterior water spraying (for tightening). It is followed by the rinsing of technological line with water (0,5 bar), sterilization at 85-90° C at the same pressure during 30 minutes through recirculation and compression of sterilizing agent with CO_2(0,5…1 bar). Filtration itself will continue on the flux speed 150 l/m^2/h, with the pressure 1,5 bars more than the pressure of CO_2 from the drink.

Then the mellitus will become 40 g/dm^3 the vessel is tightened and after the reduction of mellitus to 30 g/dm^3, wine is frozen to -5° C, with the later clarifying in 48 hours and sterile filtration in a isothermal-isobaric regime. After 24h of rest and physical-chemical balancing, the natural semisweet effervescent wine is bottled in isobar regime with common seal**.**

Preparations of the sterile bottling line include application of UV lamps in the area of bottles rinsing, this operation is repeated after long periods and at the end of the work

exchange, the communications, mechanisms of equipment, water used for bottles rising, which contacted with wine and cork, are sterilized and cleaned.

Also, there are respected rules of own hygiene of working stuff. As about preparation of bottles and corks, this one contains their cleaning in order to obtain and quality. It's obvious that new bottles will be rising with sterilized water, followed by insistent leakage. It will be paid attention to the adjustment of water hardness for calcium or magnesium chloride/ sulphite which will settle down as salts, contaminated by auxiliary materials. So, it is recommendable one more rising with recovered wine in a closed cycle through a separated filter.

The same thing will be done with corks, which are processed in the grinding mechanism for 30 minutes, cleaned in cold water and in sterile solution (20 min), are kept 1-2 h in solution of 3% SO_2, and are very good dried and farther they are processed with paraffin (20 min in the whirlwind mechanism), which ease their glissade in bottles.

Water, air, temperature, rising number and microbiological load of rising water, degree of subject contamination up to and after preparation are controlled. The corks are special sterilized and packed aseptically and tight in polyethylene bags by their producers. Such corks are ready to be used in dry state, immediately after their unpacking, being used the entire bag.

For sterile bottling "in cold" will be used:

- Jumbo Sartoclean SC 30 prefilter:
- Sartopure GF2 filter in pores
- Vinosart filter with membranes 0,65/0,45 μm for white wine: 0,8/0,65 μ red wine.

For microbiological control of sterile bottling process "in cold", the membrane method is applied and is determined by:`

- The microbiological state of wines;
- The microbiological control of the bottling line, containers, communications;
- The sterile level for bottles, corks, air, carbon dioxide;
- The health state of bottling section.

Air testing in the buildings of rising/dozing area made after desinfection of bottling section shows an insignificant infection, which could be removed with the local installation of some UV lamps, that are conected foe 30...60 minutes before the work exchange or a longer interruptions in lack of stuff; testing of CO2, which is used for contrpressure in the dish dispenser of wine and in the microfiltration installation must be filtred through a filter with membrane.

The microbiological control of the wines for microfiltration, shows different levels of infection and in dependence of this different methods of intervention are needed for their conditioning.

For example: some wines(23, 26 samples) have the microbiological load in the limits of 0....3000 for 1L of wine and it is enough for them for the prefiltration through filter boards SA 795 before the microfiltration, other (28, 35 samples) need an additional inervention for avoiding the rapid clogging of membranes and inffection of the whole line; wine control after bottling, before and after putting of stoppers (samples nr. 17, 24, 25, 26, 27) shows a relative sterility- zero colonies growth in 750 ml of bottled product.

CONCLUSIONS

1. Heat treatment of grape skin accelerates the dissolution of anthocyanins, free disposal of juice with a high output of must from 1t of raw material and simlify the technological scheme of pink wine, reduces the alcohol loss and improves the microbiological state.

2. The clarification of must with mineral sorbents reduces its degree of contamination and diminishes the nitrogen content with 15-20 %, which will ease the cessation of fermentation of semidry natural wine.

3. The repeated filtration of must in fermentation on the automatic installations MMS "Handtman" ensures the continue nitrogen exhaustion at the cessation of fermentation in VERD with low content of preservatives.

4. The VERD production of effervescent type allows to increase the quality of alcoholic beverages and to expand the range with original products requested by the market

BIBLIOGRAPY

1. VACARCIUC, L. *Tehnologhia pererabotki vinograda.* -M.: Piscepromizdat, 1990.– 325
2. VACARCIUC, L. *Potențialul biotehnologic la producerea vinurilor roze ecologice în Moldova* // Viticultura şi vinificația în Mpldova, 2008, nr.5.-p.24.
3. VACARCIUC, L., JIBCIUC, O. *Ameliorarea calității culorii vinurilor roze fabricate în Moldova* // Comunicări Simpoz Intern. Chişinău: UASM, 2008. -p.24.
4. VACARCIUC, L. *Reducerea dozei dioxidului de sulf în vinul roze ecologic* // Comun. Simpoz. Intern. Iaşi: UŞAMV, 2008. -p.24.
5. VACARCIUC, L. Vinurile roze: aspectul tehnologic al macerației prefermentative // Lucr. Şt. Simp. Intern.:"Agr. Modernă – realizări şi perspective", vol. 16. – Chişinău: UASM, 21.10. 2008. -p.260.
6. VACARCIUC, L. *Potențialul biotehnologic la producerea vinurilor roze ecologice în Moldova* // Comun. Simpoz. Intern. Cluj-Napoca: UŞAMV, 2008. -p.24.
7. VACARCIUC, L., MADAN, I.*Filtrarea băuturilor – ghid practic.* – Chişinău: Tip. Centrală, 2001.-270 p.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

PROFICIENCY TESTING: EXPERIENCES FROM LAFCH – UNIVERSITY OF CRAIOVA ON THE ISSUE OF SOME ADDITIFS DETERMINATION IN SOFT AND ENERGY DRINKS

Violeta Nour, Trandafir I., Mira Elena Ionică[1]

KEY WORDS: proficiency testing, soft and energy drinks, aspartame, saccharin, acetsulfame-K, caffeine, benzoic acid

ABSTRACT

Quality assurance on the analytical results is an obligation of all analytical laboratories which tend to be credible. In order to obtain accuracy and precision of results each laboratory implements suitable programmes according to EN ISO/IEC 17025:2006.

Since 2009, LAFCH-University of Craiova, with the activity domain food safety and quality, is accredited according to the above mentioned norm. Validation of analytical methods and verification of validation parameters are part of good laboratory practice. Quality of analytical results is assured by use of reference methods and certified calibration standards and by participation in international proficiency trials.

LAFCH-University of Craiova has its own protocol of quality control which is based on analytical procedures and methods which are traceable, accurate, reliable and applicable for certain purpose. At the same time, our laboratory participated in some proficiency testing schemes and further will present the results obtained of two different PTs organised in 2007 on some addtifs in soft and energy drinks.

INTRODUCTION

University of Craiova developed in the period 2006-2009 the national project no. 203/2006, entitled "Infrastructure′s development of the analysis laboratory for the food products safety and quality at the level of the UE directives requirements in the field of the conformity evaluation", within the frame of the national Program CEEX, module IV of the Roumanian Ministry of Education and Research.

The project proposed the adoption of physical-chemical analysis methods imposed by the harmonized European Regulations concerning the safety and the quality of the food products and the accuracy needed for the analysis methods used for the evaluation of the food products quality through the control of some contaminants and additives.

Also, the project proposed the accreditation of the laboratory LAFCH – University of Craiova for these physical-chemical analysis, in concordance with the requirements of the SR EN ISO/CEI 17025/2005 "General requirements of testing and calibration laboratories", which has as objective the ensurance of the food products conformity evaluation.

[1] University of Craiova

Participation in Proficiency Testing (PT) exercises and Inter-Laboratory Comparisons (ILC) is an essential part of the measures taken by any competent organisation that conducts calibration or testing. Best practice demands that such organisations maintain quality systems that are accredited, by statutorily-recognised third party accreditation organisations, to comply with the requirements of ISO 17025 [1]. This international standard, in its Section 5.9, requires accredited organisation to "assure the quality of test and calibration results" and most accrediting organisations normally regard PTs and ILCs as being one of the most important means of achieving this. Ideally, these exercises will have target values which are directly traceable to relevant international (SI) standards. These standards are normally reproducible to a very high degree of precision.

Regular participation in a proficiency-testing scheme provides independent verification of the analytical competence of a laboratory and shows a commitment to the maintenance and improvement of performance. It demonstrates to the public, customers, accreditation bodies, regulators and management that analytical procedures are under control and gives analysts confidence that the service which they provide will withstand scrutiny. The cost of participation in a proficiency testing scheme gives good value for money compared with the consequences of producing inaccurate results which might put workers' health at risk, damage company's reputation or contravene national regulations.

Proficiency testing (PT) is a kind of inter-laboratory comparison used for the determination of the competence of individual laboratories for specific tests and to assist in resolving of inter-laboratory differences. Inter-laboratory comparison is the organization, performance and evaluation of tests of the same items or identical portions of an effectively homogeneous material in two or more different laboratories in accordance with predetermined conditions [2, 3, 4]. The procedure for PT is as follows: each participant in a PT receives a sample prepared by the organizer and has to determine a list of analytes; the results are sent back to the organizer and the collected data are analyzed [5].

A test material distributed by a PT provider must be similar to the material that is routinely analyzed in testing laboratories with respect to the composition of the matrix, the concentration range and/or the quantity of the analyte. As a general principle, procedures used by testing laboratories participating in the comparison should simulate those used in their routine analytical work [2, 4].

When the number of testing laboratories participating in PT is a large enough (more than 20-30), the assigned value of the test material can be calculated from analytical results of the laboratories as a consensus value (as the mean of the median of the results) while the performance of the participating laboratories is assessed based on the differences between their results and the assigned value. A performance score is calculated for each laboratory using statistical schemes detailed in [2, 3, 4]. The competence of PT schemes providers is assessed according to the guidelines [6].

PT has dramatically pervaded throughout the world of chemical measurement over the last few decades. A lot of nationally and internationally recognized PT providers are active in different analytical fields.

At European level, the use of high sweetening edulcorants is regulated by the European Parliament and Council Directive 94/35/EC on sweeteners for use in foodstuffs, as well as by Directive 2003/115/EC of December 2003 amending Directive 4/35/EC.

According to Directive 95/2/EC [5], article 1, paragraph 3 (a), benzoic acid (E 210), sodium benzoate (E 211), potassium benzoate (E 212) or calcium benzoate (E 213) belong to the category of conditionally permitted preservatives and are regulated with a limit of 0.015% in soft drinks and up to 0.2% in other food products [5].

According to Directive 2000/13/EC, quinine and/or caffeine used as a flavouring in the production or preparation of a foodstuff must be mentioned by name in the list of ingredients immediately after the term "flavouring". In addition, according to Directive 2002/67/EC of 18 July 2002, drinks containing caffeine in excess of 150 mg/l must also provide a warning message on the label followed by an indication of the caffeine content such that: "High caffeine content (X mg/100ml)".

All these considerations have lead to increased interest in the development of reliable methods for the evaluation and the quantitation of these additifs in food products.

Operational parameters leading to the development of a new analysis method of acesulfame-K, saccharin, aspartame, caffeine and benzoic acid in no-added sugar cola soft drinks have been studied in this paper by using liquid chromatography and "diode array" detection. The validation of the analysis method was attempted in terms of sensitivity, linearity range, reproducibility, repeatability, analytical recovery and robustness. The method has been developed according to the specifications of the SR EN 12856/2001 standard [19], which, although developed for the determination of acesulfame-K, aspartame and saccharin, it also allows the determination of the benzoic acid and caffeine.

This paper describes two inter-comparison exercises in our laboratory for the determination of some additifs (aspartame, sodium saccharin, acetsulfame-K, caffeine, benzoic acid) in soft and energy drinks.

MATERIALS AND METHOD

The analytes in the test solution sample are separated by reversed-phase chromatography on a 250 mm × 4.6 mm i.d., 5 μm particle DS Hypersil C18 column, detected by absorbance at 227 nm wavelength for acesulfame-K, 265 nm for saccharin and 217 nm for aspartame, benzoic acid and caffeine, and are quantified by using a calibration graph.

Certified reference materials have been used, produced by Supelco such as acesulfame-K (99.9%, 47134), saccharin (99.0%, 47839), aspartame (99.0%, 47135) and benzoic acid (99.9%, 47508-U). All the other reagents, acetonitrile (Baker, 8257), potassium dihydrogen orthophosphate 98+% (Alfa Aesar, A 12142), phosphoric acid 85% (Merk, 1805), caffeine 99.0% (Alfa Aesar, A 10431) were of analytical purity or for chromatographic use.

The water used was ultrapure, Basic TWF. The stock solutions and the corresponding dilutions were made in ultra-pure water and were stored in dark places at low temperature (+4°C) between experiments.

HPLC was performed by using a Surveyor Thermo Electron system including vacuum degasser, Surveyor Plus LCPMPP pump, Surveyor Plus ASP auto sampler, "diode array" detector with 5 cm flow cell and Chrom Quest 4.2 software.

The mobile phase was filtered through a polyamide membrane (0.2 μm) and degassed with an ultrasonic bath DK 102p Bandelin. The test solutions were filtered through nylon syringe filter (0.45 μm) before injection.

The chromatographic separation was performed by using potassium dihydrogen orthophosphate buffer (pH 4.3) and acetonitrile (88:12, v/v) as mobile phase.

The column was equilibrated for one hour before samples injection. The volume injected was 5 μL and the flow rate of the mobile phase was 1mL/min.

After a complete series of analysis, the HPLC system was cleaned using an adequate washing method.

RESULTS AND DISCUSSION

Validation of the method. Determination of the performance parameters for the developed method

The method was validated in terms of sensitivity, linearity range, reproducibility, repeatability, analytical recovery and robustness.

To test linearity, standard solutions of 10 mg/L, 25 mg/L, 50 mg/L, 75 mg/L and 100 mg/L were prepared and analyzed with three replicates and the results processed with Chrom Quest 4.2 software. The calibration graphs are linear, with five calibration levels. The equations of the calibration graphs, the correlation coefficients and the selected wavelengths for the analytes detection are shown in table 1.

Table 1

Equations of calibration graphs and correlation coefficients (r^2) for the five analytes

Analyte	λ, nm	Equation of the calibration graph	r^2
Acesulfame- K	227	y = 1.38137e-005x – 1.04665	0.9999
Saccharin	265	y = 0.000104801x + 0.826302	0.9992
Caffeine	217	y = 1.23545e-005x – 0.791620	0.9999
Aspartame	217	y = 5.04373e-005x + 0.891074	0.9996
Benzoic acid	217	y = 1.47759e-005x + 1.49733	0.9997

The linearity range was 1–100 mg/L (y = peak area in mAU (milli absorbance units)×s; x = concentration in mg/L).

The relative standard deviations (RSD) for the retention time were between 0.013% (acesulfame K) and 0.291% (caffeine) therefore, in standard solutions, the HPLC method developed for the chromatographic separation of the five analytes provides stable retention times. The calculation of peak areas led to RSD between 0.041% (aspartame) and 0.966% (acesulfame K). Moreover, the calculated relative standard deviations also prove stability in terms of peak height and asymmetry.

The repeatability of the method was verified through the analysis of a cola light sample with addition, which was fully processed ten times, every time preparing the sample and chromatographically analyzing it, according to the developed method.

By using Chrom Quest software, relative standard deviations were calculated for retention times, heights and peak areas of each analyte for the ten replicates.

For peak areas, the RSD values varied between 0.030% (benzoic acid) and 1.249% (saccharin), fact which shows a good repeatability of the method developed.

The average recovery values were somewhere between 93.5% in case of aspartame and 104.9% in case of saccharin.

Organisation of proficiency tests and evaluation of the results

The main type of proficiency test for food safety testing is the interlaboratory comparison. This involves subdivided samples taken from a bulk sample, which are distributed to participating laboratories which test them concurrently. The calculation of the consensus values is taken from the returned results from the participating laboratories.

Sample preparation procedures are designed to ensure that the samples used are as homogenous and stable as possible, while still being similar to samples routinely tested by laboratories. A number of each type of sample are selected at random and tested, to ensure that they are sufficiently homogeneous for use in the proficiency program. Whenever possible this is done prior to samples being distributed to participants.

The participating laboratories analyze the samples as part of their normal routine, and report the results to the scheme organizers. After the statistical treatment done by the organizers the participating laboratories were provided with a report showing how closely their results agree with the accepted value.

In testing programs the evaluation of results is based on comparison to assigned values which are usually obtained from all participants' results (i.e. consensus values). Given that any differences between the samples have been minimised, variability in the results for a program usually has two main sources - variation between laboratories (which may include variation between methods) and variation within a laboratory.

To statistically evaluate the participants' results, proficiency tests use z-scores.

Participats' z scores were calculated as:

$$z = \frac{\left(x - \hat{X}\right)}{\sigma_p}$$

where:

x = the participant' s reported result,

$\hat{X}$ = the assigned value,

σ_p = the target standard deviation.

The z-scores can be interpreted as follows:

$|z| \leq 2$ result is satisfactory

$2 < |z| < 3$ result is questionable

$|z| \geq 3$ result is unsatisfactory

Proficiency testing provides objective evidence of a laboratory's capability. Under accreditation body's due diligence obligations they must ensure that where a laboratory has not performed satisfactorily, that appropriate action is taken to: corect the problem; review other works that could have been affected by the same problem and where necessary recall reports; take action to prevent recurrence of the problem.

Participation in proficiency testing

The first proficiency test we participated was organized by FAPAS, Central Science Laboratory, Sand Hutton, York, United Kingdom, FAPAS Proficiency Test 0368 – Cola Soft Drink. The test materials were dispatched in April 2007. Each participant received a cola soft drink test material to be analyzed for acesulfame-K, benzoic acid, caffeine and saccharin. In total, 93 sets of test material were distributed to 36 countries.

The average analytes concentration determined, the assigned values $\hat{X}$ and the z-scores obtained by our laboratory in the FAPAS proficiency test are presented in table 2.

Table 2

Results obtained by our laboratory at the FAPAS proficiency test

Matrice	Analyte	Assigned value (mg/l)	Result (mg/l)	z-score
Cola soft drink	Acesulfame K	49,6	46,7843	z = - 0,6
Cola soft drink	Saccharin	69,3	69,5499	z = 0,0
Cola soft drink	Benzoic acid	145	141,5897	z = - 0,3
Cola soft drink	Caffeine	120	122,9512	z = 0,3

The second proficiency test we participated was organized by Food and Consumer Product Safety Authority (Chek Working Group), Al Groningen, The Netherlands, CHEK Proficiency study 377 – Acesulfame K, aspartame and caffeine in energy drink which concerned the investigation of acesulfame K, aspartame and caffeine in two energy drink samples (coded A and B). Twenty-two laboratories were invited to join this proficiency study. The samples were distributed in 25 June 2007 and the deadline for the production of results was 27 July 2007.

The average analytes concentration determined, the assigned values $\hat{X}$ and the z-scores obtained by our laboratory in the CHEK proficiency test are presented in table 3.

Table 3

Results obtained by our laboratory at the CHEK proficiency test

Matrice	Analyte	Assigned value (mg/l)	Result (mg/l)	z-score
Energy drink - Sample A	Acesulfame K	530	515	z = - 0,45
Energy drink - Sample B	Acesulfame K	516	495	z = - 0,64
Energy drink - Sample A	Aspartame	638	650	z = 0,32
Energy drink - Sample B	Aspartame	621	620	z = - 0,03
Energy drink - Sample A	Caffeine	175	173	z = - 0,31
Energy drink - Sample B	Caffeine	170	165	z = - 0,55

CONCLUSIONS

Proficiency testing is being increasingly used as an important quality assurance tool for laboratories. It is an extremely powerful quality tool when used in conjunction with other tools such as certified reference materials, validated methods and a formal quality system. It is of utmost importance for clients and laboratories that the methods used give correct and reliable test results. From the client's point of view, laboratory accreditation provides evidence of technical competence and reliability, and means that results obtained by accredited laboratories may be used with confidence.

The z-scores obtained in two proficiency testing schemes proved the traceability and the accuracy of our analyses results and contributed to the accreditation of our laboratory.

REFERENCES

1. ISO/IEC 17025, General requirements for the competence of testing and calibration laboratories. International Organisation of Standards, Geneva, Switzerland
2. Thompson M., Wood R. International harmonized protocol for proficiency testing of (chemical) analytical laboratories. J AOAC, 76:926-940, 1993.
3. ISO Proficiency testing by interlaboratory comparison. Part 1: Development and operation of proficiency testing schemes. ISO/IEC Guide 43-1, ISO, Geneva, 1997.
4. Kuselman I., Pavlichenko M. Designs of experiment for proficiency testing with a limited number of participants. Accredit Qual Assur, 9:387-390, 2004.
5. Lafargue E., Biogeaud S., Rutledge D.N., Feinberg M.H. Proficiency testing schemes: solutions from homogenity control. Accredit Qual Assur, 9:333-339, 2004.
6. ILAC. Guidelines for the requirements for the competence of providers of proficiency testing schemes. ILAC G13:2000, International Laboratory Accreditation Co-operation (ILAC), 2000.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

DETERMINATION OF SORBIC ACID IN BAKERY PRODUCTS USING HPLC

Violeta Nour, Trandafir I., Mira Elena Ionică[1]

KEY WORDS: sorbic acid, bakery products, method validation

ABSTRACT

Sorbic acid is particularly utilized to protect dairy and bakery products, fruit juices, dried fruits, wines, pickles, seafood, mayonnaise and sauces against molds, yeasts and many species of bacteria. Sorbic acid presents low toxicity, however if abused can threaten consumer's health.

As the directives of the European Union regulate the applicability fields and the maximum quantities of sorbic acid in foods, it is required that methods should be elaborated and validated for determining its quantity.

An isocratic HPLC technique was developed for the determination of sorbic acid in industrial bakery products. The chromatographic separation was achieved with a C18 column and potassium dihydrogen orthophosphate buffer (pH 2.3)-methanol (65:35, v/v) as the mobile phase. The effluent was monitored at 254 nm. Effective separation and quantification was achieved in less than 15 min. The method was validated in terms of sensitivity, linearity range, reproducibility, repeatability and analitycal recovery. Mean recoveries of 96.85–99.56% and detection limit of 0.4 mg/kg were obtained. The presence of sorbic acid in bakery products available on the Roumanian market was also determined. Levels of sorbic acid determined in pound cake samples are high but they didn't exceed the legal permitted level of 2 g/kg in bakery products.

INTRODUCTION

Sorbic acid and its salts are popular preservatives for many foods because they are considered as generally safe food additives. Extensive testing and feeding to test animals have indicated that they are among the safest of all food preservatives with oral lethal doses (LD_{50}) of 7.4-10.5 g of sorbic acid/kg body weight in rats and 4.2-6.2 g of potassium sorbate/kg body weight. Thus, based on acute toxicity, sorbic acid is considered one of the least harmful preservatives in use. In addition to being considered less toxic, sorbic acid is also more effective than benzoate or propionate in preserving foods such as cheese, fish and bakery products. The usefulness of sorbates as preservatives relies on their ability to inhibit the growth of numerous yeasts, molds and bacteria [1].

Levels usually not exceeding 0,1% are used in beverages, fruit juices and jams, wines, baked goods, cheeses, margarine, dry sausages, salads and pickles; if applied, when permitted, in higher concentration, the influence on taste may be sensed [2].

The maximum permitted concentrations of sorbic acid (E200) and its salts in various foods are controlled by Directive 95/2/EC [4], so their determination is important to any analyst involved in the routine analysis of foods [3].

[1] University of Craiova

Analytic methods used and tested for qualitative and quantitative detection of sorbic acid and sorbates in foods include acidimetry, bromometry, colorimetry, enzymatic, spectrophotometry, polarography and chromatography. The most widely used methods, however, have been colorimetric and spectrophotometric, although chromatographic methods have gained acceptance in recent years [5-7]. Detection methods require quantitative extraction and separation of sorbic acid from the food material without food ingredient interference. Extraction methods include acid-steam distillation, selective gas diffusion and solvent extension using ethyl or petroleum ether, dichlormethane and isooctane. In some foods, filtration, dialysis or direct analysis has been used [8].

The purpose of this study was to develop an analytical method for routine laboratory work for the rapid and efficient analysis of sorbic acid in bakery products. HPLC with a photodiode array detector was used for the analysis. The developed method was validated in terms of sensitivity, linearity range, reproducibility, repeatability and recovery.

MATERIALS AND METHOD

Solid food samples were finely ground prior to the extraction. About 1.5 g sample is accurately weighed, suspended in water, homogenised and transfered into a 50 ml volumetric flask which is placed in an ultrasonic bath at 40°C for 20 minutes. The solution is then diluted to the mark with water. The content was filtered through a 0.45 μm syringe nylon membrane filter and the clear filtrate was injected into the HPLC column.

The sorbic acid in the sample test solution is separated by reversed phase chromatography on a 250 mm × 4.6 mm i.d., 5 μm particle DS HYPERSIL C18 column, detected by absorbance at the wavelength of 254 nm and quantified with an external calibration graph.

Sorbic acid with 99.0% purity has been used, produced by Alfa Aesar (A 16196). All the other reagents, acetonitrile (Baker, 8257), potassium dihydrogen orthophosphate 98+% (Alfa Aesar, A 12142) and phosphoric acid 85% (Merk, 1805) were of analytical purity or for chromatographic use.

HPLC was performed with a Surveyor Thermo Electron system comprising vacuum degasser, Surveyor Plus LCPMPP pump, Surveyor Plus ASP autosampler, diode array detector with 5 cm flow cell and Chrom Quest 4.2 software.

The determinations were made in isocratic conditions, at 40°C, using a mobile phase made of 65 % phosphate solution (dissolve 6.8 g potassium dihydrogen phosphate in 900 mL water. The pH value should be adjusted to pH = 2.3 with phosphoric acid and then filled to 1000 ml with water) filtered through a polyamide membrane (0.2 μm) and 35 % methanol. The volume injected was 5 μL and the flow rate of the mobile phase was 1mL/min.

RESULTS AND DISCUSSION

Primary stock sorbic acid standard was prepared by weighing 100 mg of sorbic acid into a 100 mL volumetric flask and diluting to volume with Type I water. Sorbic acid calibration standards were prepared by taking appropriate volumes (1 to 10 mL) of the sorbic primary stock solution and dilute to 100 mL with Type I water to give calibration standards with concentrations in the ranges 10-50 ppm. Five μL of each calibration standard is injected onto the HPLC and analyzed in triplicate. A calibration curve is prepared by plotting the concentrations of the standards versus their respective peak areas. The resulted calibration curve is linear, with five calibration levels, it has the equation y=3.66776e-006x and the correlation coefficient is $r^2 = 0.9994$.

To test peak area and retention time reproducibility, Chrom Quest software allows the

calculation of the relative standard deviation (RSD) for the retention time of sorbic acid, for all levels of the calibration curve and the calculation of RSD for peak area at each calibration level. The relative standard deviation for the retention time was of 0.066%, therefore, on standard solutions, the HPLC method developed provides stable retention times. The calculation of peak areas led to RSD between 0.129 % (conc. 50 mg/L) and 0.367 % (conc. 10 mg/L). Moreover, the RSDs also prove stability in terms of peak height and asymmetry.

In order to establish the method traceability on real samples, a sample of pound cake commercially available was taken for analysis, sample containing sorbic acid. Applying the developed method we find 1308.8 mg of sorbic acid/kg of pound cake. Four increasing addition levels of sorbic acid were added to this sample. Thus, 0.25, 0.5, 0.75 and 1 mL of stock solution (1g/L) were added in the 50 mL volumetric flask and the solution was then diluted up to the mark with water. This might correspond to an addition of 5, 10, 15 and 20 mg/L respectively in the sample test solution. The final concentrations of sorbic acid in the addition test solutions were calculated.

The four addition samples and the witness were chromatographically analyzed with three injections and samples were treated similar to a five point-calibration graph, with the calculated concentrations on the abscissa axis, as pointed above, and with the peak areas corresponding to sorbic acid in the addition samples on the ordinate axis. The calibration curve resulted was linear and have five calibration levels. The equation of this curve is y = 4.15777e-006x – 4.01005 and the correlation coefficient $r^2 = 0.9926$.

Chromatogram of a sample is shown in figure 1.

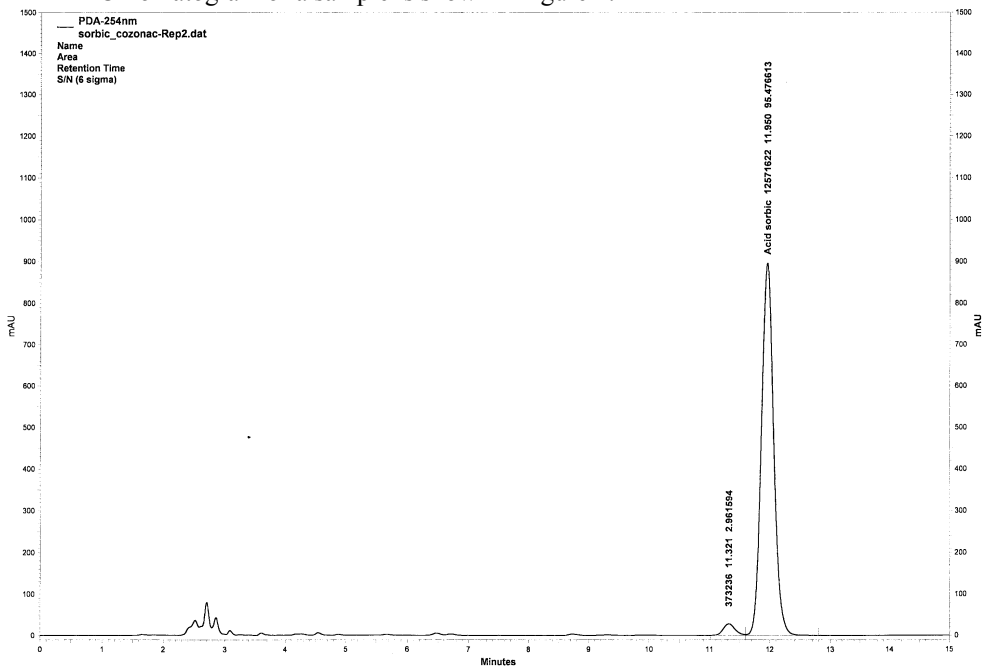


Fig.1. HPLC of a test solution obtained from the witness sample of pound cake.

Similar to the determination of the method traceability for standard solutions, we tested the reproducibility of the peak areas and retention times for the traceability on real samples, as well. The relative standard deviations for the retention time was of 0.252% for sorbic acid, therefore, on real samples, the HPLC method developed for the separation of

sorbic acid provides stable retention times. The calculation of peak areas led to very good RSD values below 2%, i.e. between 0.129% and 0.356%.

In order to verify the reproducibility, the standard solution of 50 mg/L was analyzed by 10 repeated injections. For the peak areas, the relative standard deviation was 0.105% which shows very good reproducibility of the method developed.

The method repeatability shows the variability noticed inside a laboratory in a short period of time, using a single operator, equipment etc. The repeatability of the method was verified through the analysis of a pond cake sample, which was fully processed eight times, every time preparing the sample and chromatographically analyzing it, according to the developed method. RSD for peaks areas was 0.288% which show very good repeatability of the method developed.

A spiked recovery study was performed using an experiment similar with the one which was developed for the traceability on real samples. There were achieved average recovery values of 99.56 % for an addition level of 5 mg/L in the test solution, 97.05 % for an addition level of 10 mg/L and 96.85% for an addition level of 20 mg/L in the test solution. Detection limits were estimated starting from the principle that a peak, to be detected, must have a signal-to-noise ratio > 3. The detection limit was 0.02 mg/L in the test solution, which corresponds to a concentration 0.4 mg sorbic acid/kg in the analyzed sample. Levels of sorbic acid determined in pound cake samples are high but they didn't exceed the legal permitted level of 2 g/kg in bakery products.

CONCLUSIONS

An HPLC method with diode array detection was developed and validated for the quantitative analysis of sorbic acid in bakery products. The method provides stable retention times and a detection limit of 0,4 mg/kg. For analysis, the sample is extracted with water. The sorbic acid in the sample test solution is separated by reversed phase chromatography on a 250 mm × 4,6 mm i.d., 5 μm particle DS HYPERSIL C18 column, detected by absorbance at λ=254 nm and quantified with a calibration graph.

REFERENCES

1. Naidu A. S. (editor). *Natural food antimicrobial systems*, 2000, p. 652.
2. De Tibor Deák. *Handbook of food spoilage yeasts*, 2nd edition. CRC Press, Taylor & Francis Group, 2007, p. 96.
3. Leo M. L. Nollet (editor). *Food analysis by HPLC*, 2nd edition, 2000, p. 580.
4. European Parliament and Council Directive No. 95/2/EC of 20 February 1995 on food additives other than colours and sweeteners.
5. Ferreira J.M.P.L.V.O., Mendes E., Brito P., Ferreira M.A.. *Simultaneous determination of benzoic and sorbic acid in quince jam by HPLC*. Food Research International, 2000, 33, p. 113-117
6. Techakriengkrai I., Surakarnkul R. *Analysis of benzoic acid and sorbic acid in Thai rice wines and distillates by solid-phase sorbent extraction and high-performance liquid chromatography.* Journal of Food Comp. and Analysis, 2007, 20, p. 220-225.
7. Saad B., Bari M.F., Saleh M.I., Talib M. *Simultaneous determination of preservatives (benzoic acid, sorbic acid, methylparaben and propylparaben) in foodstuffs using high-performance liquid chromatography.* Journal of Chromatography A, 2005, 1073, p. 393-397.
8. Davidson P. M., Sofos J. N., Branen A. L. (editors). *Antimicrobials in foods*. Third edition, 2005, p. 73.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

THE TECHNOLOGICAL POSIBILITIES FOR OBTAINING WINES WITH LOW CONTENT IN ANTOCYANS TYPE CLAIRET

Camelia Muntean, M. Gheorghiță, Felicia Stoica,
C. Băducă, Anişoara Penga[1]

KEY WORDS: chromatic characteristics, anthocyans, polyphenols, maceration

ABSTRACT

The revigoration and profitability of viticulture and wine industry suppose - another thing - a milder range of finit products with a high degree of quality and naturalness, accessible to an ever larger number of consumers. One of these posibilities is the production of "Clairet" wines using the same grapes as in obtaining red wines. The difference consist in the of some technological specific elements.

INTRODUCTION

The wines called "Clairet " or 'cafe' differ from typical rose and *red* wines especially from the point of view of the content of antocyans leucoantocians and the chromatic characteristics (Andre P., Aubert S., Pelisse C, 1970; Andre P., 1976; Ribereau-Gayon J., Peynaud E., Ribereau-Gayon P., Saudraud P., 1976).

The content of 100 mg/l anthocyans was established as superior for rose wines obtained through a short-term maceration process. When the antociani values of a product are higher than the one just mentioned, the product is a "Clairet" or a "cafe", and is a well-reputed wine, with a controlled name, that has been produced since the Middle Ages in the French vineyard of Bordeaux. Actually, this is a red wine of a paler coloring, containing small amounts of tannic polyphenols and having a suite, individualized fruity taste; these characteristics recommend it to be drunk young and cold (just like white vintage wines).

The principles of a good vinification of a "Clairet" have also been established : red vintage varieties will be used, whore technological characteristics are to be found in the finite product : when harvested, the grapes should have good amounts of glucides, but an average acidity; the maceration process should not take more than 36 hours; moderate sulphitation will be used (in order not to binder the malolactic fermentation but to prevent oxidation); the alcoholic fermentation is to take place when dry, as the "Clairet" - type wine should not contain fermentable glucides (Sudraud P., 1958).

The first elements regarding the means of obtaining this type of wine in our country came up while conductive a study on the vinification in rose of some varieties cultivated both on hills and in sandy areas (Muntean Camelia, 1997).

The researches on the production of “Clairet” wines have acquired new technological dimensions lately.

[1] University of Craiova

MATERIAL AND METHODS

Different stages of the project were carried out between 2005-2008, with Merlot and Burgund mare grapes from Sâmbureşti Olt, vineyard as raw materials.

While investigating the materials the study focused on: glucids and anthocians amounts and acidity at the point of technological maturation, purity of varieties and the phyto-sanitary state of the grapes when pressed. At the same time we considered the degree of implication of the main primary vinification technological factors (sulphitation, duration of contact between the pressing stages and the fermentation temperature)**.**

The main composition characteristics of grapes at the point of vinification had the following values: glucids 195-210 g/l, acidity 4, 05-4,86 g/l (in H_2SO_4), anthocyans 870-959 mg/kg grapes, complete polyphenols 2680-3206 mg/kg grapes.

RESULTS AND DISCUSSIONS

The data presented in table 1 show that sulphurous anhydride also has an important role in dissolving polyphenols in the solid parts of the grapes. If the raw materials, the temperature and the time of fermentation are constant, the 100 mg/1 SO_2 dose, also known as the "security" dose, ensures the chromatic parameters characteristic of the "Clairet" wines, in point of both anthocians content and chromatic characteristics (Ic and Tc) determined on the values of the optical density at 420 nm and 520 nm.

Table 1

The influence of sulphitation on the chromatic characteristics and on the tannin content (at the point of separation of must phases)

Sulphitation doses mg/l	Anthocians mg/l	Ic	Tc	Tanin g/l
0(Mt)	19	0,112	1,6	0,301
25	30	0,164	1,33	0,324
50	56	0,201	1,09	0,366
75	87	0,256	0,96	0,372
100	108	0,389	0,84	0,391
125	140	0,445	0,77	0,566

Ic = D.O. 420nm+D.O. 520nm
Tc = D.O. 420 nm/D.O. 520 nm

Experiment conditions:
Variety: Burgund mare
Time of maceration: 12 ore
Temperature of maceration: 20°C

The temperature of maceration (table 2) is one of the main primary vinification technological factors with significant influence on the process of extraction of organic and mineral constituents in the solid stage of the pressing.

When the SO_2 dose, the time of maceration and the raw materials are constant, we can notice that as a level of the maceration temperature increases, there is a continuous increase in the extractability, color intensity and tannin proportions.

By analyzing the above-mentioned composition parameters, we consider that maceration temperatures around 20 °C will bring forth the expected results in the production of" Clairet" - type wines. This is also confirmed by the sensorial examination mark.

If the raw materials, the sulphitation dose and the maceration temperature are constant, the time of maceration influences the results as shown in table 3.

Table 2

The influence of the temperature of maceration on the extraction of some constituents and of polyphenols from the solid part of the grapes

Temperature of maceration	Unreducing extract g/l	Ic	Tc	Tannins g/l	Tasting mark
10-11	17,3	0,157	0,88	0,886	8,5
15-16	17,7	0,188	0,86	0,911	8,9
20-21	18,4	0,198	0,83	0,935	8,8
24-25	18,7	0,288	0,78	1,204	7,3
28-29	18,8	0,378	0,75	1,436	6,9

Ic = D.O. 420nm+D.O. 520nm
Tc = D.O. 420 nm/D.O. 520 nm

Experiment conditions:
Variety: Burgund mare
Time of maceration: 12 ore SO_2 – 100 mg/l

Table 3

The influence of the duration of maceration on the main chemical and chromatics of wines

Duration of maceration	Alcohol vol%	Total acidity g/l	Volatile acidity g/l	Unreducing extract g/l	Ic	Tc	Tasting mark
0	11,7	4,44	0,38	17,4	-	-	6,9
6	11,5	4,47	0,41	18,5	0,129	1,06	7,2
12	11,5	4,52	0,49	19,6	0,203	0,88	8,5
18	11,6	4,44	0,25	21,7	0,350	0,79	9,2
24	11,6	4,45	0,55	23,2	0,380	0,75	7,5
30	11,4	4,42	0,56	23,7	0,405	0,71	7,0

Experiment conditions: variety - Burgund mare; $S0_2$: 100 mg/l; Temperature of maceration: 20-21°C

In point of alcohol content the differences among variants are minor, of no particular enological meaning. In point of total acidity there are also minor differences, while in point of volatile acidity, there is an increase determined by the time of maceration. Extractibility and color intensity gradually increase in accordance with a longer contact between the two pressing stages.

A general analysis of the data shows that the times of maceration between 10 and 20 hours are suitable so the purpose.

The three primary vinification technological factors being met, the industrial procedure ROTO ensures the main composition characteristics of "Clairet" - type wines obtained out of Merlot and Burgund Mare shown in table 4.

The general analysis shows that the two varieties from the famous vineyard Sâmbureşti -Olt have a high degree of suitability for the production of "Clairet" type wines. These, when using the "security" dose (100 mg/l) of SO_2 a temperature of maceration of 20-22 °C and of time of maceration between 11 and 16 hours, the chromatic characteristics expressed by the anthocians content the color intensity and tone fully correspond to this type of wine, which is highly appreciated in France.

The typical chromatic characteristics of the investigated product are accompanied by content of alcohol acidity and extract, the values of which are indicated for vintage wines.

Table 4

Composition characteristics of the "Clairet" type wines obtained from Merlot and Burgund mare – Sâmbureşti – Olt

Characteristics	Merlot		Burgund mare	
	Variation limits	Average	Variation limits	Average
Alcohol vol %	11,6-12,3	11.9	11,3-11,8	11,5
Acidity g/l H_2S0_4	3,95-4,44	4,22	4,26-4,90	4,59
Reduced extract g/l	18,9-21,4	20,3	18,7-20,9	19,9
Anthocians mg/l	110-132	124	103-125	115
Tanning/1	0,780-0,890	0,810	0,745-0,820	0,766
Ic	0,352-0,468	0,419	0,346-0,428	0,383
Tc	0,75-0,82	0,79	0,74-0,86	0,80
Tasting mark	9,3-9,6	9,4	8,7-9,2	9,0

Ic =D.O. 420 nm +D.O. 520 nm Tc =D.O.420 nm/D.O.520 nm

Experiment conditions: SO2 = 1 0 0 mg/l;

Temperature of maceration: 20-22°C;

Time of maceration: 12-15 ore;

Number of repetitions: 4-5 yearly for each variety

CONCLUSSION

By their main technological characteristics, the Merlot and Burgund mare varieties of grapes cultivated on the hills of Oltenia are suitable to the production of "Clairet" type wines, which range among the rose and typical red ones, because of their polyphenol content.

By using the industrial procedure ROTO, the times of maceration will not be less than 11-12 and more then 15-16 hours, if a constant temperature of 20-21 °C is maintained these conditions will ensure the avoidance of tannin and anthocians proportions increase above the accepted limits.

BIBLIOGRAPHY

1. Andre P., Aubert S., Pelisse C, 1970 - Contribution aux études sur les vins roses méridionaux. /. La couleur - influence sur la dégustation. Ann. Techn. Agr. 19, pag. 323-340
2. Andre P., 1976 - La vinification des Vins Roses Comptes rendus des essais (1975). Ed. Syndicat des Cotes de Provence. Commission Technique
3. Muntean Camelia, 1997 - Studiul posibilităţilor tehnologice de obţinere a vinurilor roze în principalele areale viticole ale Olteniei. *Teză de doctorat.* Univ. din Craiova
4. Ribereau-Gayon J., Peynaud E., Ribereau-Gayon P., Saudraud P., 1976 - Traite d'Oenologie. Science et techniques du vin, tome 1, pag. 573-575 et tome 3, pag. 452-462. Ed. Dunod-Paris
5. Sudraud P., 1958 - Interprétation des courbes d'absorption des vins rouges. Ann. Techn. Agric, nr. 7, pag. 203-208.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

ANALYSIS OF THE THERMAL STABILITY FOR THE EXTRA-VIRGIN OLIVE OIL WITH OR WITHOUT ADDED EXTRACT OF SOLIDAGO VIRGA AUREA

Dumitru Condrat[1], Dorina Chambree[1], Florian Harja[1], Alfa X. Lupea[2]

KEY WORDS: thermal analysis, extra-virgin olive oil, derivative thermogravimetry, vegetal extract

ABSTRACT

The aim of this paperwork is to study the thermal stability of the extra-virgin olive oil with or without added extract of Solidago virga aurea.

The determination of the thermal stability was evaluated using thermogravimetry (TG) and derivative thermogravimetry (DTG) up to a temperature of 800°C with a heating speed of 5°C/min.

The thermo-gravimetric profiles of the extra-virgin olive oil had similar characteristics up to a certain concentration of the vegetal extract, showing a high thermal stability up to a temperature of approximately 335,7°C.

INTRODUCTION

Olive tree (Olea europaea) is a 10-20 m tall tree, a member of the oleaceae family, mainly cultivated in the Mediterranean regions, southern part of Russia, Crimea and other hot climate regions. The tree thrives on limy soils and warm environments, having no resistance to cold [1].

The fruit, olive, is a fleshy drupe, having an olive-green to black color, depending on the variety.

Olives are fruits that have a high fatty content (20-30%), proteins and sugars. The chemical composition of olives is presented in table 1.

Table 1.

Chemical composition of olives [1].

Substance type	Pulp	Core	Peel
Water	22-28%	6-7%	4-5%
Fats	40-60%	15-16%	5-8%
Proteins	6-7%	13-15%	14-16%
Cellulose	9-10%	64-66%	70-72%
Ash	2-3%	2-3%	4-5%

The oil is obtained through processing, followed by extraction and contains high quantities of oleic acid, linoleic acid and triglycerides. The composition in fatty acids and triglycerides is given in table 2.

[1] Universitatea „Aurel Vlaicu”, Blvd. Revolutiei nr. 77, RO-310130, Arad, România.
[2] Universitatea „Politehnica” Timişoara, Str. Piaţa Victoriei, Nr. 2, Timişoara, România.

Table 2.

Composition in fatty acids and triglycerides of the extra-virgin olive oil. [1,2].

Compound	Fatty acid symbol	Content [%]
Palmitic acid	C 16:0	3,40
Stearic acid	C 18:0	0,30
Oleic acid	C 18:1	14,50
Linoleic acid	C 18:2	3,60
Linoleic acid	C 18:3	Traces
Glyceryl tristearate	C 18:0	0,5-5
Glyceryl trioleate	C 18:1	55-83
Glyceryl trilinoleate	C 18:2	3,5-21
Glyceryl trilinolenate	C 18:3	0,0-0,9

The high content in triglycerides, oleic acid and linoleic acid gives extra-virgin olive oil an average thermal stability when subjected to a thermal treatment.

For example, oleic acid that undergoes an oxidative degradation forms a mixture of 8-, 9-, 10- and 11- hydroxyperoxides while linoleic acid due to its 1,4-pentadiene structure forms a mixture of 9-,10-,11-,12-,13- hydroxyperoxides.

Hydroxyperoxides are degraded in different stages and lead to the formation of various decomposition products which also undergo oxidations and decompositions, thus contributing to the increase of free radicals.

The oxidation of oils takes place via a free radicals mechanism, initially characterized by the emission of a sweet and unpleasant scent, which progressively becomes more pungent until it reaches the characteristic smell of rancid, the hydroxides and peroxides decomposing into small molecules acids and aldehydes.

Solidago virga aurea (goldenrod) is a plant with a high content in antioxidants [3-5] capable to act during the stage of initiation, propagation and chain branching of the auto-oxidation reactions [6].

The specialized literature does not offer too many conclusive information regarding the thermal stability of the extra-virgin olive oil [7,8], therefore a more detailed study of the thermal stability of the olive oil with or without added extracts of Solidago virga aurea is necessary. In order to evaluate the thermal stability of the olive oil containing or not the chosen vegetal extract, thermogravimetry (TG) and derivative thermogravimetry (DTG) were chosen due to the fact that the literature shows that these methods offer reproducible results in the study of oxidative degradation of olive oils [9, 10].

MATERIALS AND METHODS

The vegetal material, Solidago virga-aurea – goldenrod was produced by SC Fares SA, Orăştie.

The vegetal extracts were produces as follows: dried vegetal material, previously grinded, was subjected to static extraction (maceration) with ethanol for 10 days at room temperature and kept in a dark room, with a molar ratio vegetal material:ethanol of 1:10 [11]. The obtained macerate was filtered and then quantitative determinations were carried out.

Materials and reagents: glyceryl tristearate (Sigma Aldrich), butylated hydroxytoluene (BHT) - 99% purity (Sigma Aldrich), 96% ethanol (Merck).

The extra-virgin olive oil was purchased from the manufacturers, being packaged in sealed glass containers.

The experimentation method is described below.

Non-isothermal TG/DTG curves were obtained using Netzsch STA 409 PC device in air (30ml/min) using alumina crucibles and a heating rate of 5°C/min.

In all the analyses that were performed 13.5-35.5 mg of sample was used and the temperature interval was between 36 and 800°C. The program used to interpret the results was Netzch Proteus – Thermal Analysis.

RESULTS AND DISCUSSIONS

The thermal behavior of the bought extra-virgin olive oil is presented in figure 1.

The profile of the TG/DTG curves show three stages of decomposition for the extra-virgin olive oil.

The beginning of the oxidative degradation is characterized by the action of the singlet oxygen (O_2^1) on the monounsaturated fatty acids with formation of peroxides. This behavior is generally identifiable by the increase in weight of the initial mass of the samples. In the case of extra-virgin olive oil this was of approximately 2.5%.

In regards to the stages of thermal decomposition, the first stage (180-370°C) corresponds, according to the DTG curves, with two superimposed processes of weight loss and was attributed to the decomposition of the saturated and unsaturated triglycerides. This stage, for the extra-virgin olive oil, began at T_{onset} = 233.7°C with the top peak of the DTG at 261.9°C, temperatures that correspond to the first process, while at T_{onset} = 317,3°C and the top peak of the DTG at 322,7°C corresponds to the second process. At approximately 370°C a fast combustion of the volatile compounds probably takes place, followed by an oxidation of the carbonic residues [12].

During the heating, the triglycerides which make 96-98% of the extra-virgin olive oil, decompose with the forming of dimmers, trimmers and polymers which are constantly removed from the system by the vapors generated during heating.

- The first stage is the most important for the evaluation of the thermal stability of the extra-virgin olive oil because is the stage during which begins the decomposition of the unsaturated fatty acids.

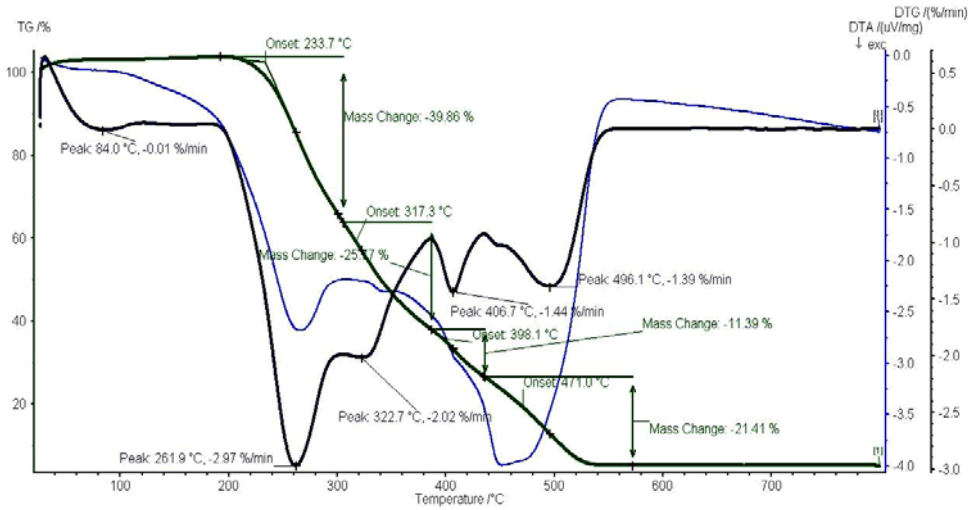


Figure 1. TG/DTG/DTA curves for the extra-virgin olive oil.

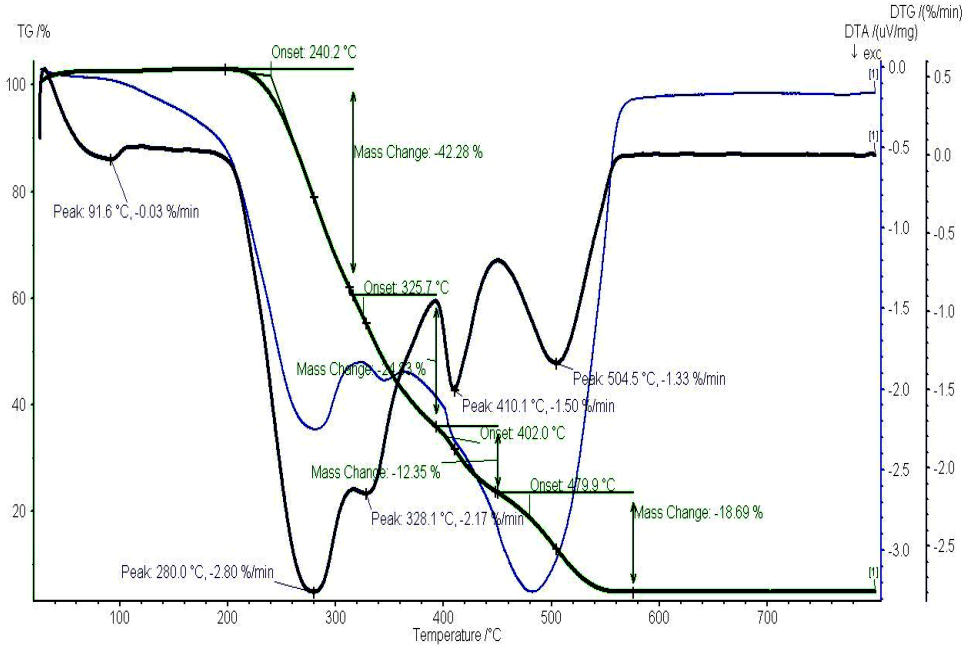


Figure 2. TG/DTG/DTA curves for the extra-virgin olive oil with added butylated hydroxytoluene (BHT) 1,18g/1 kg fat.

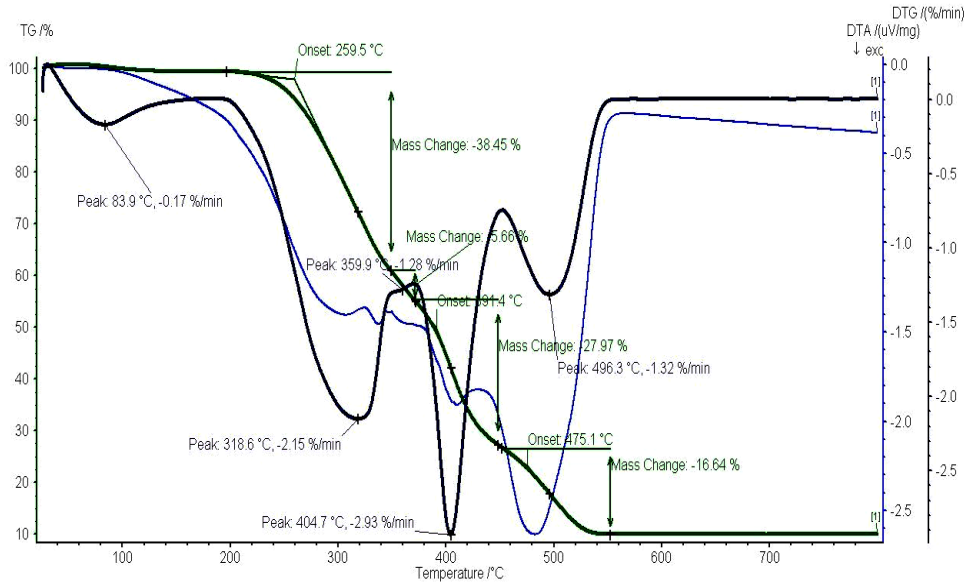


Figure 3. TG/DTG/DTA curves for the extra-virgin olive oil with added goldenrod extract 0,5 mL/0,5 kg fat.

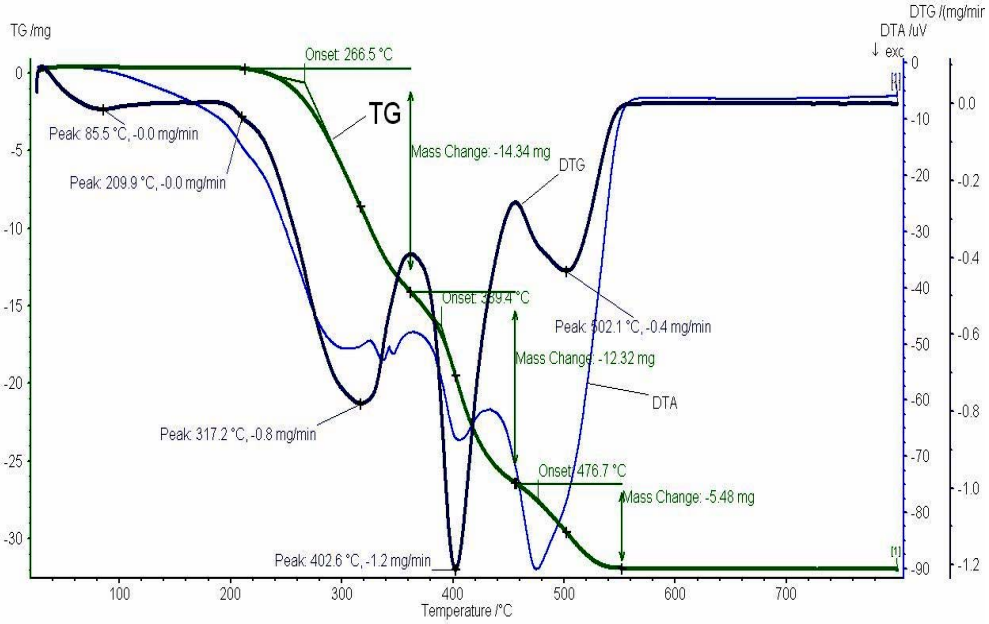


Figure 4. TG/DTG/DTA curves for the extra-virgin olive oil with added goldenrod extract 1mL/0,5 kg fat.

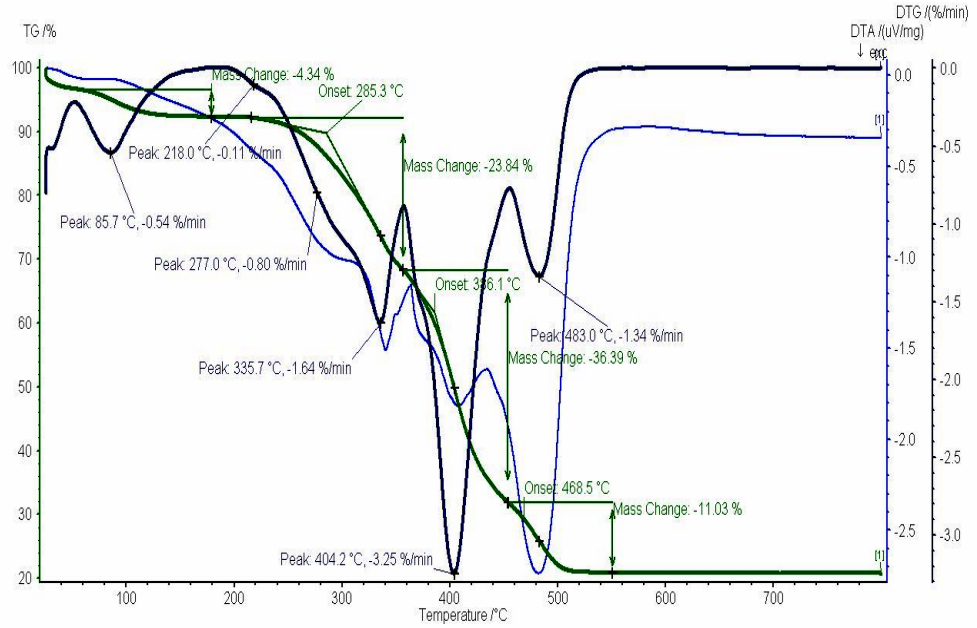


Figure 5. TG/DTG/DTA curves for the extra-virgin olive oil with added goldenrod extract 3mL/0,5 kg fat.

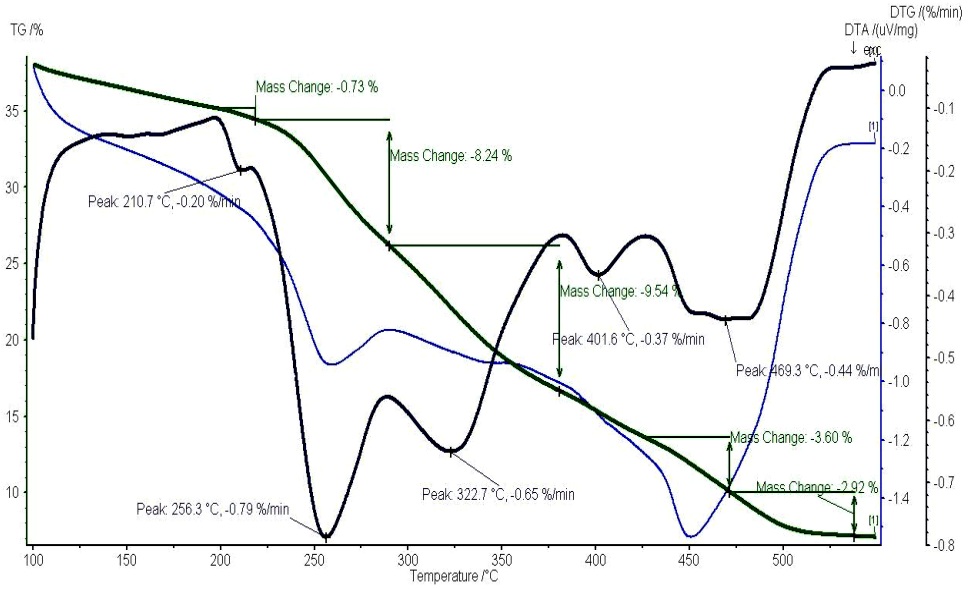


Figure 6. TG/DTG/DTA curves for the extra-virgin olive oil with added goldenrod extract 5mL/0,5 kg fat.

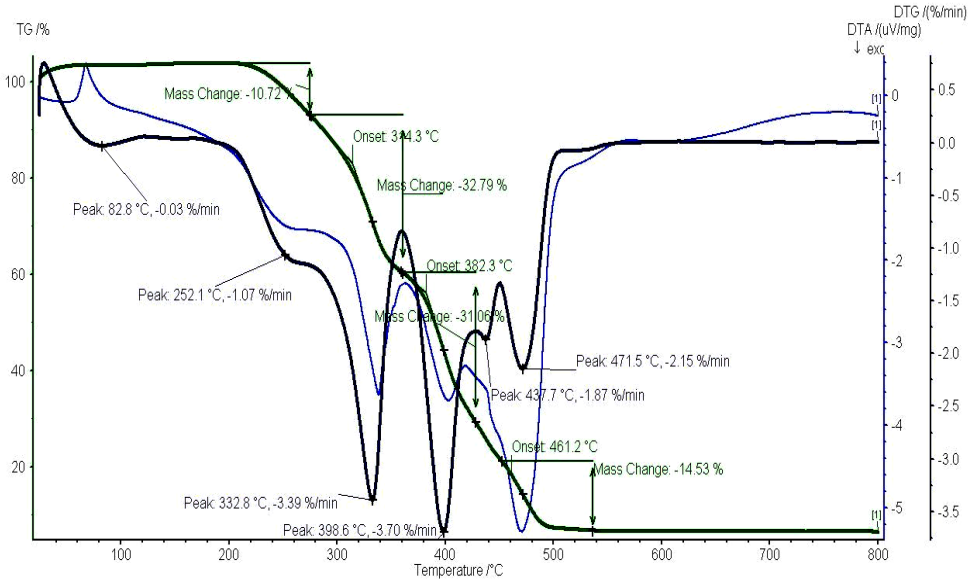


Figure 7. TG/DTG/DTA curves for glyceryl tristearate.

- The second stage of decomposition of the extra-virgin olive oil takes place at T_{onset}=398,1°C with a peak at 406,7°C. According to Sauza et. al. [10] this stage would correspond to the decomposition of the monounsaturated fatty acids such as oleic acid. During this reaction the double bonds are broken leading to the formation of hydroperoxides in the 8, 9, 10 and 11 positions and are constantly removed from the system by the vapors formed during heating.

- The third stage of thermal decomposition takes place at T_{onset} = 471,0°C with a peak at 491,6°C and corresponds to the decomposition of the saturated fatty acids such as palmitic acid.

Unfortunately the literature presents various hypothesis in regards to the second and third stages of thermal decomposition and in a certain level for the first stage of decomposition stage as well, stage which includes the oxidative degradation of the saturated and unsaturated triglycerides, phenomenon that takes place between 180 and 370°C.

For this we have analyzed the thermal analysis of the glyceryl tristearate (C 18:0). TG/DTG curves for the glyceryl tristearate (C 18:0) show in figure 7 show only one decomposition stage at T_{onset} = 314,3°C with a peak at 332,8°C for the temperature interval between 180 and 370°C, the second stage takes place at T_{onset} = 382,3°C with a peak at 398,6°C and the third decomposition stage taking place at T_{onset} = 461,2°C and a peak at 471,5°C. One can note that the final two decomposition stages are similar to those from the olive oil. The difference is that only one peak was registered in the temperature interval between 180 and 370°C which confirms the fact that in this interval takes place the decomposition of the saturated triglycerides.

After analyzing the results obtained through kinetic analysis, Vecchio et. al. [7] concluded that the first peak that appears at low temperatures and having low activation energy thresholds is probably due to the decomposition of the saturated bond from the triglycerides and corresponds to the first decomposition stage, while the degradation of the Glyceryl trilinoleate (C 18:2) and of the Glyceryl trilinolenate (C 18:3) corresponds to the second degradation stage of the extra-virgin olive oil.

The first decomposition stage is the most important for the thermal stability of the natural or animal origin fats. Based on the initiation temperature of the thermal decomposition process, the thermal stability of the extra-virgin olive oil can evaluated along with the efficiency of the added natural or synthetic antioxidants.

DTA curves corresponding to the oils with or without goldenrod extracts and butylated hydroxytoluene (BHT) shown in figures 2-6 show that there are three endothermic stages and one exothermic stage, found around 325°C.

The exothermic stage corresponds according to [10] to the polymerization of the fragments resulted from the decomposition of the polyunsaturated fatty acids.

This finding is also sustained by the fact that for the extra-virgin olive oils that have a high content in polyunsaturated fatty acids the exothermic stage is present for all the analyzed samples.

The first thermal decomposition has the temperatures moved towards higher values in the case of samples with added goldenrod extracts and butylated hydroxytoluene (BHT).

In the case of goldenrod extract the obtained results were reproducible when a certain extract volume was used.

Adding only 0.5 mL goldenrod extract / 0.5 kg extra-virgin olive oil moved the T_{onset} for the first stage from 233.7°C to 259.5°C as one can see in figure 3.

Adding only 1 mL goldenrod extract / 0.5 kg extra-virgin olive oil moved significantly the T_{onset} for the first stage from 233.7°C to 266.5°C as one can see in figure 4.

Adding only 3 mL goldenrod extract / 0.5 kg extra-virgin olive oil moved the T_{onset} for the first stage from 233.7°C to 285.3°C as one can see in figure 5.

Adding only 5 mL goldenrod extract / 0.5 kg extra-virgin olive oil had pro-oxidative effect, thus for the first stage the peak from 261.9°C was moved to 256.3°C as one can see in figure 6.

The results obtained in the case of goldenrod extract points out that the use of a 3 mL / 0.5 kg extra-virgin olive oil ensures the optimal thermal stability for the studied fat.

Smaller amounts of extract used moved T_{onset} with smaller intervals while adding a higher amount than 3 mL leaded to the decomposition of extra-virgin olive oil to lower values than T_{onset} = 233.7°C for the first decomposition stage, the higher vegetal extract content having a pro-oxidative effect.

By comparison the antioxidant activity was compared using the butylated hydroxytoluene standard. By adding only 0.59 g butylated hydroxytoluene / 0.5 kg extra-virgin olive oil moved T_{onset} for the first stage from 233,7°C to 240,2°C as seen in figure 2.

By comparing the above found temperatures for first stage of decomposition of the extra-virgin olive oil spiked with the vegetal extracts of Solidago virga aurea and of that spiked with butylated hydroxytoluene for the same stage, one can see a significant difference in temperature value which highlights the greater antioxidant potential of the vegetal extract.

CONCLUSIONS

Butylated hydroxytoluene (BHT) ensures a smaller thermal stability of the extra-virgin olive oil compared with the stability given by the goldenrod extract as long as the amount of added extract does not exceed 3 mL/0.5 kg oil.

By using this method it was found that the goldenrod extract used in the experimentation contributed significantly to the thermal stability of the extra-virgin olive oil and having a higher efficiency than Butylated hydroxytoluene (BHT).

The obtained results confirm the antioxidant potential of the Solidago virga aurea vegetal extract.

REFERENCES

1. Dicu A. M., Uleiuri şi grăsimi vegetale, Ed. Universității „AUREL VLAICU”, Arad, 2007,p.13-21.
2. Bauer A.W, Kirby W.M.M, Sherris J.C, Turck M: Antibiotic susceptibility testing by a standardized single disc method. Am J Clin Pathol 1966, 45:493-496.
3. Popovici I., Moruzi C., Toma I.,Atlas Botanic,Ed. Didactică şi Pedagogică, R.A, Bucureşti, 1992,132-175.
4. Enciclopedia Florei şi Faunei din Romania, www.Eukarya.ro.
5. Constantin Pârvu, „Universul plantelor – Mica Enciclopedie”, Edit. Enciclopedică, Bucureşti, 2000, p. 168.
6. REUBEN, C., Antioxidants, Prima Publ., Rocklin (CA), 1995, p. 29- 45.
7. Vecchio S., Campanella L., Nuccilli A., Tomassetti M., Kinetic Study of Thermal Breakdown Of Triglycerides Contained in Extra – Virgin Olive Oil, Journal of Thermal Analysis and Calorimetry, Vol. 91 (2008), 1, 51- 56.
8. Kirk and Otmer, Éncyclopedia of Chemical Tehnology: Fats and Fatty Acids, 3rd Ed., wiley and sons, vol. 9, 1980, p.88.
9. Gennaro L., Bocca A.P., Modesti D., Masella R., Cani E., Effect of Biophenols on Olive Oil Stability Evaluated by Termogravimetric Analysis, J. Agric. Food Chem., vol. 46, pp. 4465-4469, 1998.
10. Santos J.C.O.,Santos A.V.,Souza A.G., Thermal Analysis in Quality Control of the Olive Oil.Europ.J.Pharm.Sci.,vol.,13 (Supp.1),pp S23-S24,2001.
11. Farmacopeea Română,ediția a-X-a, Editura medicală, Bucureşti 1993.
12. Dweck J., Sampaio C.M.S., J. Therm. Anal. Cal., 87 (2007) 835.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

FOOD FRAUD - CONSIDERATIONS

Iacobescu Fanel[1], Poenaru Liana[2]

KEY WORDS: food fraud, instant coffe, caffeina, virgin olive oil, honey

ABSTRACT

The work presents some considerations regarding the research in a very complex and important field: food fraud.

The notion of "food fraud" is defined. The main types of food fraud are characterized.

There are some general considerations on three experimental methods for detecting fraud in the following food: mixtures of Arabica-Robusta soluble coffee, virgin olive oil and bee-honey.

GENERAL CONSIDERATIONS

The concern regarding food fraud represents a priority especially nowadays when consumers became more and more demanding. In order to obtain good results in detecting food fraud you have to perfectly know the respective products.

Food fraud can be defined, in a general and minimal manner, as an ill-intentioned act harming the interests of one or more third persons who can be the consumers of the product, the professional buyers of the finite or semi-finite product (deliverers or industrial customers) and, finally, the competition which brings in the market the same product without practicing fraud; so, they are all victims of a "competition disadvantage" related to the economic agent who defrauds.

According to "Illustrated Little Larousse", fraud is "an ill-intentioned act carried out by infringement of law or regulations, affecting the person's rights" and is defined as " an ill-intentioned deed meant to cheat". The meaning of product fraud refers to nature, origin, quality or quantity of goods.

Food fraud is mainly an offence and occasionally a third-class minor offence if no offence can be proved. These offences imply the existence of a material element when one or more analytical methods are liable to emphasize: the addition of a substance not mentioned in the applicable regulation, the addition of some wrong information or lies concerning the composition of product, appearing on its label.

It is highly important that the notion of "ill-intention" is not limited to the intentional element of an offence. Accordingly, "ill-intention" is either criminally punished, through offences that may not imply intentional elements, or civil punished, within the execution of the obligations stipulated by contracts; so, we are in the field of civil responsibility concerning the mistake or still inside the "contractual responsibility".

[1] The National Sanitary Veterinary and Food Safety , Scientific Council
[2] Romanian Movement for Quality

TYPES OF FOOD EMBEZZLEMENT

1. FRAUD BY COUNTERFEIT

Counterfeit embezzlement is, undoubtedly, the oldest and most usual: food product undergoes a voluntary change from an economic agent so that its intrinsic qualities are modified. The reason for this type of embezzlement lies in the diminishing of costs and is related to one or more product ingredients.

"Little Robert" defines this term taking into account "counterfeit" and "falsification". The existence of an intentional element in the delictual behaviour results from the sense of these terms.

The food product can be changed by using some substances such as water added in milk, wine, fruit juice or sugar added in bee-honey or wine and, by way of exception, the embezzlement of some substances (cream presented as whole milk). It can also be changed by the substitution of one ingredient into another, without modifying the organoleptic qualities of the product: the artificial flavour replaces the natural one, vanillin replaces natural vanilla, cow milk replaces goat or sheep milk...

The present debates on the incorporation of genetically modified organisms (GMO) in raw materials or in other ingredients of food product make us consider the apparition of fraud in products containing GMO but labelled as not having it; whatever the content of GMO presented within the law of appliable labelling for this type of food products, we may speak about a new type of counterfeit by replacing a gene, thus modifying the cell structure of a product or ingredient of a product.

We may also find a product labelled as 100% vegetal but its analysis shows that it contains one or more substances of animal origin, nutritionally and organoleptically equivalent. Furthermore, we may take into account the emergence of fraud in food supplements incorporating gelatine of animal origin and labelled as " 100% vegetal", an aspect that can be attractive and not neglected by consumers.

2. FRAUD BY NON-CONFORMITY

The second type of food fraud appears when a product complying certain settlements is not conform to its indications. We can speak about "fraud by non-conformity".

For instance, unauthorized sweetening of wine can be considered fraud by non-conformity.

An important category of this type of food fraud is non-conformity related to geographic, chronologic or specific origin.

Fraud by non-conformity, as well as by counterfeit, always imply the existence of an intentional element in committing offence.

3. FRAUD BY CONTAMINATION

The third category of frauds implies the cases when food products contain a xenobiotic substance whose origin can be variable and looked for in every stage of product manufacturing (Pascal, 1996). We may speak about a forbidden substance or about a ermitted substance but used in a quantity that exceeds the level allowed by regulations. We may also speak about a new natural substance, very little used or consumed. And finally, we may also speak about a substance unusual for the manufacturing of product and its composition.

TRACING OUT, BY EXPERIMENTAL METHODS, OF FOOD FRAUDS

1. IDENTIFICATION OF ARABICA-ROBUSTA MIXTURES INTO SOLUBLE COFFEE

In order to better control the quality of commercial instant coffee and emphasize the possible use of Robusta coffee into Arabica coffee, it is important to apply analytical methods that allow to make the difference between the two types of coffee. Recent studies deal with the discrimination related to the varieties of roasted coffee, starting from their chemical composition. The parameters would be: caffeine, trigonelline, chlorogenic acid (5-CQA) and coumaryol-tryptophan (COT).

These descriptors are soluble in the water used during the extraction of roasted coffee in order to industrially produce instant coffee. They use samples of ground and roasted coffee, of known origin and varieties. In a laboratory, by using the simulated extraction method, they obtain instant coffee; they make comparative analyses.

Then, starting from the ground and roasted types of coffee, the operative protocol allowed to define the reference values for the four identified compounds chosen to characterize the product. The combined use of the relation between constituents and the detection of derivative COT by high-fidelity liquid chromatography allow to emphasize Robusta in Arabica. Applied to a number of different types of instant coffee, the analytical method allow to check their conformity or non-conformity to the label.

2. IDENTIFICATION OF UNKNOWN MONO-UNSATURATED OILS IN THE VIRGIN OLIVE OIL

By having such a high price, compared to other food oils, the virgin olive oil is exposed to frauds.

For instance, the virgin olive oil is falsified by using oleic oils (hazelnut and kernel oil). The physico-chemical characteristics of these oils limit the opportunity of identifying the mixtures of fat acids and sterols. The research concerning α-amyrin and lupeol in the fraction of triterpenic alcohol led to the diminishing of detection level for the mixtures of virgin olive oils (hazelnut and kernel oils), up to 5%.

Regulation CE 2568/91 stipulates methods for emphasizing other oleic oils (the oleic sunflower oil, etc.)

There are methods for detecting the presence of olive oil in the virgin olive oil.

3. CONFIRMATION OF FLORAL AND GEOGRAPHIC DENOMINATION FOR HONEY BY ESTABLISHING THE CONTENT OF GLUCONIC ACID

The wrong floral or geographic denomination and the addition of sugar syrup are the main embezzlements for honey. The research pointed out that 10% of the honey samples taken from commerce were falsified [1]. The poor crop of the great producers (China, Argentina, Vietnam) and the growing demand in the countries under development led to a constant increase of the price, respectively of the “lucrativeness” of frauds in this field.

The microscopic analysis of pollens is used to establish [2] the authenticity of floral and/or geographic varieties; by using this method, one can also detect the presence of corn sugar syrup and sugar beet syrup in honey [3,4].

Techniques based on isotopic properties of atoms are used to control the conformity of honey [5,6].

Capillary electrophoresis is an efficient technique for quick analyses and facilities by dosing a great number of organic acids in a complex matrix without preparing the samples, at a relatively low cost [7,8,9].

By using the zone capillary electrophoresis the gluconic acid is measured in honey in order to develop some new physico-chemical criteria used to characterize monofloral types of honey.

The researches made [...] allowed to establish the content of gluconic acid for honey sampling and to analyze the types of authentic, respectively commercial honey.

BIBLIOGRAPHY

1. DUCAUZE J. Christian, Fraudes Alimentaires, Collection Sciences&Techiniques Agroalimentaires, Paris, Lavoisier, 2003
2. Faury Phillipe, Derbesy Michel, Estienne Jaques, Ann.Fals.Exp.Chim.-Octobre-November-December Lavoisier, 2002-95-No 961 – pp 381-391
3. J. KERKVLIET, M. SHRESTHA, K. TULADAR, H. MANANDHAR. Apidologie, 1995, 26, 131-139
4. J. KERKVLIET, H.A.J. MEIJER. Apidologie, 2000, 31, 717-726
5. L.W.DONER, J.W. WHITE. Sciences, 1977, 891-892
6. J.W. WHITE, L.W.DONER. J. AOAC, 1978, 61, 746-750
7. G. BONDOUX, P. JANDIK, R. JONES, Spectra 2000, 158, pp 47-51
8. D.B. MARSH, K.L. NUTTAL. J, Electrophoresis Capillary, 1995
9. F.B. KENNEY. J. Chromatogr., 1991, 546, 423-430

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

EXPERIMENTAL EQUIPMENT TO STUDY THE INFLUENCE OF VACUUM PROCESSING ON FRUITS PRESERVATION

Rosca Adrian, Rosca Daniela[1]

KEY WORDS: *equipment, vacuum, fruits, infusion, preservation*

ABSTRACT

The paper presents experimental equipment special designed and made for interdisciplinary research studies concerning the influence of vacuum process fruits preservation technologies. The research studies concern in infusion speed and quality of the fruits utilizing a non-thermal preservation method: vacuum process up to 0,01bar(-0,99bar). The paper presents experimental results proving the possibility of increasing the infusion speed and the fruit infusion quality depending on the vacuum values, and the processing succession and duration.

INTRODUCTION

Due to the increased consumers demand for improved nutritional and sensorial of food characteristics, with no "fresh taste" loss, in the last 20 years, cold (non-thermal) preservation method such as high pressure process (HPP), and medium and low vacuum processing (MLVP) have been extensively studied in food industry research activity.

After year 2000, the European "Novel Foods" Directive has been reviewed, remaining few limitations for HPP and MLVP products research development. [1, 2, 4]

In order to begin the interdisciplinary studies concerning HPP research, in the Unconventional Technologies and Equipment for Agro-Food Industry Laboratory within Faculty of Horticulture in Craiova, an experimental HPP equipment was made. The experimental HPP equipment consists in stainless steel vessel (0,5 liter capacity; maximum pressure up to 800bar reached using a test strength machine, and low pressure up to 500bar obtained using a special screw mechanism). [3, 4]

The experimental HPP equipment develop an isostatic process: the food product is immersed in a incompressible liquid, which transmits the pressure uniformly with no direct contact with the food product, and with no heating process. [1, 2, 4]

The fruits (apples, cherries, strawberry) were infused (several processing variants up to 800bar/20 min) in sugar syrup with 70% dry soluble mater content. After infusion, for each variant it was determined the fruits and syrup dry soluble mater content. Increasing the high pressure level and the infusion duration of the apples, it was observed the increase of the dry soluble mater content of the apples cubes (up to 27%), accompanied by the decreasing of dry soluble mater content of the syrup. An interesting behavior was observed for three steps gradual pressure processing, (with maintaining on each step), the recorded dry soluble mater content increasing up to 30%).

[1] University of Craiova

Apples cubes infused using HPP were translucent, with no browning, with a good shape maintaining and with typical properties of the candied fruits. [3, 4]

The cherries were HPP processed using similar variants method, and it was observed important increases (not as important as for the apples) of the dry soluble mater content at the high pressure process infusion. Due to fruits texture, but especially the presence of the epidermis which represents an important barrier for the diffusion and osmosis processes, it was observed a lower velocity of cherries infusion than for apples. [4]

In order to put in evidence the quantitative comparisons between the HPP method, and the MLVP method, respectively, there were determined the strawberry dry soluble mater after infusion, and the syrup dry soluble mater after infusion. The syrup infusion process in strawberry using MLVP is a faster and economically method comparatively with HPP, and the dry soluble mater has more important values due to MLVP to -0,99bar, comparatively with the HPP up to 500bar. [5]

EXPERIMENTAL EQUIPMENT

In order to determine the middle and low vacuum influence on fruits preservation, in the Unconventional Technologies and Equipment for Agro-Food Industry Laboratory within Faculty of Horticulture in Craiova, a MLVP experimental equipment was made.

In main, the experimental equipment is composed in a vacuum pump, a condensed gases dryer module, and a stainless steel vessel for fruits vacuum processing (figure 1).

The main characteristics of HYVAC type vacuum pump: absolute pressure up to 0,5 militorr; maximum flow rate up to 40 l/min.

The condensed gases dryer module, in main, consists in a mettalic vessel containing two type molecular sieves. The mettalic vessel is designed and made according romanian ISCIR norms. The stainless steel vessel for fruits vacuum processing is designed and made according Romanian ISCIR norms: absolute pressure up to 0,5 militorr; stainless steel W1.4571; 9mm tubular wall; welding coefficient 1; 100% ultrasonic control for welding assemblies. The vessel is provided with two flanges sealed with special PTFE gaskets.

To observe the inlet vessel process, one of the flanges is provided with a Ø230×14 transparent visor/plate, made in high resistant polycarbonate.

To observe the pressure/vacuum losses, the condensed gases dryer module and the processing vessel are provided with special manovacuumeter gauges (stainless steel W1.4571; 1,6 precision class). The experimenal equipment coupling accesories (ISO/NW/NPT type) are made in AISI 316L stainless steel.

Figure 1. Experimental equipment for MLVP fruits preservation

MATERIAL AND METHOD

In order to determine the influence of medium and low vacuum process in fruits preservation, experimental research using several fruits (Gold apple, Jonathan apple, pear, strawberry, orange) were performed. The selected fruits were cutted in pieces, then weighted to be introduced in sugar syrup.

The same quantity of fruit and sugar syrup were put in transparent plastic vessel to be introduced into processing vessel of the experimental equipment. For each experimental test, three transparent plastic vessels were introduced into the vacuum processing vessel of the experimental equipment. To observe the influence of MLVP in fruits preservation, sugar syrup with 71% dry soluble mater content, was used. Before and after the MLV infusion process, the dry soluble mater content for each fruit type, and the syrup dry soluble mater of each fruit after the MLV infusion process was determined with ABBE refractometer type (model Kruss 90).

In order to improve the infusion effect during the vacuum processing, the processing vessel of the experimental equipment was rotated.

The vacuum processing consists in several depressurizations/pressurizations cycles (at different vacuum values), up to 22min/cycle. The vacuum processing is a *cold preservation method*; therefore, the MLV processing was necessary to be permanently monitored. Due to the vacuum process value, it was used a non contact method (FLIR Infrared Thermovision Camera, provided by Thermomechanical Parameter Monitoring Laboratory, within Faculty of Horticulture). During the preservation process, into the vacuum processing vessel were noticed temperatures up to 27^{o}C.

RESULTS AND DISCUTIONS

The paper presents one of the several experimental variants to study the influence of vacuum process in fruit cold preservation.

In this variant were used strawberry, orange and pear. To observe the influence of MLVP in fruits preservation, sugar syrup with 71% dry soluble mater content, was used.

This vacuum process variant (figure 2) consists in 5 processing steps (during this 22 min total vacuum process time, the processing vessel of the experimental equipment was rotated):

- depressurization form 1bar to -0,97 bar = 1 min
- maintaining from -0,97 bar to -0,95 bar = 5 min
- maintaining from -0,95 bar to -0,90 bar = 10 min
- maintaining from -0,90 bar to -0,85 bar = 5 min
- pressurization from -0,85 bar to 1 bar = 1 min

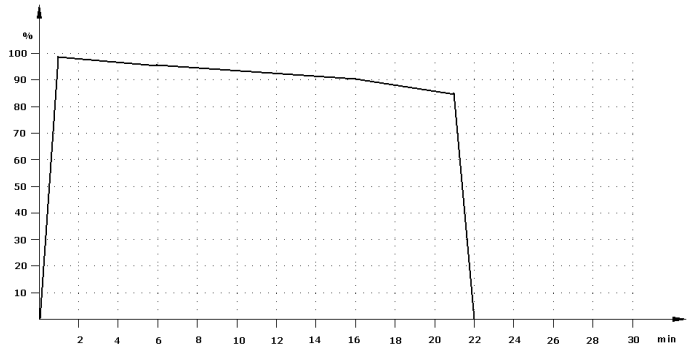


Figure 2. Vacuum processing cycle for cold preservation method

The fruits dry soluble mater and the fruit' syrup dries soluble mater before and after the infusion, using the described variant processing, is presented in table 1. In table 1 is observed that after the infusion vacuum process, the dry soluble mater in fruit increase more then 100%, and the dry soluble mater in fruit' syrup decrease 5,9…7,8%.

The fruits dry soluble mater and the fruit' syrup dries soluble mater before and after the infusion, using the described variant processing

Table 1

Fruit	Dry soluble mater in fruit, [^{0}R]		Dry soluble mater in fruit increase during the infusion process, [^{0}R]	Dry soluble mater in fruit' syrup, [^{0}R]
	before infusion	after infusion		after infusion
strawberry	10,2	22,1	11,9	65,1
orange	10,4	21,5	11,1	64,5
pear	14,2	28,8	14,6	63,2

In figure 3 and figure 4 are presented two steps of the vacuum infusion process.

Figure 3. Depressurization stage up to -0,97 bar

Figure 4. The vacuum infusion due to osmosis process during the vacuum evaporation

CONCLUSIONS

The MLVP fruits infusion is based on the osmosis process between fruits and syrups. During this process the sugar content in fruits gradually is increasing, and in the same time the juice of the fruits dilutes the syrup. The process continues until the syrup and the fruit until the equilibrium stage is realized depending on process parameters.

REFERENCES

1. Cheftel, J. C. - Effect of high hydrostatic pressure on food constituents. High Pressure and Biotechnology (Proceedings of the Third European Seminar on HPP and Biotechnology), 1997.
2. Knorr, D. - Effects of high-hydrostatic pressure process on food safety and quality. Food Technology, 1993.
3. Nour, V., Rosca, A., Ionica M.E. - Researches concerning the influence of high pressures on the dynamics of the fruits candy process. University of Agronomic Sciences and Veterinary Medicine, Bucharest, Horticulture Scientifical Papers, Serie B, Vol. XLVII, Bucharest, 2004.
4. Rosca, A., Rosca, D. - Equipment for high pressure influence study in food industry technologies. Symposium Horticulture-Science, quality, diversity and harmony, Romanian Academy – Iasi, 2004.
5. Rosca, A., Rosca, D. - Considerations Concerning the Influence of High Pressure and Low Vacuum Processing on Candy Fruits Preservation, Annals of University of Craiova, Biology, Horticulture, Food Industry, Agriculture Environmental Engineering Series, Vol.XIII (XLIX), 2008.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

STUDY OF THE ACETIC BACTERIA RESISTANCE AT THE DIFFERENT CONTENTS IN ALCOHOL, ACIDITY AND SULPHUROUS ANHYDRIDE OF THE WINES IN VINEGARD TECHNOLOGY

Felicia Stoica[1], L. Giurgiulescu[2], I. Popescu[3]

KEY WORDS: alcohol content, acidity content, resistance, acetic bacteria, vinegar

ABSTRACT

The vinegar is defined as a solution of the acetic acid in water. The touring sour of the wines as a process of deterioration is known from the antique. The vinegar or the sour wine is natural products which can be obtained by the action of the acetic bacteria on the wine. Because acidity, alcohol and anhydride in sulphurous constitute limiting factors in obtaining vinegar was required to initiate this study to determine the limits do not affect process

INTRODUCTION

Hit by alcoholic fermentation of grape must, wine incorporates an impressive number of constituents which give it one of the most complex chemical compositions of one known food of plant origin. In the process of fermentation by biological oxidation of ethyl alcohol to acetic acid - the main component of vinegar - is carried out under the action of acetic bacteria. Acetic bacteria are microorganisms belonging to the genus Acetobacter, the family Pseudomonadaceae.

Among many species of bacteria produce acetic acid in vinegar, depending on the nature of raw materials are selected species act more vigorously on the substrate providing a good yield in vinegar. (Dan Valentina, 2000).

Resistance to alcohol in the fermentation medium, in addition to other biological features of acetic bacteria, is important in the choice of microorganism cultures in vinegar industry.

After tolerance to alcohol, acetic bacteria are grouped in three categories:

• Weak acetic bacteria resistant (up to 6- 7% alcohol) as Acetobacter oxydans, Acetobacter industrium and Acetobacter xylinium. More than 7% alcohol fermentation medium exert inhibitory action of cells;

• Mid-strength acetic bacteria able to grow in average by 9 11% alcohol. In this category included species: Acetobacter pasteurianum, Acetobacter kutzingianum, Acetobacter acetic Orleans and Hansen;

[1] University of Craiova
[2] North University Baia Mare
[3] Aurel Vlaicu University, Arad

• acetic bacteria resistant, showing high tolerance to alcohol, being able to grow on average by 11- 13% alcohol. In this category is framed Acetobacter schutzenbachii and Acetobacter curvum (Hurduc D., 2002, Stoica Felicia 2007).

High tolerance to alcohol does not always mean improved ability of fermentative activity, an oxidation potential of alcohol to acetic acid. A species of acetic bacteria can develop in wine by 11- 12% alcohol, but does not produce more than 6- 7% acetic acid (Popa A., 2004).

MATERIAL AND METHODS

The accession to the EU market and consumer requirements more insistent it must obtain food with high naturalness and typical. In this context it is placed and vinegar one of the oldest foods, getting his first being contemporary with the wine.

It requires, therefore, study the influence of alcohol and acidity contents of the wines on the activity of acetic bacteria, and the influence of sulphurous anhydride on the activity of acetic bacteria. To test alcohol resistant bacteria acetic were used fermentation media with 7, 8, 9, 10 and 11% alcohol, acidity of 2% acetic acid, derived from pasteurized vinegar. Alcohol content was provided in refined alcohol.

Experimental variants are:

V_1 – 2% acetic acid + 7 % alcohol
V_2 – 2% acetic acid + 8% alcohol
V_3 – 2% acetic acid + 9% alcohol
V_4 – 2% acetic acid + 10% alcohol
V_5 – 2% acetic acid + 11% alcohol

To study the influence of acidity on the activity of acetic bacteria have mounted an experience with the following:

V_1 – 2% acetic acid + 9% alcohol
V_2 – 3% acetic acid + 8% alcohol
V_3 – 4% acetic acid + a7% alcohol
V_4 – 5% acetic acid + 6% alcohol
V_5 – 6% acetic acid + 5% alcohol

Knowing the fact that both alcohol and acidity are factors limiting the activity of bacteria acetic, the alcoholic falls in the set of experimental variations as the acid content increases. There studied the limiting factor for obtaining a vinegar wine quality, namely the presence and concentration of sulfur dioxide**.**

In this way, have mounted an experience with a range of 4 variants distinguished by different proportions of sulfur dioxide: control variant, variant with 5 mg / l SO_2, version with 10 mg / l SO_2 and version 15 mg / l SO_2.

RESULTS AND DISCUSSIONS

Results regarding the alcohol resistance of acetic bacteria

The experimental results obtained are presented in Table 1.

The analysis of data shows that in an average of 7% alcohol, acetic bacteria multiply and acetic fermentation starts soon, after 10 days to obtain the highest percentage of acetic acid (76% of the total achieved in 20 days).

In medium with 7% alcohol and 2% acetic acid, Acetobacter culture metabolize oxidative the ethanol, with a maximum yield of 93%.

Resistance of these bacteria acetic is optimal at higher concentrations of alcohol (8- 9%), bio-conversion yields of alcohol in acetic acid acetic maintaining between 82-

91%. In medium with 9% alcohol and 2% acetic acid, the acidity increased to 9.36% acetic acid, yield 82% practical. Acetic bacteria that inhibit all activity at variants with 10 and 11% alcohol. Bacteria can grow in acetic fermentation medium with 7, 8 and 9% alcohol. Not grow in media containing greater than 10 11% alcohol.

Table 1.

The alcohol resistance of the acetic bacteria

Variants	Acidity, g acetic acid/100 ml after:						Yield %
	4 days	7 days	10 days	13 days	17 days	20 days	
V_1	3,42	4,80	6,48	8,04	8,76	8,52	93
V_2	3,18	4,50	5,88	7,74	9,30	9,30	91
V_3	2,58	3,60	4,50	5,94	7,92	9,36	82
V_4	2,22	2,22	2,22	2,22	2,22	2,22	0
V_5	2,36	2,22	2,22	2,16	2,16	2,16	0

Results regarding the acidity resistance of acetic bacteria

Results of the influence of the fermentation medium on acetic bacteria are presented in table 2 data.

Table 2

The influence of fermentation medium on acetic bacteria

Variants	Acidity, g acetic acid/ 100 ml after							Yield, %
	2 days	4 days	7 days	10 days	13 days	17 days	20 days	
V_1	2,34	2,4	2,4	2,46	2,6	3,84	5,28	36,44
V_2	3,24	3,30	3,36	4,38	5,52	7,38	8,68	71,00
V_3	4,14	4,20	4,26	4,26	5,10	6,90	8,22	60,29
V_4	5,10	5,10	5,10	5,10	5,16	6,96	8,52	58,67
V_5	6,0	6,0	6,0	6,0	6,0	6,0	6,0	0

The acetic bacteria resistance of acetic acid rises to 4- 5% acetic acid and is subject to a high nutrient intake of 1% extract from corn. A higher concentration of 6% acidity, affect the activity of bacteria and reduces the yield of acetic acid bioconversion alcohol. In culture media with 2 5% acetic acid, 5 9% alcohol (60% obtained pasteurized wine and 40% of refined alcohol) Acetobacter species working poor, realizing it is a strength of up to 5% acetic acid. Under these conditions the fermentation medium, presents a better activity variant V_2.

Poor results obtained in other variants can not be made solely to acidity; it is possible that fermentation medium does not fully satisfy the requirements of the acetic bacteria, especially bearing in mind those variants by more acetic acid, alcohol the average enter a lesser amount and participation in nutrient rich wine is reduced**.**

All acetic bacteria have resistance to acidity and can also develop in medium with 5 to 6% acetic acid, the nutritional requirements of the medium are met by adding 1% corn extract.

Results regarding the resistance of acetic bacteria at sulphurous anhydride

In vinegar obtaining raw material (wine, picket, etc.) can contain different amounts of SO2 added in the process of obtaining them. Sulfur dioxide is an antiseptic and a powerful antioxidant to preserve the organoleptic characteristics of wine by inhibiting or destroying microorganisms in wine. If using wine as raw material for obtaining vinegar, this chemical compound is a disturbing factor in the work acetic fermentation bacteria. Therefore, verification of this factor is particularly important for vinegar production technology knowing that there are acetic sulphite resistant bacteria that may prove valuable in terms of industry. Acetic bacteria in general are poorly resistant to sulfur dioxide.

The data table 3 differentiated their behavior resulting from the presence of SO2 in fermentation medium.

Table 3

Resistance to different concentrations of acetic bacteria sulfur dioxide

Medium	SO_2 Content	Acidity, g acetic acid/100 ml after						
		Initial	3 days	8 days	11 days	14 days	17 days	20 days
Wine + Vinegar	Control	1,8	2,58	5,76	6,78	7,2	7,2	8,22
	5 mg/l	1,8	2,58	5,94	7,08	7,32	7,38	7,5
	10 mg/l	1,8	2,34	5,10	6,6	6,9	6,9	6,9
	15 mg/l	1,8	2,04	4,62	5,88	6,48	6,6	6,66

A first finding is that high doses of sulfur dioxide, more than 10 mg / l, affects reproduction and activity of acetic bacteria, meaning that is carried in small amounts of acetic acid fermentation media.

Thus, the variant Control the final content of acetic acid is 8.22 g; it decreased as the dose increased the SO2 from the fermentation medium.

It is further noted that the first 3 variants were formed over 5 g of acetic acid for 8 days and in the variant with the highest dose of sulfur dioxide equal amounts of acetic acid is acetic fermentation after 11 days.

At the control variant observed a significant increase of acetic acid content in the last 3 days of fermentation while the other increases are becoming smaller (up to 0.06 g the last version) with increasing dose of antiseptic.

CONCLUSIONS

Following the study can conclude that:

- In medium with 7% alcohol and 2% acetic acid, Acetobacter culture metabolizes ethanol to a maximum of 93% yield.
- Acetic acid-resistant bacteria amounted to 4-5% acetic acid. A higher concentration of 6% affects the activity of bacteria and reduces the yield of the alcohol to acetic acid bioconversion.
- A very important element in wines raw-material for acidification is sulfur dioxide content, antiseptic severe acetic bacteria development.
- Overall acetic bacteria are poorly resistant to sulfur dioxide.
- High doses of sulfur dioxide, more than 10 mg / l, affects reproduction and activity of acetic bacteria, meaning that is carried in small amounts of acetic acid fermentation media.

BIBLIOGRAPHY

1. Dan Valentina, 2000 – *Microbiologia produselor alimentare*, vol. 2, Galați
2. Hurduc D., 2002 – *Tehnologia de producere a oțetului din vinurile materie primă obținute în arealul Bârlad – Fălciu – Huşi.*, Teză de doctorat, U.S.A.M.V., Iaşi
3. Popa A. şi colab., 2004 – *Microbiologia eonologică.* Editura Universitaria, Craiova
4. Stoica Felicia, 2006 – *Tehnologii generale în industria alimentară. Ghid de lucrări practice.* Editura Sitech, Craiova
5. Stoica Felicia, 2007 - *Tehnologii generale în industria alimentară.* Editura Sitech, Craiova

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

RESEARCHES CONCERNING THE MALIC ACID CONTENT OF GRAPES DURING MATURATION PERIOD

Ionel Popescu-Mitroi[1]

KEY WORDS: malic acid, malolactic fermentation, climatic conditions, grapes, red wines

ABSTRACT

For red dry quality wines as for some white and pink dry wines, the malolactic fermentation consists a important link during their elaboration process.

The intermittent changes in the chemical composition dynamic of wines through developing the malolactic fermentation which is even more pronounced how in grapes and wines obtained from these grapes, the malic acid quantity is higher. The climatic conditions and dynamic of sugars and organic acids accumulation in grapes present a special importance to the malolactic fermentation development especially in spontaneous work conditions when the fermentation must be finished only by lactic bacteria contribution present in inner microflora. The results of this study shows the fact that exists an interesting predisposition of some varieties (Cabernet Sauvignon and Cadarca in Minis vineyard, Burgund Mare and Cabernet Sauvignon in Recas vineyard) to accumulate a higher quantity of organic acids at full maturity having as consequence obtaining some wines with very low pH, difficult to start and finish the malolactic fermentation.

INTRODUCTION

The predominant acids in grapes at maturity are tartaric and malic acids. From the studies made in our country results that at the beginning of maturation, in grapes is found more malic acid than tartaric acid. After acidity reduction made by the end of maturation, grapes contain at full maturity 2-7 g/l tartaric acid and 2-3 g/l malic acid **(Țârdea C, 1964)**. The malic acid has as main forming way the combustion respiratory process of sugars. The organic acids formations represent in fact intermediary steps of the respiratory process, releasing a part of the stored energy in sugars molecules **(Camelia Muntean, 2001)**. As other organic acids of grapes, the malic acid is formed in the combustion respiratory process of sugars, in order that the vine to get a part of the necessary energy and by the same process is decomposed to final products. The two steps of the combustion respiratory process are:

I) glucose + oxygen → oxaloacetic acid + cabon dioxide + water + energy
II) oxaloacetic acid + oxygen → malic acid (intermediary compound) → carbon dioxide + water + energy

During grapes maturation, the second step is made as rapid as the climate is more warm and dry. In this way is explained The fact that on the sands in south Oltenia, in very warm autumms, the malic acid from some variety grapes exists in insignificant contents or it disapears **(Gheorghiță M. and colab., 2006)**.

[1] "Aurel Vlaicu" University of Arad, Faculty of Food Engineering, Tourism and Environmental Protection

The climatic conditions influence the organic acids and sugars acummulation in grapes determining in the end the physico-chemical characteristics of wines (sugar

concentration, alcohol concentration, total acidity, pH); the physico-chemical characteristics of wines further influence the malolactic fermentation especially when the malolactic fermentation is leaded exclusively by lactic bacteria present in inner micro flora **(Popescu – Mitroi I., 2008)**.

In order to determine the evolution of malic acid in grapes and wines can be used more methods **(Țârdea C., 2007)**:

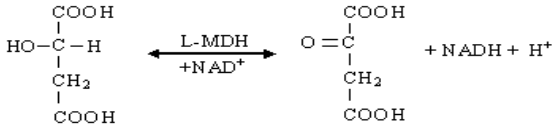
a) malic acid estimation through paper chromatography (Michaud method);
b) malic acid determination by colorimetric method;
c) malic acid determination through RP-HPLC (high performance liquid chromatography);
d) malic acid determination through enzymatic methods;
e) malic acid determination by using the amperometric biosensor.

In this paper, the malic acid monitoring during maturation period of grapes was made for the harvest years 2004 and 2005 (completely different climatic years), in Minis (Arad county) and Recas (Timis county) vineyards.

MATERIAL AND METHOD

L-malic acid was determined cantitatively by enzymatic method.

L-malic acid is oxidised to oxalacetate acid, by NAD (nicotine-adenine-dinucleotide), in the presence of L-malate-dehidrogenase (L-MDH):



L-malic acid oxalacetate acid

The formed NADH quantity is stoechiometic with the L-malic acid quantity. The NADH variations are measured spectrophotometricly in the self absorbence basis at 334, 340 or 365 nm.

Table 1

Work protocol to determine the L-malic acid
(after Diamedix Diagnostica documentation, 2006)

Pipetting	Standard	Sample
Solution 1	1,000 ml	1,000 ml
Solution 2	0,200 ml	0,200 ml
Suspension 3	0,010 ml	0,010 ml
Sample	-	0,100 ml
Bidistilled water	1,000	0,900 ml
Are mixted and the solutions absorbences are read after 3 minutes (A_1). The reaction is started by adding:		
Solution 4	0,010 ml	0,010 ml
Are mixed, we wait 10 minutes untill the reaction is finished and the absorbences of standard and sample are read(A_2)		

The absorbences differences are determined ($A_1 – A_2$) for standard and for sample. The obtained difference for standard is decreased from the difference obtained for the sample and we obtain ΔA. Depending on ΔA, the malic acid concentration from samples is calculated $\Delta A = (A_2\text{-}A_1)_{sample} - (A_2\text{-}A_1)_{standard}$

RESULTS AND DISCUSSIONS

The centralized data from table 2 show us that in harvest years 2004 and 2005 are very different years from the climatic point of view. In the conditions of harvest year 2004. when the real thermal balance is more than 3700°C, the number of insolation hours is over 1370 hours, and the preciptation level is under 350 mm Hg col., comparative with harvest year conditions 2005 when the real thermal balance hardly reaches 3100°C, number of insolation hours does not cross 1300 hours and the precipitations level is way cross 500 mm. In these conditions, the malic acid content, in total acidity respectively for the same analyzed grapes varieties is lower in the conditions of harvest year 2004, comparative with the same parameters registered in harvest year conditions 2005.

Table 2

Climatic conditions in the vegetation period (1 IV – 30 IX), years 2004, 2005 in Minis-Maderat Vineyard

Month	Real thermal balance (ºC)		Ilumination (insolation hours)		Precipitations (mm)	
	2004	2005	2004	2005	2004	2005
April	458,7	175,9	199,9	178,3	78,5	159,3
May	532,1	397,8	211,1	235,2	39,5	37,7
June	621,0	572,1	244,6	280,5	53,5	63,4
July	745,8	688,0	268,1	244,7	53,1	92,2
August	759,1	669,5	257,4	169,3	47,9	114,5
September	625,0	600,7	192,3	165,4	76,7	86,5
Total	3741,7	3104	1373,4	1273,4	349,2	553,6

Note: The data were given by the Meteorological Station of Cercetation-Development Resort for Viticulture and Vinification Minis.

Table 3

The variation in free malic acid content during maturation period of grapes and wines, in Miniș-Măderat, vineyard, harvest 2004

Variety	Determination *)	Analyze date						
		Grapes			Wine			
		16 VIII	23 VIII	30 VIII	6 IX	13 IX	23 IX	5 XI
1. Burgund mare	Acidity	13,23	9,11	7,44	6,96	5,78	4,96	4,55
	Malic acid	8,2	5,1	3,53	2,85	1,5	1,0	traces
2. Merlot	Acidity	14,40	9,41	6,46	6,02	4,31	4,22	3,95
	Malic acid	7,1	4,85	3,27	2,5	1,8	0,5	traces
3. Cabernet Saugvignon**	Acidity	19,79	13,2	11,0	9,59	6,22	5,65	4,20
	Malic acid	11,0	8,4	6,3	5,15	4,36	3,5	3,0
4. Oporto	Acidity	6,27	5,39	4,36	4,11	4,90	4,15	3,89
	Malic acid	3,7	2,26	1,7	1,3	1,0	0,5	traces
5. Pinot noir	Acidity	12,74	6,76	6,56	5,48	5,48	4,9	4,6
	Malic acid	6,3	3,86	3,05	1,75	1,5	1,0	traces
6. Cadarcă**	Acidity	18,03	11,2	8,53	8,52	6,07	6,0	5,97
	Malic acid	10,5	7,15	6,2	5,15	4,0	3,2	2,65
7.Blauerzweigelt	Acidity	11,27	7,79	6,66	6,12	5,14	4,45	3,90
	Malic acid	5,62	3,95	3,35	2,90	2,0	1,2	traces

*) Acidity is expressed in g/l sulphuric acid, malic acid is expressed in g/l, and total SO_2 in mg/l

**) Wines with unmade malolactic fermentation

From the analyzed varieties in the fall of year 2004 in Minis – Maderat vineyard, the highest content in malic acid at the beginning of maturation have the grapes from variety Cabernet Sauvignon (11,0 g/l) which present a high total acidity (19,79 g/l). The lowest content in malic acid at the beginning of maturation have the grapes from Oporto variety (3,7 g/l), which registers also a relative low total acidity in the determinations moment (6,27 g/l). At the end of maturation, the content in acid malic falls down until the value 0,5 g/l while after vinification hardly can be found traces of malic acid, fact that can be explained by the malolactic fermentation development.

On the other hand, the wines obtained from the variety grapes Cabernet Sauvignon and Cadarca register at the end of vinification process important contents in malic acid (2,65 – 3 g/l) due the fact that these wines did not succeed to have a maloalctic fermentation. It can be noticed that also at all analyzed varieties the malic acid decrease is more spectacular in the last week of August, after which follows a less sensitive decrease.

Table 4

The variation in free malic acid content during maturation period of grapes and wines, in Recaş vineyard, harvest 2004

Variety	Determination *)	Analyze date						
		Grapes		Wine				
		23 VIII	30 VIII	6 IX	13 IX	20 IX	30 IX	15 XI
1. Burgund mare**	Acidity	14,4	10,2	8,65	7,8	6,20	5,90	5,65
	Malic acid	9,3	6,4	4,65	3,75	3,0	2,15	1,0
2. Merlot	Acidity	16,8	9,45	7,21	6,15	4,75	4,55	4,12
	Malic acid	8,3	6,12	4,27	3,68	2,66	1,5	traces
3. Cabernet Saugvignon**	Acidity	18,6	14,8	10,2	8,57	6,12	6,0	5,85
	Malic acid	10,5	8,7	6,52	5,26	4,23	3,0	2,6
4. Oporto	Acidity	8,28	7,12	5,26	4,90	4,55	4,27	4,0
	Malic acid	4,83	2,81	1,66	1,24	0,97	0,4	traces
5. Pinot noir	Acidity	13,9	8,21	6,86	5,88	5,1	4,88	4,32
	Malic acid	7,1	4,96	4,02	1,63	1,29	0,8	traces

From the analyzed varieties in the fall of year 2004 in Recas vineyard, the highest content in malic acid at the beginning of maturation have the grapes from variety Cabernet Sauvignon (10,5 g/l) which present a high total acidity (18,6 g/l). The lowest content in malic acid at the beginning of maturation have the grapes from Oporto variety (4,83 g/l), which registers also a relative low total acidity in the determinations moment (8,28 g/l).

The wines obtained from the grapes varieties Cabernet Sauvignon and Burgund mare, register at the end of vinification process important contents in malic acid (1 – 2,6 g/l) due the fact that these wines did not succeed to have a malolactic fermentation.

The results registered in Recas vineyard are similar with those registered in Minis vineyard, the same variety Cabernet Sauvignon manifesting a more pronounced acidity and a higher malic acid content. Thus, in Recas, the Burgund mare variety, through its high total acidity and consistence in malic acid proves to be more “difficult” to start and finish the malolactic fermentation .

Table 5

The variation in free malic acid content during maturation period of grapes and wines, Miniş vineyard, harvest 2005

Variety	Determination*)	Analyze date						
		Grapes					Wine	
		22 VIII	29 VIII	5 IX	12 IX	21 IX	1 X	15 XI
1. Burgund mare**	Acidity	14,21	9,1	8,13	7,44	6,44	5,95	5,20
	Malic acid	9,5	6,2	4,55	3,90	3,5	3,5	3,1
2. Merlot	Acidity	13,47	11,3	9,21	8,42	5,83	4,60	4,20
	Malic acid	8,2	5,95	4,15	3,5	2,8	1	0,5
3. Cabernet** Saugvignon	Acidity	18,13	14,5	12,25	9,1	6,75	6,25	6,15
	Malic acid	12,1	9,2	7,1	6,25	5,0	4,75	4,5
4. Oporto	Acidity	9,70	8,23	6,46	5,14	4,95	4,10	3,90
	Malic acid	4,8	3,25	2,9	2,3	2,0	0,5	traces
5. Pinot noir	Acidity	12,44	9,31	7,54	7,05	5,39	4,55	4,00
	Malic acid	7,1	4,95	4,00	2,85	2,5	1	traces
6. Cadarcă**	Acidity	16,26	12,2	10,29	8,91	5,88	5,70	5,50
	Malic acid	11,5	8,12	6,7	5,25	4,2	4	3,75
7.Blauerzweigelt	Acidity	10,29	8,5	7,35	6,75	5,29	4,80	3,90
	Malic acid	6,32	4,90	4,45	4,11	3,75	2,1	traces

From the analyzed varieties in the fall of year 2004 in Minis vineyard, the highest content in malic acid at the beginning of maturation is found at the grapes from variety Cabernet Sauvignon (12,1 g/l) which present a high total acidity (18,13 g/l). The lowest content in malic acid at the beginning of maturation have the grapes from Oporto variety (4,8 g/l), which registers also a relative low total acidity in the determinations moment (9,70 g/l). At the end of maturation, the content in acid malic falls down until the value 2 g/l while after vinification process, hardly can be found traces of malic acid, fact that can be explained by the malolactic fermentation development. On the other hand, the wines obtained from the variety grapes Cabernet Sauvignon, Burgund mare and Cadarca register at the end of the vinification process important contents in malic acid (3,1 – 4,5 g/l) due the fact that these wines did not succeed to have a maloalctic fermentation. It can be noticed that also at all analyzed varieties that in climatic conditions of harvest year 2005 grapes retain a higher quantity of malic acid at the end of maturation and during vinification process, comparative with harvest year 2004.

From the analyzed varieties in the fall of year 2005 in Recas vineyard, the highest content in malic acid at the beginning of maturation have the grapes from variety Cabernet Sauvignon (11,7 g/l) which present a high total acidity (17,2 g/l). The lowest content in malic acid at the beginning of maturation have the grapes from Oporto variety (5,88 g/l), which registers also a relative low total acidity in the determinations moment (9,2 g/l). The wines obtained from the grapes varieties Cabernet Sauvignon, Merlot and Burgund mare, register at the end of vinification process important contents in malic acid (2 – 2,48 g/l) due the fact that these wines did not succeed to have a malolactic fermentation. It can be noticed that also at all analyzed the decrease of malic acid content is more spectacular in the first week of September after which follows a less sensitive decrease. At Recas and also Minis, the 2005 year proves to be difficult for starting the malolactic fermentation at most wines because of total acidities too high and high contents of malic acid in grapes.

Table 6

The variation in free malic acid content during maturation period of grapes and wines, Recaş vineyard, harvest 2005

Variety	Determination*)	Analyze date						
		Grapes					Wine	
		29 VIII	5 IX	12 IX	19 IX	26 IX	6 X	15 XI
1. Burgund mare**	Acidity	14,6	9,5	9,3	8,6	7,6	7,1	6,65
	Malic acid	10,4	7,2	5,85	4,62	4,05	3,25	2,77
2. Merlot**	Acidity	15,4	11,6	11,2	8,2	6,4	6,0	6,0
	Malic acid	9,6	7,26	5,39	4,53	3,55	2,7	2,0
3. Cabernet Saugvignon**	Acidity	17,2	13,6	12,3	7,0	6,35	6,0	6,0
	Malic acid	11,7	9,8	7,59	6,33	5,19	3,96	2,84
4. Oporto	Acidity	9,2	7,2	6,7	5,8	4,9	4,27	4,0
	Malic acid	5,88	3,96	2,54	1,22	1,1	0,6	traces
5. Pinot noir	Acidity	14,7	12,8	10,2	9,9	6,2	5,88	5,32
	Malic acid	8,3	6,13	4,95	2,67	1,57	0,73	traces

CONCLUSIONS

From the made experiments to follow the malic acid evolution in grapes and wines obtained in Minis and Recas vineyards we can conclude:

- climatic conditions influence the malic acid accumulation in grapes and its evolution during maturation; in harvest years 2005 (rich in precipitations, with a real thermal balance relatively low, low number of insolation hours during vegetation period) a large amount of malic acid is accumulated at all studied varieties comparative with harvest year 2004;
- the massive accumulation of malic acid in grapes, in conditions of high acidity and low pH, determines an obstruction of malic acid degradation through spontaneous malolactic fermentation, during vinification period;
- there is a direct correlation between variety and content in malic acid of grapes; grapes from Oporto and Pinot noir variety accumulate at maturity, reduced quantities of malic acid, that can be degraded easily during the malolactic fermentation, while grapes from Cabernet Sauvignon and Cadarca in Minis varieties respectively Cabernet Sauvignon and Burgund mare varieties are "the first" in what concerns the malic acid content of grapes in maturity phase;
- the most important reduction of malic acid content during maturation period of grapes takes place at the end of August.

REFERENCES

1. Gheorghiță M., Băducă Câmpeanu C., Camelia Muntean, Giugea N., *Oenologie. Bazele industriei vinicole*, vol I, Editura Sitech Craiova, 2006, pp. 314-326.
2. Muntean Camelia, *Materii prime pentru industria vinicolă*, Editura Sitech Craiova, 2001, pp. 29 – 37.
3. Popescu-Mitroi I., *Studiul proceselor microbiologice şi biochimice care definesc fermentaţia malolactică la vinurile obţinute în podgoriile din vestul României*, Teză de doctorat, Universitatea din Craiova, 2008, pp 104-110.
4. Ţârdea C, *Dinamica acizilor tartric şi malic în timpul perioadei de maturare a strugurilor la principalele soiuri din podgoria Copou – Iaşi*, în *Industrie Alimentară*, 1964, pp. 264.
5. Ţârdea C., *Chimia şi analiza vinului*, Editura „Ion Ionescu de la Brad" Iaşi, 2007.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

BASIL FLAVORING OF THE SUNFLOWER OIL

Căpruciu Ramona[1]

KEY WORDS: volatile oils, sunflower, fats

SUMMARY

According to the data achieved due to many years of research programes on vegetable oils, the biomedical sciences concluded that oil is a strong preventive medicine , when it is enriched with nutrient elements , minerals and vitamins or organic substances, in various proportions.

Starting from these reasons this study traces the flavoring of the sunflower oil used in diverse preparation of traditional recipes with basil(ocimum basilicum), this plant being named " king of spices" by many chefs and gastronomic author (www.condimenteweb.ro). With this purpose have been realized determinations over the sunflower seeds and basil's flowers and leaves.

INTRODUCTION

Basil flavored sunflower oil is particularly used in alimentation for salad dressing but also for enriching the taste and smell of different roasts.

Sunflower is one of the most important oily plants cultivated on the planet (13% of the worldwide oil production) and the most important oily plant from Romania (L.S . MUNTEAN and col.-2001), lately being exploited by biochemists too because of the fat acids content (linoleic acid) prime for human alimentation.

The basil (Ocimum basilicum) represents a valuable aromatic species, also being considered an important medicinal species, being largely used in traditional medicine(as infusions in the treatment of asthma, whooping cough and intestine inflammation), as in the scientific medicine (in the treatment of some inflammatory processes of the respiratory ways, as an antispasmodic cure and as a stimulant of the neural system)-according to SILVICA AMBRAUS and col.-2006, ROMAN GH. V. and col.-2008, www.uleiurivolatile.ro.

MATERIAL AND METHOD

For this study have been used three sorts of sunflower seeds(unshelled, half-shelled and shelled) with the purpose of establishing the highest potential category in achieving the best quality oil. The determinations over the seeds consisted in the realization of organoleptic test, analysis of water content, brute protein and fat content- according to RACOLTA EMIL and col.-2002.

The organoleptic exam was achieved according to STAS 6256/80 and consisted in a subjective examination of the qualities of smell, taste, exterior aspect and in section. After the obtained results we noticed that the analyzed seeds did not show major imperfections.

[1] University of Craiova

The determination of humidity for sunflower seeds and basil leaves has been achieved by means of drying oven. The determination of brute protein content was realized according to STAS 21/b-73 with the Keldal method. The method consists in the mineralization of sunflower with H2SO4 in the presence of a catalyst, the alkalizing of the resulted substances from reaction, the distillation of the eliminated and titrated ammonia . It has been used the mineralization installation composed from Kedal flask connected at the distillation installation, a flask prop, a heating source .The reagents used in the reaction are: H2SO4, CuSO4, HCl. The results were mathematical interpreted and registered in the test report.

The fat determination (oil content) of the sunflower seeds was achieved by means of Soxhlet machine through extraction with light petroleum(according to STAS 8004-82). From the laboratory sample composed from seeds free of foreign mater, according to STAS 1608-75 was constituted, by reduction method, an analysis sample for 30 g.

Beside humidity determination, basil leaves as well as the flowers were subjected to the volatile oil extraction with a mixture of fats through pickling method.

The fat mixture used in this study was formed by 40% lard, 40% cattle tallow and 20% sunflower oil, this mixture being kept at a 60° C temperature during the determination period.

OBSERVATIONS AND DETERMINATIONS

The sunflower seeds are noticed through a high content of fats and protean substances. From table 1 we can notice that the analyzed sunflower seeds contain between 42,4% (unshelled seeds) and 53,2% (shelled seeds) grease(oil), conferring to the final product a high alimentary value.

Table 1

Chemical composition of the sunflower seeds

Chemical constituents (%)	Sunflower seeds		
	Unshelled	Half-shelled	Shelled
Water	11,0	11,8	12,2
Brute protein	19,6	20,1	24,3
Fat (oil)	42,4	45,3	53,2

The determined proteins from the sunflower seeds have a high biological value , their chemical composition includes all the essential amino acids. Table 1 shows a higher content of the shelled seeds of 24,3% towards the unshelled seeds (19,6%) as well as in the case of fats. The results show that in order to achieve an oil with a higher biological value it is necessary the shelling operation of the seeds in a percentage of 95-100%, in order to prevent the loss of essential substances. The half-shelled seeds have shown average values both for the fat content (45,3%) as well as for the brute protein (20,1%).

The water content of the oily seeds represents an important indicator particularly when it is necessary their unlimited storage. Once the seeds were shelled we notice, from table 1, a constant rise of the sunflower seeds' humidity (from 11,0% for unshelled seeds to 12,2% for shelled seeds). Though, this aspect also shows the storage of the unshelled oily seeds in ventilated storehouses with the possibility of daily intervention (ex. with the

shovel).The humidity of the basil leaves destined for chemical analysis must not exceed 10-12%, and the impurities(foreign plants) shall not exceed 2%. For the analysis have been used basil leaves and flowers from the upper part of the bush (figure 2). These were carefully gathered , in order not to harm them (avoiding the loss of the volatile oil). They were carefully examined to avoid the use of spotted, unhealthy or bug invaded leaves .

a

b

Figure 2 a- Basil leaves taken from the upper part of the plant , b- basil flowers

The year 2008 distinguishes through high temperatures fact that positively influenced the volatile oil quantity of the basil leaves and flowers.

It was noticed a greater quantity of volatile oil in the second decade of August (2,2 ml/kg), after that the volatile oil content decreased (1,6 ml in September), also because of the intense climatic changes-table 2 .

Table 2

Determination the volatil oil from basil in climatic conditions the year 2008

Constituents (%)	Calendaristic date				
Volatile oil (ml//Kg)	15.05.08	15.06.08	15.07.08	15.08.08	15.09.08
	0,4	1,2	1,8	2,2	1,6

According to this fact , the gathering of the basil destined for pharmaceutical, medical or alimentary industry must be done during the end of July and the entire August, mainly depending on the climatic factors .

CONCLUSIONS

By flavoring the sunflower oil with a common plant in our country's cultural tradition (basil) we wanted to achieve a flavored oil that could be considered a "medicine" prescribed in the prevention of many hard curable affections as : inchoate ulcer , neural asthenia, respiratory and heart diseases , also it decreases blood cholesterol.

From the oily seeds industrialization ´s point of view in order to achieve the best quality vegetable oil it is necessary the use of a material with a low percentage of unshelled seeds; broken, spotted seeds or bug infected seeds.

Once the seeds are shelled their humidity increases so it is recommended the storage of the unshelled oily seeds in well ventilated storehouses, if they are not immediately used . If the seeds are introduced after the quantity and quality reception in the

technological process it is recommended that the seeds to be shelled or half-shelled because has been noticed a superior percentage of fat and brute protein.

Knowing the climatic conditions of the harvest year, of the cultivation system and the used techniques , the healthy basil leaves and flowers destined to alimentary , pharmaceutical or medical industry can be used when the level of the volatile oil is at the highest potential.

Knowing these aspects corroborated with the positive effects of the active principles of the volatile oil extracted from the basil, make the flavored sunflower oil a ”food-oil” that can successfully participate to the smell improvement of various aliments as well to the treatment of some diseases.

BIBLIOGRAPHY

1. Ambăruş Silvica, Barbu Iuliana, Brezeanu Creola, Stan Nistor- Cercetări privind cultura biologica a busuiocului (*Ocimum basilicum*) , Lucrare simpozion stiintific U.S.A.M.V. Iasi-2006
2. Racolţa Emil, Crina Muresan – Tehnologia uleiului si margarinei. Caiet de lucrări practice. Editura AcademicPres, Cluj-Napoca, 2002
3. Roman Gheorghe Valentin, Maria Toader, Lenuta Iuliana Epure, Viorel Ion, Adrian Gheorghe Băla- Cultura plantelor medicinal si aromatice în system ecologic. Editura Ceres, Bucuresti, 2008
4. Muntean Leon Sorin, Ioan Borcean, Mihail Axinte, Gheorghe Valentin Roman- Fitotehnie. Editura ,,Ion Ionescu de la Brad,, Iasi-2001
5. www.condimenteweb.ro
6. www.uleiurivolatile.ro

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

THE STUDY OF THE TECHNOLOGICAL POTENTIAL OF SAUVIGNON VARIETY PLANTED IN DRĂGĂŞANI VINEYARD, IN RELATION TO THE AREA AND VARIETAL BIOTYPE

Cocoş M., Gheorghiță M., Popa A.[1]

KEY WORDS: variety, biotype, grape, glucides, flavors

ABSTRACT

Sauvignon Variety planted in Drăgăşani vineyard shows an interesting production and quality potential, especially depending on the bioype. The area of crop and the viticulture year – with the weather conditions, they also put their mark on the technological potential of the two biotypes- Petit Sauvignon and Gros Sauvignon, installed some time ago in Drăgăşani vineyard. Petit Sauvignon Biotype shows a high quality potential and Gros Sauvignon biotype was evidenced by high productivity, but with a lower quality.

INTRODUCTION

Since the '60s - '70s from the recent concluded century, Sauvignon variety was evidenced by the quality of its wines made from its grapes, particularly the semidry and sweet ones. They displayed "massive", well balanced, and with a distinct flavor, expressive, clearly defined and sustainable over time chemical compositions. The exceptional genetic basis of Sauvignon variety was transferred and potentiated in the wines through systematic and high professional studies, both of potential and also of optimization the wine obtaining technology (Butănescu Gh - 1963, 1969). Oenological value of Sauvignon variety, planted in the different areas of Drăgăşani vineyard has been also mentioned after recent studies, that were done using modern means of investigation (Felicia Stoica - 2003; Nicolaescu C. - 2007; Băcanu Alina - 2009). The results of the researches were related to Sauvignon variety - in general – without any specific references to the two existing types in culture - Petit Sauvignon and Gros Sauvignon - with proportions in the favor of Gros biotype.

The study whose results are the subject of the present work aimed the potential of both biotypes, planted in two representative areas of Drăgăşani vineyard.

MATERIAL, METHOD, EXPERIMENTAL CONDITIONS

The researches were conducted in the viticulture years 2006, 2007 and 2008, having established as target the oenological potential of Petit Sauvignon and Gros Sauvignon planted in the center of Olt Hill and Greaca-Eforie Hills area, positioned 10 - 11 Km south to Olt Hill. In accordance with the methodologies adopted by ICVV, each year,

[1] Universitatea din Craiova

for both biotypes were monitored the growth and maturation process of the grapes, on the bases of the results being fixed the parameters of productivity and quality of the grapes at absolute maturity and technological maturity: grapes yield, the relative glucides and acidity contents; contents of terpenic flavors (total, free and combined in precursors).

Olt Hill is direct influence by the great accumulation of water from Olt River and Greaca-Eforie hills are decisively influenced by massive Eforie-Baneasa forests and also by Mamu and Dâlga streams. The main climatic conditions during the study are presented in Table 1. There is a warming trend of the area, with a particularly high average annual temperature in 2007 (12.7^0C), unprecedented, with continuous reduction of the rainfall and with the same continuous increasing of the sun exposure.

Table 1

The main climatic elements of Dragaşani vineyard (2006 – 2008 period)

Viticulture year	The average annual temperature – ^{0}C –	Precipitations Annual Σ – l/m^2 –	Sun shine Annual Σ – hours –
2006	10,90	768,5	2162,8
2007	12,70	688,5	2466,6
2008	11,95	571,6	2592,0

RESULTS AND DISCUSSION

The main technological parameters of the two biotypes, at absolute maturity and at the harvest moment are quantified in Table 2. The yields of grapes at absolute maturity, have also exceeded 9000 kg/ha at Gros Sauvignon and have never fallen below 8000 kg/ha, even in dry and very warm years, as 2007 and 2008.

In both centers, the grape yields of Petit Sauvignon have ranged from 6930 kg/ha and 7400 kg/ha, with averages around 7100 kg/ha, lower by 1000 - 1300 kg/ha comparatively to the averages recorded at Gros Sauvignon .

At technological maturity, the average grapes yields fell with 320 - 380 kg/ha which means 4.6 -5.4% at Petit Sauvignon and with 263 kg/ha (Olt Hill) and 400 kg/ha (Greaca-Eforie) at Gros Sauvignon, which means 3.2% and respectively 4.8%.

Relative glucides contents (g/l) at absolute maturity, had levels ranging from 205 g/l and 211 g/l at Petit Sauvignon and between 186 g/l and 193 g/l at Gros Sauvignon, with averages that were around 209 g/l at Petit Sauvignon and 190 g/l at Gros Sauvignon.

At technological maturity, due to the specified decreases of the yield, the glucides contents were ranged from 226 g/l and 232 g/l at Petit Sauvignon and between 209 g/l and 216 g/l at Gros Sauvignon, the concentrations recording increasings, as average 19,7 g/l (Olt Hill) and 20,2 g/l (Greaca-Eforie) – at Petit Sauvignon and 24,7 g/l (Olt Hill) and respectively with 21,0 g/l (Greaca-Eforie) – at Gros Sauvignon. The acidity content at absolute maturity, being ranged from 4,26 g/l and 4,86 g/l for Petit Sauvignon and between 4,85 g/l and 5,11 g/l for Gros Sauvignon, with averages of 4,41 g/l and respectively 4,70 g/l at Petit Sauvignon and of 4,94 g/l and respectively 4,99 g/l at Gros Sauvignon.

Between absolute and technological maturity acidity decreased, as averages to 4,04 g/l (Olt Hill) and up to 3,94 g/l (Greaca-Eforie) for Petit Sauvignon and to 4.43 g/l (Olt Hill) and respectively up to 4.41 g/l (Greaca-Eforie) for Gros Sauvignon.

The terpenic flavors potential of the grapes from the two biotypes are presented as values in Table 3.

Overall analysis shows the following:

- also at total flavors and even at their component fractions, free (TVL) and combined (TLP), for the same phenophase, in the both areas, the levels are higher at Petit Sauvignon;

- for the same biotype planted in the two areas, at all three categories of flavors, the differences are minor, at absolute maturity and also at technological maturity;

- to all types of terpenic flavors, the contents increase from absolute maturity to technological maturity

- warmer and sunnier years promote the biosynthesis of flavors, with a direct relationship between these developments and the glucides increases during the phenophases of grapes ripening.

The proportions of free and combined flavors, from the total terpenic flavors are quantified in Table 4. At absolute maturity, for the same viticulture area, both at the free flavors (TVL) and at the combined ones (TLP), the differences for the two biotypes are insignificant, from 0.5% in Olt Hill and 1.0% at Greaca-Eforie concerning the free flavors and with the same percentage at the combined flavors. At technological maturity, for both biotpes of the two centers, the fraction of combined flavors increases, reaching values of 26,3 – 26,5% for Petit Sauvignon and of 23,2 – 24,0% for Gros Sauvignon.

CONCLUSIONS

In very favorable for viticulture environmental conditions of Drăgăşani vineyard, Sauvignon variety "expresses" its oenological potential to a high level. In the vineyard's plantings there are the two biotypes - Petit Sauvignon and Gros Sauvignon.

For the same area of planting and the same viticulture year, Gros Sauvignon biotype produces grapes at least 1000 kg per hectare in addition to Petit Sauvignon.

For the same area of planting, the same viticulture year and the same phenophase of grapes ripening , Petit Sauvignon biotype appears with higher glucides and terpenic flavors contents and lower acidity contents than Gros Sauvignon.

Implementation of some plantations with the two biotypes, reasonably proportionate, will lead to beneficial results, both quantitatively and qualitatively.

Table 2

The main technological parameters of Sauvignon variety biotypes, planted in two areas of Drăgăşani vineyard

Vineyard Center (area)	Biotype	LV/M	Phenophases of maturity					
			Absolute maturity			Technological maturity		
			Grapes yield kg/ha	Glucides g/l	Acidity g/l H_2SO_4	Grapes yield kg/ha	Glucides g/l	Acidity g/l H_2SO_4
OLT HILL	Petit Sauvignon	LV	6930 – 7480	207 – 211	4,26 – 4,63	6530 – 7060	226 – 231	3,86 – 4,22
		M	7140	209,0	4,41	6757	228,7	4,04
	Gros Sauvignon	LV	8010 – 9070	186 – 193	4,85 – 5,02	7710 – 8810	212 – 216	4,36 – 4,51
		M	8400	189,0	4,94	8137	213,7	4,43
GREACA-EFORIE HILLS	Petit Sauvignon	LV	6870 – 7400	205 – 211	4,55 – 4,86	6510 – 7025	227 – 232	3,88 – 4,02
		M	7095	208,6	4,71	6775	229,7	3,94
	Gros Sauvignon	LV	7905 – 8960	186 – 193	4,90 – 5,11	7675 – 8310	209 – 213	4,22 – 4,62
		M	8355	190,0	4,99	7955	211,0	4,41

Table 3

The terpenic flavors potential of the grapes from Sauvignon variety biotypes, planted in the two centers of Drăgăşani vineyard (2006 - 2008)

Vineyard Center (area)	Biotype	LV/ M	Phenophases of maturity					
			Absolute maturity			Technological maturity		
			Total Flavors µg/kg boabe	Free Flavors (TVL) µg/kg grapes	Combined Flavors (TLP) µg/kg grapes	Total Flavors µg/kg grapes	Free Flavors (TVL) µg/kg grapes	Combined Flavors (TLP) µg/kg grapes
OLT HILL	Petit Sauvignon	LV	1255 – 1280	1050 – 1070	196 – 210	1502 – 1575	1090 – 1180	395 – 412
		M	1265	1062	204	1529	1124	405
	Gros Sauvignon	LV	1048 – 1196	875 – 1010	168 – 186	1293 – 1341	991 – 1030	295 – 321
		M	1135	959	176	1320	1014	306
GREACA-EFORIE HILLS	Petit Sauvignon	LV	1256 – 1275	1040 – 1070	203 – 216	1492 – 1610	1102 – 1205	390 – 422
		M	1266	1058	208	1545	1139	406
	Gros Sauvignon	LV	1067 – 1154	885 – 998	156 – 182	1325 – 1368	1005 – 1033	310 – 335
		M	1099	930	169	1340	1018	322

Table 4

The proportions of free and combined flavors in the grapes of Sauvignon variety biotypes (average 2006 - 2008)

Vineyard Center (area)	Biotype	Phenophases of maturity			
		Absolute maturity		Technological maturity	
		Free Flavors (TVL) µg/kg grapes	Combined Flavors (TLP) µg/kg grapes	Free Flavors (TVL) µg/kg grapes	Combined Flavors (TLP) µg/kg grapes
OLT HILL	Petit Sauvignon	84,0	16,0	73,5	26,5
	Gros Sauvignon	84,5	15,5	76,8	23,2
GREACA-EFORIE HILLS	Petit Sauvignon	83,6	16,4	73,7	26,3
	Gros Sauvignon	84,6	15,4	76,0	24,0

REFERENCES

1. Butănescu Gh. – „Sauvignon. Un tip de vin de mare perspectivă în podgoria Drăgăşani”, Garden, winery and orchard Magazine, No.5, 1963.
2. Butănescu Gh – „Caracteristicile de bază ale vinului Sauvignon de Drăgăşani, tip I demisec şi tip II dulce şi arealul tipizării lor în podgoria Drăgăşani”, Magazine of Horticulture and Viticulture, No. 12, 1969.
3. Stoica Felicia – „Studiul posibilităţilor tehnologice de obţinere a vinurilor aromate de tip VDOC în Podgoria Drăgăşani”, Doctoral Thesis, University of Craiova, 2003.
4. Nicolaescu C. – „Studiul potenţialului oenologic al arealului Dealul Banului-Strjeşti-Cârlogani din sudul podgoriei Drăgăşani”, Doctoral Thesis , University of Craiova, 2007.
5. Băcanu Alina – „Cercetări privind influenţa stadiului de maturare a strugurilor şi a factorilor de vinificaţie primară asupra compoziţiei şi calităţii vinurilor de Drăgăşani”, Doctoral Thesis , University of Craiova, 2009.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

FETEASCA ALBA – VARIETY WITH A REMARKABLE OENOLOGICAL POTENTIAL, IN DRAGASANI VINEYARD

Cocoş M., Gheorghiță M.[1]

KEY WORDS: variety, yield, glucides, acidity, composition

ABSTRACT

Feteasca alba autochthonous variety, important component of varieties from the center Transylvania and from the wellknown Cotnari vineyards, had and has a significant contributor to achieving high quality white wines. This variety "shows", also in Drăgăşani vineyard, an oenological potential equal or better than that achieved by Riesling italian, planted in most vineyards producing white wines. The yieds of grapes that are between 7500 and 8000 kg/ha and the exceptional quality of the wines, recommend Feteasca albă as one of the varieties with real values of oenological order even for Drăgăşani vineyard.

INTRODUCTION

Retention to expand Feteasca albă variety in Drăgăşani vineyard had as argument, its characteristic to produce grapes on the upper third of the strings of greater length, which in terms of vines planting in the system with replacement spigots and string, raises some problems. When adopting semihigh and high forms of cutting, the deficiency being charged is eliminated. Another aspect of "critic" was linked to lower acidity contents, problem which can be easily solved by establishing on scientifical basis the best time of harvest, taking into account that the variety shows also a certain earliness from other varieties of the assortment.

The studies and researches carried out in other vineyards, some with equal or even lower conditions to Drăgăşani, showed that Feteasca albă had a potential, especially of quality order, that is worth to be taking into account (Macici M. and col. - 1962; Lepădatu V. and col. - 1962).

MATERIAL AND METHOD

Researches on potential of Fetească albă were made during the years 2006 - 2008, being taking into account the areas where this one is planted together with Riesling italian, areas that are located in the center of the Drăgăşani vineyard.

According to the official methodology, it was studied the ripening process of the grapes, by the developments of the grapes weight and the relative glucides and acidity

[1] University of Craiova

contents. With the results it were established the levels of productivity, yield and quality parameters of the grapes, at absolute and technology maturity.

The wines were obtained by strictly applying the technologies of primary wine-making, for both varieties, and the physic-chemical and organoleptic analysis of these were performed using the OIV rules.

RESULTS AND DISCUSSION

In Table 1 are listed the results of quality and productive potential of varieties.

At absolute maturity, during the experimental cycle, the glucides contents ranged from 189 g/l and 197 g/l, with an average of 194 g/it for Riesling italian and between 201 g/l and 206 g/l, with an average of 203 g/l for Fetească albă. Concerning the acidity, the relative contents were in favor of Riesling italian variety, being located between 4,96 g/l and 5,06 g/l with an average of 5,01 g/l, compared to those between 4,55 g/l and 4,83 g/l, with an average of 4,71 g/l at Fetească albă.

Table 1

The main technological parameters of varieties to absolute maturity and technological maturity (2006 - 2008)

Variety	Viticulture year	Absolute maturity				Technological maturity			
		Glucides g/l	Acidity g/l H_2SO_4	Yield of grapes kg/ha	Calendar Date	Glucides g/l	Acidity g/l H_2SO_4	Yield of grapes kg/ha	Calendar Date
Riesling italian	2006	189	5,06	8635	5-6 IX	208	4,41	8190	24-25 IX
	2007	197	5,02	7826	1-2 IX	203	4,20	7560	26-27 IX
	2008	196	4,96	7640	1-3 IX	207	4,26	7340	23-24 IX
	Average	194	5,01	8034	-	206	4,30	7697	-
Fetească albă	2006	202	4,83	7930	1-2 IX	216	4,10	7660	18-19 IX
	2007	206	4,75	7680	30-31 VIII	219	3,98	7330	15-16 IX
	2008	201	4,55	7610	30-31 VIII	220	4,08	7305	14-15 IX
	Average	203	4,71	7740	-	218	4,05	7432	-

At this phenophase, grape yields were higher at Riesling italian comprising an average of 8034 kg/ha, comparatively to 7740 kg/ha at Fetească albă. These data were obtained under conditions to achieve absolute maturity earlier with 3 -5 days, at Fetească albă.

Between absolute and technological maturity (harvest), the glucides contents have evolved to levels of between 203 g/l and 208 g/l, with an average of 206 g/l for Riesling italian and between 216 g/l and 220 g/l, with an average of 218 g/l, for Fetească albă. The acidity decreased at both varieties, recording contents ranging from 4,20 g/l and 4,41 g/l, with an average of 4,30 g/l for Riesling italian and between 3,98 g/ l and 4,10 g/l, with an average of 4,05 g/l, at Feteasca albă.

Considering the average yields, these have decreased by 337 kg/ha, which means 4,2% at Riesling italian and by 308 kg/ha, which is 4,0% at Feteasca albă. It is clear that technological maturity occurred earlier, with 7-10 days for Feteasca albă.

On the basis of the grapes yieds, the output of primary winemaking and relative glucides contents were determined: the volume of must for fermentation (l/ha), the amount of fermentable glucides (kg/ha), the amount of obtained alcohol (l/ha) - Table 2.

Table 2

The main parameters of the output of grapes, at technological maturity - the average 2006 - 2008

Varieties	Yield of grapes kg/ha	Output of must l/100 kg grapes	Must l/ha	Glucides kg/ha	Alcohol l/ha
Riesling Italian	7697	70,1	5396	1112	654
Fetească albă	7432	71,9	5343	1165	685

The quantity of must was higher at Riesling italian (53 l/ha). However, due to the relative content of glucides, Feteasca albă variety exceded Riesling italian, both at the amount of glucides subject to fermentation and also at alcohol (l/ha).

The data contained in Table 3 means that both varieties are "able" to produce, in Drăgăşani vineyard, high quality white wines. But there is observed a certain superiority of Feteasca albă, concerning the contents of: alcohol (with 0,66% vol), glycerol (with 0,39 g/l), extract (0,7 g/l), ash (0,1 g/l), tasting notes (0,6 points). But acidity is lower at Feteasca albă (with 0,27 g/l H_2SO_4).

Table 3

Main parameters of the composition of wines and the tasting notes (average 2006 - 2008)

Varieties	Alcohol %vol.	Acidity totală g/l H_2SO_4	Glycerol g/l	Unreduced Extract g/l	Ash g/l	Tasting note
Riesling Italian	12,05	4,38	8,96	18,4	1,72	18,60
Fetească albă	12,71	4,11	9,35	19,1	1,84	19,20

CONCLUSIONS

- Feteasca albă variety shows in Drăgăşani vineyard a productive potential located near the one developed by the other varieties for high quality white wines from the assortment.

- Even at absolute maturity, in similar conditions to the years of study, wines with alcohol degrees around 12,0% vol. can be obtained, and also with a good acidity, of more than 4,5 g/l.

- By picking up the grapes at over-ripening (not too advanced), it is possible to obtain fine, extremely pleasant, with a well balanced chemical composition and with great tasting appreciation wines.

REFERENCES

1. Macici M., Popa Elena, Ghilaciu Margareta, Bivolaru Mihaela - „Maturarea strugurilor la principalele soiuri în podgoria Pietroasele", Scientific papers ICHV, vol.V, page.685-696, 1962.
2. Lepădatu V., Bellu O., Basamac C., Popa Ecaterina, Macici M., Mujdaba F., Mihalca A., Giosanu T., Taraş Sofia, Butănescu Gh., Sandu-Ville Gabriela – „Stabilirea momentului optim de recoltare a strugurilor în principalele podgorii din România", Scientific papers ICHV, Vol.V, page.747-762, 1962.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

[6]-GINGEROL CONTENT AND BIOACTIVE PROPERTIES OF GINGER (*ZINGIBER OFFICINALE*) EXTRACTS FROM SUPERCRITICAL CO_2 EXTRACTION.DOCUMENTAR STUDY.

Claudiu Nicolae Şimonaţi[1]

KEY WORDS: [6]-gingerol, ginger extract, supercritical CO_2 extraction, bioactive properties

ABSTRACT

Ginger (Zingiber officinale Roscoe) is one of the most widely used herbs that contains several interesting bioactive constituents and possesses health promoting properties. [6]-gingerol, a major pungent ingredient of ginger, also has great potent antioxidant activity. Monitoring of [6]-gingerol content during drying process, ginger extraction with supercritical CO_2 and bioactive properties analyses of extracts were performed. Fresh mature ginger rhizomes with 94.17 ± 0.16% moisture content were dried using a rotary air dryer at 55 ± 2°C for 11 hours to achieve moisture content of 11.54 ± 0.29%. After drying process, [6]-gingerol content of ginger rhizome was reduced from 21.15 ± 0.13 to18.81 ± 0.15 mg/g dry weight basis. Dried gingers were pulverized to coarse powder approximately 0.5 mm diameter prior to extraction. The supercritical CO_2 extraction of ginger was undertaken with two conditions of 200 bar at 35°C and 230 bar at 40°C. The result showed that the extracts from both conditions; 200 bar at 35°C and 230 bar at 40°C, had [6]-gingerol contents of 238.94 ± 0.79 and 170.50 ± 0.45 mg/g extract, total phenolic contents of 183.96 ± 1.25 and 126.04 ± 0.72 mg gallic acid/g extract, respectively. In addition, the ginger extracts showed antioxidant activities using DPPH (1,1-Diphenyl-2-picrylhydrazyl) radical scavenging assay, compared with BHT standard, expressed as EC_{50}, were 13.09 ± 1.77 and 26.68 ± 1.76 μg/ml, respectively. Whereas their antioxidant activities using ABTS (2,2'-azinobis [3-ethylbenzothiazoline-6-sulfonic acid]) radical cation scavenging assay were 813.33 ± 6.67 and 724.44 ± 7.70 μmol Trolox/g extract, respectively.

INTRODUCTION

Ginger (*Zingiber officinale* Roscoe) is one of the most widely used herbs and food-flavoring agent. Its neutraceutical properties have been interesting in food processing and the pharmaceutical industries. The volatile essential oils contributing to the characteristic flavor of ginger, varies from 1.0-3.0%. While the oleoresin, responsible to the pungent flavor of ginger, varies from 4.0-7.5% and also possesses substantial antioxidant activity (Balachandran *et al.,* 2006). [6]-gingerol (structure shows in Figure 1) is the most abundant constituent of fresh ginger but it decreases during postharvest storage and processing especially thermal processing (He *et al*., 1998; Zhang *et al*., 1994). The typical extractions of ginger, such as steam distillation or solvent extraction rather have several drawbacks, such as time consuming and employing large amounts of chemical solvent. Recently, the

[1] Germisara Hotel Resort&SPA****,Geoagiu Băi,Hunedoara

supercritical fluid extraction plays an important role in extraction process of natural product which can produce extracts that free from residues. In addition, it can be conducted at a moderate temperature, which is necessary to remain the thermal-sensitive components intact. Carbon dioxide (T_C = 31.05 °C, P_C = 73.8 bar) is the most frequently used solvent for this extraction because of its practical advantages, such as nontoxic, moderate critical temperature and easy separating after depressurization. Furthermore, extracts from the supercritical carbon dioxide (SC-CO_2) extraction can be regarded as all natural with the GRAS status for food applications (Diaz-Reinoso *et al.,* 2006).

The objectives of this study were to monitor [6]-gingerol content during drying process of fresh ginger, to extract [6]-gingerol from dried ginger by using the SC-CO_2 extraction and to determine the bioactive properties of ginger extracts.

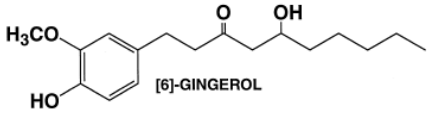


Figure 1 Chemical structure of [6]-gingerol (5-hydroxy-1-(4′hydroxy-3′-methoxyphenyl)-3-decanone)

MATERIALS AND METHODS

Materials

Fresh mature ginger rhizomes were harvested at the age between 10-12 months with the weight in the range from 100-200 grams per rhizome and purchased from Dobrogea Region.

Methods

1. Material preparation

Fresh mature ginger rhizomes were graded, washed through with tap water, peeled and cross-sectional cut into 2 ± 1 mm thickness.

2. Drying of fresh mature ginger

Cut ginger samples were dried in an air dryer at 55 ± 2°C to achieve 10-12% moisture content. During drying for 0, 3, 6, 9 and 11 hours, samples were taken for the analyses of [6]-gingerol content and bioactive properties.

3. SC-CO_2 extraction of ginger

Dried ginger samples were pulverized and sieved through 35/40 mesh (approximately 0.5 mm diameter) prior to extraction with SC-CO_2 lab scale (5L/42MPa Equipment, Masson new separation technology, China). Two extraction conditions, 200 bar at 35°C and 230 bar at 40°C, were performed. 1,000 g of ground ginger were used for each experiment and packed into stainless steel column (column capacity 2 kg dry weight). CO_2 (>99.5% purity) was used as extraction solvent. The oleoresin extracts were collected, and at proximately 10 min extraction time, the extracts were taken for analyses of [6]-gingerol content and bioactive properties.

4. [6]-gingerol and bioactive property analyses

4.1. [6]-gingerol content

The contents of [6]-gingerol were analyzed by high performance liquid

chromatography (HPLC 1100, Agilent, Germany) equipped with a reversed phase column C18 (Hypersil®ODS 250 mm x 4.0 mm i.d., 5 μm), Elution was isocratic using a mixture of HPLC grade acetonitrile and water (55:45 v/v) flow rate 1.0 ml/min, temperature 30°C. Detector was the Variable Wavelength Detector (VWD) set at 282 nm. The compound was identified and quantified based on retention time using [6]-gingerol as HPLC external standard. 10 g of cut ginger were blended with 50 ml methanol (HPLC grade) by electrical blender for 1 min and centrifuged at 5,000 rpm for 5 min. The supernatant was subsequently filtered through a 0.20 μm Nylon membrane filter (Whatman, England). A 20 μl ginger extract was subjected into HPLC for the [6]-gingerol analysis.

4.2. Antioxidant activities

The antioxidant activities were determined with two radical scavenging assays: DPPH (1,1-Diphenyl-2-picrylhydrazyl) radical scavenging assay and ABTS (2,2′-azinobis [3-ethylbenzothiazoline- 6-sulfonic acid]) radical cation scavenging assay. DPPH assay was performed according to the method of Yamasaki *et al.* (1994).

Results were expressed as EC_{50} (Efficient Concentration, the amount of sample (μg) needed for 50% decreasing in the initial DPPH concentration per 1.0 ml of initial solution) and BHT was used as a standard (EC_{50} = 13.82 ± 0.38 μg/ml). ABTS (2,2′-azinobis [3-ethylbenzothiazoline-6-sulfonic acid]) radical cation scavenging assay was conducted according to the method of Re *et al.* (1999), compared with Trolox standards (final concentration 0-15 μM) in ethanol. The higher the value of μmol Trolox meant the stronger the antioxidant activity. Results were expressed as μmol Trolox/g extract.

4.3. Total phenolic content

Total phenolic content was determined by the Folin–Ciocalteu method (Miliauskas *et al.*, 2004) and gallic acid (final concentration 0-8 μg/ml) was used as a standard. Results were expressed as mg gallic acid/g extract.

5. Statistical analyses

The experimental design was a Complete Randomized Design (CRD). Data were analyzed and expressed as Means ± standard deviation using paired T-test to determine statistically significant differences at the $P \leq 0.05$. All analyses were conducted using SPSS for Window Version 12.0.

RESULTS AND DISCUSSION

1. Determination of [6]-gingerol content and bioactive properties of fresh and dried ginger

The amounts of [6]-gingerol from fresh and dried ginger is shown in Table 1. [6]-gingerol was the major ginger oleoresin. Molecular structure of gingerol consisted of β-hydroxyl keto functional group which was thermally labile.

The thermal degradation products of [6]-gingerols including shogaols and aliphatic aldehydes possibly occured during the drying process (Zhang *et al*., 1994; Bhattarai *et al.*, 2001). As a result, dried ginger had less in the amount of [6]-gingerol compared to fresh one.

The moisture content, [6]-gingerol and the bioactive properties of fresh and dried ginger including the total phenolic content (mg gallic acid/g extract), antioxidant activities as assay by DPPH (EC_{50}, μg/ml) and ABTS (μmol Trolox/g extract) are shown in Table1.

Dried ginger showed the antioxidant activity significantly ($P \leq 0.05$) higher than that of fresh ginger. The antioxidant activities of fresh and dried ginger, determined by DPPH assay, expressed as EC_{50}, were 64.60 ± 0.18 and 32.95 ± 1.32 μg/ml, respectively.

While ABTS assay of fresh and dried ginger were 169.06 ± 3.96 and 403.71 ± 7.24 μmol Trolox/g extract and total phenolic contents were 24.63 ± 0.43 and 59.80 ± 0.14 mg gallic acid/g extract, respectively.

The results indicated that drying process of ginger caused significant increase in the total phenolic content contributing to stronger in the antioxidant activity. The decrease in the amount of [6]-gingerol during drying process was observed, in contrast to the amount of total phenolic content and antioxidant activity. In addition, Kikuzaki and Nakatani (1993) reported that thermal degradation products of gingerols such as shogaols and zingerones also exhibited in antioxidant activity.

Table 1

Chemical and bioactive properties of fresh and dried ginger

Chemical and bioactive properties	Materials	
	Fresh ginger	Dried ginger
Moisture content (%)	94.17 ± 0.16[a]	11.54 ± 0.29[b]
[6]-gingerol content (mg/g dry weight basis)	21.15 ± 0.13[a]	18.81 ± 0.15[b]
Total phenolic content (mg gallic acid/g extract)	24.63 ± 0.43[b]	59.80 ± 0.14[a]
EC_{50} (μg/ml)[1]		
ABTS assay (μmol Trolox/g extract)	64.60 ± 0.18[a]	32.95 ± 1.32[b]
	169.06 ± 3.96[b]	403.71 ± 7.24[a]

2. Changes of [6]-gingerol content during drying process

Fresh mature ginger rhizomes contained the initial moisture content of 94.17 ± 0.16% were dried in an air dryer at 55 ± 2°C for 11 hours to achieve moisture content of 11.54 ± 0.29%.

Changes of [6]-gingerol content during drying process are shown in Figure 2. The results showed that [6]-gingerols decreased gradually as the drying time increased. The amount of [6]-gingerol was decreased from 21.15 ± 0.13 to 18.81 ± 0.15 mg/g dry weight basis.

The results also implied that drying process contributed to the reduction in [6]-gingerol content. Dried ginger contained lower [6]-gingerol content than that of fresh ginger (based on dry weight basis).

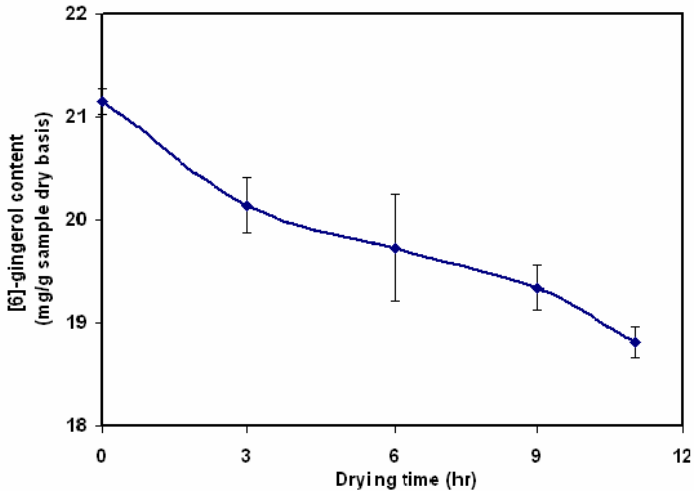


Figure 2 Changes of [6]-gingerol contents during drying process at 55 ± 2°C

3. Determination of [6]-gingerol content and bioactive properties of ginger extract from SC-CO_2 extraction

Chemical and bioactive properties of ginger extracts from SC-CO_2 extraction are shown in Table 2. It was found that SC-CO_2 extraction provided the ginger extracts contained great amounts of [6]-gingerols.

The extracts from the condition at 200 bar and 35°C had significantly ($P \leq 0.05$) greater in the amount of [6]-gingerol than that at 230 bar and 40°C. The extraction condition at 230 bar and 40°C also contributed to less in the amounts of [6]-gingerol and total phenolic content.

The extracts obtained from 200 bar at 35°C and 230 bar at 40°C, had antioxidant activity with DPPH method, expressed as EC_{50} were 13.09 ± 1.77 and 26.68 ± 1.76 μg/ml, respectively, compared to BHT standard 13.82 ± 0.38 μg/ml.

The antioxidant activity with ABTS method, expressed as μmol Trolox were 813.33 ± 6.67 and 724.44 ± 7.70 μmol Trolox/g extract, respectively. This study found that the extracts remained high phenolics and high antioxidant activities.

The ginger extracts produced from SC-CO_2 extraction were also free from chemical solvent leading to great advantage in application as functional ingredients for food industry.

Table 2

Chemical and bioactive properties of ginger extracts from SC-CO_2 extraction

Chemical and bioactive properties	Ginger extracts from SC-CO_2 extraction	
	200 bar, 35°C	230 bar, 40°C
[6]-gingerol content (mg/g extract)	238.94 ± 0.79[a]	170.50 ± 0.45[b]
Total phenolic content (mg gallic acid/g extract)	183.96 ± 1.25[a]	126.04 ± 0.72[b]
EC_{50} (μg/ml)	13.09 ± 1.77[b]	26.68 ± 1.76[a]
ABTS assay (μmol Trolox/g extract)	813.33 ± 6.67[a]	724.44 ± 7.70[b]

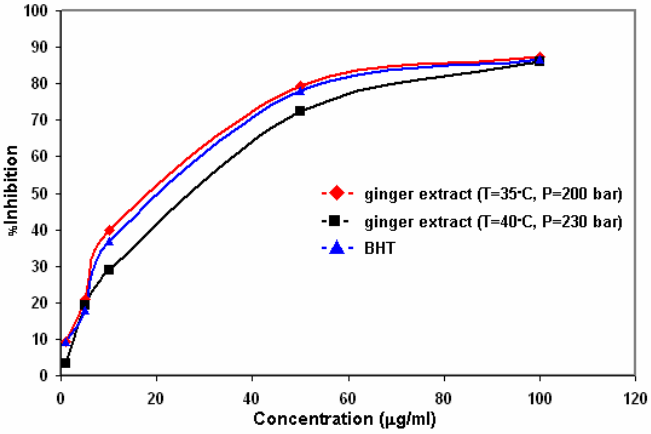


Figure 3 % inhibition of ginger extracts from SC-CO_2 extraction, based on DPPH scavenging method (compared with BHT standard).

Figure 3 shows changes in % inhibition (the percentage inhibition of DPPH radical) of ginger extracts from SC-CO_2 extraction, based on DPPH scavenging method using BHT as a standard. Ginger extracts from SC-CO_2 extraction at 200 bar and 35°C had higher in %inhibition than that at 230 bar and 40°C. At the concentration of 100 µg/ml, ginger extract from 200 bar at 35°C showed 87.29% on inhibiting DPPH radicals while ginger extract from 230 bar at 40°C had 86.85% inhibition and was comparable to 85.99% inhibition of BHT standard. The HPLC chromatograms of [6]-gingerol from fresh ginger and extracts obtained from SC-CO_2 extraction are shown in Figure 4. The retention time of [6]-gingerol as shown on chromatograms varied from 4.2-4.3 minutes.

CONCLUSIONS

Drying process affected on the [6]-gingerol contents. As the drying time increased the amount of [6]-gingerols was decreased. The ginger extract from SC-CO_2 extraction at 200 bar and 35°C had [6]-gingerol content, and its bioactive activities greater than those at 230 bar and 40°C. The SC-CO_2 extraction is great alternative extraction process providing the extracts contained high bioactive properties.

REFERENCES

1. King, J. W., et al., The 4th International Symposium on Supercritical Fluids, Sendai, Japan, 1997, p. 833
2. Reverchon, E., The 4th International Symposium on Supercritical Fluids, Sendai, Japan, 1997, p. 839
3. Stahl, E., Quirin, K.W., Gerard, D., "Verdichtete Gase zur Extraktion und Raffination", 1987, Spinger-Verlag
4. Nguyen, U., et al., US Patent #5,017,397, May 21st. 1991.
5. Nguyen, U., et al., US Patent #5,120,558, June 9th. 1992.
6. Yao, J., Nair, M.G., Chandra, A., J. Agric. Food Chem, 42, 1994, p. 1303
7. Chen, C., Kuo, M., Wu, C., Ho, C., J. Agric. Food Chem, 34, 1986, p. 477
8. Badalyan, A.G., Wilkinson, G.T., Cheen, B.S., The 4th International Symposium on Supercritical Fluids, 1997, Sendai, Japan, p.183

9. Pellerin, P., The International Symposium on Supercritical Fluids, Nice, France,1988, p. 677
10. Sankar, K.U., Manohar, B., The International Symposium on Supercritical Fluids, Nice, France, 1988, p. 807
11. Z. Knez et al., The 2nd International Symposium on Supercritical Fluids, Boston, Massachusetts, 1991, p. 101

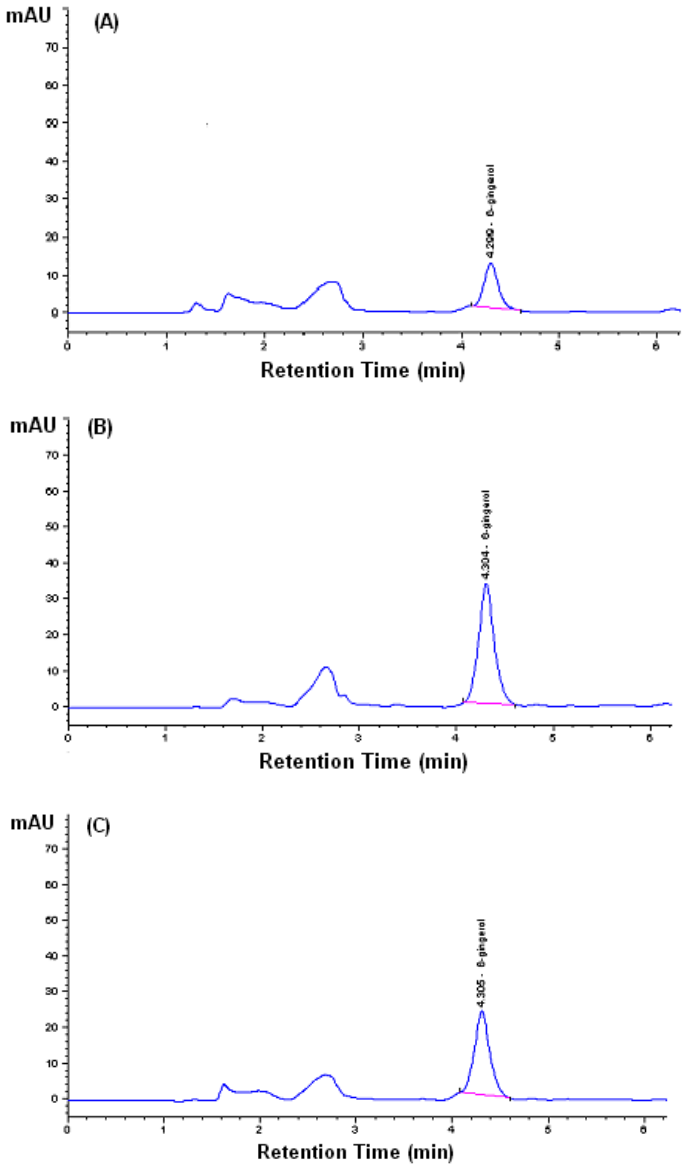


Figure 4 The HPLC chromatogram of [6]-gingerol (A) fresh ginger, (B) ginger extract from SC-CO_2 extraction (T = 35 °C, P = 200 bar) and (C) ginger extract from SC-CO_2 extraction (T = 40 °C, P = 230 bar)

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

EFFECT OF GAMMA IRRADIATION ON CHEMICAL PROPERTIES OF CURCUMA PIGMENTS

Claudiu Nicolae Şimonaţi[1]

KEY WORDS: carotene glycosides, chromatography, high–performance liquid

ABSTRACT

Changes in coloring properties of curcuma after γ- irradiation at doses of 2.5 and 5 KGy (necessary for microbial decontamination) were investigated.

Carotene glycosides that impart color to the spice were isolated by solvent extraction and then subjected to high–performance liquid chromatography (HPLC).

Fractionation of the above pigments into aglycon and glycosides was achieved by using ethyl acetate and n-butanol, respectively.

Analysis of these fractions by HPLC revealed a decrease in glycosides and an increase in aglycon content in irradiated samples. The possibility of degradation of pigments during gamma irradiation is discussed.

INTRODUCTION

Curcuma (*Curcuma longa* L.) is the most expensive spice widely used for its aroma and coloring properties. It has been used as a sedative and analgesic in traditional medicinal preparations (Rios et al., 1996; Sampathu et al., 1984) and has recently been shown to have distinct anticancer activities (Rios et al., 1996; Nair et al., 1991).

The coloring property of the spice is attributed mainly to its water-soluble carotenoids, the curcumin.

Various analytical separation techniques such as thin–layer chromatography, high – performance liquid chromatography (HPLC), and gas chromatography and spectrometric methods such as nuclear magnetic resonance (NMR), mass spectrometry, and infrared spectroscopy, have been used to isolate and characterize these carotenoids. So far, six carotene glycosides have been reported to be present in curcuma(Pfander and Rychener, 1982).

Like other spices, curcuma is prone to microbial contamination due to improper handling, storage and transportation.

Although fumigation using chemicals such as ethylene oxide is the currently practiced method for decontamination of spices, the process is banned in several countries of the world because of possible toxic residues and potential health hazards for workers in fumigation plants.

[1] Germisara Hotel Resort&SPA****,Geoagiu Băi,Hunedoara

Exposure to ionizing radiation, such as γ- rays offers an effective alternative to fumigation, as it is a safe, physical process that leaves no detectable toxic residues (Diehl, 1995). A dose of 5-10 KGy is recommended for decontamination of spices without adversely affecting their flavor quality (Nickerson et al., 1966).

MATERIALS AND METHODS

Commercial samples of curcuma were obtained from Nuclear Research Laboratory, Magurele, Romania. Samples were divided into two equal lots.

One lot was kept as the non-irradiated control sample, and the other lot was subjected to γ-irradiation at 25 ^{o}C to an overall average dose of 2.5 and 5 KGy at a rate of 18 Gy/min using. Samples were analyzed for changes in volatile oil constituents within one to two days of storage after irradiation.

Isolation and Analysis of Coloring Pigment

Isolation Aliquots of 5g each of control and irradiated curcuma (root) were extracted three times with 80 % aqueous methanol (3×15) at room temperature.

The filtrates of each sample were pooled evaporated to dryness under vacuum to obtain a residue that was then brought to a 5 % solution in 80 % aqueous methanol (total extract). A part of the total extract was appropriately diluted with distilled water and then successively extracted with ethyl acetate and n-butanol.

The respective organic layer were evaporated to dryness as above and then brought to 1 % in methanol and 80 % aqueous methanol, respectively.

Analysis

Absorption spectra of ethyl acetate and n-butanol fractions were carried out in 80 % aqueous methanol on CECIL 2025 Uv-vis spectrophotometer in wavelength range of 200-700 nm. High-performance liquid chromatography (Youngling) was carried out on a C_{18} column Nova pack/15cm / 4.6 mm/ 4 μm.

Pigment were eluted over 40min with a linear gradient from 1 % (v/v) acetic acid in water to 100 % methanol at a flow rate of 1 ml/min. Peaks were monitored on a Uv-vis spectrophotometer at 440nm.

Comparing the retention time of individual peaks with those of standard pigments.

RESULTS AND DISCUSSION

Absorption spectra of n-butanol and ethyl acetate fractions obtained from both control and irradiated samples showed a λ max at 440.5 nm. However a substantial decrease in the absorbance of the butanol fraction and a distinct decrease in the absorbance of the ethyl acetate fraction at the above wavelength were noted in the irradiated sample when it was compared to that of the control.

A radiation induced breakdown of carotene glucoside could thus be predicted, giving rise to carotene and sugar residue with the former being extracted into ethyl acetate. A representative HPLC profile of n-butanol fraction obtained from the 5 KGy irradiated.

The chromatogram of the butanol fraction is similar to that of curcuma root extract reported earlier (Nickerson et al., 1966). This fraction showed three distinct peaks at R_t 8.146, 13.763, 15.063 min that were tentatively assigned as curcumin ester, curcumin gentiobiosyl-glucosyl ester and curcumin neapolitanosyl ester, respectively.

Chromatograms of irradiated samples were characterized by an appreciable decrease in content of the above compounds. Although the relative distribution of these pigments remained unchanged.

Table 1.

Effect of gamma irradiation on the pigment content of curcuma root as estimated by HPLC

Compound name	Retention Time (min)	Concentration, g/Kg[a] control	Concentration, g/Kg[a] Irradiated (5 KGy)
Curcumin ester	25.3	41.033 ± 2.77	4.3296 ± 0.214
Curcumin gentiobiosyl – glucosyl ester	27.0	9.3550 ± 1.890	1.0127 ± 0.183
Curcumin neapolitanester	31.0	4.5440 ± 0.340	0.7540 ± 0.192

REFERENCE

1. Diehl, J.F. (1955). Safety of irradiated foods. Marcel Dekker, London, pp 173-223.
2. Dufresne, C., Cormier, F., Dorion, S., Niggli, U.A., Pfister, S. and Pfander, H. 1999. Glycosylation of enacapsulated crocetin by a *Crocus sativus* L. cell culture. Enzyme Microb. Technol. 24:453-462.
3. Nair, S.C., Pannikar, B., Pannikar, K.R.(1991). Antitumor activity of Curcuma (*Curcuma longa* L.). Canc.Lett. 57:109-114.
4. Nickerson, G.B. and Likens, S.T. (1966). Gas chromatography evidence for the occurrence of hop oil components in beer. J. Chromatogr. 21:1-5.
5. Pfander, H. and Rychener, M. (1982). Separation of curcumin glycosyl esters by high-performance liquid chromatography. J. Chromatogr. 234:443-447.
6. Rios, J.L., Giner, R.M. and Manez, S.(1996). Anupdate review of spices and its active constituents. Phytotherapy Res. 10:189-193.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

RESEARCH REGARDING THE CHEMICAL COMPOSITION OF WILD BOAR SALAMI

Giurgiulescu Liviu, Cionca Bianca[1]

KEY WORDS: wild boar, fat, acidity, mineral substances, nitrites

ABSTRACT

Salami of wild boar is part of raw-dried preparations were obtained from the following ingredients: wild boar meat, cow meat and bacon, and various auxiliary materials for preservation, flavoring, color enhancing, packaging, addition of animal or plant needed to improve indicators of quality and secondary materials, which confers specificity of the product. Meat intended for the manufacture of boar salami operations subject: the salting, fezendate, mincing, bradt manufacture, formulation composition, filling, clips, drying stove in the cells of smoke, airy, aging and drying, labeling, storage and delivery. Under the chemical composition of meat of venison is coming from domestic animals with a poor state of fattening. Boar meat presented the following chemical composition: water 22.50%, 20.08% nitrogen substances, fatty substances 6.62%, 1.10% mineral salts. Research conducted on the product refers to the organoleptic characteristics, physical and chemical composition.

INTRODUCTION

Means any food product of animal or vegetable origin, used as such or form prepared by culinary preparation, which has sensory qualities, energy, nutrients and organic nutrition and ensuring the human body, without the risk of disease.

At the beginning of development of human hunting activity that has been crystallized social relationships. With the increasing number of human population and technological development of agriculture, industries and services, living day to day of man in harmony with nature was more hurt. Relationship *man - nature* is becoming more complex and ecosystems are increasingly influenced by human activity. Hunting has survived the transformation of processes and having a long historical role in the development undisputed society.

In Europe, hunting is practiced in all countries and has a long tradition. Even if customs differ from country to country and hunting practice is to purchase food in some areas, sports or social event in others, in time, hunting practices have evolved to respect nature, hunting and habitat, conservation and sustainable use of their traditions and maintain a lifestyle.

[1] North University of Baia Mare, Science Faculty

Today, we talk about venison, to be able to distinguish meat from domestic animals. You know, however, that a large part of the game sold comes from increasing wildlife specialist, which allows for earliest and meat quality.

Venison is healthy, weak and very rich in protein. Because venison is obtained in specialized farms, this makes the product is poor in fat.

This type of meat is becoming more accessible to a variety of people, thanks to producers such as venison Stenyon. For many of us, hunting is often considered, wrongly, as a reserved special occasions and autumn. Venison can be appreciated in all circumstances and at all occasions.

MATHERIAL AND METHOD

To determine the organoleptic quality and physico-chemical, a "salami of wild boar" has been discussed a lot of product from which they took more samples.

Samples was legally permissible under the rules and methods of determination were the professional standards required by SP-C 401/1995 "Preparations of meat-sausage".

Physico-chemical examination, in accordance with legal stipulations next sought to determine physico-chemical indicators of quality:

- Water - through the drying stove drying method according STAS-9065/3-73,
- Sodium chloride, using Molir, confonn STAS-9065/5-73,
- Nitrite - by Griess method, as STAS-9065/9-74,
- Total mineral substances, according STAS-9065/7-74.

RESULTS AND DISCUSSION

From the organoleptic sought to appearance, consistency, color, smell and taste the product reviewed.

In this way:

- type - whole bars or cylindrical pieces with a length of 25 cm obtained by filling the artificial membranes with a diameter of 45 cm
- appearance - white-pink mosaic specify crude products, no spots of mold.
- layout per section - mosaic table or paste fine pink-red specific type of meat, according to the instructions of work;
- taste and smell - specific components and spices used without foreign taste and odor (sour, mold, rancid, etc.)
- consistency - less hard, flexible.

Following physic-chemical examination were obtained the following results:

Table 1

Variation of water content at wild boar salami

The wild boar salami			Average	Conditions of admissibility, max%, STAS 9065/3 –73
Det 1	Det 2	Det 3	Water 24%	35%
24%	25%	23%		

The water content was in according with STAS 9065/3 –73

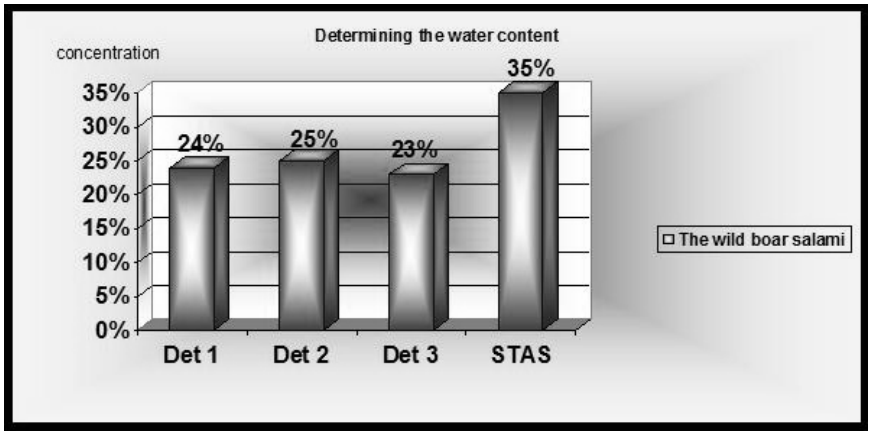


Figure 1. Variation of water content at wild boar salami

Table 2

Variation of NaCl at wild boar salami

The wild boar salami			Average	Conditions of admissibility, max. %, STAS 9065/5 –73
Det 1	Det 2	Det 3	NaCl, 3,51%	6%
3,50	3,52%	3,51%		

After determining the NaCl content according to STAS 9065/5 –73

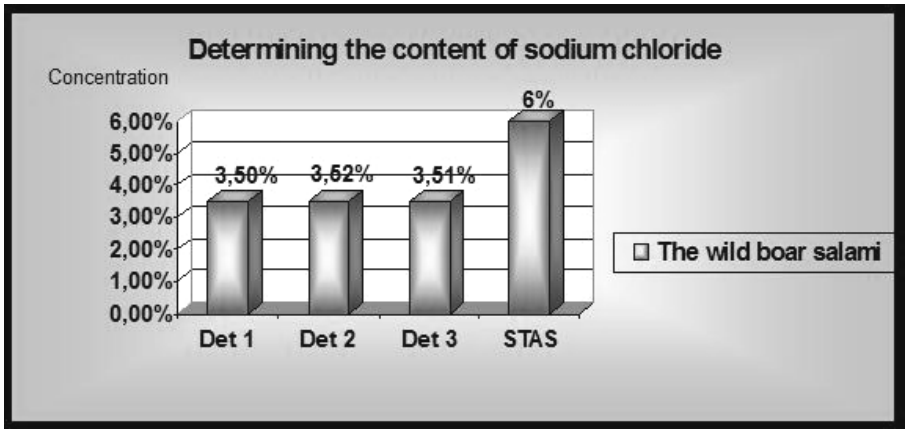


Figure 2. Variation of NaCl content at wild boar salami

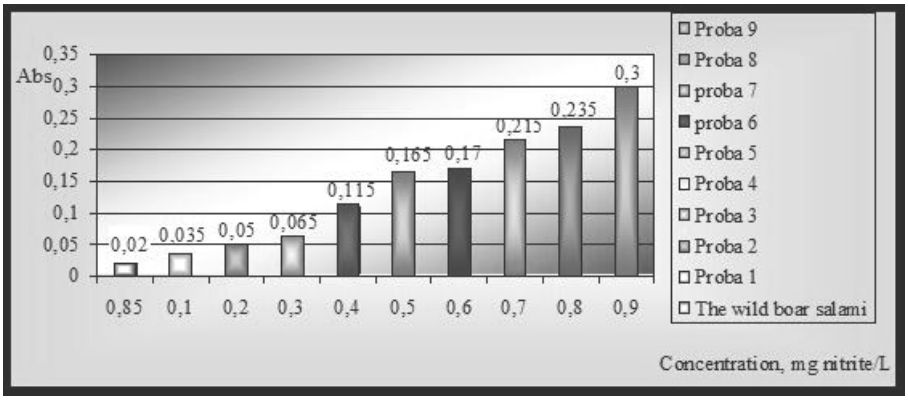


Figure 3 Variation of nitrite contents at wild boar salami

CONCLUSION

Following the study carried out on preparations of meat quality in the membrane ie the boar salami to the following conclusions:

- and auxiliary materials used for obtaining preparations of meat membranes (wild boar salami), corresponding aspects organoleptic, physico-chemical and microbiological testing;
- the technological flux observed hygiene of premises and equipment of the meat cutting and storage to finished product;
- finished products meet the organoleptic point of view;
- product delivery falling from the physico-chemical, within the limits allowed by STAS history in force;
- raw and auxiliary input technology were of good quality, which prevented the emergence of defects in freshness, the finished product falling under the state of freshness in the preparation time, and could be put into use.

Venison offers a meat diet with high nutritional value and fat content of 5-7%, compared with 14-18% as chicken meat containing eg. It's so-called good fat, low caloric value, which our body needs. Because of these essential elements, meat diet is recommended to fight diseases such as nervous disorders, obesity or TB. Lipid levels, for example, is eight times lower than in the case of beef, and cholesterol is low compared with other venison meat. The meat of venison is superior to fish through the higher phosphorus, and the beef, pork or lamb with higher content of potassium. Content are higher in iron than spinach. Venison is very little fat and fat that it contains is very good quality.

BIBLIOGRAPHY

1. BANU C. – *Manualul inginerului de industrie alimentară* Vol.II., Editura Tehnică, Bucureşti, 2002, p 142-150;
2. BANU C. – Procesarea industrială a cărnii, Editura Tehnică, Bucureşti, 2003

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

RESEARCH REGARDING THE TECHNOLOGICAL POTENTIAL OF DJEBEL VARIETY

Giurgiulescu Liviu[1], Stoica Felicia[2]

KEY WORDS: alkaloids, nicotine, reduced sugar, class quality

ABSTRACT

Oriental tobaccos are included in majority fabrication recipes of superior cigarettes. Thanks to chemical composition balanced and special flavour at burning quality which are very appreciated by smokers. The study research the determination of albumins, sugar reduces, alkaloids and total reduces sugar .

INTRODUCTION

Oriental tobaccos prefer poor soil, with low concentration in N,P,K. The climatic conditions must be poor in precipitations, the temperature must be between 35-38^{0}C. The best results are obtaining if the air humidity is very high.

The leaves are harvest at technological maturity, in many time it was prefer the end of this maturity. Leaves size is small in generally between 10 cm for top level and 25 cm for base level and middle. The harvest begin with the base levels and end with the top levels. After the harvest, leaves was pass to the dry technological process. It was prefer the sun cured system, the leaves was arrange by rope, the rope was put in wood frames.

Sun cured follow to obtain the uniform color leaves. In these sense, leaves was sorted by size, color, integrity, in quality classes, before curing process.

After the dry the tobacco it was re-classed by the parameters describe before.

MATHERIAL AND METHOD

Table 1

Oriental tobacco classify by STAS 511/980

Tobacco type	Variety	Characteristic	Superior	I class	II class	III class
Oriental	Djebel	Level	Top, Under top	Middle under top	Under middle, base	All levels
		Maturity	Mature leaves	Mature leaves	Mature leaves	Mature leaves and over
		Color	Yellow and orange light	Yellow and red orange	All red collor	Chestnut and brown
		Consistence	Leaves with elastic and fine tissue		Leaves with elastic tissue	Any type of tissue

[1] North University of Baia Mare, Science Faculty
[2] University of Craiova, Horticulture Faculty

At superior Djebel and I class Djebel fermentation process it was realized at 43-45 ^{0}C temperature and 55-60 % air humidity. Djebel from II class it was fermentated at 45-47 ^{0}C temperature and 60-65 % air humidity. The fermentation period it was between 6-8 days. At the end of fermentation process it was determinate the main chemical compounds from composition of Djebel tobacco.

RESULTS AND DISCUSSION

Table 2

Variation of chemical composition at Djebel tobacco leafs after fermentation process

Variety	Class	Provenience	Total reduce sugar (%)	Soluble sugars (%)
Djebel 133	I	Voiceşti	12.01	7.08
Djebel 133	II	Voiceşti	9.93	6.55
Djebel 144	I	Voiceşti	9.06	6.15
Djebel 144	II	Voiceşti	8.87	5.56
Djebel 212	I	Voiceşti	15.01	12.09
Djebel 212	II	Voiceşti	11.02	5.25
Djebel 292	S	Vlăduleni	21.56	8.04
Djebel 292	I	Vlăduleni	21.02	7.89
Djebel 292	II	Vlăduleni	19.08	7.05

Tobaccos take in study it was from Vlăduleni and Voiceşti dry factory and the results it was present in percent by dry substance.

Table 3

Variation of chemical composition at Djebel tobacco leafs after fermentation process

Tobacco variety	Class	Provenience	Albumins (%)	Alkaloids (%)
Djebel 133	I	Voiceşti	6.75	2.17
Djebel 133	II	Voiceşti	9.17	1.83
Djebel 144	I	Voiceşti	7.06	2.29
Djebel 144	II	Voiceşti	8.55	2.08
Djebel 212	I	Voiceşti	5.35	2.13
Djebel 212	II	Voiceşti	7.01	2.46
Djebel 292	S	Vlăduleni	6.85	1.45
Djebel 292	I	Vlăduleni	7.23	1.56
Djebel 292	II	Vlăduleni	8.15	1.87

In generally for obtaining a good industrial quality at oriental tobaccos, these need to have in their chemical composition high concentration in carbohydrates (total reduced sugars and soluble sugars) and low compositions on albumins and alkaloids.

At tobaccos take in study we record high values in substances with positive action at Djebel 292 provenience Vlăduleni and Djebel 212 variety Voiceşti provenience. The high level of soluble sugars it was recorded at Djebel 212 Voiceşti even low quality classes comparative with Djebel 292 from Vlăduleni. (figure 1)

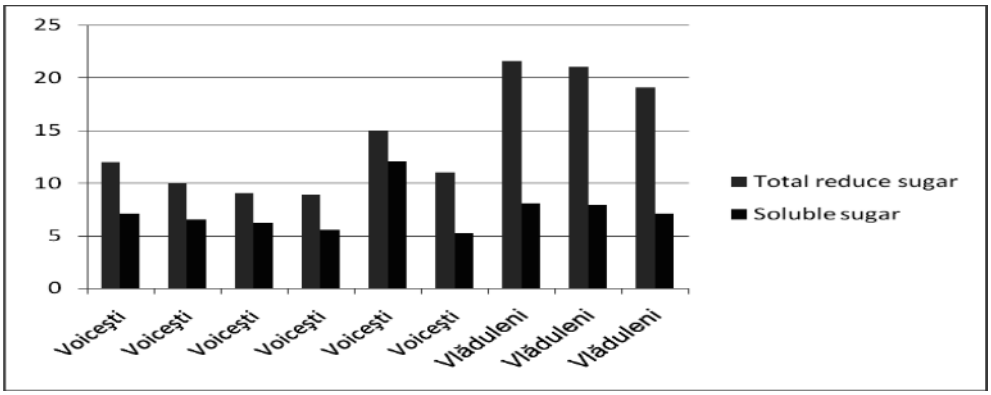


Figure 1 Variation of chemical composition at Djebel tobacco leafs after fermentation process

Regarding the concentration in substances with negative action in tobaccos quality, it was to type take in study albumins and alkaloids. It knew that these type of substances generate at the temperature of burning cigarettes compounds with disagreeable smelt and toxic fume. A high concentration in alkaloids determine high level of nicotine. This substances it was not so toxic for the organism but it determinate a dependence similar with drugs. The high level in albumins it was recorded at Djebel 133 Voiceşti and Djebel 144 Voiceşti. The alkaloids have high level at tobaccos from inferior quality classes comparative with tobacco from superior classes. The concentration in albumins it was low comparative with the results recorded after the dry process, because the hydrolytic enzymes determinate the transformation of this substances in compounds with small molecular mass. The same process it was observe at alkaloids concentration. The levels in nicotine was reduced by process who determinate the bioconversion of nicotine in chemical compounds with low toxicity.

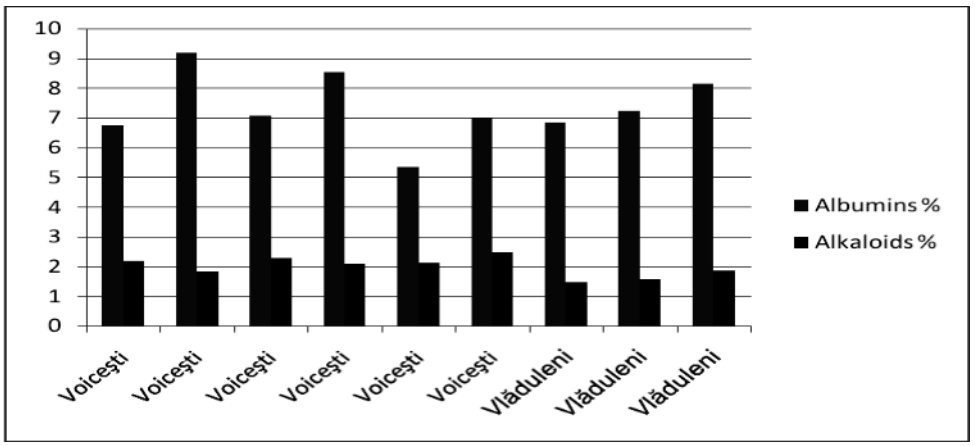


Figure 2 Variation of chemical composition at Djebel tobacco leafs after fermentation process

CONCLUSIONS

The researches tobaccos record values of concentration in normal limits for these type of variety. The best results was obtained at Djebel 212 and Djebel 292, tobaccos who can use in fabrication of superior cigarettes.

In the case of Djebel 133 and Djebel 144 we recommend a high fermentation period by increase the level of temperature at the end of technological operation.

In fabrication recipes for superior cigarettes, proportion of oriental tobacco it must be lower than Virginia and Burley tobaccos, because oriental tobaccos have a very high level of aromatic compounds.

The Romanian pedo-climatic conditions offer the opportunity to grow with best results the oriental tobaccos similar with tobaccos from country with long tradition in these like Macedonia, Turcia, Grecia. Together with Molovata and Ghimpati, the Djebel variety it was the base of the oriental tobacco production from our country.

BIBLIOGRAPHY

1. Aniţia N., Marinescu P.: Fiziologia şi biochimia tutunului, Editura Tehnică, Bucureşti, 1993
2. Aniţia N., Marinescu P.: Tehnologia tutunului, Editura Tehnică, Bucureşti, 1983
3. L.Giurgiulescu, Stoica Felicia, Ionică Laura **:** Research regarding the variation of quality sign at Oriental tobaccos cultivated in "Câmpia Română". Scientifical Researches Agroalimentary Processes and Technologies, Volume X, nr.2 (2004), 299-313, Timisoara

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

STUDIES ON THE INFLUENCE OF WATER STRESS ON FREE AMINO ACIDS AND PROTEINS CONTENT IN WHEAT LEAVES

Babeanu Cristina[1], Daniela Popa[1], Carolina Constantin[2], Paunescu C.V[1]

KEY WORDS*: wheat, water stres, amino acids*

ABSTRACT

The objective of the study was to investigate the ability of four varieties of wheat to synthesize amino acids and proteins during water stress. These varieties differ somewhat in their general response to water stress, and it was desired to see if under water stress conditions does exist also differences in their- nitrogen metabolism. Water stress induced increase in quantity of each amino acids fraction thus implicitly total amino acids content increases. A decrease of the soluble protein content in plants under water stress was found in all the studied genotypes. Decreased content of soluble protein could be the result of the proteic catabolism intensification, increasing protease activity indicating that fact. The increase in amino-acids levels may be an indicator of water stress in plant tissues.

INTRODUCTION

Drought is the biggest limiting factor for crop production and today this situation is more serious (1). In the study of biochemical changes in plants under water stress conditions, a special attention has been paid to changes in nitrogen compounds. Water stress induces a characteristic change in the levels of free amino acids, especially a great increase in free proline (2, 3) and amides. The accumulation of amides is thought to be the result of incorporation of free ammonia released by de-amination of amino acids, which were in turn released by proteolysis induced by water stress (4). The accumulation of the amino acid proline in tissues of several plant species is regarded as a general response to water and other kinds of stresses. Proline has several functions during stress: osmotic adjustment (5), osmo-protection (6), free radical scavenger and antioxidant (7), protection of macromolecules from denaturation (8), regulation of cytosolic acidity and carbon and nitrogen reserve after stress relief (9). Proline might confer drought stress tolerance to wheat plants by increasing the antioxidant system rather than as an osmotic adjustment mediator. In addition, some other amino compounds were also found at higher concentrations in stressed tissues. Total soluble nitrogen tends to increase in water-stressed tissues because of an enhanced proteolysis, a depressed protein synthesis, a *de novo* enhanced synthesis of amino acids and a reduced incorporation of them to proteins.

1. University of Craiova
2. Nat. Researches and Developm. Inst. for Soil Science, Agrochemistry and Environment Protection - ICPA Bucharest

The objective of the present study was to investigate the effect of water stress (50% field capacity) on amino acids and protein content of four varieties of wheat. These varieties differ somewhat in their general response to water stress, and it was desired to see if under water stress conditions differences also exist in their- nitrogen metabolism.

MATERIAL AND METHOD

Four varieties of wheat were studied (*Triticum aestivum* L.cv. S9913-15; S9916-12; S0718; S0444). Experiments were carried out in the ICPA Bucharest vegetation house using soil from Research and Agricultural Development Station from Simnic farmland, in pots containing 10 kg soil. Each genotypes was conducted in one level soil water treatment (50% Field capacity) controlled by weighting method, and matched with one control correspondingly. The soil use for experiments is characterised by an acid pH (pH=5,7), by a low content of humus (1,8%), nitrogen (IN%=0,81) and potassium (128 ppm) and by a significant supply of mobile phosphorus (54ppm).

Biochemical analyses were realized on fresh leaves cut at stem elongation. Free amino-acids spectra were determined by paper chromatography from 80% ethanol extract. Amino acids were located on the chromatogram with a 1% ninhydrin solution in butanol (10). A quantitative estimation of these fractions was made with a densitometer type 65 Karl Zeiss and the concentration of each amino-acid fraction was expressed in densitometric units. Total soluble proteins were extracted in distilled water (1:10 w/V) and assayed according to Layne (11) Protease activity was assayed in phosphate buffer using casein as a substrate (12). Quantitative results were obtained using a standard curve with 0-0.2 μM tyrosine, and expressed as $U.g^{-1}$ FW. One unit (U) represents the amount of enzyme which catalyzes the liberation of 1 μmole of tyrosine in a minute, at 25°C.

RESULTS AND DISCUSSION

Amino acids spectrum analysis indicates for all the studied genotypes, in both experimental variants (plants well-watered -control and plants under water stress) 7 fractions but quantitatively different (Figure 1).

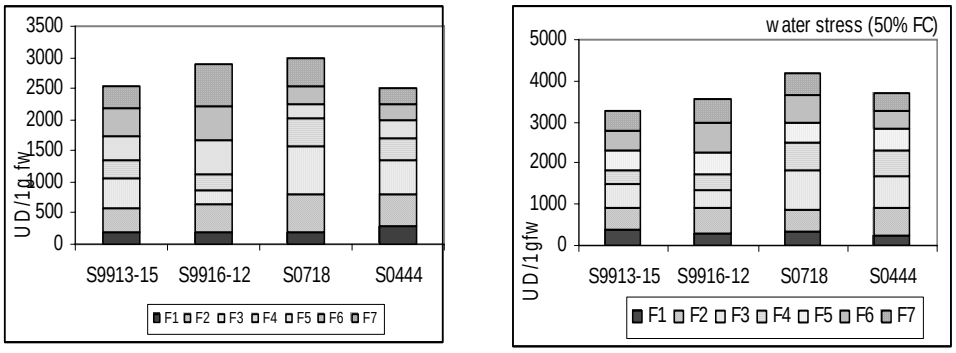


Figure 1 Aminoacids pattern in wheat leaves in studied varieties

Fractions have been identified by measuring the Rf's standards as follows: F1:aspartic acid; F2: treonine; F3:glutamic acid; F4: lisine F5:serine; F6: proline; F7: alanine. Each genotype to water stress induced increase in quantity of each fraction thus implicitly total amino acids content increases. Amino acids accumulation was found to vary among varieties, a different behaviour is clearly visible. In both experimental variant genotype S0718 presents the highest level associated with the sharpest increase of proline content. For plants subject to water stress literature recorded the rise of the proline content but is observed for our study that also other marked components increased (serine to genotype S0444).

The increase in level observed for the amino acids in leaves of wheat under water stress is in agreement with other data in literature (4, 6). The increase in free amino acids could contribute to the tolerance of the plant to water deficit through an increase in osmotic potential, or as a reserve of nitrogen, principally for the synthesis of specific enzymes.

A decrease of the soluble protein content in plants under water stress was found in all the studied genotypes (figure 2). Decreased content of soluble protein could be the result of the proteic catabolism intensification, increasing protease activity indicating that fact. Enzymatic activity of protease and its increased activity in the case of water stress could explain also the increasing amount of the amino acids released.

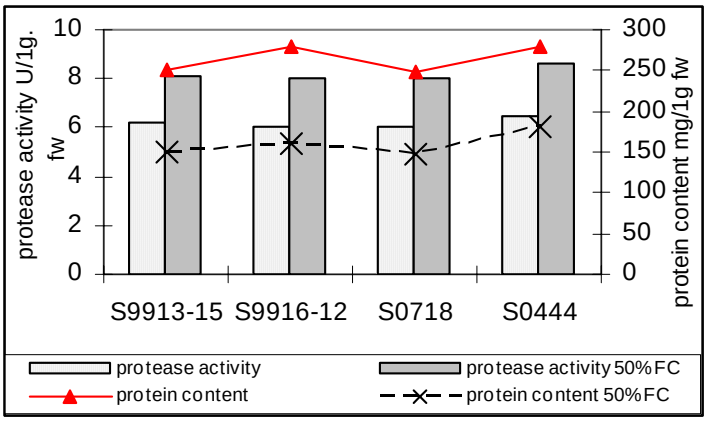


Figure 2 Soluble proteine content and protease activity

The obtained results show that the studied varieties can tolerate the experienced water stress by metabolic changes characterized by investigated biochemical indices.

CONCLUSIONS

Water stress induces a deviation of plant metabolism from its normal pattern. The conditions of water stress induced an increase in quantity of each amino acids fraction thus implicitly total amino acids content increases. Clearly the effect of genotypes on the intensity and the accumulation may be due to genetic origins.

Proline is clearly the most readily accumulated amino acids in water-stressed plants. A decrease of the soluble protein content in all the studied genotypes was also observed.

The increase in amino-acids levels may be an indicator of water stress in plant tissues. A possible association of proline accumulation with the drought resistance of different genotypes will have a major practical importance: it would provide an easy screening criterion to help plant breeders and agronomists to assess the field performance of genotypes.

BIBLIOGRAPHY

1. Yordanov I. , V. Velikova, T. Tsonev, Plant responses to drought and stress tolerance, Bulg. J. Plant Physiol, Special Issue, 187–206, 2003.
2. Kirigwi FM, Grinkel M van, Trethowan R, Sears RG, Rajaram S, Paulsen GM. Evaluation of selection strategies of wheat adaptation across water regimes, Euphytica, 135, 361–371, 2004
3. Frlores H.E., Young N.D., Galston A. W., Polyamine metabolism and plant stress. InJL Key, T Kosuge. eds. Cellular and Molecular Biology of Plant Stress. Alan R Liss, New York. 93-114, 1985
4. Miflyn B.J., Lea P. J., Aminoacid metabolism., Annu Rev Plant Physiol, 28, 299-329, 1977
5. Voetberg GS, Sharp RE. Growth of the maize primary root in low water potentials. III. Roles of increased proline depositions in osmotic adjustment. Plant Physiol, 96,125–130, 1991
6. Kishor PBK, Sangam S, Amrutha RN, Laxmi PS, Naidu KR, Rao KS, Regulation of proline biosynthesis, degradation, uptake and transport in higher plants: its implications in plant growth and abiotic stress tolerance, Curr Sci, 88, 424–438, 2005
7. Sharma SS, Dietz KJ., The significance of amino acids and amino acid-derived molecules in plant responses and adaptation to heavy metal stress, J Exp Bot, 57, 711–726, 2006
8. Vanrensburg L, Kruger GHJ, Kruger RH, Proline accumulation the drought tolerance selection: its relantionship to membrane integrity and chloroplast ultra structure in *Nicotiana tabacum,* J Plant Physiol, 141, 188–194, 1993
9. Sivakumar P, Sharmila P, Saradhi PP., Proline alleviates salt-stress induced enhancement in Rubisco oxygenase activity., Biochem Biophys Res Commun, 279, 512–515, 2000
10. Babeanu C., Marinescu G., Glodeanu E., Ciobanu G., Biochimie vegetala practica, Ed INFO, Craiova, 2003
11. Sarath G., Protease assay methods. Proteolytic enzymes–a practical approach, R. J. Beynon & J. S. Bond (Ed), Oxford University Press, 25–55., 1989.
12. Layne E., Spectrophotometric and turbidimetric methods for measuring proteins. Methods in Enzymology (10): 447-455, 1957

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

THE SEWAGE SLUDGE DOSES INFLUENCE UPON ZINC CONTENT IN THE LUVOSOIL- PLANTS ECO-SYSTEM

Mujea G.[1], Ionescu N.[2], Marilena Diaconu[1], Ana Iordanescu[1], Katalin Ionescu[1]

KEY WORDS: processed sludge, luvosoil, Zn, field plants

ABSTRACT

Zn represents a chemical element within the heavy metals category which in reduced quantities can benefit plants feeding process, yet while in excess can induce specific toxicity phenomena. For observing the Zn content trend, both in cultivation soil and in plants, progressive doses of sludge were used: 0, t.ha^{-1}, 5 t.ha^{-1}, 10 t.ha^{-1}, 25 t.ha^{-1} and 50 t.ha^{-1}, together with doses of chemical fertilizers: o, ½ and 1/1 of the specific plants need. By using these fertilizers some statistically covered decreases were observed compared to the sample in respect to total Zn forms for maize and wheat, but also an increase of the mobile forms in case of all cultivated plants. Field plants absorbed Zn^{2+} in specific quantities. Correlations obtained between plants biomass and the Zn contents show evident increases for total biomass and insignificant for grains. Such researches are required since they emphasize most of the aspects related to the nutrition of each specific organism (plants).

INTRODUCTION

In general, soils contain variable zinc (Zn) quantities. At Earth's surface, there is estimated a medium content of 80 mg.kg^{-1} d.w. Zn, with oscillations between 10 and 300 mg.kg^{-1} d.w. The presence of this chemical element into the soil does not represent a criterion for the availability of the plants (Tisdale 1966). Solubility and accessibility varies in case of zinc from soluble forms to strongly retained ones. However, Zn inaccessibility takes place through some mechanism no-entirely elucidated (Bajescu 1984). In soil, zinc is absorbed as Zn^{2+} ions and a reduced manner under other forms. As in the case of other heavy metals, Zn occupies octaedric position through partial replacement of aluminium (Al), iron (Fe) and manganese (Mn) in the structure of clayey minerals. Zn can also be incorporated in the hydrated oxides of Fe and Mn existing in specific concretions, bobovines (small balls), or as thin layers on clayey mineral surface. Zinc regime in soil has a strong complex character, due to several factors according to which the cultivation plant can absorb or not. The most important factors would be: soil's reaction, REDOX potential, rains, temperatures, minerals composition, phosphates level in soil, plants rotation (Hera 1988). In soils with pH between 5.1 and 6.5 Zn becomes accessible to plants (Wear 1956). From this point of view, luvosoil has good accessibility conditions of Zn for plants.

[1] SC APA CANAL 2000 SA PITESTI
[2] Statiunea de Cercetare- Dezvoltare Agricola PITESTI

Between the Zn ions and phosphorus (Zn-P relation) there is a clear antagonism when the zinc phosphate precipitate forming takes place – $Zn(OH)_2$, little accessible to plants.

In carbonated soils, in those with plenty of organic matter, as well as in those for which amendments were used, Zn is also accessible in a reduced manner. New researches demonstrate that there is a tendency for Zn to form little soluble compounds in soil by precipitation under the form of: carbonates, hydro- oxides and phosphates (Tisdale 1966). However, the eco-environment luvosoil on which sludge spreading was used demonstrate both the existence of Zn total and Zn mobile, as well as large options of being adsorbed and used in that multitude of biological processes in which it is involved (Brown 1960, 1963, Davidescu 1981, Bilteanu 1988). However, using different doses of sewage sludge it is possible that in this favorable environment for Zn to have some excesses which could lead to toxic effects upon field plants. In the present paper there are presented some results of the way cultivation plants – maize, winter wheat and soybeans – grew and developed under progressive doses of processed sludge, rich in zinc.

MATERIAL AND METHODS

In the period 2004- 2007 a complex experiment was initiated in which plants were cultivated based on the scheme: 1st year maize, 2nd year winter wheat, 3rd year soybeans and 4th year winter wheat. In the first 2 years both for maize and winter wheat processed sewage sludge anaerobically digested and dewatered was spread, in the quantities: 0 $t.ha^{-1}$, 5 $t.ha^{-1}$, 10 $t.ha^{-1}$, 25 $t.ha^{-1}$ and 50 $t.ha^{-1}$. Soybeans and winter wheat in the last year benefited of the remaining effect (carry over effect) of previous applied sludge doses.

The sewage sludge suffered an anaerobic digesting followed by dewatering within Pitesti Wastewater Treatment Plant. Besides there were used chemical fertilizers in three levels as follows: i) without chemical fertilizers, ii) ½ of a normal doze of chemical fertilizers and iii) 1/1- complete dose of chemical fertilizers specific for each plant. Thus, for maize was ensured ½ of the $N_{50}P_{50}$ level, at winter wheat $N_{60}P_{40}$, at soybeans $N_{30}P_{30}$ and for winter wheat on 4th year $N_{40}P_{40}$; at level 1/1 the maize benefited of $N_{120}P_{80}$, winter wheat of $N_{120}P_{80}$, soybeans of $N_{60}P_{60}$, and winter wheat on 4th year of $N_{80}P_{80}$. The experiment with the lot divided had the A factor – sludge doses and the B factor – chemical fertilizers doses. Each variant had a surface of 100 m^2 each and was rehearsed (replicated) for 3 times.

Soil sampling was performed with the agricultural sampling device, in the working depth (0-20 cm) in the plants blooming (flowering) period and maturity period. Leaves samples were taken during blooming period: at maize the leaves located at cob level, at winter wheat the last 3 leaves, including the standard leaf and the soybeans the leaves in the central area of the plant but also with bean- pods in formation process.

Chemical analyses were performed based on the most recent modern European norms and methodologies (Zn total forms – SR ISO 11047-99, Zn mobile forms – SR ISO 14870-99, Zn from plants – SR ISO 11047-99), both over sludge anaerobically digested and over soil and plants. Statistical data processing was performed by analysis of the variant (ANOVA test) and with the help of correlations and regressions.

RESULTS AND DISCUSSIONS

Zn contents in the cultivation environment. Based on the determinations performed on the soil, Zn contents demonstrate the presence of the heavy metal both with its total and mobile forms (Table 1). Of the dates obtained, it proves that Zn was present in the

cultivation soil through values considered as good. Thus, Zn total content was in the margin 40 – 206 mg.kg^{-1} d.w. as limits and between 63 and 111 mg.kg^{-1} d.w. as annual average values. Mobile Zn forms were between 1.7 and 18.9 mg.kg^{-1} d.w. as limits and between 4.2 and 8.2 mg.kg^{-1} d.w. as average values.

Taking into consideration the critical Zn limits there is considered that data obtained here demonstrate the existence of proper conditions for absorbtion and translocation of this very important chemical element for ensuring plants' development and growth (Thorne 1949, Davidescu 1975, Borlan 1982).

Compared with the natural Zn reserves in the soil, the sewage sludge contributed by means of improving it, yet at reduced levels. Thus, the multi- annual average value of Zn total was of 83 mg.kg^{-1} d.w., and through the contribution of the sludge it was at the level of 112 mg.kg^{-1} d.w., compared to the maximum admissible legal limit of 300 mg.kg^{-1} d.w. soil. The Zn mobile level was of 2.5 mg.kg^{-1} d.w. and was improved as a result of the sludge contribution to 7.0 mg.kg^{-1} d.w.

Experimental factors contribution over Zn contents in leaves and grains. Due to the favorable conditions in the cultivation soil, field plants absorbed Zn in the vegetative organs. Specialized literature data are unclear, without presenting practical, concrete cases regarding the Zn contents in different plants. Zn is considered for plants as an indispensable micro- nutrient. An average concentration of Zn in plants would be situated in general at 20 mg.kg^{-1} d.w. (after Epstein 1972 quoted by Davidescu 1981).

Under 15-20 mg.kg^{-1} d.w. in leaves is considered as a hazardous margin, where Zn deficit starts. A normal plants nutrition would generally be between 20 and 100 mg.kg^{-1} d.w. Zn (Bajescu 1984). By contrast, a Zn excess is possible in certain circumstances, as is the case of sewage sludge, very rich in this heavy metal. Toxicity occurs when concentrations accumulated in soil are in the margin between 300 and 500 mg.kg^{-1} d.w. Zn (Juste 1970).

Taking into account these options, plant analyses revealed moderate Zn concentrations. In case of the biometric analyses of the three plants (Figure 1) the existence of some favorable correlations with the Zn content was observed. Thus, the total produced biomass was correlated directly and increasingly with the Zn concentrations accumulated in leaves in the flowering period.

The trend of the 4 correlations is quite accentuated, demonstrating the positive effect between the sludge doses, chemical fertilizer doses and Zn content. From a statistical point of view, only 2 correlations – those of the winter wheat- had the degree ensured. These situations could emphasize the feeding characteristic of the wheat in relation with the Zn contents.

Compared to wheat and maize – as cereals, soybeans was on the last place in terms of biomass oscillation according to Zn, yet from an absolute values point of view soybeans plants absorbed in flowering period the highest Zn amount. Of the 3 plants, soybeans has o complex and profound reticular system, which might explain the Zn absorbtion at the highest levels (Wilkinson 1968, Edwards 1974).

In a more advanced development phase – at maturity – there was noticed that plants have deposited Zn in grains. Representing one of the constitutive plants' element, Zn was initially absorbed, transposed through xylem and phloem, and contributed to a better enzymes regime functioning, photosynthesis and resistance regimes of the plants, then Zn deposited into grains. Thus a Zn export phenomenon took place, from the cultivation environment into the grains. In this respect there are some estimations, yet with few data (Bergman 1976).

Correlations were thus set between the grains production formed and the Zn concentrations in grains, with slightly increasing trends, with few data fluctuations (Figure 2). This demonstrates on one side that at maturity plants no longer need Zn, and their value was relatively variable compared with the grains production. Higher Zn values in the grains were determined in case of winter wheat in 2nd year, then for soybeans plants, winter wheat in the last year and the lowest values were found in case of maize.

Expressing Zn^{2+} concentrations in the cultivations plants. As noticed before, plants need the Zn ions. In order to avoid the perilous lack of Zn as well as the negative effects of some excesses, it is important to have periodical controls regarding the plants "supply" with Zn. Usually, companies producing micro- nutrients make estimations, these being a necessary benchmark in ensuring the complex feeding of the plants. Compared to these estimates, the experimental results have proven different situations (Table 2).

After YARA (2007), with recent data, at the beginning of the vegetation phase – young phases, plants need about 25 $mg.kg^{-1}$ d.w. Zn. Compared with these, average data demonstrated that for maize there was necessary a quantity of 10 $mg.kg^{-1}$ d.w. Zn in leaves, then for wheat 21 $mg.kg^{-1}$ d.w., and for soybeans 72 $mg.kg^{-1}$ d.w.

In the final phase, the mature phase, plants contained Zn at the level of 24 $mg.kg^{-1}$ d.w. in maize grains, 55 $mg.kg^{-1}$ d.w. in winter wheat grains and 49 $mg.kg^{-1}$ d.w. in soybeans plants grains. From here is deducted the specific and different character of Zn absorbtion and transposition by the plants. A first phase in ensuring the Zn content is represented by ensuring the micro- nutrients contents, among which the sewage sludge from WWTP is perfectly adaptable due to its high capacity for mineralization.

Table 1

The zinc concentrations from the luvosoil cultivated with field crops

Crop plants	Zn, $mg.kg^{-1}$ d.w., total forms		Zn, $mg.kg^{-1}$ d.w., mobile forms	
	limits	media	limits	media
Maize	53 – 206	111	2.2 – 18.7	7.8
Wheat	52 – 120	79	1.7 – 11.3	4.2
Soybeans	50 – 123	78	1.8 – 18.9	6.8
Wheat	40 - 98	63	2.4 – 26.1	8.2

Table 2

The expression of the Zn^{2+} concentration ($mg.kg^{-1}$ d.w.) from field crops

The crop	The necessary amounts for growing period*)	Plant determinations	
		Flowering stage	Maturity stage
Maize	25	10	24
Wheat	25	21	55
Soybeans	25	72	49

*) YARA

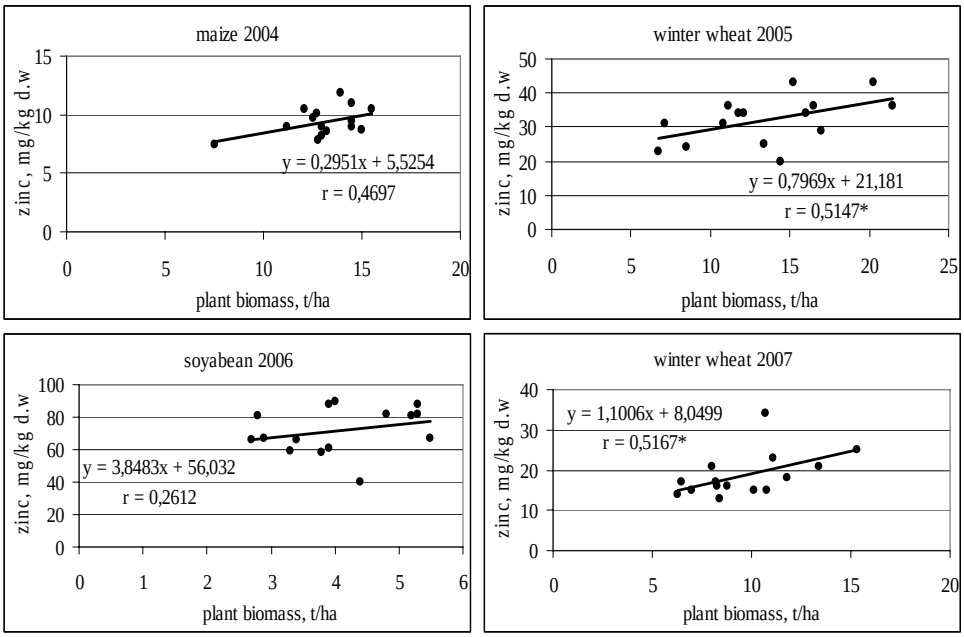


Figure 1. Correlations between total plant biomass and Zn content from plant leaves

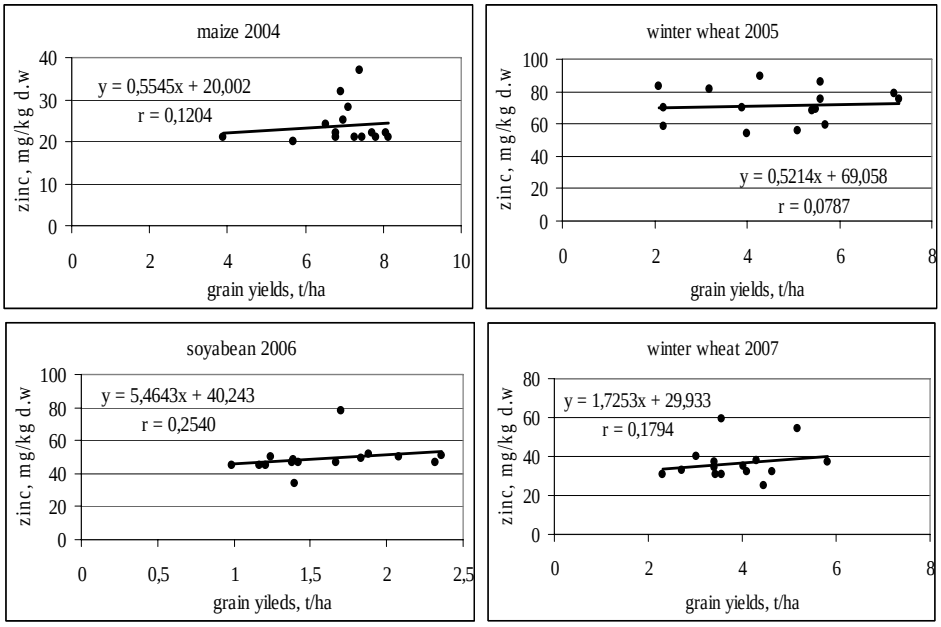


Figure 2. Correlations between grain yields and Zn content from plant grains

CONCLUSIONS

Sewage sludge improved the feeding regime of the plant, including zinc (Zn), an indispensable micro- nutrient for the plants. Total Zn forms increased from 83 $mg.kg^{-1}$ d.w. (natural reserve) to 112 $mg.kg^{-1}$ d.w. with the used doses of sludge. Mobile forms increased from 2.5 $mg.kg^{-1}$ d.w. (initial state) to 7.0 $mg.kg^{-1}$ d.w. due to processed sludge contribution. From a chemical point of view, the luvosoil environment improved also the Zn content, demonstrating normal limits and being favorable for plants' growth and development.

Biomass production increased in an evident manner as a result of optimal feeding conditions creation. Correlations between the biomass and the Zn content in leaves demonstrated the Zn absorbtion and movement in direct relation to its increase.

Zinc was deposited in the useful production – grains, which stand for an export of this essential micro- nutrient. Correlations between grains production and Zn concentrations showed a relative standstill.

Plants needs in terms of Zn ions presented specificity issues, in close relation with both environment factors and the feeding sources ensured. Sewage sludge ensure non-hazardous Zn quantities, having due to the mineralization degree the quality of bio-nutrient.

BIBLIOGRAPHY

1. Bajescu I., Chiriac A. Distributia microelementelor in solurile din Romania. Implicatii in agricultura. Ed. Ceres Bucuresti, 1984.
2. Bergman W., Neubert P. Pflanzendiagnose und Pflanzenanalyse, VEB Gustav Fischer Verlag, Jena, 1976.
3. Bilteanu G., Baicu T., Barbulescu C., Birnaure V., Hera C., Magdalina I., Maracineanu F., Pasol P., Puiu S., Toma D. Mica enciclopedie agricola, Ed. Stiintifica si Enciclopedica, Bucuresti, 1988.
4. Boawn L.C., Viets Jr. F.G., Crawford C.L. Effects of nitrogen carrier, nitrogen rate, zinc rate, and soil pH on zinc uptake by sorghum, potatoes, and sugar beets, Soil Science, 90, 1960.
5. Borlan Z., Hera C. Tabele si nomograme agrochimice. Ed. Ceres Bucuresti, 1982.
6. Brown A.L., Krantz B.A. & Martin P.E. Plant uptake and fate of soil- applied zinc, Proceedings SSSA, 26, 1963.
7. Davidescu D., Crisan I. The effect of fertilizers on the protein content of wheat and maize grown of different soil types. Fertilizer use and protein production, Berna, 1975.
8. Davidescu D., Davidescu V. Agrochimia moderna, Ed. Academiei Bucuresti, 1981.
9. Edwards J.H., Kamprath E.J. Zinc accumulation by corn seedlings as influenced by phosphorus, temperature and light intensity, Agronomy Journal, 66, 1974.
10. Juste C. Action toxiques des oligo- elements. Annales Agronomiques, 21(5), 1970.
11. Thorne W. Zinc deficiency and its control, Advanced Agronomy, 9, 1949.
12. Tisdale S.L. & Nelson W.L. Soil fertility and fertilizers, Ed. Mc Millan Publishing Co.Inc. New York, 1966.
13. Wear J.I. The effect of soil pH and calcium on uptake of zinc by plants, Soil Science, 81, 1956.
14. Wilkinson H.F., Loneragan J.F. & Quirk J.P. The movement of zinc to plant roots, Proceedings SSSA, 32, 1968.
15. xxx Ordinul nr. 344/708/2004. Normele tehnice privind protectia mediului, in special a solurilor cand se utilizeaza namoluri de epurare in agricultura, Monitorul Oficial 959/10 oct.2004.
16. xxx YARA International ASA. Technical elements, Oslo, Norge, 2007.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

STUDIES CONCERNING THE DISMEMBERMENT AND CASSATION OF AN AGRICULTURAL PLOT

Luminița Livia Bârliba[1], C. Bârliba[1], Nicoleta Chiscop[2], Carmen Peptan[1]

KEY WORDS: cadastral works, rectangular coordinates, plot dismemberment, TCR 1205 Leica total station

ABSTRACT

This paper has been developed in accordance with current methodology and is focussed on the dismemberment and definitive cassation of an agricultural plot. The works have been done with in a local projection system as part of a stereographical projection system 1970. The measurements have been made with a performing Leica total station type. Processing of data has been made through the analytical method using the AUTOCAD 2009 programmes.

INTRODUCTION

This definition has in view the fact that land has always had, for any people, a very particular significance. As a space of physical and of social, national historical existence, land has represented, during centuries, not only an essential source of life for the people, not only the main living source, bit also the symbol of millions of labourers who, letting their lands from generation to generation, have gained their right as a nation. History has proved that a people fighting for existence can ultimately rely only on the use of its own land and therefore all efforts to protect and use it in the most reasonable way should be made. But history has also shown that people disappears with the disappearance of its land abandoned to water and wind erosional processes. The principle according to which the right to propriety must be understood as a "social function" is also valid for peoples and people. In this world of interdependence among peoples nobody can allow himself not to cultivate land according to its suitability and not to protect it against degradation and pollution.

According to Law no. 18/1991 all lands no matter the destination make up land stock in Romania. They are owned on the ground of property titles and constitute the private stock land or are part of the public domain.

All terrains that directly serve agricultural production processes constitute the agricultural stock fund.

Terrains with buildings on them belong to the intra-urban specific to urban and rural areas and they harbour buildings and other facilities, including agricultural and forestry lands. The conclusion is that according to Law no. 18/1991 only intra-urban lands harbouring or not buildings (agricultural or forestry lands) are considered to have buildings on them. Extra-urban buildings are part of the agricultural, forestry or special destination-

[1] University of Agricultural Science and Veterinary Medicine of the Banat, Timisoara
[2] OCPI Bacau

fund, as they are usable categories within usage categories. The law regime of building lands differs from those already harbouring buildings for agricultural, forestry or special use (economic or social) as they are allotted, as a rule, to residence buildings or to administrative or social-cultural buildings and only rarely to productive facilities. There is nowadays everywhere a tendency toward cassation of industrial facilities and inclusion within the extra-urban.

Conditions for locating buildings and competence of habilitated institutions to advise or acknowledge cassation of agricultural lands

- Location of buildings no matter their destination and of all kind of investments is being done in accordance with the stipulations of the Stock land law no. 18/1991 republished with further changes on lands within the intra-urban area.
- Definitive or temporal cassation of agricultural lands measuring up to 1 ha can be acknowledged by general offices for agriculture and food-stuff industry together with district offices for cadastre, geodesy and cartography.
- Agricultural land cassation is made upon request from investors on the ground of documentation.

Contents of documentation concerning principle agreement on facility opportunity requiring agricultural land cassation

The contents of documentation concerning principal agreement on facility opportunity requiring agricultural land cassation is as follows:

1. Argument memo containing:
- the necessity and opportunity of investment in the area;
- the description of variants of location with mentions concerning the use categories of the lands, the surface to be under definitive or temporary cassation, the names of land owners, the position of the lands to the intra-urban, and name of locality for each variant.

2.The land owners' agreement in which they are to mention the conditions under which they are filled in with the duration of the granting or lent, the use category of lands, the surface and the location of the land.

3.The principle agreement of cadastre, geodesy and cartography district offices with a brief description of the location variants, use category, surface, position to the intra-urban, land owners and optional variant.

4. Area-inclusion plan.

5. Location plan.

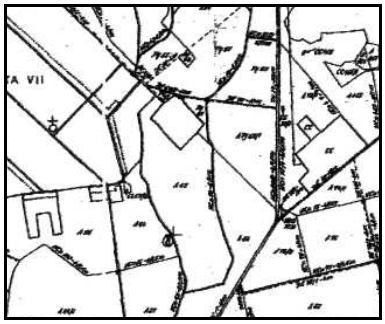
6. Stock land register.

MATERIAL AND METHOD

Cadastral works were made in order to dismember and definitively submit cassation an agricultural plot.

The plot under discussion is on the territory of the Remetea Mare village (Picture 1),, District of Timiş.

The land is located at about 50 m far from the intra-urban area of the village, in the residential area, and it is part of the village planning in the Apj 1143/2 cadastre plot with a total surface of 810 m^2 fitting the acknowledged PUG. The use category of the land is arable in pasture, 3^{rd} class with an improvement average of 51 points, as the quality certificate supplied by the O.S.P.A. Timisoara shows.



Picture 1. Area inclusion plan.Scale 1: 20 000

The Apj 1143/2 plot is mentioned in the C.F. 1857 Remetea Mare in the possession of the village and under the administration of the Local Council through the HCL no. 4/2002, no. 4473 /2002 brought from C.F. 1827 no. 9420/2002 with a right to granting the land during the building functioning starting with April 1, 2002 in favour of the beneficiary no. 9420/2002.

The works were made in the local project system. Land measurements were made with a TCR 1205 Leica total station. Land data were collected under favourable temperature and environment conditions.

Data processing was made with a post-processing soft and with specific programmes.

A location plan at a scale of 1:500 was made with all elements collected on the terrain and specific checking was done.

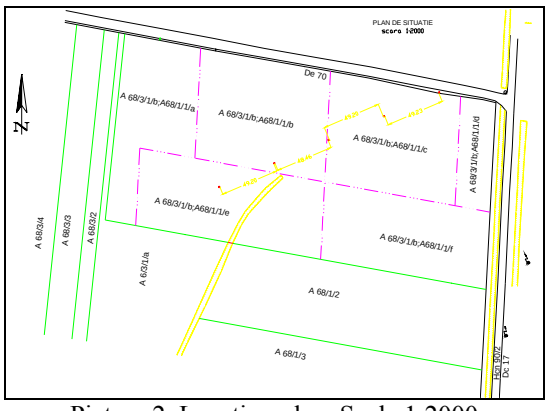
The surface calculus was made by the analytical method, using contour point rectangular coordinates. Thus, the measured surface of the Apj 1143/2 plot was of 810 m^2 coresponding to that in the C.F.

This paper has been elaborated in accordance with methodology in use.

In order to make up the dismemberment and cassation documentation for the Apj 1143/2 plot in Remetea Mare we had to appeal to the C.F. 1875 in Remetea Mare.

RESULTS AND DISCUSSION

A location plan at a scale of 1:2000 (Picture 2) was made with all elements collected on the terrain and specific checking was done.



Picture 2. Location plan. Scale 1:2000

The report was made up in order to establish the average circulation value of the agricultural land necessary in the calculus of tax due to definitive cassation of the land owned by the beneficiary.

The estimate of land circulation value was made using the following three methods:

- the soil quality appraisal grade method;
- the estimation method based on the H.G. no. 746/1991 modified with the H.G. no. 59/1994;
- the assimilation method with the patrimonial value adjusted with localisation coefficients.

As a result of land evaluation in the three variants we established circulation value of the land to 17277,3 RON or 0,27 RON/m^2.

The calculi were made on the ground of production potential of the land under natural conditions for the arable and wheat crop use category, as basic categories in our country.

CONCLUSIONS

For all station and detail points we determined the coordinates with the help of modern methods, total station productivity being very high.

A thorough handling of the apparatus influenced work accuracy.

Data processing was done on a computer in a very short time using an AUTOCAD 2009 programme and programmes specific to make up the whole technical documentation.

On dossier development the beneficiary had to add the planning certificate acknowledged by the Remetea Mare mayor's hall and the vertical planning issued by the planning, architecture, and design office.

The other documents, including the C.F. copy concerning the new booking of the land after cassation belong to a firm or authorised person to make topographical and cadastral works.

BIBLIOGRAPHY

1. Legea nr. 247/2005 privind reforma în domeniile proprietatii şi justitiei.
2. Legea fondului funciar nr. 18/ 1991republicată.
3. Legea arendei nr. 16/1994 şi normele metodologice orientative de calcul al arendei aprobate prin ordinul ministrului agriculturii şi alimentației cu nr.26/1994.
4. Legea nr.34/1994. a impozitului'pe venitul net agricol.
5. Bos.N., 2009, Cadastrul şi cartea funciară, Editura All Bucureşti.
6. Regulament privind conținutul documentațiiior referitoare la scoaterea terenurilor din circuitul agricol necesar amplasării obiectivelor de investții, 2001.

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

OPERATIONS AND TECHNICAL DOCUMENTATION CONCERNING CADASTRAL DELIMITATION OF ADMINISTRATIVE TERRITORIES

Luminița Livia Bârliba[1], C. Barliba[1], M. Mazilu[1], Carmen Peptan[1]

KEY WORDS: cadastral delimitation, administrative limit, and intra-urban limit

ABSTRACT

This paper presents the methodology and operations necessary to achieve cadastral delimitations of administrative territories, to draw boundaries among neighbouring administrative territories and intra-urban limits in the area in accordance with present regulations. It also presents the stepping of work from the beginning of the works to final cadastral documentation and to marking administrative boundaries.

INTRODUCTION

Cadastral delimitation of administrative territory represents the basic operation by which it identifies, measures and sets the limits of administrative territories, as it contains breaking points and boundary limits among neighbouring administrative territories as well as intra-urban limits within the area. This work must be done before starting the introduction of general cadastre on an administrative territory.

DELIMITATION OPERATIONS

In order to achieve such cadastral delimitations one should do the following:

a) To nominate a delimitation commission and its composition, acknowledged by the prefect;

b) To get acquainted with the terrain and to settle administrative territory boundaries as well as boundary points that have to be materialised

c) To materialise boundary points with milestones and underground stones in accordance with the SR3446-1/96 Standard or with other types of stones and marks acknowledged or homologated by the A.N.C.P.I.;

d) To execute land and paperwork operations in order to determine boundary point coordinates;

e) To make the confirmation papers agreed by the cadastral delimitation commission members and by neighbouring administrative territory representatives;

f) To work out the cadastral delimitation file and the marking of administrative boundaries.

[1] University of Agricultural Sciences and Veterinary Medicine of the Banat, Timişoara

The cadastral delimitation commission should have the following structure: mayors and mayor's hall secretaries of the administrative territories involved in the cadastral delimitation operation, the A.N.C.P.I delegate and, if the case, the delegate of the General Office for urbanism and territory planning. The structure of the commission should be agreed by prefect's order. They recommend the joining of the commission by natives that know well the boundaries, but they should.not be nominated in the constitution order. In establishing administrative boundary they can invite, if the case, delegates designed by ministries administrating the areas in discussion.

Before starting delimitation works, the A.N.C.P.I delegate together with the mayor proceed to the commission calling together, whose members must study (before they go on the terrain) the whole documentation referring to the last cadastral delimitation.

The mayor's hall that wishes to delimitate its territory boundaries shall notify in writing the neighbouring mayor's hall, at least 15 days in advance, the date, time, and place of meeting in order to proceed with the delimitation. The neighbouring mayor's hall must confirm receipt and delegate the representatives that shall take part in the boundary delimitation.

When some of the administrative territory boundary is right on the boundary between two districts, the delimitation committee shall be made up by a common prefects' order. The mayor's hall that is delimitating its territory and the A.N.C.P.I shall notify in writing the neighbouring prefecture and A.N.C.P.I about the delimitation operation at least 15 days before the date settled for delimitation. They must send their delegates, members of the commission, at the right date, time, and to the right place.

In case the mayor's hall delegates of the neighbouring administrative territory, neighbouring prefecture or neighbouring A.N.C.P.I do not show up in due time, boundary delimitation shall be done in their absence, absence that shall be mentioned in the delimitation report and cadastral sketch.

The boundary delimitation operation should start from three or more boundary points, by the identification of the line up to the next point made up by the crossing of several boundaries. Line identification should be made with the help of the sketch of the last delimitation. If none, line delimitation should be made by the commission members by outlining it on the existing maps and topographical plans. The representatives of the workers, summoned by the care of the A.N.C.P.I, must also take part in the operations of setting of boundary line points and of points to be materialised.

For all materialised boundary points they should make up land-marking sketches and topographical descriptions. Data concerning lands crossed by boundary line segments should be mentioned in the delimitation report.

If the boundary line is also a border, the coordinates for the boundary points shall be taken from the Geodesy, Photogrammetry, Cartography, and Cadastre Institute through the A.N.C.P.I. The National Border Guard Head Quarters should also acknowledge borderline.

During the direct contact with the terrain they should also describe the state of milestones both for boundary points and for the new points that must be materialised by milestones.

Points to be mile-stoned are:

- boundary line crossing points;
- some lining change points on the boundary chosen as to allow, if the case, an exact reconstitution of the boundary line; on boundary segments longer than 3 km, milestones should be set every 2 km;
- boundary and stream, railway, highway crossing points should be mile-stoned

only on one side, while the opposite one should be marked by 10 cm diameter and 70 cm long wooden poles protected by earth piles.

In case lining change or crossing points that are to be mile-stoned cannot be marked, witness mile stones should be planted in the near vicinity marking boundary point coordinates.

If the boundary crosses in a straight line a compact forest, a pasture, a meadow or a lake, the boundary line and surface limit of the previous crossing point should be marked. If the boundary line crossing a forest is broken or sinuous, they shall pick and determine the coordinates at wich points define the line in discussion. In this case, the delimitation commission shall also include representatives of the District Forestry Office and of the Romanian Water Regie.

If the boundary is formed by a stream thalweg, only boundary line and streamline crossing points shall be delimited, no matter the length of the segment.

If roads, railways, dikes, canals, etc. delimit the administrative territory, boundary line dentifies with one of these borders, so that they contain within the administrative territory.

In case streams, roads, railways, etc. lines are sinuous or broken, they should determine intermediary point coordinates that should be used, in the calculus of the administrative territory surface.

The coordinates X, Y, and Z of the boundary points they should calculate according to the 1970 Stereographic projection system and as a reference point the 1975 Black Sea, with a determining precision similar to that of points in support geodesic networks.

In case there are misunderstandings among neighbours as far as boundary line settlements is concerned and the commission members cannot solve them, this should be mentioned in the delimitation documents, as follows:

- on the general sketch of the administrative boundary and on the sketch concerning the segment of boundary under dispute, they should mention both variants;
- the disputed surface should be calculated from the contour point coordinates that are established in the presence of the delimitation commission;
- some characteristic points on the disputed surface contour should be materialised with 50 cm long and 10 cm diameter wooden poles having a different numbering from the rest boundary points;
- until the resolution of the dispute, the disputed area should be included in the calculated surface of the territory nominated by the A.N.C.P.I.;
- in the delimitation report they should mention the arguments of both parts and they should attach copies of the papers they own;
- after resolution, cadastral documentation should be remade and point should be materialised with milestones according to the variant agreed.

DELIMITATION DOCUMENTATION

Delimitation file should be made in three copies: one for the A.N.C.P.I., one for the mayor's hall and one for the district council. For boundary segments common to neighbouring administrative territories they should make up files containing boundary segment sketches and boundary point position and numbering. For segments identifying with district boundaries, they need the agreement of prefectures and of A.N.C.P.I. of the two neighbouring districts: seal of the prefecture, signature of the prefect, signature and seal of the district council president on the sketch next to the boundary segment.

Delimitation file destined to reception should contain the following:

- a general sketch of the boundary and sketches of the boundary segments between two points at the crossing of three or more boundaries with the agreement and the signature of the delimitation commission members;
- identification sketches of all materialised points;
- a coordinates inventory for all boundary points (materialised and not materialised); topographical descriptions of all materialised points;
- a scheme of all measurements;
- the territory surface calculated from coordinates of all boundary points;
- a delimitation report with the description of all segments of boundary corresponding to every neighbouring administrative territory, with the signatures of the delimitation commission members;
- copies of the letters of notification sent to the mayor's halls of the neighbouring administrative territories and, if the case, to the prefects and neighbouring A.N.C.P.I.;
- a coordinate inventory for all materialised points, on a magnetic support; the general sketch of the administrative boundary should be made on copies after cadastral or topographical maps at a scale of 1:25000 or 1:50000 so that the entire size be represented on a single sheet of paper.

The general sketch of the administrative territory should be accompanied by a description of the boundary line and should contain the following:

- the main communication ways network;
- the hydrographic network made up of streams and lakes, canals and main dikes;
- the perimeter of intra-urban and their denomination;
- the position and the numbering of materialised points and of three or multiple boundary points;
- the boundary line marked by conventional signs;
- the denomination of neighbouring territories.

The general sketch of the intra-urban limit should be at a scale of 1:5000, 1:10000 or 1:15000 and contain the point numbering, the denomination of the intra-urban, the general network of roads and streets and the hydrographic network. In special cases they can also present larger scale details.

CONCLUSIONS

The issue of Law 18/1991 and of Law 1/2000 resulted in the constitution and reconstitution of propriety right over terrains, which engendered a strong necessity for delimitation and materialisation of village, urban, and municipal boundaries in order to start the introduction of general cadastre works on administrative territories.

Material and moral reconstruction of the country is impossible without village reconstruction, a field in which cadastre can make its own contribution by identifying and materialising old boundaries and by executing works on these territorial units.

BIBLIOGRAPHY

1. Brebu P., Ritt C., Popescu C., 2002. Ghid pentru lucrările de cadastru funciar. Editura Eurobit Timişoara.
2. Bos N., 2009, Cadastral si cartea funciară. Editura All Bucureşti.
3. Uniunea geodezilor din România, 1999. Revista de geodezie, cartografie si cadastru nr.2 (supliment)

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

EXPERIMENTAL EQUIPMENT FOR CORROSIVE GASES DRYING IN VACUUM FOOD PROCESS

Rosca Adrian, Rosca Daniela[1]

KEY WORDS: equipment, vacuum, molecular sieves

ABSTRACT

The paper presents experimental equipment designed and made for gases drying in vacuum food processing. Due to the physical and chemical properties of the gases coming into contact with the absorber synthetic zeolite surface, ZMS are usually used for selective adsorption of air components, for selective filtration of dangerous gases in air, for air drying used in food industry and environmental engineering. To reduce the air humidity and to reduce the concentration of hazard gaseous components in ZMS pores, the actual methods for ZMS recovery. The experimental equipment consists in a modular filter with used zeolite molecular sieves, which is not possible to be recovered for selective adsorption of gases components.

INTRODUCTION

In order to determine the influence of medium and low vacuum process in fruits preservation, in Unconventional Equipment and Technologies for Food Industry in Faculty of Horticulture, experimental equipment was made.

In main, the experimental equipment is composed in a vacuum pump, a condensed gases dryer module, and a stainless steel vessel for fruits vacuum processing (figure 1).

The condensed gases dryer module working is based on ZMS adsorption and absorption proprieties.

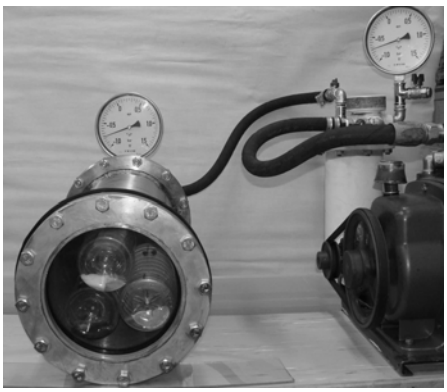


Figure 1. Experimental equipment for vacuum food processing

[1] University of Craiova

The gases drying method is possible due to the physical / chemical properties of the industrial gases in contact with the synthetic zeolite (the main components of gases have molecular dimension comparable with the molecular sieve pores diameter).[1, 2]

The experimental equipment for this drying method operates in five main steps: air pressurization of the absorber vessel at the working pressure; humidity separation from air supplied under pressure; pressure equalizing in the both filtering stages; fast depressurization for purging humidity; re-pressurization at supplying. [3, 4]

After more then 350 hours working, due to the increase of the humidity in the molecular sieve, the drying module is no more able to provide a dried gas and the molecular sieves must be changed or recycled.

In Unconventional Equipment and Technologies for Food Industry in Faculty of Horticulture, an experimental equipment for air drying using A and X ZMS type, was made (figure 2).[5]

During operating, the molecular sieve humidity might increase up to 20%, and the due to the porous saturation, the adsorption/drying process is not possible properly.

The molecular sieve recovery process consists in heating up to 350…450^{o}C, under 0,35…0,5bar vacuum. At this temperature range, during the heating/ drying process, in the molecular sieve a lot of micro crashes are observed (under electronic microscope). These micro crashes produce the increase of the porous dimension that determines the decreasing of the adsorption property. In the same time, the small molecular sieve particles are over heated and can not be used for adsorption/drying process. [5]

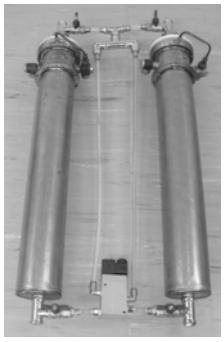


Figure 2. Experimental equipment for air drying using ZMS

The compressed air drying module (figure 2), in main, consists in a stainless steel cylindrical double wall vessel (H_c /D_c =10) which contains two filter device containing X and A ZMS type.

In order to recovery at lower temperature heating and higher vacuum the molecular sieve used in interdisciplinary food research, an experimental equipment was set up making some adaptations of the experimental equipment for air drying using molecular sieves.[5]

The experimental research set up the optimum duration of the molecular sieve recovery process, considering the humidity level before starting the recovery process.

During this the recovery process there considered four temperature steps (120^{o}C, 130^{o}C, 140^{o}C, 150^{o}C) for heating process and a constant vacuum level about 0,05…0,1bar (absolute vacuum 0,99…0,995bar). After this process the recovered ZMS are not possible to be used in adsorption separation process, and is necessary to study the recovery possibility for condensed gas filtration.[5]

EXPERIMENTAL EQUIPMENT

During the vacuum processing, the corrosive condensed gases can contaminate the vacuum pump. Therefore before the vacuum pump inlet, a filter module is recommended.

Due to the high corrosivity of the condensed air that result during the low vacuum ($1…10^3$mbar) food processing the drying process must utilize ZMS filter module. [6]

In Unconventional Equipment and Technologies for Food Industry in Faculty of Horticulture experimental equipment with ZMS filter module for high corrosive gases drying was made (figure 3). In the filter module contains process recovered ZMS that are no more possible to be used in adsorption separation process. Before being utilized in filter module, the recoverable ZMS are heated (in vacuum -0,5bar) at 420…440^{o}C.

Figure 3. ZMS drying filter module for high corrosive gases

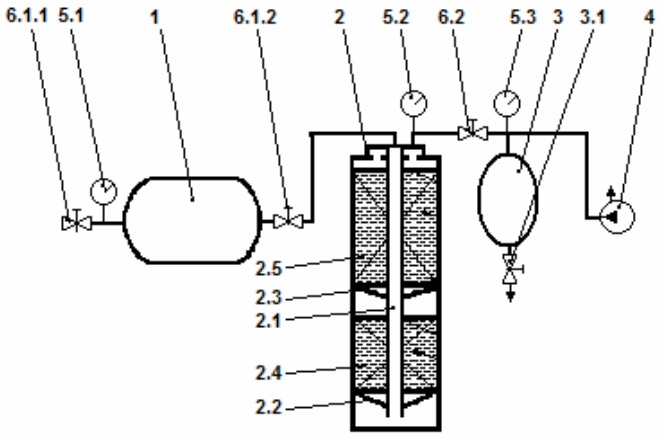


Figure 4. Experimental equipment for corrosive gases drying in vacuum food processing

In main, the experimental equipment for corrosive gases drying in vacuum food processing (figure 4) consists in a stainless steel vessel for fruits vacuum processing *1*, a ZMS drying filter module *2*, and low vacuum pump *4*.

The main characteristics of HYVAC type vacuum pump: ultimate vacuum up to 0,1 militorr; maximum flow rate (pumping speed) up to 40 l/mim.

The stainless steel vessel for fruits vacuum processing *1* and the ZMS drying filter module *2* and the condensed gases probe vessel *3* are designed and made according Romanian ISCIR norms: ultimate vacuum up to 0,5 militorr; stainless steel W1.4571; welding coefficient 1; 100% ultrasonic control for welding assemblies.

In principle, the ZMS drying filter module *2* consists in a stainless steel vessel with a central supply pipe 2.1, two filter device containing X (*2.4*) and A (*2.5*) ZMS type.

Each filter is closed with alloy porous plates: the inferior porous plates *2.2* with 5 μm porosity; the superior porous plates *2.3* with 0,3 μm porosity.

To control the pressure/vacuum process, the ZMS drying filter module *2*, the fruits vacuum processing vessel *1*, and the condensed gases probe vessel *3* are provided with special manovacuumeter gauges (stainless steel W1.4571; 1,6 precision class) *5.1*, *5.2*, *5.3*, and special manual switchers *6.1.1*, *6.1.2*, *6.2*.

The manual switcher *3.1* permits the fast connection between the probe vessel *3* and the gases analyzers (VOC - Dragger analyzer; humidity - Humidimeter). [7]

CONCLUSIONS

In order to determine the influence of low vacuum process in fruits preservation, the experimental equipment was used to determine the drying filter module capacity to absorb the moisture due to vacuum process.

According to experimental research concerning the influence of low vacuum process in fruits preservation, the vacuum pump have to utilized at the following parameters: ultimate vacuum from -0,7bar up to -0,99; maximum flow rate (pumping speed) from 10 l/mim up to 40 l/mim.

During the experiments it was observed that using recoverable ZMS filter system, the humidity' decrease up to 12%, and in the same time the total VOC' decrease up to 7%.

REFERENCES

1 Cruceanu M. - Zeolite molecular sieves. Bucharest Scientific and Encyclopedic Publishing House, 1986.

2 Rosca Adrian (project manager) - Autonomous generator of technical oxygen for industrial application. Research project A59/2002, financed by the Romanian Ministry for Education and Research.

3 Rosca Adrian - Autonomous generator for technical oxygen. The 7th International Conference on Frontiers of Polymers and Advanced Materials, ICFPAM, Bucharest, 2003.

4 Rosca Adrian, e.a. - Autonomous Generator of Technical Oxygen. Molecular Crystals and Liquid Crystals Journal, Vol. 417, Taylor & Francis Academic Journal, London, Journal Sequence Number 69498J0, ISSN 1058-725X, 2004.

5 Rosca Adrian, Rosca Daniela - Considerations concerning a new economical and ecological method for zeolite molecular sieves recovery. Annals of University of Craiova, Biology, Horticulture, Food Industry, Agriculture Environmental Engineering Series, Vol.XIII (XLIX), 2008.

6 *** BOC EDWARDS-Vacuum Products, 2000.

7 *** Product Handbook for equipment provided by Thermomechanic Parameters Monitoring Laboratory in Faculty of Horticulture, and by Environmental Parameters Laboratory Faculty of Electromechanics (financed by CNCSIS grant Interdisciplinary Platform Tehnoplat Oltenia).

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

EVALUATION OF AIR POLLUTION CAUSED BY ACTIVITIES DEVELOPED IN JILT- SOUTH MATASARI QUARRY

Roxana-Gabriela Popa, Ramona-Violeta Mitran[1]

KEY WORDS: *air, pollution, mine, powders*

ABSTRACT

Jilt Mining is part of Turceni Steam Power Plant and consists of two quarries: South Jilt and North Jilt. Air quality is mainly altered in the technological process from the quarry, dump and the coal warehouse, by the increase of powders, gases, smoke concentrations in certain areas, resulting from motorcars and burning processes.The highest emissions of particles in suspension occur during the phases of excavation, dumping and loading the tailings and the coal into wagons. In order to evaluate the impact caused upon air by the activities developed in Jilt-South Matasari Quarry, air sampling points were established and the main polluting agents have been monitored: depositing powders and suspension powders.

INTRODUCTION

Jilt mine perimeter is located in the North-West side of Oltenia, in South-West of Gorj County, respectively, mostly within the perimeter of Matasari, Runcurel, Dragotesti, Croici, Negomir and Slivilesti.

The quarry perimeter is conventionally delimited:

- to the north – by the mine perimeter of Jilt North Quarry
- to the west – by Plostina and Leurda mines perimeter
- to the south – by Tehomir mine perimeter
- to the east – by the industrial area of Jilt basin (fig. 1)

Opening works for this quarry began in 1977 and its operation is provided for 90-100 from now on. Jilt Quarry has a 6,250,000 tons coal capacity, being one of the greatest lignite quarries in Romania.

Between 1978 and 2005, 390,409 thousand (m^3/t) mine mass was excavated, transported and stored, 50,859 thousand tons of coal from 12^{th}, 10^{th}, 9^{th}, 8^{th} and $6\text{-}7^{th}$ layers to an average barring ratio of 6,7 m^3/t. The technological vertical excavation design caused 8 operation steps with the height of 20 m/step.

The excavated material resulting from technological excavation areas is transported on belts to the quarry distribution junction, where the tailings are distributed on the main belts and directed to the exterior or interior dump, and the coal is distributed on one of the main belts and directed to the coal warehouse.

Opening and putting into operation Jilt mine field were made with the purpose of

1 University "Constantin Brancusi" of Tg-Jiu

providing lignite to the Turceni Power Plant. Jilt Mining is part of Turceni Steam Power Plant and consists of two quarries: South Jilt and North Jilt. South Jilt quarry uses "sterile rocks transport to interior and exterior dumps operation method" and "continuous excavation technology, transport and dumping" by using excavation, transport and dumping plants.

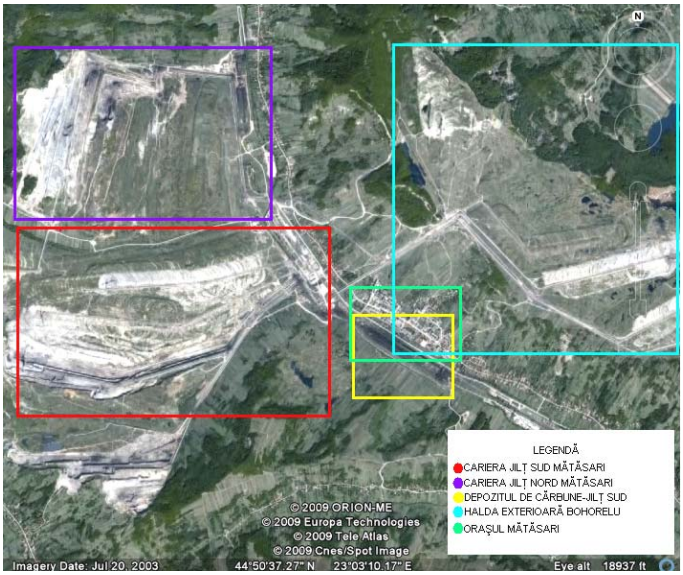


Fig.1 Satellite view of Jilt -South Matasari Quarry

Air quality is mainly altered in the technological process from the quarry, dump and the coal warehouse, by the increase of powders, gases, smoke concentrations in certain areas, resulting from motorcars and burning processes.

The highest emissions of particles in suspension occur during the phases of excavation, dumping and loading the tailings and the coal into wagons.

The impact upon the air caused by coal operation activities in Jilt mine field is a local, temporary impact and refers to:

- emissions of particles in suspension – depositing powders during excavation, belt transport, tailings dumping, coal dumping and handling
- emissions of burning gases and depositing powders in the air, due to internal burning plants and transport means operation within the mine perimeter
- emissions of volatile hydrocarbons, through normal breathing at the fuel warehouse or evaporations when handling fuels
- various acoustic emissions, fixed or mobile, caused by technological plants or transport means
- refuse dumps, through the dust resulting from their overflowing and sloping
- dust occurred at the technological transport of the tailings and coal with funiculars, belt conveyors, dumpers or wagons inside the quarry, preparation factories, coal warehouses and refuse dumps

- dust occurred at the changing point of the transport system when one passes from discontinuous transport to continuous transport, with belt conveyors dust resulted from the eolian erosion of refuse dumps dry surfaces.

MATERIAL AND METHOD

In order to evaluate the impact caused upon air by the activities developed in Jilt-South Matasari Quarry, air sampling points were established and the main polluting agents have been monitored: depositing powders and suspension powders.

Depositing powders emissions monitoring points for the influence area of Jilt South Quarry were located in inhabited areas. Two sampling points were established:

- ✓ PsdJS1 – located east from the quarry near the coal warehouse and loading point influence area ($44^0$50'42"N and $23^0$05'10"E);
- ✓ PsdJS2 – located south from the quarry ($44^0$49'50"N and $23^0$05'06"E).

From the material particles in suspension, which are all the particles from a stable volume, PM_{10} fraction was determined. The measurement process is based on nitrocellulose filter sampling with $\Phi = 47$ mm of PM_{10} fraction, separated from the suspension particles in the air and their gravimetric determination.

Suspension particles monitoring, PM_{10} fraction from the South Jilt quarry influence area was made by air sampling from four distinct points, located as follows:

- ✓ PMJS1 – located near the coal loading point into wagons, 50 m east ($44^0$50'41" N and $23^0$05'12"E);
- ✓ PMJS2 – located near the loading point, 150 m north-east ($44^0$50'44" N and $23^0$05'14"E);
- ✓ PMJS3 – 400 m north-east from the pollution source ($44^0$50'50" N and $23^0$05'23"E);
- ✓ PMJS4 – 250 m south-east from the source and 20 m from houses ($44^0$50'37" N and $23^0$05'19"E);

Measurements were performed three days consecutively for every sampling point.

RESULTS AND DISCUSSIONS

Depositing powders pollution

The results regarding the measurements of depositing powders carried in 2007 and 2008 are presented in table 1.

The interpretation of the results for this air quality indicator was performed according to STATS 12574/1987 provisions "Air from protected areas. Quality conditions". Measurements were performed with the gravimetric method according to STAS 10813/1976.

In 2007, at PsdJS1 sampling point, from the 12 measurements performed within a year, exceeding value frequency compared to the maximum admitted concentration provided by the standard was 41,6%. The highest value was recorded in January, namely 2,41 times over the admitted limit. The lowest concentration during 2007 was measured in December, 4 times smaller than the admitted limit.

In PsdJS2 point, exceeding value frequency was only 16,6%. The highest value was recorded in August, 1,06 times over the maximum admitted concentration. The minimum value was recorded in December, 2,55 times smaller than the admitted limit.

In 2008, at PsdJS1 sampling point, from the 12 measurements performed within a year, 6 recorded exceeding value of maximum admitted concentration, with a frequency of

50%. The highest measured value was in March, 1,58 times over the admitted limit. The lowest concentration was recorded in February, 2,48 times below the admitted limit.

Table 1

Depositing powders concentrations in the air

Sampling period	Concentration (g/m^2/months)				C.M.A. (g/m^2/months)
	2007		2008		
	Sampling point		Sampling point		
	PsdJS1	PsdJS2	PsdJS1	PsdJS2	
January	41,03	8,31	8,98	2,84	17
February	13,44	7,24	6,84	9,49	
March	15,87	12,6	26,89	9,6	
April	14,77	15,39	17,56	8,89	
May	21,95	16,1	18,98	12,38	
June	15,4	12,24	7,07	14,15	
July	22,72	17,89	21,32	16,14	
August	29,77	18,04	21,13	14,94	
September	26,82	14,21	19,16	12,78	
October	9,63	11,7	16,05	8,33	
November	14,29	7,72	10,57	7,16	
December	4,17	6,66	11,52	10,84	

At PsdJS2 point, in 2008 there was no exceeding value recorded. The highest values were recorded during the summer months, and the smallest in winter. In January, the measured value was almost 6 times smaller than the maximum admitted value.

For the South Jilt quarry, air samples were taken monthly, between 2007 and 2008, depositing powders concentrations were analyzed and determined and resulting values were graphically represented (fig. 2).

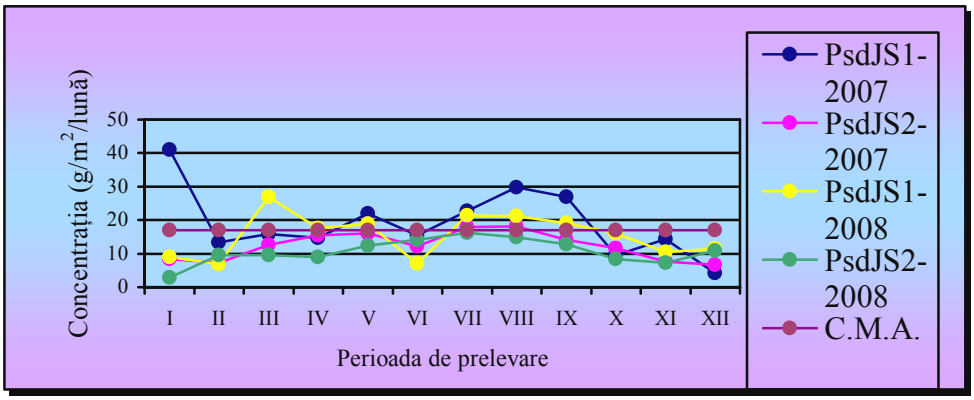


Fig. 2. Depositing powders concentration fluctuation in the air in the Jilt-South Matasari quarry

Suspension powders pollution (PM_{10})

The values of the measurements performed are presented in table 2.

Results were interpreted according to the provisions of the Ministry of Waters and Environment Protection no. 592/2002 for the approval of the Regulations regarding the determination of limit values, threshold values and evaluation criteria and methods for sulphur dioxide, nitrogen dioxide and nitrogen oxides, suspension powders (PM_{10} and $PM_{2,5}$), lead, benzene, carbon monoxide and ozone in surrounding air. According to these regulations, the daily limit value for the protection of human health is 50 µg/m^3.

Table 2

Suspension powders concentrations in the air

Measurement point	Concentration (µg/m^3)	Measurement point	Concentration (µg/m^3)	C.M.A(µg/m^3) Conf. Ord. 592/2002
PMJS1	37,51	PMJS3	63,44	50
	24,91		25,01	
	31,46		71,04	
PMJS2	58,36	PMJS4	33,84	
	31,29		60,49	
	35,52		65,53	

At the PMJS1 point, located near the crushing wagons loading point, all the values measured for PM_{10} are below the admitted limit (fig. 3).

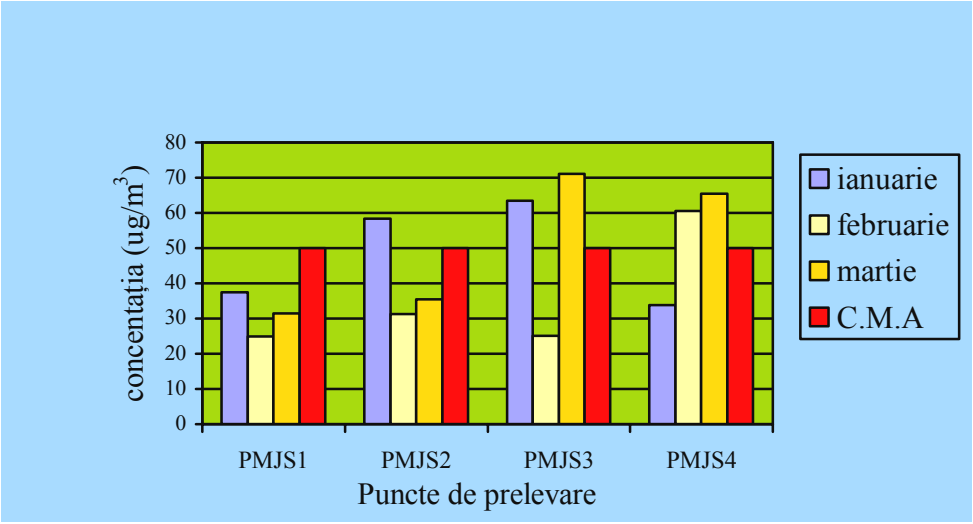


Fig. 3. PM10 concentration fluctuation in the area of Jil-South Matasari quarry

At the PMJS2 point, located farther from the pollution source, there was only one exceeding value, 16,7% higher than the technical admitted limit value.

At PMJS3 point, located in the same direction as PMJS2, but farther from the source, from the three measurements performed, two exceeded the limit, this time 26,8% and 42% respectively higher than the daily admitted limit value.

The same case was found for the PMJS4 point located farther than the first two, but on another direction from the source. Exceeding values in this case were 20,9% and 31% respectively higher than the daily limit value.

CONCLUSIONS

1. In the case of assessing air pollution with depositing powders, we analyzed the chart with the values resulting for the two years of measurements and it was concluded that the frequency of exceeding values is close, but in 2007 there were higher values than in 2008 at the PsdJS1 point, this point being close to the coal warehouse and coal loading point into the wagons.

2. We also notice that at the two sampling points the frequency of exceeding values was higher in summer than in other seasons. This explains through the fact that the excavated mining material (coal) is friable, with low mechanic resistance and humidity is reduced during summer leading to high amounts of dust.

3. Lower concentrations generally measured in winter are explained by the fact that in this period, coal extraction and transport activity develops with low intensity, the operation personnel being free.

4. In the case of suspension powders indicator, increased values were recorded compared to the daily admitted limit from the points located farther than the pollution source. The greatest value was recorded at PMJS3, located north-east and farthest from the pollution source.

REFERENCES

1. Fodor D., *Pages from the Mining History,* Infomin Press, Deva, 2005
2. Fodor D., Baican G., *Impact of Mining Industry on the Environment,* Infomin Press, Deva, 2001
3. Huidu E., *Monograph of Mining in Oltenia,* 2nd volume, Jilt Basin 1974-2007, Maiastra Press, 2007
4. Lazarescu I., *Protection of Surrounding Environment and Mining Industry,* Scrisul Romanesc Press, Craiova, 1983
5. STATS 12574/87, *Air from Polluted Areas. Quality Condition. Depositing Powders*
6. STAS 10813/76, *Determining Suspension Powders*

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

STUDY ON THE QUALITY OF SOIL ALTERED BY S.C. SUINPROD S.A. GORJ

Roxana-Gabriela Popa, Ramona-Violeta Mitran[1]

KEYWORDS: soil, contaminations, pH, nitrogen

ABSTRACT

S.C. Suinprod S.A. Bumbesti-Jiu operates in the porcine rearing and trading field of activity. In order to evaluate the quality of the soil altered by the activity, a study was performed in 2008, approaching the sampling method of 4 soil samples from outside the location and 13 soil samples from inside.The content of total nitrogen and pH was chemically determined and it was proved that all soil samples are low acid or neuter with one exception, in the case of the soil samples taken from the incinerator under construction, for which the pH was slightly basic. Analyzing the results of the chemical test for the determination of Nt in the soil, we notice that 14 soil samples have very low total nitrogen content, one soil sample has low total nitrogen content and 2 soil samples have medium total nitrogen content.

INTRODUCTION

S.C. Suinprod S.A. Bumbesti-Jiu operates in the porcine rearing and trading field of activity.

The unit was established in 1972, under the name of State Agricultural Enterprise for Pigs Rearing and Caring. 10 warehouses were built at first, providing accommodation for 12,000 pigs. The, 7 more warehouses were built, providing space for 30,000 pigs.

Pigs rearing activity develops continuously 365 days/year, and operational processes developed at S.C. Suinprod S.A. for pigs rearing and trading can be divided in 22 sequential parts.

S.C. Suinprod S.A. production activity does not develop in chemical plants. Pigs rearing is an activity based on biologic processes and animals' life maintenance naturally, without the intervention of chemical raw materials, undergoing interactions with composition alterations. From pigs rearing activity in production warehouses, liquid and solid waste results, loading the effluent with polluting agents, requiring treatment operations before being discharged in Jiu river.

At the researched location, by 1972, agricultural and pasturing activities were chronologically performed, and by 1998 intensive pig rearing activities under the ownership of Romanian state, when privatization occurred, preserving the same pigs rearing and trading activity.

[1] University "Constantin Brancusi" of Tg-Jiu

S.C. Suinprod S.A. Bumbesti-Jiu location is on a plateau characterized by an average altitude of +240 m and is bordered by DN 66 Tg-Jiu – Petrosani and the railway at east, by a field and by Jiu river left arm meadow to the west. The entire plateau is characterized by the general quota of +240 m with a slight slope, the level quotas easily increasing in the north-west (fig. 1).

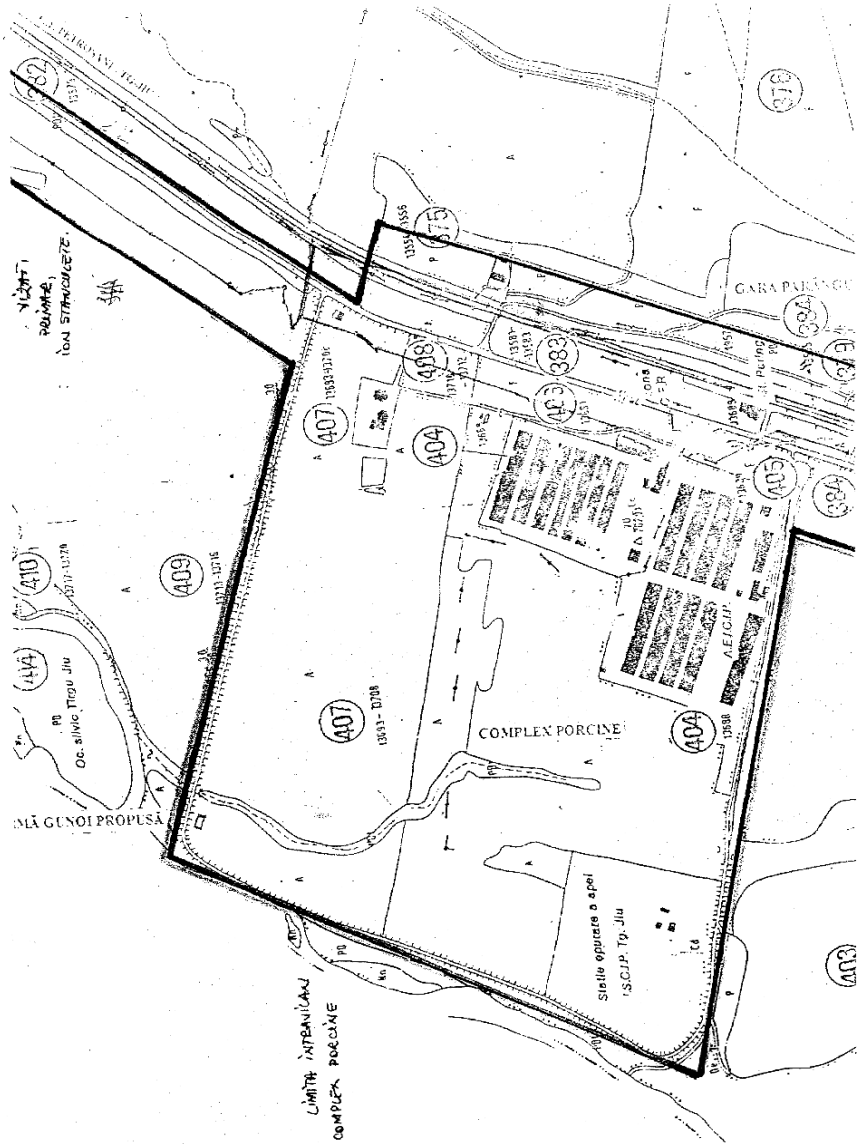


Fig. 1. Status plan regarding the location of S.C. Suinprod S.A. – Gorj

MATERIAL AND METHOD

In order to identify possible soil contaminations with animals waste, in the previous and present activity, a simple matrix was developed revealing the alteration of soil quality indicators, pH and Nt. (table 1).

The study regarding the evaluation of soil quality affected by the activity developed by S.C. Suinprod S.A. Gorj in 2008 was performed in order to identify a possible previous pollution, taking into consideration that the reproduction, rearing, fattening and trading activity of pigs at this location began 34 years ago. Hence, soils samples were taken from the depth of 500 mm, and in order to determine pH and total nitrogen, 4 samples of soil were taken from the exterior side of the location and 13 soil samples from inside (table 2).

Table1

Simple matrix of soil inside and outside SC Suinprod SA Gorj

Period	The use of previous and present location	pH's	Nt soil
up to 1972	crops and pastures	X	X
1972–1998	growth of pigs and meat processing	X	X
1998-2004	growth of pigs and meat processing	X	X
2004-2008	growth and marketing of pigs	X	X

Table 2

Soil sampling points location

Number of soil samples	Sampling point
1	No.3 trunk area carved by running water from its groundwater
2	No trunk area. 5 dig for water extraction
3	Zone located 100 m south of the farm
4	Afiltrului antiepizootic area
5	Former slaughterhouse area
6	Holding area for breeding and growing pigs
7	No drilling area. 4
8	Inside the complex at a distance of 200 m of fence
9	No drilling area. 7
10	Area WWTP
11	No trunk area. 8 dug for water extraction
12	Zone No.2 dug the well for water extraction
13	Incinerator area under construction
14	No drilling area. 1 deep
15	Outdoor area 30 m south of the farm
16	No trunk surface area. 6
17	Outdoor area 100 m east of the farm

17 holes were made, having the sizes of Q = 300 and depth = 500 mm, 1 kg soil samples were taken, labelled, packed and sealed. Soil samples were analyzed from the chemical point of view and resulting values were analyzed according to the methodology or compared to the level of soil provision with nitrogen, according to the regulations established by the Research-Development Institute for Soil Science, Agro-chemistry and Environment Protection, Bucharest and were graphically represented.

The comparison of the values resulted for the nitrogen content in the soil was made based on the instructions for performing agro-chemical studies, revealing soils characterization, depending on the nitrogen content (%), as follows:

- low nitrogen content soils – Nt<0,14
- medium nitrogen content soils – Nt=0,14 – 0,27
- high and very high nitrogen content soils – Nt>0,27

RESULTS AND DISCUSSIONS

Table 3 presents the results achieved from the chemical analysis of the 17 soil samples taken from the outside and inside of S.C. Suinprod S.A. Tg-Jiu, for the quality indicators, pH – metric pH and Nt - through the Kjeldhal method.

Table 3

Determining the pH and Nt for soil samples taken from the outside and inside of the location

pH (pH units)		Total nitrogen content (%)	
The amount of soil samples collected	Rating according to the methodology	The amount of soil samples collected	Characterization of nitrogen supply
6,09	Moderate Acid	0,039	Very small values
6,25	Moderate acid	0,070	Very small values
6,33	Moderate acid	0,118	Very small values
7,50	Slightly alkaline	0,028	Very small value
6,70	Moderate alkaline	0,046	Very small values
7,01	Neutral	0,085	Very small values
6,60	Moderate alkaline	0,088	Very small values
7,09	Neutral	0,057	Very small values
6,77	Moderate alkaline	0,040	Very small values
7,10	Neutral	0,251	Stock medium
6,49	Moderate alkaline	0,068	Very small values
6,66	Moderate alkaline	0,087	Very small values
8,70	Moderate alkaline	0,077	Very small values
7,69	Slightly alkaline	0,250	Stock medium
6,22	Moderate acid	0,048	Very small values
6,54	Moderate acid	0,067	Very small valu
7,29	Slightly alkaline	0,057	Very small value

Figures 2 and 3 describe the graphic representations of the variations of the two indicators (pH and Nt) in the 17 soil samples.

Analyzing this chart, we notice that all the soil samples are weakly acid or neuter, the lowest value being recorded in the case of soil sample no. 1, taken from the area near shaft no. 3 dug for water from phreatic water (pH=6,09) and the highest value, slightly basic, was recorded for sample no. 13, taken from the area of the incinerator under construction (pH= 8,70).

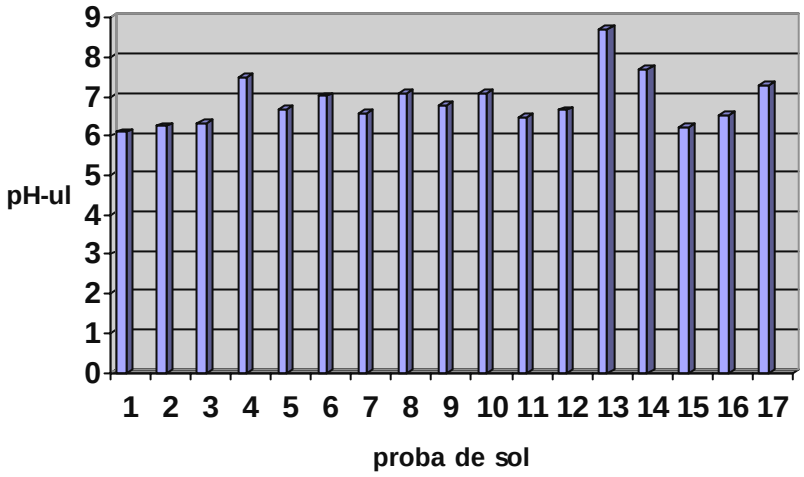


Fig. 2 Graphic representation of pH variation in the soil samples taken from S.C. Suinprod S.A. Gorj

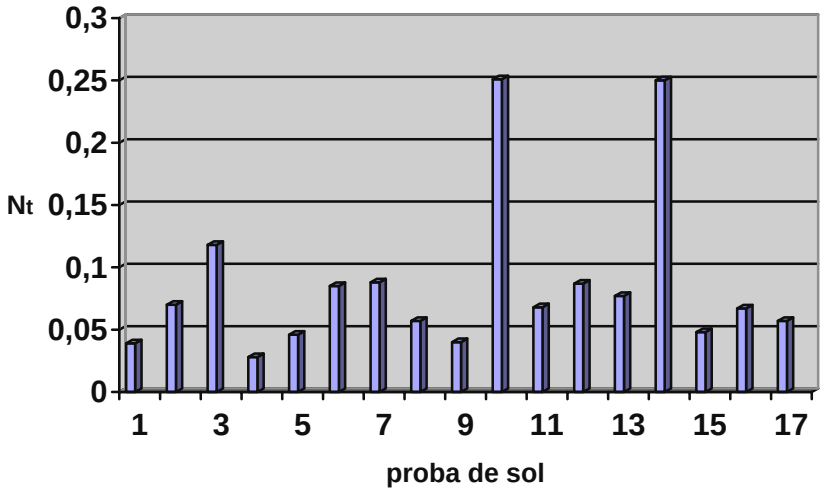


Fig. 3 Graphic representation of Nt variation is soil samples taken from S.C. Suinprod S.A. Gorj

Analyzing the results of the chemical test for the determination of Nt in the soil, we notice that the total nitrogen supply status is as follows:

- 14 soil samples (samples no. 1,2,3,4,5,6,7,8,9,11,12,13,15,16,17) have a very low content of total nitrogen
- one soil sample (sample no. 3) – has a low content of total nitrogen
- 2 soil samples (samples no. 10 and 14) – have a medium content of total nitrogen

For a normal supply of nitrogen to the soils, a certain amount of nitrogen based mineral and organic fertilizers is necessary in all the analyzed cases.

The structure of the 17 soil samples (4 from the outside and 13 from the inside) taken to 500 mm depth, was examined on 3 levels of depth, their quality being as follows:

- for the 0-50 mm depth – vegetal soil
- for the 50-400 mm depth – marbling-yellow soil
- for the 400-500 mm depth- river alluvial gravel

The analysis of the soil quality for the presence of smells (olfactory) gas or steam releasing and water (visual) proved the absence of the 3 indicators in all 17 analysed soil samples.

CONCLUSIONS

1. S.C. Suinprod S.A. Bumbesti-Jiu operates in the porcine rearing and trading field of activity.
2. In order to evaluate the quality of the soil altered by the activity, a study was performed in 2008, approaching the sampling method of 4 soil samples from outside the location and 13 soil samples from inside.
3. The content of total nitrogen and pH was chemically determined and it was proved that all soil samples are low acid or neuter with one exception, in the case of the soil samples taken from the incinerator under construction, for which the pH was slightly basic.
4. Analyzing the results of the chemical test for the determination of Nt in the soil, we notice that 14 soil samples have very low total nitrogen content, one soil sample has low total nitrogen content and 2 soil samples have medium total nitrogen content.
5. The analysis of the soil quality for the presence of smells (olfactory) gas or steam releasing and water (visual) proved the absence of the 3 indicators in all 17 analysed soil samples.

REFERENCES

1. Stãnicã Ezeanu D., Environmental Protection, Publisher UPG, Ploieşti, 2005
2. Barnea M., Papadopol C., Pollution and the Environment, Publisher Scientific and Encyclopaedic, Bucureşti, 1975
3. Duca G., Scurlatov I., Misiti A., Macoveanu M., Surpateanu M., Organic Chemistry, Publisher Matrix Rom, Bucuresti,1999
4. Surpateanu M., Elements of environmental chemistry, Publisher .MatrixRom, Bucuresti, 2004
5. Popa R.G., Protection and soil remediation techniques, course notes, Faculty of Engineering, University Constantin Brancusi of Tg-Jiu, 2008
6. Impact assessment and environmental balance, S.C. Suinprod S.A. Gorj, 2008
7. Stas sites in place for determining soil pollutants - pH's and Nt soil

UNIVERSITATEA DIN CRAIOVA
UNIVERSITY OF CRAIOVA

Seria: ✓*Biologie*
✓*Horticultură*
✓*Tehnologia prelucrării produselor agricole*
✓*Ingineria mediului*

Vol. XIV (XLX) - 2009

ASSESSMENT AND QUANTIFICATION OF NOISE RESULTING FROM URBAN TRANSPORT

Buzatu Gilda-Diana[1], Petrişor Ion[2]

ABSTRACT

In Craiova noise is an important part of general pollution and also a major threat to the quality of the environment along with air pollution, water and inadequate waste management. In the noise pollution, the main sources of Craiova Municipality are road traffic, particularly on major thoroughfares where cars movement overlaps with the transport, as well as tram routes that cut residential areas.

The achievement of noise maps is an important factor in determining future development strategies of the city of Craiova, to improve habitat in the area, the ecological conditions of European mandatory requirements of the National Action Plan to reduce the noise levels.

INTRODUCTION

In residential areas the climate noise reaches levels between 60-70 dBA, which shows exposure to hazardous noise. Psycho-physiological indicators, the index for the inconvenience and traffic noise index recorded an upward trend from moderate values to high values of noise, which has a negative impact on the population.

European Parliament and the Council adopted: Directive 2002/49/EC on 25 June 2002 on the assessment and management of environmental noise; GD 321/2005 on the assessment and management of environmental noise, GD no. 674 of 28 June 2007 amending and supplementing GD nr.321/2005. They aim to develop measures to reduce noise emitted by major sources of noise, and establish a common approach by Member States in order to avoid, prevent or reduce harmful effects on the population, caused by ambient noise.

Implementation is achieved through the following measures:

- making publicly available information on noise exposure and its effects;
- determination of exposure to the ambient noise of the population, by drawing up noise maps;
- making strategic noise maps and action plans;
- adoption plans of action to reduce ambient noise and keeping the noise level allowed.

According to the latest release of the National Statistics Institute on June 2006, Craiova City had a population of 299,200 inhabitants and an area of 81.41 km^2. Infrastructure of the city of Craiova and fences is 419.16 km, of which 79.38 km European

[1] University of Craiova, Faculty of Horticulture
[2] REPA Craiova

roads (13.13 km by Municipality Craiova), 36.38 kilometers of national roads (6.50 km by Municipality Craiova); 182.80 km county roads, 120.60 km roads community.

MATERIAL AND METHOD

Noise maps represent an important factor in determining future development strategies of Craiova city, to improve habitat in the area, the ecological conditions of Europe, the mandatory requirements of the National Action Plan to reduce noise levels.

Table no. 1

Noise limits values in accordance with the report, Study on the limit for Romania:

The goal of environmental action	Period	Lden/Lnight
Threshold values Indicate areas of conflict	Short Term Planning	70/60 dB(A)
Values-irritant Avoiding areas of irritation	Long-term planning	65/55 dB(A)

Noise maps are made to identify the number of people exposed to unacceptable noise levels, to develop strategies for noise protection and preservation of the quiet; also noise maps and specialized software can help a slow implementation of the strategy to combat noise, improve the use and transport planning, and help to evaluate the impact noise variations for the proposed development.

The Directive 2002/49/EC is transposed into Romanian legislation (G.D. 321/14.04.2005) and establishes noise indicators used for strategic noise maps: Lden and Lnight.

Lday is the average sound pressure level, weighted in the interval of time, as defined in SR ISO 1996-2:1995, determined for periods of days (12 hours/day) a year.

Levening is the average sound pressure level, weighted in the interval of time, as defined in SR ISO 1996-2:1995, determined for periods of night (4 hours/day) a year.

Lnight is the average sound pressure level, weighted in the interval of time, as defined in SR ISO 1996-2:1995, led to periods of night (8 hours/day) a year.

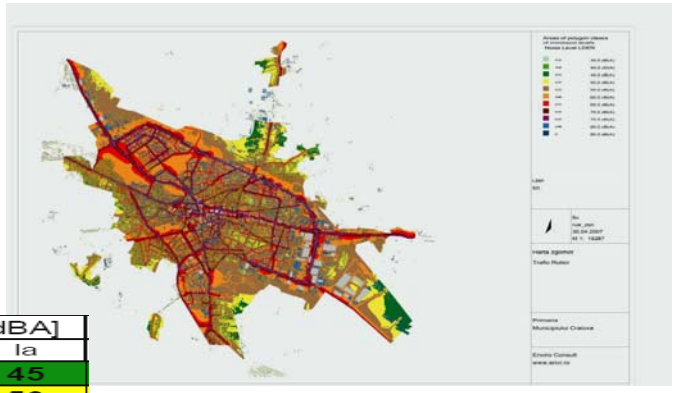
RESULTS AND DISCUSSIONS

In the following images are the results of noise maps and maps of conflict, using the indicators Lnight and Lden. We used the same color code for both indicators:

- red and purple indicates a high impact noise areas where values - the threshold is exceeded.
- shades of green and yellow indicate less impact of noise areas where action should be taken long term for keeping the noise level.
- maroon and orange indicates a medium impact of noise.

High levels of over 75dB are present in the axis of the street, almost all street tram, values between 70-74 dB is found only in small areas (Decebal Boulevard, A.I. Cuza Street, Caracal Street, Carol Boulevard, etc.).

Values of 60-64 dB were recorded on the following sectors: Decebal Boulevard, Stirbei Voda Boulevard between Matei Basarab Street and Calea Unirii Street, Ispirescu Street, Carol Boulevard.



LDEN [dBA]	
de la ...	la
0	45
45	50
50	55
55	60
60	65
65	70
70	120

Figure 1. Craiova - traffic noise map – Ln

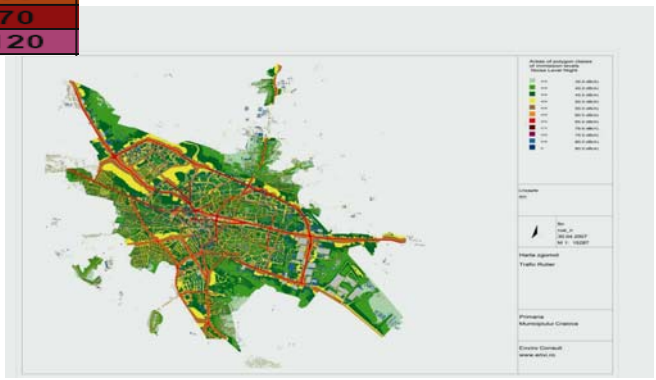


Figure 2. Craiova - traffic noise map - Ln

Under Lszn, values between 60-65 dB in the street axis were recorded throughout the city tram routes where noise reaches facades and objectives in areas where the tread out bends; in terms of indicator Ln, the values recorded were between 55-59 dB in the street axis.

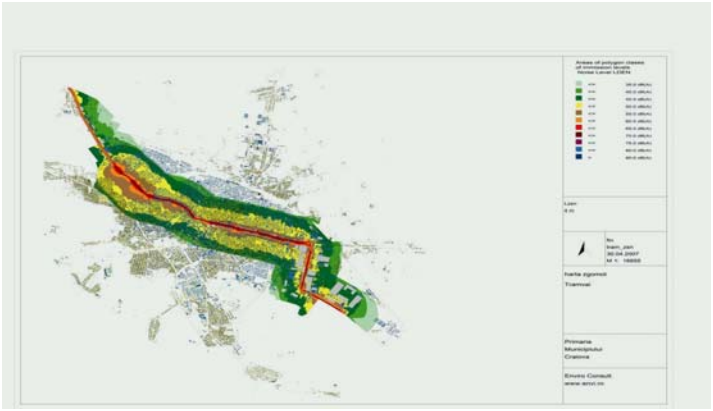


Figure 3. Estimated number of buildings and people exposed to noise from road traffic

Tabel no. 2

Noise from road traffic, Lden

Imission (dB)	55-60	60-65	65-70	70-75	75-
Number of buildings	30380	15611	7854	1031	37
Number of people (hundreds)	594	307	156	20	1

Table no. 3

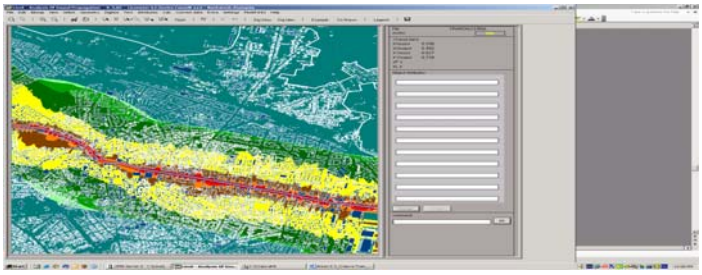
Noise from road traffic, Lnight

Imission (dB)	55-60	60-65	65-70	70-75	75-
Number of buildings	10672	5620	731	0	0
Number of people (hundreds)	209	111	14	0	0

After consulting the maps of noise and actual situation on the ground, were identified the following solutions:

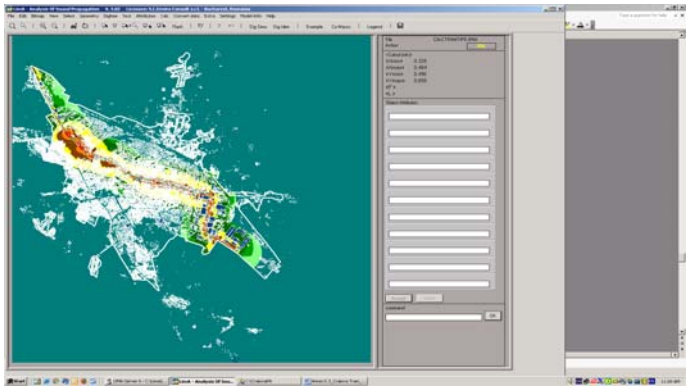
- action of the source involves reducing the noise emitted by road and can be achieved by: reducing noise emitted from asphalt contact - wheel, reducing vibration by changing their vehicles with quieter vehicles, reducing vehicle noise and track running through the flow of traffic.
- action on sound propagation path involves the use of panels isolation;
- action on receptors involves absorbing cladding of buildings.

Difference maps have certain characteristic features: 1. If you change the route of transmission, for example by raising a barrier, then the map will show the difference in noise reduction behind a barrier, but also may show an increase in noise across the barrier due to reflections in the barrier:

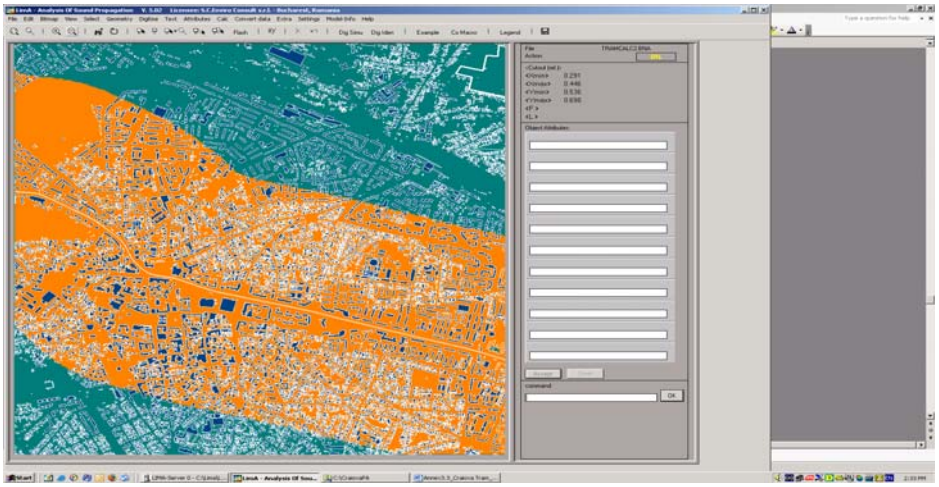


2. If the noise source is moved, for example by moving traffic from one line to another, the map will show a difference in noise reduction in the area in which traffic was reduced but at the same time, will show an increase in noise if the traffic has been moved.

.



3. If there is only one source of noise, for example tram, and the sound power level is changed using new wagons, then the map will have a single color difference. Route of transmission has not changed, as a result the noise reduction will be the same everywhere. If there are multiple noise sources, then the difference map will be more complex.



Protection against noise can be achieved through the following objectives and measures:

- preventing and controlling noise at source;
- restricting large vehicles access on major arteries of traffic and diversion of their less-traffic areas;
- filtering and reducing noise on the interval between the source and the exposed population by different screening, using green curtains of protection;
- construction of buildings is preferable to be conducted with blanks, an important role in reducing noise due to distance from the noise source.

Assumptions on action plans for the city of Craiova on noise from road traffic are:

A. The volume of traffic within the city of Craiova is kept constant,

B. Hall may intervene in any area affected by noise,

C. The budget for noise reduction is limited,

D. Buildings and terrain around the areas affected by noise remain unchanged.

Under Action Plan 1 (PA1) will be put into operation a traffic management system to reduce travel times between two parts of the city, regardless of the time.The advantages of such an integrated system are:

1. Traffic fluency;
2. Decreased intervention time for special purpose vehicles;
3. Encourage public transport use;
4. Encouraging walking and cycling;

The disadvantages are:

1. Long implementation;
2. Results do not come immediately;
3. People have a certain inertia to apply or use a new system.

Action Plan 2 (PA2) consists in minimizing, if possible, the number of heavy vehicles with mass exceeding 3.5t, on main streets. The benefits of prohibiting areas are:

1. Decrease noise and vibration from heavy machinery,
2. Hall may sell expensive tickets for entrance to the city of heavy vehicles,
3. Fleet renewal by service providers in Craiova.

Action Plan 3 (PA3) consists of replacing the current tread with another one which has absorbing properties that can reduce noise in the area affected by the change of asphalt with up to 5 dB. This method has its advantages and disadvantages, but the effects of the sound landscape is immediately felt.

Public awareness strategy on environmental issues, in general, and those relating to noise in particular require a long-term strategy.

There must be a political consensus that environment protection is important and should promote environmental issues. National campaigns should be accompanied by such local campaigns.Non-governmental associations are important partners in this long-term process. Other important partners are represented by the newspapers, television, magazines, as well as schools and kindergardens, which serves to make children and young people to become aware of the harmful effects of noise.

CONCLUSIONS

After identifying the main sources of noise in Craiova city, we concluded that these are represented by road traffic, particularly on major thoroughfares where cars movement overlaps with transport, tram routes that cuts off residential areas.

The most affected areas in the city are: Decebal Boulevard, George Enescu Street, N. Romanescu Boulevard, Petre Ispirescu Boulevard, Spain Street, Maresal Antonescu Boulevard, Raului Street, Brestei Street, Stirbei Voda Boulevard, Tabaci Street, Caracal Street, Carol 1 Boulevard, Dacia Boulevard, Bariera Valcii district, Severin Boulevard, Titulescu Boulevard, Calea Bucuresti Street.

BIBLIOGRAPHY

1. Cepstra Grup, Zaplaic M., Noise and vibration, Extracts from papers, 2007.
2. Grumazescu M., Sounds fighting and vibrations, Technical Publishing, Bucuresti, 1964.
3. REPA Craiova, Action plans for the city of Craiova regarding noise, 2008

Prof. univ. dr. PETRE BANIȚĂ

După o lungă şi grea suferință, în zorii zilei de 3 august, 2009, Prof. ***Petre Baniță*** *a încetat din viață.*

Născut în 6 aprilie 1926, în Comuna Breaza, județul Buzău, fiul lui Mihai Baniță, gospodar de elită, neîntrecut pepinierist viticol, excelent ampelograf autodidact. A urmat cursurile Facultății de Horticultura din Bucureşti pe care a absolvit-o în anul 1950. Îşi câştigă titlul ştiințific de "Doctor în Agronomie, specialitatea Viticultură" cu teza „Studiul ampelografic al portaltoiului Berlandieri x Riparia Teleki 8B la Stațiunea Experimentală Viticolă Drăgăşani, selecția clonului Drăgăşani 57" în anul 1971.

Îşi începe activitatea profesională la Stațiunea Experimentală Viticolă Drăgăşani (1950), mai întâi ca cercetător la laboratorul de material săditor viticol şi apoi ca secretar ştiințific (din 1953) şi de director (din 1957 şi până în 1961).

Rezultatele ştiințifice de excepție obținute la Drăgăşani (crearea de soiuri de portaltoi şi vițe nobile, elaborarea de tehnologii performante în domeniul pepinieristic, punerea în valoare a soiurilor de viță de vie locale şi autohtone); crearea unui corp de cercetători ale căror rezultate ştiințifice au fost repede cunoscute în țară şi în lume; consolidarea şi diversificarea bazei tehnico-materiale a stațiunii; sprijinirea şi îndrumarea permanentă a podgorenilor (podgoria Drăgăşani avea pe atunci cca. 14000 ha cultivate cu viță de vie, iar podgorenii considerau pe bună dreptate stațiunea ca o patriarhie a lor).

Recunoaşterea ştiințifică, faima de bun organizator a profesorului i-a determinat pe cei care coordonau activitatea ştiințifică din domeniul horticulturii româneşti să-l numească (în 1961) director al Stațiunii Ştefaneşti-Argeş, cea mai mare, mai complexă şi mai diversă, pe care numai în trei ani o dezvoltă, o consolidează, o rentabilizează şi o aduce în rândul stațiunilor de cercetări din România cu frumoase şi recunoscute performanțe. Drept consecință podgoria Ştefaneşti-Topoloveni a renăscut şi şi-a continuat faima de altădată.

Din motive independente de voința sa, dar cu siguranță în interesul viticulturii din Oltenia, în anul 1963 este transferat la Stațiunea Experimentală Agricolă Şimnic şi în paralel îşi câştigă postul de conferențiar şi apoi de profesor universitar la Facultatea de

Ştiinţe Naturale şi cea de Horticultura din Craiova, predând cursul de Ampelografie şi apoi pe cel de Viticultură intensivă.

Din anul 1967 şi până în anul 1996 este director al SCCAN-Bechet (Dolj), mutată ulterior la Dăbuleni.

Dacă la Drăgăşani a continuat şi a consolidat o şcoală ştiinţifică, la Bechet şi Dăbuleni a făcut istorie. Coordonează programul de valorificare superioară a nisipurilor, acordând viticulturii şi pomiculturii un rol predominant; participă activ la punerea în valoare a sistemului de irigaţii a nisipurilor din perimetrul Sadova-Corabia (70 mii ha), nivelarea dunelor şi interdunelor, fertilizarea terenului, sortimentele de soiuri, stabilitatea raportului optim între diversele culturi. Realizează la Bechet şi Dăbuleni cel mai puternic colectiv de cercetare, în problematica nisipurilor, apelând în primul rând la talentul, hărnicia, iscusinţa şi dăruirea tinerilor absolvenţi de învăţământ superior din România, în special la cei de la Craiova. Pentru tinerii cercetători le crează condiţii dintre cele mai bune pentru cercetare dar şi pentru viaţa familială. Se ocupă de perfecţionarea lor ştiinţifică, dându-le şansa să cunoască activitatea ştiinţifică similară din Europa, America, dar şi din Asia (mai ales China). Curând tinerii cercetători, prin rezultatele lor ştiinţifice sunt cunoscuţi şi recunoscuţi în lumea ştiinţifică din ţară, dar şi din lume. Mulţi dintre ei astăzi lucrează în învăţământul superior agronomic, în institutele naţionale de cercetare dar şi în cadrul organelor decizionale din România.

Activitatea ştiinţifică laborioasă desfăşurată cu întregul său colectiv de cercetători de la Bechet şi Dăbuleni au făcut din staţiune una cunoscută şi mai ales recunoscută de proprietarii de pământ nisipos, a căror avuţie a prosperat, drept consecinţă unitatea de cercetare le-a devenit indispensabilă iar cercetătorii şi în mod deosebit profesorul a căpătat statutul de cei mai respectaţi intelectuali.

Bogata activitate ştiinţifică şi practică i-a permis profesorului ***Petre Baniţă*** *să pătrundă extrem de uşor în galeria marilor dascăli ai învăţământului superior horticol de la Craiova. Tratatele „Tehnica pepinieristică" „ Viticultura generală şi specială", „Viticultura pe nisipuri" vor fi utile mult timp pentru pregătirea studenţilor, cercetătorilor şi a celorlalţi specialişti din viticultura României.*

Pentru meritele sale ştiinţifice, profesorul ***Petre Baniţă*** *a fost ales membru corespondent (1969) şi apoi titular (1990) al ASAS, membru al ONVV, membru al SRH. A fost onorat cu diplome, premii şi distincţii, între care: Ordinul Muncii, Steaua României, Meritul Ştiinţific, ş.a. După anul 1990 a fost ales Deputat în Parlamentul României.*

De toate aceste recompense s-a bucurat pe moment, dar bucuria şi satisfacţia lui deplină a găsit-o în respectul şi recunoştinţa ce i-au purtat-o cei mai mulţi dintre semeni.

Ne-am despărţit de marele viticultor, iscusit şi respectat cercetător, dascăl de referinţă, de omul care a făcut enorm de mult pentru oameni şi pentru viticultura României, cu gândul şi speranţa ca modelul său strălucit să fie de folos generaţiilor viitoare, care trebuie să slujească viticultura României, pentru ca ea, aşa cum spunea marele dispărut, sa fie una respectată şi recunoscută în lume.

Prof.univ.dr. ing. Aurel Popa
Universitatea din Craiova
Facultatea de Horticultură