

UNIVERSITĂȚII DIN CRAIOVA

VOL. XVI (LII) - 2011

✓ BIOLOGIE

✓ HORTICULTURĂ

✓ TEHNOLOGIA PRELUCRĂRII PRODUSELOR AGRICOLE

✓ INGINERIA MEDIULUI



EDITORS'BOARD:

Prof. univ.dr.ing. ION VLADIMIRESCU	- president
Prof.univ.dr.ing. Mihail MANGRA	- member
Prof.univ.dr.ing. Dan POPESCU	- member
Prof.univ.dr.Marcel DRACEA	- member
Prof.univ.dr. Nicolae PANEA	- member
Prof.univ.dr. ing. Dumitru TOPAN	- member
Prof.univ.dr. Edmond-Gabriel OLTEANU	- member

EDITOR'S STAFF OF THE SERIES:

✓ BIOLOGY
 ✓ HORTICULTURE
 ✓ FOOD PRODUCE PROCESSING TECHNOLOGY
 ✓ ENVIRONMENTAL ENGINEERING

Prof.dr. Popa Aurel (Romania) Prof.dr. Mitrea Ion (Romania) Prof.dr. Anton Doina (Romania) Prof.dr. Giugea Nicolae (Romania) Dr. Francoise Dosba (France) Prof.PhD. Michèle Guilloux – Bénatier (France) Prof. Jocelyne Pérard (France) Prof.dr. Balan Valerian (Republica Moldova) Prof.dr. Papachatzis Alex (Greece) Prof.dr.Marta Diszy (Spain) Prof.dr. Ștefan Nicolae (Romania) Prof.dr. Sestraş Radu Emil (Romania) Prof.dr. Hoza Dorel (Romania) Prof.dr. Grădinariu Gică (Romania) Prof.dr. Lăzureanu Aurel (Romania) Conf.dr.Sina Cosmulescu (Romania) Prof.dr. Baciu Adrian (Romania) Prof.dr. Violeta Nour (Romania) Conf.dr. Daniela Cichi (Romania) Conf.dr. Costea Dorin (Romania) Conf.dr. Mira Ionică (Romania) Conf.dr. Ciupeanu Călugăru Eleonora Daniela (Romania)

ANNALES OF THE UNIVERSITY OF CRAIOVA – DOLJ

A.I.Cuza Street, No. 13, Code 200585 – Craiova, Romania

COMPUTERISED EDITING:

Conf.univ.dr. DOINA ROȘCA Asist. univ. dr. MARIUS GRUIA

I.S.S.N. 1435 - 1275

Secțiunile: HORTICULTURĂ

BIOLOGIE

TEHNOLOGIA PRELUCRĂRII PRODUSELOR AGRICOLE

INGINERIA MEDIULUI

Sections:

HORTICULTURE

BIOLOGY

FOOD PRODUCE PROCESSING TECHNOLOGY

ENVIRONMENTAL ENGINEERING

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

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

Vol. XVI (LII) - 2011

DYNAMIC CHANGES OF ANTIOXIDANT ENZYMES ACTIVITIES ON WHEAT DROUGHT TOLERANT VARIETIES DURING VEGETATION STAGES

Băbeanu Cristina¹, Gabriela Păunescu²

KEY WORDS: wheat, antioxidant enzymes, drought

ABSTRACT

The objective of this study is to investigate the behavior of five wheat cultivars in year with drought conditions. The paper presents the antioxidant enzymes activity behavior along two vegetation stages. The activity of catalase, peroxidase system and isoperoxidase, enzymes involved in the scavenging of reactive oxygen species were measured. The obtained results have showed a variation of biochemical indices analyzed both on genotype and on plant's developmental stage. Determined biochemical indices correlated with yield data recommend selecting the tested genotypes as high productivity varieties.

INTRODUCTION

In Oltenia drought is becoming a major environmental constraint on crop production and one of the solicited characteristics of wheat in these area is drought tolerance (Paunescu et al. 2008). Numerous researches are carried out to obtain and select new varieties adapted to certain crop conditions, increasing the productivity, ameliorating certain characters and increasing the resistance against diseases, pathogens or drought (Mark 2007, Babeanu et al. 2010, Haris et al. 2010). Drought stress induced significant changes in normal physiological and biochemical processes.

One mechanism of injury involves the breakdown of the balance between the production of reactive oxygen species and the antioxidant defense, causing accumulation of ROS which induces oxidative stress to proteins, membrane lipids and other cellular components (Nicolaeva et al. 2010). In order to limit oxidative damage under stress conditions plants have developed a series of detoxification system that break down the toxic reactive oxygen species.

The plant antioxidant system is composed of both enzymatic and non-enzymatic components such as: superoxide dismutase (SOD), ascorbate peroxidase (APX), glutathione reductase (GR), catalase (CAT), peroxidases (POX), reduced glutathione, cystein, ascorbic acid, α -tocopherol and carotenoids (Jaleel et al. 2009). With that end in view, this study aims to experiment of investigated varieties in comparative crops in the specific pedological, climatic and technological conditions of Oltenia (area characterized by a warm and drought climate) in order to point out the most stable and high performance genotypes.

¹ Department of Chemistry, University of Craiova, e-mail: <u>cbabeanu@yahoo.com</u>

² Research and Agricultural Development Station from Simnic

This paper is referring to the variation of catalase activity, peroxidase system and isoperoxidase activity in leaves of five varieties of wheat, during development time, in correlation with the proteins contents.

MATERIAL AND METHOD

Experiments were carried out on five varieties of Triticum aestivum (1:Dropia; 2:Boema; 3:S0718; 4: S0719; 5:S0726) at Research and Agricultural Development Station from Simnic. These were chosen because they had a high productivity level in drought conditions. The "S.C.D.A." geographical region Simnic is known as a drought area, with reduced rainfall and extremely high summer temperatures. These experiments were performed in highly-controlled technological condition. The plants have been complexly fertilized 12-52-0 200 kg/ha (autumn) and treated with DIVIDENT 11/t. The soil from the investigated area is characterised by an acid pH (pH=5.7) by a low content of humus (1.8%), nitrogen (IN%=0.81), potassium (128 ppm) and by a significant supply of mobile phosphorus (54ppm). Biochemical analyses were realized on fresh leaves cut at different growing stages: phase I: tillering stage, phase II: steam elongation. Fresh tissue was homogenated with 0.1 M phosphate buffer (pH 7.0) containing 0.1 mM EDTA. Homogenates were centrifuged for 20 min at 10,000 r.p.m. and the supernatants were used for enzyme assay. The activity of ascorbate peroxidase was measures by determining the oxidative rate of ascorbic acid and expressed as µmoles ascorbic acid/1 min/1g. Total soluble peroxidase (guaiacol-type E.C.1.11.1.7) was assayed by measuring the increase in A_{436} due to the guaiacol oxidation and their activity was expressed as $\Delta A/min/1g$ fresh weight (Babeanu et al. 2003). Catalase (E.C.1.11.1.6) was assayed through the colorimetric method and expressed as mmoles H2O2/min/g at 25°C. The separation of soluble isoperoxidases was done by agarose gel electrophoresis at pH 8.6, performed in a horizontal gel system Statron 301 E, at 6V/cm for 4 h. Gels were stained for 30 min in 1% benzidine reagent (Babeanu et al. 2003). Quantitative evaluation of zymogrames was performed with GelAnalyzer 2010. Total soluble protein were extracted in distilled water and the concentration was evaluated by the method of Bradford using bovine albumin as a standard.

RESULTS AND DISCUSSION

The analyzed biochemical indices show a dependency with the investigated phase and the studied genotype. Enzyme activities and protein content in the leaves of varieties of wheat are presented in figure 1 and figure 2.

The biochemical data presented confirm that the vegetation phase induces a modulation of the peroxidase system activity in plant leaves, which influences the peroxidase controlled processes. Plant peroxidases have been used as biochemical markers for various types of biotic and abiotic stresses due to their role in very important physiological processes, like control of growth by lignification, cross-linking of pectins and structural proteins in cell wall, catabolism of auxins (Selote et al. 2010). Guaiacol peroxidase, ascorbat peroxidase activity and protein content increase in the steam elongation stage, suggesting an intensification of the biosynthesis process for each studied genotype. The less sensitive among the antioxidant enzymes tested was catalase. Catalase activity was low influenced with the vegetation phase at each studied genotype suggesting that it's activity is less important during stages when peroxidase is active, this fact confirming the hypothesis of the alternative activation and inhibition of the two hem-

enzymes (Shao et al. 2005). It can be observed that catalase activity didn't significantly vary during the same developmental stages.





Figure 2. Ascorbat peroxidase, protein content

In the cases of all studied genotypes, three anionic isoperoxidase fractions and a cationic one in the first vegetation stage can be observed; and two anionic isoperoxidase fractions and one cationic fraction for the second vegetation stage.

The quantitative evaluation shows the isoperoxidase activity depends on the genotype, as well as on the vegetation stage (figure 3). The isoperoxidase activity shows a considerable increase in case of Dropia and Boema genotypes at steam elongation. For the S0718, S0719 and S0726 the isoperoxidasic activity slightly increased at second vegetation stage. The obtained electrophoregrames are shown in figure 4



Figure 3. Isoperoxidase pattern for the five studied genotypes, at two vegetation stages



Figure 4. Electrophoregram of isoperoxidase on two vegetation stages

CONCLUSIONS

The obtained results have showed a variation of biochemical indices analyzed both on genotype and on plant's developmental stage. Determined biochemical indices, correlated with yield data, at varieties S0718, S0719 and S0726 comparative tested with Dropia and Boema (the most cultivated varieties in Romania) recommend their selection as high productivity varieties.

BIBLIOGRAPHY

- Babeanu C., Marinescu G., Glodeanu E., Ciobanu G., Biochimie vegetala practica, Ed INFO, Craiova, 2003
- Babeanu C, Constantin C. Paunescu G. Popa D., Effects of drought stress on some oxidoreductase enzymes in five varieties of wheat, Journal of Environmental Protection and Ecology, 11, No 4, 1280-1284, 2010
- Harris B., Sandras V., Tester M., A water-centred framework to assess the effects of salinity on the growth and yield of wheat and barley, Plant and Soil, 336, (1-2), 377-389, 2010
- 4. Jaleel C.A., Riadh K., Gopi R., Manivannan P., Inès J., Antioxidant defense responses: physiological plasticity in higher plants under abiotic constraints, Acta Physiologiae Plantarum, 31, (3), 427-436, 2009
- 5. Mark E. S., Application of new knowledge, technologies, and strategies to wheat improvement, Euphytica, 157, (3), 299-306, 2007
- Nikolaeva M. K., Maevskaya S. N., Shugaev A. G., Bukhov N. G., Effect of drought on chlorophyll content and antioxidant enzyme activities in leaves of three wheat cultivars varying in productivity, Russian Journal of Plant Physiology, 57 (1) 87-95, 2010
- Păunescu G., Boghici O.N., Performance of several wheat cultivars under contrasting conditions of water stress, in central part of Oltenia, Romanian Agricultural Research, 25, 13-18, 2008
- 8. Selote D., Khana Chopra R., Antioxidant response of wheat roots to drought acclimation, Protoplasma, 245 (1-4), 153-163, 2010
- Shao H.B., Z.S.Liang, M.A Shao, Q. Sun, Dynamic changes of anti-oxidative enzymes of 10 wheat genotypes at soil water deficits, Colloids and surfaces B: Biointerfaces, 42, 187-195, 2005

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

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

Vol. XVI (LII) - 2011

STUDY CONCERNING THE INFLUENCE OF THE BORON COMPOUNDS APPLICATION ON THE COLONIES OF HETEROTROPHIC BACTERIA

Florentina Badea¹, Daniela Popa², Anca Mihaela Bulearca³, Mihaela Mitrut⁴

KEYWORDS: natural fertilizers, boron, tomatoes, heterotrophic bacteria colonies

ABSTRACT

The objective of this paper is to establish a quantitative and qualitative influence of the organic boron compounds on heterotrophic bacteria colonies. The quantitative determinations of the heterotrophic bacteria from the soil presented differences between experimental cases, either function of the solid organic fertilizers applied in the soil and function of the combination between soil and foliar fertilization. The qualitative analysis of the bacteria colonies shows that in A1 (radicular treatment with Calcium Fructoborate) and A1b1 variants (radicular treatment with Calcium Fructoborate + foliar treatment with glucose Folibor) five taxones have been identified, as compared to the blank case in which only two taxones have been found in the first step. Then, in the second step, four and three taxones, respectively, have been identified.

INTRODUCTION

The role of the microbial communities is to control the biogeochemical cycles and the nutritive elements availability in soil and, consequently, they can influence the soil composition and structure (Conrad, 1996). One of the driving forces behind microbial diversity in the soil environment is because these microbial populations develop and thrive in an incredibly diverse environment, both on a global scale and on a local scale (Daniela Popa, Mark Coyne, 2007). They play an important role in soil process, determining plant productivity. Heterotrophic bacteria are one of the main components of microbial community. The population of these bacteria gives an indication about the soil sustainability for agriculture. Boron is recognised as an essential micronutrient for plants and animals, very important for their growth and development (Scorei R. et al., 2005). It has a favourable effect onto flowering and fruiting of plants, because it stimulates the rapid pollen germination (D. Miljkovic et al., 2009).

Boron (B) is an essential element for plants and physiological B concentrations are needed to support sugar transport, metabolic processes membrane functions, cell wall synthesis, and lignification (F. H. Nielsen 1996, quoted by Scorei R. et al. 2005).

Researches have shown that boron is a bioactive element for our organism (Nielsen F.H. -2008). However, the boron effect on the human body is not completely elucidated (Armstrong, 2001).

¹ PhD Candidate in Horticulture University of Craiova

² University of Craiova

³ PhD. Student Eng. Department of Organic Technology and Macromolecular Compounds Politehnica University of Bucharest

⁴ S.C. Natural Research S.R.L, E-mail: floribadea_2007@yahoo.com

MATERIAL AND METHOD

The experiments were performed at S.D. Banu Maracine, Dolj County, inside a solarium, in four repetitions, having the following experimental variants:

- Blank = untreated witness;
- A1 = radicular treatment with Calcium Fructoborate;
- A2 = radicular treatment with Calcium Glucoborate;
- A1b1 = radicular treatment with Calcium Fructoborate + foliar treatment with glucose Folibor;
- A1b2 = radicular treatment with Calcium Fructoborate + foliar treatment with fructose Folibor;
- A2b1 = radicular treatment with Calcium Glucoborate + foliar treatment with glucose Folibor;
- A2b2 = radicular treatment with Calcium Glucoborate + foliar treatment with fructose Folibor.

Commercial fertilizer, produced by Natural Research Ltd., was administered. It was calculated at the surface unit of 5L/ha and the concentration of the solution for each foliar fertilizer was of 1%. A solid product quantity of 200 Kg/ha was applied for the radicular fertilization. The latter was done 10 days before planting the tomatoes.

A series of two foliar treatments each was applied for every individual variant, during the vegetation period, thusly:

- The first treatment when the tomato plants had 8-10 leaves formed and normally developed;

- The second treatment after 15 days from the first application.

Balkan Select F1 tomato hybrid was used as biological material.

The most used quantitative method for establishing the bacteria population dimension is the dispersion method of the soil decimal serial dilutions on nutritive agarized media. On Topping medium for bacteria (Clarck, 1965, Pochon, 1954, Florenzano, 1983, Papacostea, 1976), or Czapeck media 0.1 mL from the certain soil dilution are inoculated. The colonies raised on the crop media surfaces are counted and enclosed in a computing formula to find out the total number of bacteria (TNB).

TNB = n x dilution x 10 x 100 / (100 - U)

where:

n = colonies average on the crop medium (Topping or Czapeck);

10 = equilibration coefficient of the 0.1 mL, where the soil dilution degree is registered;

U = the soil humidity in %.

The normal values of the total heterotrophic bacteria number from a soil with high fertility are 10^{6} - 10^{8} .

For the qualitative determinations, the bacteria colonies are directly examined on the Topping medium (macroscopic) regarding the morphologic characteristics like shape, dimension, smoothing aspect, gloss, relief, profile, pigments, crystals presence on the colony surface, constitution, the degree of transparency, internal structure, iridescent, borders, etc.

The microscopic examination of the bacteria colonies was realized by coloured smears after the Gram method. This is based on the bacteria characteristic to contain the magnesia ribonucleic complex in the superficial (periplast) layer, in some proteins that are capable to retain the gentian violet (retain or not the Gram colour). This colouring method gives indications regarding the taxonomic framing to the level of type and species.

Taxonomic identifications of the microorganisms to the level of species were realized by the help of special devices: Bergey (1986) and Papacostea (1976) for bacteria.

RESULTS AND DISCUSSIONS

The quantitative determinations of the heterotrophic bacteria from the soil have shown differences between experimental cases function of the solid organic fertilizers applied in the soil and function of the combination between soil and foliar fertilization (see Table 1, Table 2, Figure 1 and Figure 2).

In the first determination stage, the TNB values varied from 4.8 x 10^{6} /g dried soil for the **A2b2** case – calcium Glucoborate + Fructoborate (fructose Folibor) to 23.5 x 10^{6} /g dried soil in the **A1b1** case – calcium Fructoborate + Glucoborate (glucose Folibor).

Data analysis showed that the highest values of TNB were obtained for soil fertilization with A1 – calcium Fructoborate, as compared to A2 – calcium Glucoborate, in both determination steps.

Combining the two fertilization variants was very interesting: soil fertilization with solid fertilizers A1 – calcium Fructoborate and A2 – calcium Glucoborate with foliar with liquid fertilizers b1 – Glucoborate (glucose Folibor) and b2 – Fructoborate (fructose Folibor). Thus, in the first step, the A1b1 – calcium Fructoborate + Glucoborate (glucose Folibor) was the best mixing that determined an effect of stimulation for bacteria developing, with 39% higher than the blank case. The A2b1 case – calcium Glucoborate + Glucoborate (glucose Folibor) registered a decrease in the TNB value with approximately 72% as compared to the blank case. In addition, the A1b2 case – calcium Fructoborate + Fructoborate (fructose Folibor) presented a superior value of TNB in comparison with A2b2 case – calcium Glucoborate + Fructoborate (fructose Folibor).

In the second determination stage, the majority of the fertilization variants showed superior values as compared to the blank case, except the **A1b2** and **A2b1** cases (see Figure 1). Like in the first step, the soil fertilized with **A1** fertilizer – calcium Fructoborate presented a better bacteria population growth, as compared to **A2** fertilizer – calcium Glucoborate. As in the first step, in the **A2b1** case the most reduced bacteria community was determined, the TNB value being of only $7x10^6$ cfu/g dried soil, with 44% more reduced as in the blank case and with approximately 68% less than the **A1** case – calcium Fructoborate with the most developed bacteria population.

In Figure 2 it can be clearly see that the best results were obtained in the variants with **A1** fertilizer – calcium Fructoborate applied either alone or in combination with **b1** – Glucoborate (glucose Folibor). The lowest results belong to **A2b1** case. It must be noted that **b1** fertilizer – Glucoborate (glucose Folibor) in combination with **A1** – calcium Fructoborate determined net superior values for the TNB, as compared to the same foliar fertilizer mixed with **A2** – calcium Glucoborate applied in the soil, with 79.6% in the first step and with 59% in the second one. The best fertilization mixture was proved to be **A1** – calcium Fructoborate applied in the soil in combination with **b1** – Glucoborate (glucose Folibor) foliar applied.

The obtained results must be considered as tendencies of the bacterial microflora response to applied treatments, taking into consideration the correlation coefficients, which are rather low.

The qualitative analysis of the bacteria highlights the fact that in the first stage, in **A1** and **A1b1** cases 5 taxones were identified, as compared to the blank case in which only 2 taxones were determined. In the second stage, 4 taxones and 3 taxones, respectively, were identified (see Table 1).

Although the bacteria species diversity is not very high in the analyzed soil for the experimental variants, nesporogene species have been identified with beneficial effect on bio-geo-chemical circuits, like *Pseudomonas sp, Arthrobacter globiformis, Arthrobacter citreus, Bacillus megaterium* and actinomices, for both determination steps.

Table 1

Quantitative determinations and taxon	omic variety of the heterotrophic bacteria
in the soil sa	mples (Stage I)

Variant	Species and types of identified bacteria (in the frequency order)	TNB [*] x 10 ⁶ cfu ^{**} /g dried soil
A ₁ b ₁	Pseudomonas sp, Arthrobacter globiformis, Bacillus sphaericus, Bacillus circulans, Actinomiceta	23.52
A_1b_2	Pseudomonas sp, Arthrobacter citreus, Bacillus cereus, Bacillus circulans	17.28
A_2b_1	Pseudomonas sp, Arthrobacter globiformis, Arthrobacter citreus	4.76
A ₂ b ₂	Pseudomonas sp, Arthrobacter globiformis, Bacillus sphaericus	13.15
A ₁	Pseudomonas sp, Bacillus cereus, Bacillus sphaericus, Bacillus megaterium Actinomiceta	18.84
A ₂	Pseudomonas sp, Arthrobacter globiformis, Arthrobacter citreus	16.47
BLANK	Pseudomonas sp, Bacillus sphaericus	18.41

Table 2

Quantitative determinations and taxonomic variety of the heterotrophic bacteria in the soil samples (Stage II)

Variant	Species and types of identified bacteria (in the frequency order)	TNB [*] x 10 ⁶ cfu ^{**} /g dried soil
A ₁ b ₁	Pseudomonas sp, Bacillus megaterium, Arthrobacter globiformis, Bacillus sphaericus	17.14
A ₁ b ₂	Pseudomonas sp, Arthrobacter citreus, Bacillus cereus,	10.19
A ₂ b ₁	Pseudomonas sp, Bacillus sphaericus	6.99
A ₂ b ₂	Pseudomonas sp, Arthrobacter globiformis, Bacillus circulans	18.34
A ₁	Pseudomonas sp, Bacillus cereus var. mycoides, Bacillus sphaericus, Bacillus circulans	21.81
A ₂	Pseudomonas sp, Arthrobacter globiformis, Bacillus megaterium	19.03
BLANK	Pseudomonas sp, Arthrobacter globiformis, Bacillus sphaericus	12.5

*total number of bacteria;

** colonies formation units



Fig. 1. Quantitative distribution of heterotrophic bacteria (TNB x 10⁶/g dried soil) in the experimental cases



Fig. 2. Quantitative evolution of heterotrophic bacteria in soil in the two determination steps

Table 3

Statistic parameters of the heterotrophic bacteria microflora values from soil in the experimental cases

	Bacterial microflora		
	Stage I	Stage II	
Xmin	4.8	7.0	
Xmax	23.5	21.8	
X – mean	15.8	15.1	
Me – median	16.9	17.1	
σ - standard deviation	5.8	5.4	
Xg – geometric mean	14.5	14.2	

CONCLUSIONS

- ✓ In the first determination stage, the TNB values varied from 4.8×10^6 /g dried soil in **A2b2** case calcium Glucoborate + Fructoborate (fructose Folibor) to 23.5 x 10^6 /g dried soil in **A1b1** case calcium Fructoborate + Glucoborate (glucose Folibor). The highest TNB values were obtained at soil fertilization with **A1** calcium Fructoborate, as compared to **A2** calcium Glucoborate, for both determination steps.
- ✓ In the second determination stage, the majority of the fertilization variants presented superior values as the blank case, except for the A1b2 and A2b1 variants.
- ✓ The best results were obtained in A1 fertilizer case calcium Fructoborate applied either alone or in combination with b1- Glucoborate (glucose Folibor), and the lowest results in the A2b1 case.
- ✓ The qualitative analysis of the bacteria colonies shows that in A1 fertilizer case calcium Fructoborate and A1b1 cases, in the first stage, 5 taxones were identified, in comparison to the blank case in which only 2 taxones were determined. In the second stage, in the A1 and A1b1 cases calcium Fructoborate + Glucoborate (glucose Folibor) 4 taxones were identified and only 3 taxones in the blank case.
- ✓ Nesporogene species, like *Pseudomonas sp, Arthrobacter globiformis, Arthrobacter citreus, Bacillus megaterium* and actinomices have been identified, with beneficial effect on bio-geo-chemical circuits.

BIBLIOGRAPHY

- 1. Armstrong T.A., Spears J.W. (2001) "Effect of dietary boron on growth performance, calcium and phosphorus metabolism and bone mechanical properties in growing barrows", J.Anim. Sci., 79:3120-3127.
- 2. Bergey's (1986) "Manual of Sistematic Bacteriology", vol. 2, Williams and Wilkins, Baltimore, USA.
- 3. Clark, F. (1965) "Agar plate method for total microbial count. Method for Soil Analysis", vol. 2. American Society for Agronomy, Madison, WL, pp.1460-1465.
- Conrad, R. (1996) "Soil microorganisms as controllers of atmospheric trace gasses", Microbiol. Rev., 60:609-640.
- 5. Florenzano G. (1983) "Fondamenti di microbiologia del rerreno", REDA ed., Firenze, 630:115-136.
- Nielsen F. H. (2008) "Is boron nutritionally relevant?", Nutrition Reviews, 66(4):183-191.
- 7. Papacostea, Cain (1976) "Abel și ordinea naturală", Ecosofia, 1-2:8.
- Pochon J. (1954) , Manuel tehnique d'analyse de microbiologie du sol", Ed. Masson, Paris.
- 9. Popa Daniela, Mark Coyne (SUA) Soil Microbiology: The Life Beneath Your Feet, Instant Publisher.com, U.S.A. ISBN 987-1-59872-9, 2007
- Scorei R., Cimpoiasu V.M., Iordachescu D. (2005) "In vitro Evaluation of the antioxidant activity of Calcium Fructoborate", Biological Trace Element Research, 107.
- 11. Miljkovic D., Scorei R.I., Cimpoiasu V.M., Scorei I.D. (2009) "Calcium Fructoborate: Plant-based dietary boron for human nutrition", Journal of Dietary Supplements, 6(3):211-226.
- 12. Warrington K. (1923) "The effect of boric acid and borax on the broad bean and certain other plants" Ann. Bot. (London), 37:629-672.

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA Seria: ✓ Biologie ✓ Horticultură ✓ Tehnologia prelucrării produselor agricole ✓ Ingineria mediului

Vol. XVI (LII) - 2011

RESEARCH ON THE ROLE OF BIOTEHNOLOGIES IN IMPROVING THE QUALITY AND TYPICAL OF WINES OBTAINED IN OLTENIA VINEYARDS

Constantin Băducă¹

Key words: biotechnologies, wines, alcoholic fermentation, winemaking, yeast

ABSTRACT

Researches conducted for over a decade in the hilly of Oltenia vineyards showed that the use of biotechnology tools is a feature of modern winemaking. The obtaining of wines with compositional and sensory characteristics that harness the true potential as varieties and growing areas requires control of biophysical and biochemical phenomena that occur in the transformation of gravy into wine - maceration, alcoholic and malolactic fermentation. The use of selected yeasts and lactic acid bacteria with suitable physiologo-biochemical traits for type of wine who wants to be obtained, the fermentation activators and enzyme preparations have a strong influence on color, aroma and gustatory balance of wine as well as on his evolution during the maturation and aging.

INTRODUCTION

Among all aliments and drinks that the human being consumes, the wine is one with the most complex composition, containing hundreds of constituents whose numbers increase continuously due to improvement of investigation methods (Stoian, V., 2001). The wine constituents in its impressive numbers classifies after 3 criteria: the high temperature behavior, chemical nature, and source. Based on the last criteria, distinguish constituents which come from grapes, constituents created during the alcoholic fermentation or other biochemical processes and constituents created during the wine evolution phases (Teodorescu, Şt., 1970). The chemical composition of wine is radically different from the must composition comes from. From some must chemical constituents, during its transformation in wine, under the action of yeasts enzymatic systems, form other constituents with different traits and chemical structures (Gheorghiță, M., 2006).

The alcoholic fermentation and the other biophysical and biochemical complex phenomena that occur during the transformation of must in wine – maceration and malolactic fermentation – are the origin of hundreds of wine constituents, very different among them as chemical structure, proportions and sensorial importance (Băducă Cîmpeanu, C., 2008). The alcoholic fermentation is the phase when the wine is born and any defects of composition or sensory properties occurred in this phase is hardly to correct or may be cannot be corrected over the next wine evolution phases (Băducă Cîmpeanu, C., 2003).

¹ University of Craiova, Faculty of Horticulture, cbaduca@yahoo.com

That's why the stringency of controlling the alcoholic fermentation and the other biochemical processes that occur during the winemaking represents a characteristic of modern Oenology (Blouin J., Peynaud E., 2006).

For the Oltenian vineyards, one of the most important Romanian wine region (Popa. A., 2008), the biotechnological possibilities of stimulation and control of biochemical and biophysical phenomena represent an important opportunity to increase the quality, expressivity and the typical of wines.

MATERIALS AND METHODS

This work has been finalized based on the research made over the past decade at the University of Craiova, Faculty of Horticulture, Department of Oenology in the main vineyards from the hilly Oltenia, with the purpose of improving the white and red winemaking technologies. The targeted technological sequences have been mainly the based on the biophysical and biochemical complex phenomena, which occur during the transformation of must in wine – maceration, alcoholic fermentation and malolactic fermentation. From the multitude of biological, biochemical and technological factors involved in the control of mentioned processes, for this work it has been retained the role of yeasts, bacteria and enzymes as biotechnological tools of the winemaker.

The research made have been done in micro-winemaking conditions in the Oenology laboratory of Faculty of Horticulture or at the pilot station of Craiova University, as well as in production conditions, in famous wine cellars from Samburesti, Dragasani, Dealurile Craiovei, Vanju Mare vineyards, with the purpose of making superior quality wines from indigenous or foreign varieties cultivated in mentioned vineyards. Therefore, this work represents a synthesis of research made at the Oenology Department of Faculty of Horticulture, materialized in research contracts, doctorate thesis, university manuals and scientific works published in country or abroad from 1997 until today.

RESULTS AND DISCUSSIONS

Results and discussions concerning the role of the yeasts

In wine microbiology, the yeasts are considered agents of alcoholic fermentation, being responsible for the transformation of sugar in alcohol. By their technological characteristics and physiological-biochemical traits, the yeasts have a significant influence on the main composition parameters and sensory properties traits of wines. In the last 2-3 decades, the use of selected yeasts in winemaking has witnessed a great expansion due to many advantages. Despite this, it persists a series of controversies regarding the utility of selected yeasts in relation with the indigenous yeasts. The research made in many Oltenia vineyards in the last 15 years comes to a series of clarification regarding these controversies. In Table 1 is presented a synthesis of results regarding the influence of these two types of yeasts on starting and ongoing of alcoholic fermentation. The first analyzed aspect, the duration of pre-fermentative phase, shows that in all cases when it has been used selected yeasts, the alcoholic fermentation started more rapidly due to higher density of initial population. The differences are more important in white winemaking, where the higher doses of sulphur dioxide and the must clarification decrease significantly the initial level of indigenous veasts population. While the white must, regardless of variety, vineyard or wine year, from debourbage to the beginning of decrease of must density, takes between 30 to 72 hours at fermentation with indigenous yeasts, by addition of selected yeasts, the

must start fermenting in less than 30 hours. Most of the times, the start of fermentation occurs in less than 24 hours. This tendency has been noticed also on red winemaking mentioning that the differences are little bit smaller due to maintaining of yeasts from indigenous micro flora in contact with the must.

Table 1

Type of	Wines	Duration of pre-	Duration of	Fermentation	
yeasts		fermentative phase, fermentation,		efficiency	
		hours	days	g/% vol. alcohol	
Indigenous	White	30 - 72	10 - 18	16.8 - 17.4	
yeasts	Red	18 - 48	8-14	17.2 - 17.8	
Selected	White	18 - 30	8-12	16.4 – 17.1	
yeasts	Red	12 - 24	6 – 9	16.7 – 17.2	

The influence of different types of yeasts on the ongoing alcoholic fermentation

The second aspect analyzed is the duration of alcoholic fermentation, depending on type of wines (white or red) and the winemaking conditions, especially the temperature control. In the case of selected yeasts, the duration of fermentation is 2-3 up to 8-10 days shorter, a very important aspect from economic and oenological point of view. The start and faster ongoing of alcoholic fermentation, eliminating the slowly and stop of fermentation represent one of the major advantage and the main argument in favor of using selected yeasts in winemaking.

Another aspect analyzed related to the yeasts fermentative capacity is the fermentation efficiency. The data from Table 1 show that the selected yeasts consume less sugar to produce 1% volume of alcohol, whatever the type of wine. So, in the white must, the selected yeasts consume between 16.4 - 17.1g of sugar while the indigenous yeasts consume between 16.8 - 17.4g of sugar to produce 1% alcohol. In red must, the consumption is little different and here the selected yeasts have better fermentation efficiency.

The superior fermentative capacity of selected yeasts is reflected in chemical composition of wine, as it can be seen from Table 2 where is represented a synthesis of results regarding the modification of main composition parameters of fermented wines with selected yeasts comparing to indigenous yeasts. From several hundreds of fermenting experiences with both types of yeasts shows that the wines made with selected yeasts for fermentation contain 0.2 up to 3.5% vol more alcohol, 0.1 up to 1.8 g/l more glycerol, 2.4 up to 54 g/l less residual sugar and a volatile acidity lower with 0.1 up to 0.6 g/l acetic acid comparing to wine made from same must but fermented with indigenous yeasts.

Table 2

Parameters	Differences +	Differences -
Alcohol, % vol.	0.2 - 3.5	
Glycerol, g/l	0.1 - 1.8	
Residual sugar, g/l		2.4 - 54
Volatile acidity, g/l acid acetic		0.1 - 0.6

The influence of selected yeasts on main parameters of Oltenia wine composition

The data from Table 2 represent the limits in differences of wines. Regarding the alcohol content, most of the times the differences are less than 1% vol, the cases when the difference are much higher being very rare and those when the differences are over 2.5%

vol are accidental. Despite these, the superior fermentative power of selected yeasts is very important for the quality and typical of wines made in Oltenia vineyards due to specific of the region. Based on the natural climate and terroir specific conditions, the Oltenia vineyards have a high grade of favorability for making quality red wine. These are dry wines, so that the complete fermentation of sugar is mandatory and the selected yeasts offer a better guarantee in this respect. For a 0.3% vol alcoholic strength corresponds over 5 g/l residual sugar, which may compromise the screening of red wine in the dry red wine category. Regarding the white wines, in all Oltenia vineyards, these have a lower acidity and a greater pH, so that it is very important to make them dry in order to have a better stability and a better guarantee.

Even if the technological advantages of alcoholic fermentation with selected yeasts are obvious, it still persists many controversies regarding their utility in the case of expressivity and typical of wines, elements that are very important in the overall quality of wines and especially demanded by the connoisseurs. Most of the time, the sensory properties of the wines are different in the case of using selected yeasts due to the fact that the yeasts are made by foreign companies from other wine regions. In this case, the region typical is practically canceled in the case of the wines fermented with selected yeasts.

Results and discussions concerning the role of the lactic acid bacteria

For the white wine the alcoholic fermentation is the only one normal microbiological phenomenon. In the case of red wine a new type of fermentation called secondary fermentation or malolactic fermentation follows winemaking the alcoholic fermentation. This type of fermentation is indubitable for red wine winemaking being a characteristic for this type of winemaking with many compositional and organoleptic implications.

The great progresses made in the wine microbiology field drive in the last decade to the use on large scale of starter cultures of selected lactic bacteria to trigger the malolactic fermentation and for a better ongoing of it. Despite this, the use of selected lactic bacteria did not reach the same scale of use as the selected yeasts in alcoholic fermentation. In our country the starter cultures of lactic bacteria are used very little. At least in Oltenia, the winemakers consider that is not justified to use selected lactic bacteria when the malolactic fermentation goes pretty well with indigenous lactic bacteria, the indigenous micro flora being very well structured.

In Table 3 is presented the influence of spontaneous malolactic fermentation by the indigenous bacteria versus selected lactic bacteria for 3 types: Cabernet Sauvignon from Simburesti, Cabernet Sauvignon from Vinju Mare and Novac from Dragasani. Also, it has been tracked the influence of spontaneous malolactic fermentation on the red wine aroma for over 40 types of wines made from different varieties in 2008 and 2009.

The data from Table 2 show that after the malolactic fermentation a series of aromas get enforced, others diminish as intensity but the intensity of these modifications depends most on the type of bacteria which make the malolactic fermentation. So, in case of triggered malolactic fermentation with selected lactic bacteria, at all varieties the aromas of butter, banana and warm bread have enforced. At the two types of Cabernet Sauvignon, which come from two different areas located at over 200 km, distance, besides the above mentioned, the aroma of geranium, cranberries and currant have been enforced.

In the case of spontaneous malolactic fermentation, at all type of wines including both Cabernet Sauvignon the aroma of butter, currant and geranium has been enforced. In the case of Novac, only the aroma of strawberry can be find at the selected lactic bacteria. Regarding the aroma which are diminished, it can be underlined the diminish of pepper and bunches aroma at all Cabernet Sauvignon wines whatever the geographical origin and the bacteria which make the malolactic fermentation. At both types of Novac, the aroma of red cornel is diminished.

Tał	ole 3	•
-----	-------	---

		Aroma which are enforced	Aroma which are diminished	
Malolactic fermentation triggered with selected lactic bacteria	CS Smb.	Butter, banana, geranium, pears, quince, warm bread, cranberries, currant	Pepper, mint, bunches, fern	
	CS Vj.M.	Butter, banana, geranium, warm bread, cranberries, currant, strawberry, cacao	Pepper, bunches, fern, clover	
	Ν	Butter, banana, core bread, black bread, strawberry jam	Red cornel, brushwood, nettle, mowing hay	
Spontaneous malolactic	CS Smb	Butter, geranium, pears, currant	Pepper, mint, bunches	
fermentation with indigenous lactic bacteria	CS Vj.M.	Butter, banana, geranium, currant, cacao	Pepper, bunches, corn	
	Ν	Butter, gingerbread, strawberry, raspberry	Red cornel, nettle, brushwood	

The influence of malolactic fermentation o	i the rec	l young wines aromas
--	-----------	----------------------

Results and discussions concerning the role of the enzymes

The use of pectolitic enzymes represents an important stimulation and control factor of phenolic and aromatic compounds extractive phenomenon during the maceration. In the cellar environment, it has been made possible in many Oltenia cellars to compare wine from same type of grapes using pectolitic enzymes versus not using them.

The wines analyzed came from the main varieties of red wines cultivated in Oltenia vineyards: Cabernet Sauvignon, Merlot, Pinot noir, Feteasca neagra, Sangiovese, Novac, Negru de Dragasani cultivated at Stirmina, Vinju Mare, Oprisor, Dragasani.

After the taste of the above mentioned varieties, it become clear that the use of pectolitic enzymes represents a very important tool for the winemakers for better control of maceration and the optimization of phenolic compound extraction depending on characteristics of grapes and the type of wine that it has to be make.

The result of taste in conjunction with the environment of experiments drives to a series of very important conclusions regarding the utility of pectolitic enzymes in red winemaking. It is revealed that the use of pectolitic enzymes brings an important qualitative improvement of wine regarding the polyphenolic composition and the chromatic structure of wines but also the organoleptic traits.

In all situations, the add of the pectolitic enzymes in maceration determined a consistent plus in color, even in the case of a shorter maceration time so that it can be clearly asserted the pectolitic enzymes determine a faster extraction of anthocyans which for the wines made for consumption as young wines is very advantageous.

In Figure 1 and 2 is clearly seen the influence of pectolitic enzymes on the aroma of red young wines from the variety Negru de Dragasani and Merlot. At both wines it can be emphasize the fact that when it has been used the pectolitic enzymes (Vinozym G), despite the fact that the maceration period of time was identical (4 days for Merlot and 5 days for Novac), the color intensity of the wine is significantly greater and the color is brighter. Regarding the taste, there is an important difference between wines, the type made

with pectolitic enzymes having more body, balance being less astringent. It can be emphasized also the enforcement of the fruitful and floral aromas and a diminish of the intensity of the vegetal aromas.

These sensory properties differences allowing a faster moving to consumption of red wines comparing to the wines made in a classical way which need more time to diminish the strength of astringency and the asperity of taste in order to improve their aromas.



Figure 1 - The sensorial profile of Cabernet Sauvignon made with or without pectolitic enzymes

The enzymes became more and more an usual presence in white winemaking where are used first of all at must clarification, one of the most important pre-fermentative operation in white winemaking. In the last years, in Oltenia vineyards, for the varieties such as Muscat Ottonel, Tamaioasa romaneasca, Sauvignon the enzymes are used more and more including here the extraction of the aroma precursors. But the results are variable, the efficiency of using these enzymes being dependent on many factors, one of them being the greater diversity of enzymes existent in the market.



Figure 2 - The sensorial profile of Merlot made with or without pectolitic enzymes

CONCLUSIONS

In last decades, the winemaking technologies evolved very much and the modern biotechnologies represent one of the most important results of scientific progress in Oenology. The making of quality wines became unthinkable today without a rigorous control of maceration, alcoholic fermentation or malolactic fermentation, which means all technological sequences where the biotechnologies have a decisive role.

The vocation of hilly Oltenia vineyards for making high quality wines is unanimously recognized. The natural conditions of clime and terroir, in conjunction with the varieties cultivated allow making a high qualitative level of grapes production but for making quality wine are necessary performing winemaking technologies which are using biotechnologies.

The use of starter cultures of yeasts and selected lactic bacteria and the control of phenolic and aromatic compounds extraction with the enzymes represent a characteristic of winemaking in hilly Oltenia area and the guarantee of making of wines with compositional and sensorial characteristics which reflect the qualitative potential of the varieties and wine areas.

REFERENCES

- Băducă Cîmpeanu, C. (2003) Bazele biotehnologiilor vinicole, Editura Sitech, Craiova.
- 2. Băducă Cîmpeanu, C. (2008) Degustarea vinului. Bazele știintifice ale degustării. Editura Sitech, Craiova.
- Blouin, J., Peynaud. E. (2006) Connaissance et travail du vin. 4^e édition. Éditure Dunod, Paris.
- Gheorghiță, M., Băducă Cîmpeanu, C., Muntean, C., Giugea, N. (2006) Oenologie, vol. I. Bazele industriei vinicole. Editura Sitech, Craiova.
- 5. Popa, A. (2008) Secretul vunului bun. Editura Alma, Craiova.
- 6. Stoian, V. (2001) Marea carte a degustării vinurilor. Degustarea pe înțelesul tuturor. Editura Artprint, București.
- Teodorescu, Şt. (1970) Studiul modificării compoziției chimice a vinului sub acțiunea tratamentelor ce urmăresc stabilizarea şi limpezirea lui. Teză de doctorat. Institutul Politehnic, Galați.

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

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

Vol. XVI (LII) - 2011

RESEARCHES ON THE BIOTECHNOLOGY POSSIBILITIES FOR INCREASING THE NATURAL RANK OF WINE

Constantin Băducă¹

KEY WORDS: biotechnologies, yeasts, alcoholic fermentation, malolactic fermentation

ABSTARCT

Wine is a food for human consumption, in which composition are found many substances with positive effects on health but is not totally devoid of risks for the consumers. Dose reduction of antiseptics and antioxidants is a specific requirement of food safety rules for wine. The main substance used for antiseptic and antioxidant protection of the wine is sulfur dioxide. Dose reduction of SO2 in wine is only possible by rigorous control of alcoholic fermentation. The use of selected yeasts and activators fermentation are the main biotechnological possibilities of obtaining complete fermentations and, in this way, valuable wines as part of compositional and sensory and microbiologically stable.

INTRODUCTION

Wine is the first alcoholic beverage produced and consumed by humans. Over time many testimonies have been reported on the health benefits of moderate wine consumption. Pasteur L. (1876) wrote, the wine is healthy and hygienic of beverages "and Renaud S. (1991) made famous expression," French paradox ". The most important benefit attributed to moderate wine consumption is linked to which it provides protection against heart disease, the leading cause of mortality in developed countries (PL Teissedre, P.L. et all. 1996).

For about a decade in the medical literature began to appear studies showing a possible association between moderate wine consumption and reduced risk of various cancers. A study published by Greenwood W. (2001), shows positive effects of wine consumption, combined with a Mediterranean-type diet may reduce cancer risks, for both men and women. The other authors have concluded that moderate wine consumption reduces the risk of cancer, such as the R. Curtis Ellison (1998) and Mollerup S. (2001), which found a lower risk of lung cancer among wine consumers compared with those who consume other alcoholic beverages, and Bozetti C. (2000) found a reduced risk of esophageal cancer in consumers of wine in Italy.

Wine is a foodstuff that stands out not only by its sensory properties and nutritional value but, by increasing body of useful substances, which gives a hygienic value as food, like no other alcoholic drink. At the same time, moderate wine consumption is a

¹ University of Craiova, Faculty of Horticulture, cbaduca@yahoo.com

component of a rational and balanced lifestyle, a factor that shows the degree of culture and civilization of a people (Baduca Campeanu, C. 2008).

On the other hand, it is equally true that wine is not a completely safe food for consumers. Besides the risks of alcohol abuse, arising from excessive consumption therefore attributable to the consumer, first, can not be overlooked in the presence of wine composition of substances that can harm consumers, such as ethyl carbamate, Ochratoxin A well as some auxiliary and adjunct aids used for the stabilization and storage of wine, the potassium ferrocyanide, especially sulphur dioxide. The conditions under which these substances come to represent a potential risk for mistakes are bound exclusively to major technology in the development, preparation and storage of wine.

Although some of these substances are particularly dangerous, especially Ochratoxin A, which is known to be carcinogenic (Crespy, A., 2005) or ethyl carmamat, animal carcinogen and potential human carcinogen (Béland, A., 2005), they are still a minor risk to consumers because they rarely meet in the wine and doses, most often insignificant. Therefore, in the general context of concerns about food safety, increasing the wine naturally implies, firstly, the reduction of content on all those constituents that may pose risks to health and comfort of honest consumers. One of these substances is sulfur dioxide, widely used in winemaking.

MATERIAL AND METHODS

The research behind this work focused on microbiology and biotechnology opportunities to increase the biological stability of wine, as a prerequisite for reducing the dosage of SO2. Since only microbiological processes that are useful in winemaking are alcoholic fermentation, in some cases, malolactic fermentation, biological stability is closely related to the control of the two fermentations. Therefore, research has been directed to study the possibilities for inducing and stimulating biotech alcoholic fermentation - all kinds of wine - and malolactic fermentation - red wines - produced in the vineyards of Oltenia. In this sense, the past five years, we conducted several experiments in red and white wine that I sought to stimulate and control of alcoholic fermentation and malolactic fermentation using modern biotechnological tools in different enological conditions. Thus, in experiments we used both musts of good quality wine produced in favorable years, well-ripened grapes and healthy but also poor quality musts obtained in unfavorable years from less ripened grapes affected by mold.

For alcoholic fermentation, we organized two experiments on white grape musts and one red. The first experience, I used a white grape with 245 g / l sugar, from well-ripened and healthy grapes. The experience has included four types of fermentation, including two indigenous yeasts and two selected yeast each having two versions: with and without fermentation activator based cell walls. The second experience was carried out on a must with 182 g / l sugar from grapes attacked by gray rot and included 5 different faces and a selected fermentation yeasts indigenous variant. The third experience was performed on a wine must made from Merlot grapes, with 224 g / l sugar and included three types of fermentation with selected yeasts and two indigenous yeasts.

For malolactic fermentation, the investigations were conducted in 2004 – 2007 in several vineyards of Oltenia (Sîmbureşti, Drăgăşani and Dealurile Craiovei), following its progress in different years with indigenous lactic acid bacteria and lactic acid bacteria selected.

RESULTS AND DISCUSSION

The main action of sulphur dioxide in winemaking is wine antiseptic protection. In Enology, the role of microorganisms is essential in two moments: alcoholic fermentation and malolactic fermentation, but the latter is not necessary in all wines. Normally, wine is a much less favorable growth environment for wine microorganisms compared to wine must, because of the presence of alcohol, which has a strong selective action on the wine microflora. However, some species of yeasts and bacteria in wine can multiply under certain conditions related mainly to the absence of SO2, low in alcohol content, higher residual sugar content, etc.. Wines with high growth potential of yeasts and bacteria contamination, thus biologically unstable, are those resulting from disrupted by the action of alcoholic fermentation of various factors.

Table 1 presents results of the first experiences with the alcoholic fermentation and it is found that under a very rich grape sugars, the risk of stopping the fermentation is considerably high even if it comes from healthy grapes.

Table 1

Variant	Duration of fermentation, days	Alcohol, % vol.	Residual sugar, g/l	Glycerol, g/l	Volatile acidity, g/l acetic acid	SO_2 combined/ SO_2 total, %
Indigenous yeasts	15	13.0	22.8	11.0	0.38	89.5
Indigenous yeasts + Activator	13	13.4	15.6	11.4	0.34	85.8
Selected yeasts	11	13.9	7.8	11.6	0.30	86.2
Selected yeasts + Activator	9	14.2	3.1	11.9	0.27	80.1

Timetable of alcoholic fermentation of grape must obtained from healthy

Thus, according to the type used and the use of an asset or fermentation the duration was 9 to 15 days, with 2up to 4 days less in the variants fermented with selected or in witch was used a fermentation activator. The chemical composition of wines obtained show significant differences between types of yeast. Fermentation with selected yeasts resulted in increases in alcohol content of about 1% volume and decreases of the residual sugar content of 12-15 g/l. The increase of proportion of fermentable sugars is also reflected in higher glycerol contents in 0.5-0.6 g/l. A very important element to consider is that the wines fermented with selected yeasts present value of maximum volatile acidity of 0.3 g/l acetic acid, lower by almost 100 mg/l to those fermented with indigenous yeasts. Consequently, the proportions of SO2 are 3-5% lower, which is particularly important for biological stability of wines and can maintain a lower dose of antiseptic.

The second experience of alcoholic fermentation, conducted on a wine must with 182 g / l sugar, from moldy grapes, included five variants of fermentation with selected yeast from different strains, denoted A, B, C, D, E and a version control, fermented with indigenous yeasts. In this case, the must sulphitation dose was 120 mg/l and for debourbage we also used 100 g/l bentonite. In these circumstances, the indigenous microflora was much reduced in numbers, both because of the health status of the grapes, as well as by treatment

with bentonite and sulphitation in behalf of deburbage. Therefore, indigenous yeast fermentation was more difficult, as noted in Table 2, where are the results of this experiment are presented.

Table 2

Yeast strains	Pre- fermentative phase, hours	Duration of fermentation, days	Alcohol, % vol.	Residual sugar, g/l	Glycerol, g/l	SO ₂ combined
Α	72	8	10,4	4,6	8,1	88,4
В	48	7	10,5	3,0	8,3	86,2
С	48	7	10,5	2,8	8,5	87,4
D	60	7	10,5	2,8	8,4	85,1
E	36	6	10,6	1,3	8,8	82,4
Indigenous	96	12	10,7	9,3	7,8	91,2

Influence of the type of yeast on a fermentation coming from moldy grapes must

Thus, indigenous yeast version had the longest prefermentative phase of 96 hours between debourbage and must start the fermentation, while versions with selected yeast fermentation started between 36 and 72 hours, i.e. 1-3 days faster. The explanation of this important decalogue is represented by the poorness of must in the indigenous yeasts microflora and in nitrogenous substances by operations prefermentative, energetic, applied to a moldy grapes must. Sowing must with selected yeasts significantly increased density of yeast population and allowed more rapid start of fermentation.

The duration of alcoholic fermentation is one of the most visible differences between selected and indigenous yeasts. Indigenous yeast fermentation lasted 12 days, while the variants seeded with selected yeast finished fermentation over 6 to 8 days, so I had a shorter fermentation of 4-6 days. If we take into consideration the fact that the onset of fermentation was slower, it is clear that if a must from grapes affected by mold seeding indigenous yeast fermentation at high risk of late start and even stop premature. However, there are important differences even between the selected yeasts. As in prefermentative phase, there was strain E, which showed the shortest duration of fermentation. This suggests that the strain E was best adapted to the difficult fermentation conditions from this must.

Analyses performed on the wine confirm the necessity of using selected yeasts in a must difficult to be fermented. Under a low sugar content (182 g/l), selected yeast fermentation caused an increase in alcohol content of wine 0.3-0.5 g/l and lower residual sugar content 1.5 - 8 g/l. Of the five strains of selected yeast strain E stands still, who led to the wine with biggest alcoholic strength (10.6% vol) and lowest residual sugar content (1.3 g/l). Contrary, strain A, after it caused the late onset of fermentation (72 hours) and longest duration of fermentation (8 days) of selected yeasts, led to the lowest alcohol content (10.4% vol) and was one of the five selected strains of yeast that has led to a wine with more than 4 g/l residual sugar. The fact that strain A was the least adapted to fermentation of this must the worth is clear in glycerol content (8.1 g/l), the youngest of all the selected yeasts. Highest content in glycerol (8.8 g/l) strain E presented with 1 g/l more than wine fermented with indigenous yeasts. The same hierarchy of yeasts is kept in the case where the percentage of SO₂ is combined from the total SO₂.

Last experience was focused on alcoholic fermentation in red wine experience, the fermented must made from ripe grapes of Merlot and healthy, with 224 g/l sugar, we tested three strains of selected yeast, plus two variants with indigenous yeast, one with active yeasts, coming form a must in full fermentation.

The results of this experiment, presented in Table 3, show that the red wine-grape seeding with selected yeasts triggers a more rapid start and completion of alcoholic fermentation, which is very important for malolactic fermentation, which must follow. It also confirms other aspects found in white wine making and proving the superior fermentation ability of selected yeasts compared with indigenous yeasts. This experience brings a new element, however, with the fact that the addition of same variety of must, in full fermentation process, over the fresh Merlot must, has effects comparable to those of the addition of selected yeasts, by starting the alcoholic fermentation faster but wine composition parameters changes little.

The malolactic fermentation is a biologically desacidification process of wine made by lactic bacterium that transforms the malic acid into lactic acid and CO_2 Normally, this change takes place of the alcoholic fermentation, therefore is called secondary fermentation. As a result of this transformation there are important changes in the chemical composition of the wine (the diminution of the total acid, increases of pH because the dicarboxilic acid is replaced by the monobarboxilic acid); the taste and the aroma of the wine (the malic acid, more aggressive for the gustative papilla, is replaced by one acid that stamps suppleness to the wine; the diminution of vegetal aroma, grassy and the appearance of new tastes, more agreeable); the biologically stability of the wine(the malic acid unstable biologically, is replaced by the lactic acid, biologically stable).

Table 3

	in red winemaking				
Yeasts	Prefermementative	Duration of	Alcohol,	Residual	Glycerol,
	phase duration,	fermentation,	% vol	sugar,	g/l
	hours	days		g/1	
А	24	9	13,0	2,8	11,7
В	18	8	13,1	1,8	11,9
С	30	9	12,9	3,8	11,5
Indigenuous	36	11	12,8	5,4	11,3
Indigenous active	18	9	12,9	3,7	11,2

Influence of the indigenous yeasts and selected alcoholic fermentation in red winemaking

Concerning the malolactic fermentation, the researches were effectuated between 2004–2007, in the main vineyards of Oltenia hilly areas, situated in South-West of Romania: Sâmburești, Drăgășani și Dealurile Craiovei. Foe this study we used 4 varieties of grapes for high quality red wines: 2 varieties very knowable in international plane Cabernet-Sauvignon and Merlot, and also 2 autochthonous varieties Fetească neagră and Novac. The period of researches include the different years like climatic conditions. So, year 2005 was for Romanian viticulture the worst in the last 50 years, very rainy and cold. Those conditions influenced the grapes and wines production, quantitative and also qualitative. The years 2004 and 2006 was a good vine-growing years, the climatic conditions was favorable for viticulture. The year 2007 was excellent for vine-growing by point of view of climatic conditions during the vegetation period and also during the ripening and over ripening.

During the years have existed visible differences upon the length of time of the malolactic fermentation among the fermentated variant with lactic bacteria resulted from the indigene microflora of the grapes and the fermentated variant with selected lactic bacteria, but the differences where variable, depending on the chemical composition of the wine, as a result of the climate conditions of the viticultural year. In the good viticultural years (2004 and 2006), the length of time of the spontaneous malolactic fermentation was between 45 and 60 days while the variants with selected lactic bacteria, the duration was, on an average, 10 days shorter, between 35 and 50 days. In drought-stricken years and very warm (2007), the length of time of the malolactic fermentation was between 35 and 45 days in case of the produces fermentation. On unfavorable climate conditions, in an rainy cold year (2005), the differences were big: 80–120 days in the case of spontaneous fermentation and 45-60 days in case of the produces fermentation, so with 1–2 months shorter. Also, it has to be mentioned that in 2005, some red wines stopped the malolactic fermentation after 90–120 days without finishing the conversion of the malic acid into lactic acid. These accidents happened in wines that presented totally contains of SO₂ over 100 mg/l (fig. 1).



Figure 1. The length of time of the malolactic fermentation (days) after the type of lactic bacteria

S – MLF spontaneous, with the bacteries from the indigene microflora of the grapes;

P – MLF induced with selected lactic bacteria

A study made in 2006 on red wines from the vineyard "Dealurile Craiovei" pointed out the important differences concerning the length of time of the malolactic fermentation, depending on the moment of the inoculation of the lactic selected bacteria. Thus in all the cases in witch the inoculation was made in unfermented wine, the length of time of the malolactic fermentation was between 30 and 36 days. In the case of the inoculation of the lactic bacterium into wine, the length of time of the malolactic fermentation was between 36–48 days, in case of the spontaneous malolactic fermentation, without lactic selected bacterium the length of time was between 42–60 days.

Therefore, the inoculation of the lactic bacterium into unfermented wine determined saves of time between 6 and 12 days confronted by de variant of the culture inoculation starter the lactic bacterium in wine and of 6 to 30 days unlike the cases when the malolactic fermentation occurred without selected lactic bacterium. This economies in time are very important because they offer the real possibility of realizing malolactic fermentation on secure during the first weeks adder the end of the alcoholic fermentation.

CONCLUSIONS

Extensive use of sulphur dioxide in winemaking is due to its many properties of enological interest in all phases of winemaking and wine storage, being the only substance that provides a double protection - antiseptic and antioxidant. Dosage reduction of SO_2 , without affecting the stability and guarantee the preservation and development in good conditions is only possible finding microbiological and technological solutions so that doses are not necessary needed in addition to those normally used.

One of those possibilities is the strict control of alcoholic fermentation to prevent premature fermentation stops at the wine presses. Complete fermentation of sugars to obtain dry wine is the first condition to increase the biological stability of wine for two reasons: first, increase the alcoholic strength of wine and alcohol is itself a protective factor against the propagation of undesirable microorganisms in the wine, in the second of all residual sugar remained unfermented forced to stop due to the fermentation medium is the main energy for bacteria and fungi contamination. Therefore, the use of selected yeasts with physiological and biochemical properties suitable type of wine to be obtained and encouraging their activities biotechnological fermentation is the first opportunity to reduce the dosage of SO_2 in wines.

At all red-wines but sometimes white-wines winemaking the alcoholic fermentation is followed by a secondary fermentation called malolactic fermentation. During favorable winemaking years, when grapes were healthy, malolactic fermentation can be carried out in satisfactory conditions under the action of lactic bacteria in grapes indigenous microflora. Spontaneous malolactic fermentation has the advantage that it is a simple procedure that does not involve additional costs and inconvenience related to its associated risks.

These risks relate to slow triggering and stop the premature onset, which creates conditions for development of micro-contamination, with negative consequences on the stability of biological and sensory characteristics of wine. In the absence of favorable environmental conditions, the multiplication of lactic acid bacteria is slowed down, which entails extending the lag phase until the onset of malolactic fermentation. This delay may be several weeks long or even months, and in these conditions the risks of developing micro-contamination are even greater when the lag phase is extended further.

The most important microbiological such incidents occur when more than delay the onset of malolactic fermentation 4 - 6 weeks after the end of alcoholic fermentation, because is no longer possible to conclude it by the coming winter and spring reactivation of lactic bacteria is accompanied, almost every time, by the deviations of the emergence of microbial and the occurrence of unwanted tastes and odors as a result of prolonged contact with the wine yeasts deposit.

In addition, delayed and complicated is the entrance of the wine in the process of normal evolution, especially those destined for maturation and aging.

Given the necessity to avoid uncertainties and incidents related to malolactic fermentation, the use of starter cultures of selected lactic bacteria constitutes a biotechnological possibility that must be taken into account for the increased biological stability and, this way, the degree of naturalness of wine.

REFERENCES

Băducă Cîmpeanu, C. (2008) – Degustarea vinului. Bazele știintifice ale degustării. Editura Sitech, Craiova.

Beland, F.A., Benson, W.R., Mellick, P.W., Kovatch, R.M., Roberts, W., Fang, J-L., Doerge, R. (2005) – Effect of ethanol on the tumoriginity of urethane (ethyl carbamate) in B6C3F1 mice. Food

Chem technol 43:1–19.

Bozetti, C., La Vecchia, C., Negri, E., Franceschi, S.(2000) – Wine and other types of alcoholic beverage and the risk of esophageal cancer. European Journal of Clin Nutrition, vol. 54, pag. 918–920.

Crespy, A. (2005) – À propos de la norme Ochratoxine A à 2 μ g/l de vin: quelles conséquences sur la filière ?. Revue des Oenologues, nr. 115, pag. 7-9.

Ellison, R. C. (1998) – Moderate consumption of wine: effects on health and implications for public healthy policy. Bulletin OIV, vol. 71, nr. 803-804, pag. 32-38.

Greenrod, W., Stockley, C., Abbey, M., Fenech, M. (2001) – Phenolic compounds in red wine and dealcoholised wine are protective against the DNA damaging effect of ionizing radiation ex vivo. In Meeting the consumer challenge. Proceedings of the 26th World Congress and 81st General Assembly of the Office International de la Vigne et du Vin, Adelaide Australia, pag. 294–295.

Mollerup, S., Ovrebo, S., Haugen, A. (2001) – Lung carcinogenesis: resveratrol rol modulates the expression of human involved in the mecanism of PAN in human bronchial epithelial cells. International Journal of Cancer, vol. 92, pag. 18-25.

Pasteur, L (1876) – Étude sur le vin. Paris.

Renaud, S., De Lorgelil, M. (1992) – Vine alcohols platelets and the French paradox for coronary heart disease. Lancet, nr. 339, pag. 1523–1526.

Teissedre, P.L., Waterhouse, A.L., Walzem, R.L., German, J.B., Frankel, E.N., Abbeler, S.E., Clifford, A. J. (1996) – Composés phénoliques du raisin et du vin et santé. Bulletin de l'O.I.V., nr. 781–782, pag., 252–277.

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA Seria: ✓ Biologie ✓ Horticultură ✓ Tehnologia prelucrării produselor agricole

✓ Ingineria mediului

Vol. XVI (LII) - 2011

COMPARATIVE DATA REGARDING THE ENCEPHALON MORPHOLOGY IN *PUNTIUS SOPHORE* (HAM.) AND *P. TICTO* (HAM.) (PISCES, TELEOSTEI, CYPRINIDAE)

Bălescu Carmen¹

KEYWORDS: encephalon, morphology, cyprinidae, variability, lobes, tubercles

ABSTRACT

This study comparatively approaches the main characteristics of the encephalon in two freshwater species of fish originary from the Asian freshwaters: Puntius sophore and P.ticto (Cypriniformes, Cyprinidae). It was observed that each of the encephalon divisions and subdivisions of the two studied species present significant variations in what concerns the shape and the size, both intraspecifically and interspecifically depending on body length and the way of life.

The variability is more obvious in Puntius ticto than in P. sophore. According to the morphologic criterion, Puntius sophore has an octavolateralis brain type characterized by well-developed visual and octavolateralis centres, having a moderate development of the gustatory centres. Puntius ticto falls into an intermediary group, having well-developed gustatory centres and large visual centres.

INTRODUCTION

The comparative ecomorphology of the teleostei brain was the subject of many qualitative and quantitative studies (Brandstatter & Kotrschal, 1990; Bauchot et al., 1977, 1989; Davis & Miller, 1967; Miller & Evans, 1965; Evans, 1931, 1952; Khanna & Singh, 1966; Kotrschal & Junger, 1989; Kotrschal & Palzenberger 1992; Kotrschal et al., 1991, 1998; Mookerjee et al., 1950; Singh, 1972, etc...).

They underlied the elaboration of different brain patterns. Although Cyprinidae family is the most known one among the teleostei to be the most rich family in freshwater species: almost 2400 species and almost 220 genres (FishBase, 2004); all data about their biology and phylogeny is not known. We have found little data in the specialty literature about the anatomy of the encephalon vesicles in *Puntius sophore* and *P. ticto* species (Khanna & Singh, 1966; Sastry & Sathyanesan, 1981,1982). The aim of the present study is to comparatively present the main characteristics of the five vesicles of the brain, both among individuals of the species and between the two species in close correlation with environment conditions specific to the biotope that they occupy and their way of living. It is studied which of the encephalon divisions and subdivisions mainly contributes to the brain variability; to which brain pattern they correspond taking into account the (forementioned) specialty literature and if the brain morphology may be ecologically interpreted.

¹ University of Craiova, Faculty of Horticulture, 13 A.I. Cuza Street

^{*}Corresponding author: E-mail address: alcor3500@yahoo.com

The present study is a beginning which underlies the future research in order to see if there are and which are the phylogenetic connections between the two species on the basis of brain structure; if they have or not a common ancestor; to compare these brain patterns with the ones of other species of the genre, too; to see in what measure the brain pattern can underlie the taxonomy revision. There are known more than 100 species of *Puntius* genre (140 sp., see Haaramo, 2008b). Many have been placed in other genres *P.ticto* presents a large variability in what concerns the colour, the body morphology, the position of the dark spots, the profile of the head, etc. It has more variants which occupy a large geographical area. The taxonomy of the species, together with other species of this genre, is presently under revision; some of its forms are tried to be reclassified. For the taxonomy revision and for the determination of the phylogenetic connections it is important that the brain structure should be taken into account.

MATERIAL AND METHODS

The analyzed species, *Puntius sophore* and *P. ticto*, are distributed into Cyprinidae family, Cyprininae subfamily. *Puntius sophore* is spread in the fresh and brackish tropical waters in Sri Lanka, India, Bangladesh, Nepal, Burma, Pakistan, Afghanistan, Bhutan, China. Being a bentophelagic amphidrome species it populates the streams, rivers and the ponds in the field and sub-mountainous regions. It is characterised by a small body, tall in the anterior part. It is silver coloured, having a grey back. It has dark stains on the middle of the dorsal fin and at the base of the caudal fin (FishBase, 2011). *Puntius ticto* is spread in the fresh and brackish tropical waters in India, Sri Lanka, Bangladesh, Pakistan, Nepal, Burma, Bhutan, Thailand, Laos and South of China. Being a bentophelagic potamodrome species it prefers little deep lakes and rivers with muddy bottom. It is silver coloured, having two black spots: one above the pectoral fin and the other near the caudal fin (FishBase, 2011 Seriouslyfish, 2011). Both species are omnivorous They have the terminal mouth without barbells. They live in fish banks and they are also aquarium fish.

The material for the processing, preserved in alcohol, was supplied from the collection of Acad. Dr. doc. Petru Bănărescu.

The study was undertaken on 5 samples of *Puntius sophore* having body lengths between 5,76 and 3,77 cm and 5 samples of *P. ticto* having body lengths between 6,06 – 4,7 cm (the body length was measured up to the base of the caudal fin). For each samples there were measurements taken regarding the length of the encephalon and of its vesicles. The encephalon, taken out of the skull by classical measures, was placed in a crucible with water in order to avoid dehydration. It was drawn at camera clara.

The details were stressed with the help of the hand held magnifying glass and of the binocular. The main vesicles, divisions and subdivisions of the encephalon, namely the telencephalon (the olfactory bulbs, the olfactory tracts, the cerebral hemispheres), the diencephalon (the lobes of the hypothalamus), the mesencephalon (the optic lobes), the metencephalon (the body and the cerebellum valvule) and the myelencephalon (the vagal lobes and the facial lobe) were comparatively analyzed. The acoustic tubercles, components which are found both at the myelencephalon and at the metencephalon level, were described in the part regarding the myelencephalon.

RESULTS AND DISCUSSIONS

Telencephalon

The cerebral hemispheres are elongated, narrower in some samples of *Puntius* sophore (Fig. 1). The dorsal surface of the cerebral hemispheres is furrowed by sulci which demarcate tubercles (Fig 1 şi 2). The latero-dorsal, postero-dorsal, postero-postremum,

antero-median, antero-lateral sulci are very clear, which outline the anterior, lateral, median, posterior, postremum tubercles. Laterally towards the lateral tubercle is the pars ultima tuberculis tubercle. In both species, in some samples it appears a lateral sulcus on the surface of the posterior tubercle which divides it into two tubercles: postero-lateral and postero-median (Fig 1a., Fig 2b.).

Both the sulci and the tubercles can be clearly distinguished, mostly in big samples than in small ones and in *Puntius ticto* species than in *P. sophore*. The number of sulci, the shape and the size of the tubercles vary intraspecifically and interspecifically (Bănărescu 1949, Bălescu 2000-2010). Their presence is explained by the fact that they have the role to enlarge the surface of the cerebral hemispheres. It is known that the telencephalon is associated with the olfactory sense.

The large and well-developed cerebral hemispheres indicate the fact that in these species the smell plays an important part in searching for food. In small samples, the sulci can be hardly distinguished, so that the surface of the hemispheres seems smooth. The olfactory bulbs are connected through short tracts to the olfactory lobes. In *Puntius ticto* the olfactory bulbs are slightly rounded. In *Puntius sophore* they are slightly pyriform.

Diencephalon

It is well rendered evident on the ventral part by the hypothalamus.

The median lobe, placed between the lateral lobes, has the rostral part slightly rounded, exceeding a little bit the lateral lobes. In *Puntius sophore* the lateral lobes of the hypothalamus are elongated, slightly caudally spaced. The vascular sac can be distinguished between them and behind the median lobe. In *Puntius ticto*, the lateral lobes are much rostrally spaced, and caudally they are close. The vascular sac is reduced, being hardly thrown into relief. The longitudinal, median and mammilar sulci on the surface of lateral lobes are distinguished in *Puntius sophore* (Fig. 1). The corresponding tubercles, with the same name, demarcated by these sulci are not thrown into relief. In *Puntius ticto*, sulci are hardly visible. Between the two species it can be observed a large variation in what concerns the aspect of the hypothalamus, determined by its components. In *Puntius sophore*, the whole hypothalamus has an oval shape (Fig. 1) and in *P. ticto* it has trapezoidal shape, rounded at the anterior part (Fig. 2).

Mesencephalon

The optic lobes are big and well-developed in both species. This suggests the fact that the two species orient themselves in water mass in order to look for food with the help of their sight.

In *Puntius sophore* the optic lobes are close to each other on the entire median line (Fig. 1). In *Puntius ticto* the optic lobes appear under three aspects:

- when the optic lobes are slightly spaced on the entire median line, the longitudinal toruses can be little distinguished on the entire median line (Fig. 2a.);

- when the optic lobes are much spaced on the median line, the longitudinal toruses can be clearly distinguished and a little part of the median portion of the cerebellum valvule can be observed (Fig. 2b.);

- when the optic lobes are rostrally close to each other and slightly caudally spaced, the longitudinal toruses can be observed (Fig. 2c.).

Metencephalon

The body of the cerebellum is small and presents a slight intraspecific and interspecific variability. In both species it can be distinguished either the shape of rounded

pentagon in some samples (Fig. 1a., Fig. 2a., b.), or the spheric shape in other samples (Fig. 1b., Fig. 2c.). The varied shape of the cerebellum body is due to the skull conformation. In *Puntius sophore* it is noticed a more accentuated development of the crista cerebellaris than in *P. ticto*. The development of the metencephalon is in close connection with the mobility degree of the individual. Although the cerebellum size is small, they are active species; the active movement also being influenced by other components of the metencephalon and of the myelencephalon.

In both species the cerebellum valvule is large and exceeds just a little in the width the body of the cerebellum. In *Puntius sophore* the lateral portions of the valvule are rostrally spaced, they exceed the median portion and they have on their surface a hardly visible sulcus (Fig. 3b.). In *Puntius ticto* the lateral portions are rostrally united, so that the median portion is placed between them; it has trapezoidal shape, having the sides slightly rounded (Fig. 3a.). The shape of the cerebellum valvule is also determined by the shape of the mesencephalic ventricle.



Fig. 3. Valvula cerebelli (VC) in *Puntius ticto* (a.) and *P. sophore* (b.). CC –corpus cerebelli; plv–the lateral part of the valvula cerebelli; pmv–the median part of the valvula cerebelli. Scale -11,6:1 (a.), 7,66:1 (b.).

Myelencephalon

Characteristic to the myelencephalon are the vagal lobes, being associated with the internal taste, and the facial lobe, being associated with the external taste (Evans H.M., 1931, Evans H.E, 1952). In both species the facial lobe, associated with the external taste, is spherical, curved, visible without raising the cerebellum. It is larger in *Puntius ticto* than in *P. sophore*. The vagal lobes, associated with the internal taste, are slightly thrown into relief and caudally close in *Puntius sophore* (Fig. 1).

The posterior portions of the acoustic tubercles, which are curved, can be well seen. The anterior portions of the acoustic tubercles are splay; they can be observed by removing the body of the cerebellum. The romboid fossa has the shape of a deep and narrow triangle (Fig. 1).

In *Puntius ticto* the vagal lobes are well thrown into relief, large, slightly caudally spaced (Fig. 2). Laterally towards the facial lobe it can be distinguished a part of the posterior portions of the acoustic tubercles. The anterior portions of these lobes are splay by the pressing of the cerebellum body against them. The romboid fossa has the shape of a slightly anteriorly widen triangle (Fig. 2).



Fig.1. Dorsal view (left) and ventral view (right) of the encephalon in *Puntius sophore* species – in individuals which have the body size different:
a. L=5,76 cm, b. L=4,83. Scale – 5,8:1 (a.), 6:1 (b.).



Fig. 2. Dorsal view (left) and ventral view (right) of the encephalon in *Puntius ticto* species – in individuals which have the body size different: a. L=6,06 cm, b. L=5,72, c. L=4,7 cm. Scale – 5,52:1 (a.), 5,8 (b., e.), 6,2:1 (c.)

Abbreviations for figures: BO = bulbus olfactorius, TrO = tractus olfactorius, CH = cerebral hemispheres, LO = lobus opticum, TL = torus longitudinalis, LMH = lobus medianus hipotalamic, LLH = lobus lateralis hipotalamic, Sc = saccus vasculosus, CC = corpus cerebelli, VC=valvula cerebelli, TA = tuberculum acusticum, Miel = mielencephalon, LF = lobus facialis, LV = lobus vagus, FR = fossa rhomboidea, ta = tuberculus (t.) anteriorus, tl = t.lateralis tm = t. medianus t., tp = t. posteriorus, tpm=t. posteromedianus, tpl=t.posterolateralis, tpt = t. posteromedianus, sld = s. laterodorsalis, spd = s. posterodorsalis, spp = s. posteropostremum, sl = s. longitudinalis, smm = s. mammillaris, sm = s. medianus

According to the characteristics of the facial lobe and the vagal lobes, being also compliant with the classification made by Bănărescu (1949), the myelencephalon of the *Puntius ticto* species falls into the 4th group, having the facial lobe and the vagal lobes well developed. The myelencephalon of the *Puntius sophore* species can be intermediarily placed between the 1st and the 4th groups, the facial lobe and the vagal lobes having an average development. On the basis of morphological aspects correlated with the measurements of the divisions and subdivisions and also taking into account the specialty literature (Kotrschal et al. 1991, 1992, 1998), we found out that:

- *Puntius ticto* is characterized by large visual centres, well-developed gustatory centres (especially the vagal), and the octavolateral centres moderalty developed. This thing also corresponds to its way of living. The developed gustatory lobes indicate the fact that in this species the gustatory buds (especially the internal ones) predominate, with the help of which it traces the food on the bottom of the water. With the sensory snout it searches on the sandy or muddy bottom the food which consists of different benthonic invertebrates, of detritus, etc. Therefore, it gets close to the chemosensory brains (Kotrschal, 1992). But the optic lobes are well-developed, which indicates the fact that the species moves actively in the water mass in search for food (of the plankton).

-*Puntius sophore* has an octavolateralis brain type characterized by well-developed visual and octavolateralis centres, but moderately developed chemosensory centres (the facial lobe is well outlined). The species has the cerebellar crest, the cerebellum valvule and the acoustic tubercles well-developed. Due to the fact that it is also an amphidromous species, it is much more active than *P. ticto*. It moves from fresh waters into salty waters under certain conditions in search for food. The small body of the cerebellum is compensated by the other components of the metencephalon and of the myelencephalon which coordinate movement. The well-developed lateral line permits a better orientation in the environment and a rapid visual localization. This framing is relative. For a more rigorous comparison, more samples of the two species from different biotopes must be studied. And also to better notice the morphological differences of the brain and be used in order to establish the phylogenetic connections (according to his statements Howes, 1984).

CONCLUSIONS

In *Puntius sophore* and *P. ticto* species it can be observed an interspecific variability in what concerns the shape and the sizes of the encephalon depending on the size of the fish. Intraspecific variability is more accentuated in individuals of *Puntius ticto* species. There is a strong connection between the different encephalon vesicles and the sensorial organs. Large variations between the two species are also observed in the aspect of the hypothalamus and of the myelencephalon due to the different development of its divisions. Among the vesicles of the encephalon, the most developed vesicle is the mesencephalon. The spacing of the optic lobes in *Puntius ticto* with the complete or partial

prominence of the longitudinal toruses is influenced by the development of the cerebellum valvule. According to the development degree of the lobes at the level of the myelencephalon, *Puntius ticto* falls into the 4th group, having the facial lobe and the vagal lobes well developed. *Puntius sophore* falls into the intermediary group, between the 1st and the 4th groups, in which the facial lobe and the vagal lobes have an average development.

According to the morphologic criterion, *Puntius sophore* has an octavolateralis brain type characterized by well-developed visual and octavolateralis centres, having a moderate development of the gustatory centres. *Puntius ticto* falls into an intermediary group, having well-developed gustatory centres and large visual centres.

The brain morphology can underlie the ecological interpretations of the species.

BIBLIOGRAPHY

Bauchot R., Bauchot M. L., Platel R., Ridet J. M. 1977. *Brains of Hawaiian tropical fishes; brain size and evolution*.Copeia, 1: 42-46.

Bauchot R., Ridet J. M., Bauchot M. L. 1989. The brain organization of butterflyfishes. Env. Biol. Fish., 25: 205-219.

Bălescu Carmen. 2000. Aspecte privind studiul comparative al encefalului la câteva specii de pești din subfamilia Gobioninae (Pisces, Teleostei, Cyprinidae). Analele Univ. Craiova. Ser. Biol. Hort. T.P.P.A., 5 (41): 69-75.

Bălescu Carmen. 2000. Studii privind morfologia externă a encefalului la trei specii de pești din familia Cyprinidae: Danio aequipinnatus (Mc.Clelland, 1839), Pelecus cultratus (L., 1758) și Salmostoma clupeoides (Block, 1782). Naturalia. Studii și cercetări. Pitești, 4-5: 199-204.

Bălescu Carmen. 2001. Morfologia externă a encefalului la Hemiculter leuciscurus (Basilewski, 1855) și Megalobrama terminalis (Richardson, 1845) (Pisces, Teleostei, Cyprinidae). Analele Univ. Craiova. Ser. Biol. Hort. T.P.P.A., 6 (42): 44-47.

Bălescu Carmen, Luminița Ungureanu, D. Ștefănescu. 2002. Aspecte privind encefalul la Crossocheilus latius diplocheilus (Kessler)- (Pisces, Teleostei, Cyprinidae) Analele Univ. Craiova. Ser. Biol. Hort. T.P.P.A., 7 (43): 45-50.

Bălescu Carmen. 2002. Comparison study of encephalon in Opsariichthys pachycephalus, Zacco platypus and Zacco temminckii (Pisces, Teleostei, Cyprinidae). Rev. Roum. Biol. – Biol. Anim. București, 47 (1-2): 21-30.

Bălescu Carmen. 2003. Encephalon characteristics of some leuciscinae species (Pisces, Cyprinidae). Rev. Roum. Biol. –Biol. Anim. București, 48 (1-2): 69-82.

Bălescu Carmen. 2004. Aspects on the external morphology of the encephalon at four species of the Rhinichthys genus (Pisces, Teleostei, Cyprinidae). Analele Univ. Craiova, Seria Biol., Hort., T.P.P.A., Ing.Med., 9 (45): 51-56.

Bălescu Carmen. 2005. A comparative study on the external morphology of the encephalon in three fish species belonging to Cyprinidae family: Amblypharyngodon mola, Danio malabaricus and Rasbora argyrotaenia. Analele Şt. Ale Univ."Al.I. Cuza" Iaşi, s. Biol anim, 51:145-150.

Bălescu Carmen, Babalean Anda. 2010. Contributions regarding the morphology of the encephalon in Capoeta tinca (Heckel, 1843) and Cirrhinus reba (Hamilton, 1822) (Pisces, Teleostei, Cyprinidae). Analele Univ. Craiova, Seria Biol. Hort. T.P.P.A., Ing. Med., 15 (51): 37-42.

Bănărescu P. 1949. Contribuțiuni la studiul encefalului la teleosteeni în legătură cu felul de viață și filogenie. Teză de doctorat. 188 p.

Brandstatter R., Kotrschal K. 1990. Brain growth patterns in four european
cyprinid fish species (Cyprinidae, Teleostei): roach (Rutilus rutilus), bream (Abramis brama), common carp (Cyprinus carpio), and sabre carp (Pelecus cultratus). Brain. Behav. Evol. 35: 195-211.

Davis B.J., Miller R. J. 1967. Brain patterns in Minnows of the genus Hybopsis in relation to feeding habits and habitat. Copeia 1: 1-39

Evans H. E. 1952. *The correlation of brain pattern and feeding habits in four cyprinid fishes*. J. Comp. Neurol. 97(1):133-142

Evans H.M. 1931. A comparative study of brains in British cyprinids in relation to their habits of feeding with special reference to the anatomy of the Medula oblongata. Proc. Roy. Soc. Londo.B, 108: 233-257.

Haaramo M., 2008 (b). Mikko's Phylogeny Arhive – Puntius. Version oh 2008-Mar-11. Retrieved 2008-Jun-29

Howes G.J. 1984. A review of the anatomy, taxonomy, phylogeny and biogeography of the African neoboline cyprinid fishes. Bull. Br. Mus. Nat. Hist. (Zool.) 47(3):151-185

Khanna S.S., Singh H.R. 1966. On the morphological peculiarities of the valvula cerebelli in some teleost. Zool. Anz (Leipzig), 67:413-419.

Kotrschal K., Junger H. 1989. Patterns of brain morphology in mid-European Cyprinidae (Pisces, Teleostei): A quantitative histological study. J.Hirnforsch, 29: 341-355.

Kotrschal K., Brandstatter R., Gomahr A., Junger H., Palzenberger M., Zaunreiter M. 1991. *Brain and sensory systems*. În Winfield I. J. and Nelson J.S., eds. Cyprinid Fishes, Systematics, Biology and Exploitation. London Chapman and Hall, p:285-331.

Kotrschal K., Palzenberger M. 1992. *Neuroecology of cyprinids: comparative, quantitative histology reveals diverse brain patterns*. Env. Biology of Fishes 33: 135-152.

Kotrschal K., M.J.Van Staaden, Huber R. 1998. *Fish brains: evolution and environmental relationships*. Reviews in Fish Biology and Fisheries 88: 377-408.

Miller R.J., Evans H. E. 1965. *External morphology of the brain and lips in Catostomid fishes*. Copeia 1: 467-487.

Mookerjee H. K., Ganguly D. N., Mookherji P. S. 1950. *Study on the structures of the brains of some Indian fishes in relation to their feeding habits*. Proc. Zool. Soc.Bengal. 2: 119-153.

Sastry V.K.S., Sathyanesan A.G. 1981. Morphology of the pineal organs of Mystus aor (Ham.) and Puntius sophore (Ham.) with special reference to their innervation. J.Hirnforsch, 22 (4): 383-392

Sathyanesan A.G., Sastry V.K.S. 1982: *Pineal innervation of the third ventricular ependyma in the teleost, Puntius sophore* (Ham.). J.Neural Transmission 53 (2-3):187-192

Singh C.P. 1972. A comparative observation of the brain of some Indian freshwater teleosts, with special reference to their feeding habits. Anat. Anz. 131: 234-237. *** FishBase (2004): Family Cyprinidae – Minnows or carps. Version of 2004- Nov-22. Retrieved 2007-03-05

*** 2011 http://www.seriouslyfish.com/profile.php?genus=puntius&species=ticto&id=152.

*** 2011 http://www.fishbase.org/summary/speciessummary.php?id=4815

*** 2011 http://www.fishbase.org/summary/speciessummary.php?id=10137

*** 2011 http://www.eol.org/pages/211476

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

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

Vol. XVI (LII) - 2011

MODEL FOR MAKING OF A GEOGRAPHIC INFORMATION SYSTEM FOR THE TERRITORIAL AREA OF LOCALITY UIVAR, TIMIS COUNTY

Livia Luminița Bârliba¹, Bârliba C.¹, Eleș G.²

KEY WORDS: topo-cadastral map, digitization of plans, vectorial map.

ABSTRACT

The aim of the paper was to make a topo-cadastral map to include the plots on the outskirts of locality Uivar, Timiş County, and to specify their owners, according to the ownership laws. Also, a plan was intended, for specifying the categories of use of the plots and their position.

The work was done in two stages. In the first stage, the already-existing maps were compared to the new measurements performed in the field with the help of a Leica 1205 C total station. In the second stage, the data were processed with the help of program AutoCAD 2009. Then they were exported in the form of DXF in WinGIS, which allows of a good digitization and the adding of images to the vectorial map resulted in the measurements.

INTRODUCTION

In the same time with social-economical development from the last decades, which determined the population increase, the development and the enlargement of urban centres and communication ways, it was obviously evident the necessity of appearing some Geographical Informational Systems (GIS).

If the first GIS couldn't make the link between a graphical data base and a textual one, or it could it in a hard way, being presented under the form of two distinct data basis, this thing was changed with the year passing.

Geographical Informational Systems takes part from the widest informational systems class. These systems have as a main characteristic the information treatment, taking into account the location or the geographical and spatial establishment into the territory, using a system of coordinates (Băduţ M.,2004).

One of the causes of GIS issuing is the impossibility to foresee what can happen in a case of disaster (natural or human activities result), and also, its effect on a zone of element belonging to Geographical Informational System.

Also, the necessity to follow one element in the real time, made imminent the appearance of a Geographical Informational System, which together with GIS technology have succeeded the supplying of extremely precise information and in the same time in a very short time, bounded by that element.

As a specificity of technological and research development domain, it is notified the orientation to the requests of geographical information users, in helping to a better

¹ U.S.A.M.V.B. Timişoara

² Universitatea "Politehnica" Timişoara

understanding and to demonstrate the potential of multimedia content of geographical information for the economical development and the improvement of commercial services and other public services in the help of citizen.

The activities core in which is enclosed The Geographical Information is located in the Technical Thematically Program: "The Creation of a Friendly Informational Society".

MATERIAL AND METHODS

The scope of work is the performing topo-cadastral plan, which will comprise the outside land surfaces of Uivar locality, their owners and the results applying Romanian property laws. There is also a request to perform a plan from which to be identified the usage categories of lands and their location.

The contractor is represented by Uivar commune town hall.

The paperwork was divided in several stages:

In the first stage it was a research to obtain the necessary documentation to start the works. The documentation is represented by plans, maps, and all types of documents that can help in the activity of getting information about the outside land of Uivar locality.

In the second stage, it was performed a detailed study of available documentation. Taking into account the field situation and the existing plans, we summarized few unconformities. In this stage, we performed also, a general selection, a very careful examination of plans and the final result was that there are necessary topographic measurements. The topographic measurements were performed with the help of measurement device Leica 1205 (Basil Savitsky, et al. 2008).

After the performing of measurements, there are gathered several number of points, all of them having known coordinates, in projection system Stereo 70.

Methods used to perform the measurement were of polygonal course, retrointersection and direct intersection.

Resulted data following the measurements were downloaded (with the help of software received from the manufacturing device company) into other processing data software, namely AutoCad.

After the points downloading, we continued with their unifying in order to obtain plots borders.

After the points unifying, the plots borders could be visible as in the following drawing (fig. 1).



Fig.1. Tracing out line borders plots

After the points unifying, we created the surfaces, marking them depending on owners and field details.

This operation was followed by file export as DXF format in WinGIS(Manual WinGIS 2010).

Because of compatibility between WinGIS and AutoCad, the import was DXF format of the above mentioned application was done in very short time.

From this moment, it can be said that we really entered in GIS part of the application.

Vectorisation was performed after the scanned map was previously georeferenced, using the points of which coordinates were known or were determined by measurements.

WinGIS software permits the accomplishment of quality digitization and the transposing of images over vectorial map resulted by measurements.

There was performed a check for plot surfaces resulted from measurements with surfaces from land registers and using Win GIS, we proceed at the parcelling of lands.

RESULTS AND DISCUSSION

After the accomplishment of graphical base, we could proceed on the creation of data base(http://www.progis.com).

The information received from Uival townhall and County Land Register Institution of Timis, we started the creation of database structure. Whilst performing the documentation, we putted into correspondence the new created database with the legal land owners documents purchased from County Land Register Institution, land registers and agricultural registers.

In the next period, the information was processed by layers, putting into correspondence the measurements data with all the other documents.

Also, there was performed GIS typology, meaning the passing on the same definition of elements having similar characteristics, located at different corners of outside locality land. As an example for this, it means to select the grasslands and their posing on the layers.

We continued the concordance of bases (graphical and textual), such as the data collected on the field to correspond to the text base, and in the same time, the correspondence of checking text base with available registers and land owner documents (fig.2).



Fig. 2 Confrontation base of data with the measurements

By example: If Meszaros Etelca, has a land owner document for a field surface of 2.90 ha, it is imperious necessary that in our plans to be the same surface (see the below WinGIS image). This can be visualized by selecting the surface having the cadastral

number A1770/2, corresponding to Meszaros Etelca. WinGIS software permits us that by selecting only one portion of land, it can be found out its surface and perimeter, north, south borders, the heirs etc.

If there is wanted a closer approach of the plan, by selecting the option "zoom", it shall be get a closer view, permitting the observation of some details, etc. (Nemeş I. et al. 2010).

This option is illustrated in the below image (fig. 3).



Fig. 3. Confrontation base of data with the measurements zoomed depending on the necessities

Referring to attribute data base (fig. 4), it is structured on the following fields: land register number, owner, address, heir, number of owner title, received date, field in rotation, plot, surfaces, neighbors (N, S, E, W), etc, as is shown below:

🐨 Inform	🖉 Informatii ale stratului 'TOT' 📃 🗖 🔀						
Tabela Ed	itare Functi 1	Interogare	Grafica Ajutor				
1 d 🛛	🏟 🕍 - 🔳	3 B	1 1 A	1 4 位	ð 🖥		
ProgisID	Area	SUPRAF	NR CAD	ANEXA/POZ	AUTOR	MOSTENITOR	ADR MOSTENIT
000000677	12102.0504	1,21	A 1770/3	24/5	MESZAROS ELENA ETI	6	SANMARTINU MAGHIAR -
000000678	28999.3298	2,90	A 1770/2	2A/25	MESZAROS ETELKA		SANMARTINU MAGHIAR
000000679	12999.3998	1,30	A 1770/1	2A/33	MIKE MARGARETA		JIMBOLIA, STR. IDAN SLA
000000680	11999.3902	1,20	A 1770/25	24/3	OLAH MARIA		SANMARTINU MAGHIAR
000000679	12999.3996	1,30	A 1770/1	2A/33	MIKE MARGARETA		JIMBOLIA, STR. IOAN SLA
000000680	11999.3902	1,20	A 1770/25	2A/3	OLAH MARIA		SANMARTINU MAGHIAR
000000681	13000.0027	1,30	A 1770/26	20/10	ORSAN GRIGORE		SANMARTINU MAGHIAR -
000000682	19392.111	1,9391	A 1770/10/1		PRIMARIA UNAR		UNAR
000000683	10001.8342	1,00	A 1770/20	3/51	OLAH ANDRAS	CSISZAR ELISABETA, TURI ELENA	DUMBRAVITA, STR. M. EF
000000684	9999.9273	1,10	A 1770/21	28/50	NAGY IOAN		SANMARTINU MAGHIAR 1
000000685	3333.3575	1,00	A 1770/22	28/33	NAGY STEFAN		SANMARTINU MAGHIAR
<u>e a</u>							
Inregistrates	467 din 1056 (1	1					

Fig.4. The attribute database

A very important thing concerning WinGIS applications is the possibility to continuously update the textual database, depending on modifications appeared on geographical data.

This connection between the two main components of WinGIS database, the attribute data base respectively, spatial data base, permits the updating of both data bases, with modifications from the operator (Bârliba C. et al. 2010).

After the creating of Geographical Informational System, all data concerning land owners of Uivar locality, are easier to be processed, visualized, the plots can be easily located on the field, etc.

From here, it starts the last part concerning the introduction of GIS technology, namely: data maintenance.

For Geographical Informational System to be efficient, there is necessary the maintenance of both databases.

This operation is the simplest part from the implementing a GIS, because it doesn't suppose a great volume of work in a short period of time, but a small volume of work in a certain period of time.

You must remember that: A GIS not being maintained is equal to zero.

CONCLUSION

GIS products are very special among of the other computers market software, such as language programs, such as traditional DBMS (Data Base Managing Systems), or products of CAD type (Computing Aided Design).

Various application domains of GIS technology have proven their efficiency.

Geographical Information System - GIS already created, it presents multiple advantages, mainly because of the easiest and fastening of getting information, Also, the maintenance of Geographical Information Systems - GIS already created, is extremely easily, by the maintenance costs and the time of introducing new data.

Geographical Information Systems are used in various domains.

GIS technology proves its usage in any activity domain based on spatial information treatment (Ienciu I. et al. 2009):

1. urbanism, local systematization and administration

2. cadastre

3. agriculture, soil science, forest management and land reclamation

4. oil and gases

5. cartography

6. town endowments

7. transports and telecommunications

8. commerce

9. special applications

10. geology

11. hydrology, oceanography

12. statistics, population registering, censures, demography

13. finance-banks

14. policy

The practical application performed on outside Uivar locality proved us the efficiency of Geographical Informational System can provide information.

Geographical Informational System helps to a better evidence of land registers in the area, a better collecting of taxes, an eventual programming of agricultural cultivations, the resources stage follow-up, getting information in short time about "objects" inside the data bases., etc. The next procedure is to update and maintain databases, a much easier operation than the ones done before that shall be developed continuously in time.

Among the advantages of using GIS technology, we remind:

- The data shall be better organized

- It eliminates the redundancies in data storing

- Updating facility

- Analysis, statistics, new easier researches as much as possible

- The users are more productive

In time, GIS technology shall be successfully applied in other parts of the county or in other domains. In the near future, with Romania becoming a member of European Community, the government should put the basis of some Geographical Informational Systems, which shall provide accurate information, in the possible shortest time.

The final general conclusion concerning Geographical Informational Systems is that they represent the future in a lot of domains.

REFERENCES

1. Băduț M.,2004, Sisteme Informatice Geografice fundamente practice, Editura Albastră București

2. Basil Savitsky, Thomas Lacher, 2008, GIS Methodologies for Developing Conservation Strategies,.

3. Bârliba C, Cojocariu Luminita, 2010, The selective distribution of pasture surfaces situated on administrative territory of Nadrag, Timis County, Banat's University of Agricultural Science and Veterinary Medicine from Timisoara, Faculty of Agriculture ,vol 42 (1), pag. 340-347

4. Ienciu I.;Oprea L. 2009, Prelucrarea automată a datelor analitice și grafice din topografie și cadastru, Editura Aeternitas, Alba Iulia,.

5. I. Nemeş, Bârliba Luminița Livia, 2010, Project for identification and measuring a forest area into the administrative territory of Giroc, Timis county. Buletinul Universității de Științe Agricole și Medicină Veterinară Cluj-Napoca, Seria Horticultură, vol.67, Editura Academic Pres, Cluj-Napoca, file 367-374.

6. Stoian I., Bârliba Luminița Livia ,2009,- Elemente de fotogrammetrie, Editura Eurobit, Timișoara,

7. *** – Manual WinGIS 2010

8. *** - http://www.progis.com

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

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

Vol. XVI (LII) - 2011

TOPO-CADASTRAL WORKS IN ORDER TO DETERMINE AND IDENTIFYTHE SURFACE OF AN AGRICULTURAL AREA IN SEITIN, ARAD COUNTY

Livia Luminița Bârliba¹, Bârliba C.¹, Eleș G.²

KEY WORDS: parcel, topographical survey, cadastral delimitation, surface computation

ABSTRACT

In economical activities, topographical surveys are directly involved in the economical activities, administrative and juridical, ensuring the land fund registry, in the geographic site and the cartographic background necessary for the cadastral works.

The topo-geodesical works are use on a wide scale in agriculture, in projecting and execution activities of land reclamation and improvements for landmarking.

The paper release is based on the topographical survey of a parcel for register it into the land register and also for registering a parcel in surface of 1,4 ha located in SEITIN, Arad county.

INTRODUCTION

Survey operatins, locations tracking, are allways made according to the general topography principles. (7/1996 Law). We can easily see that according to the applications diversity a lot of topography branches has been developed such as: mining topography, topography in construction, land reclamation and improvement topography etc., known also as engineering topography. A very important side of these topographies consist in the topographical participation in achieving the construction works and also in following the behaviour and the stability of constructions. (Novac G., 2009).

The economical activities, demand syrvey and locations traking operations for solving problems in administrative, juridical and economical branches, by ensuring the land fund record on the geographic site and the cartographic backround necessary in planning and work execution activity, following the behaviour of cadastral works, transport instalation and constructions etc. (Badea G., 2004)

MATERIAL AND METHOD

Şeitin village is situated in the South-West part of the Arad Plain, in the Mureş river meadow, at 10 km distance from Nădlac city, at 20 km from Pecica city, at 47 km from Arad and at 55 km upstream of Tisa and Mureş confluence (http://www.seitin.ro).

The distance from the Hungarian border is arround 13 km considering the national road Nădlac-Arad and less than 10 km. on straight line over the Şeitin territory.

¹ U.S.A.M.V.B. Timişoara

² Universitatea "Politehnica" Timişoara



Figura 1. Seitin city disposal

Geographic, the city is placed at the intersection of the 20 degrees 5 minute East meridian with tha 46 degrees and 7 minute parallel.

The geographic coordinates are: 46°06′36″N 20°50′28″E46°06′36″N 20°50′28″E

The administrative territory of Şeitin is confined with Şemlac village on the East side, with Pereg village at Noth-East side, with Nădlac at the West side and with Periam, Sânpetru and Capiş villages at the South side of the village. (http://www.seitin.ro).

The administrative territory of Seitin is having a total area of 6680 ha.

In order to achieve the present work, the classic method of computing the bearing with coordinates and tachimetry was use.

Therefore, in the first phase of the works the station point of coordinates was S1 and the sights were towards to old points of knowing coordinates: ogoare Signal, Şeitin Church, Catholic Church Igriş, Catholic Church of Nădlac, and at the end of the operation the points coordinate that surround the T83A 340 area were computed (figure 2).



Figure 2. T83A340 location site

RESULTS AND DISCUTIONS

The instrument use in achieving the work was the optical tachimeter DAHLTA 010A, with an angle accuracy of 25^{cc} and distances accuracy of 0.1 m. (Eleş G.,2010). The data processing has been made with CALTOP software (Nemeş I. et al. 2010), and later on by joining the detail contours the situation plan was achieved (Bârliba, C. , 2006).

The projection system use in the coordinates computation and representation was STEREO 70.

The geodetical new points and point of knowing coordinates are ilustrated in figure 3.



Figura 3. The location of the new point S1

Table 1

		14010 1
	Points of geodetical network	
Point description	X[m]	Y[m]
Semnal Ogoare	523549.231	177010.780
Biserica Şeitin	520566.028	178685.978
Biserica Catolică Igriș	521229.421	174506.630
Biserica Catolică Nadlac	527557.225	172131.177

Table 2

	New points	10010-2
Point description	X[m]	Y[m]
S1	523515.130	175343.427

The new station point of the present work is S1, landmark trough a wood marker

Table 1

POLAR POINTS COORDINATE

Station point	Point target	Distances	Directions
	Semnal Ogoare		98.6981
	Biserica Şeitin		146.0241
	Biserica Catolică Igriș		222.3418
	Biserica Catolică Nadlac		357.2510
	1	630.549	146.5200
S 1	2	667.264	146.6162
	3	728.725	181.5883
	4	696.826	183.2035
	5	585.676	146.3493
	6	585.843	145.9149
	7	720.248	146.3840
	8	720.141	146.7374
	9	763.686	180.0079
	10	765.516	180.3041
	11	663.610	185.5396
	12	661.472	185.2148

The surface of the area has been computed trough analytical method (Boş. N., 2007) by using the rectangular coordinates of the contour points for the parcel T 83 A 340/23.

SUDEACE DETERMINATION

Tabelul 3

The computed coordinates of the surface values are shown in table 3:

Sold Ree Derendin (Rition)				
$2S = \sum x_i(y_{i+1} - y_{i-1})$				
	S =14000 mp			
Doint #	COORD	INATES		
Politit #	X [m]	Y [m]		
1	523094.291	175812.987		
2	523069.036	175839.655		
3	522816.669	175551.257		
4	522842.417	175525.151		

CONCLUSIONS

Considering the aspects presented in the paper we can easily see some of the advantages of using the classic optical instruments together with adequate software in agricultural field:

- the topographical survey works are executed trough the same technical procedures that request a high effort of the operators, by increasing the time of active work.

- processing data with the computer can draw out a high accuracy of the documentation similar to the high tech that allows an electronic inventory of the effectuated works.

- the present topogeodezical methods, not emphasized in the present paper, has practically replaced all classical surveying methods, having the advantage that together with the high efficiency quantitative planimetric inventory, allow also the electronic data transfer.

BIBLIOGRAPHY

- 1. Badea G., 2002, Măsurători Terestre-fundamente, Volumul I, Topografie, Editura Matrix Rom, București.
- 2. Bârliba, C., 2006, Desen tehnic și cartografic, Editura Solness, Timișoara;
- 3. Boş. N., 2007, Topografie Modernă, Editura C.H.Beck, București,
- 4. Eleş G.,2010, Topografie cu elemente de cadastru, Editura Mirton, Timişoara.
- 5. I. Nemeş, Bârliba Luminiţa Livia, 2010, Project for identification and measuring a forest area into the administrative territory of Giroc, Timis county. Buletinul Universităţii de Ştiinţe Agricole şi Medicină Veterinară Cluj-Napoca, Seria Horticultură, vol.67, Editura Academic Pres, Cluj-Napoca, file 367-374.
- 6. Novac G., 2009, Cadastru , Editura Solness, Timişoara.
- 7. *** Legea 7/1996 a cadastrului și publicității imobiliare, Monitorul Oficial, 1997
- 8. *** http://www.seitin;
- 9. *** http://ro.wikipedia.org/wiki/Seitin.

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

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

Vol. XVI (LII) - 2011

STUDIES ON POST-HARVEST QUALITY OF SOME APPLE GENOTYPES

Beinşan Carmen¹, Şimonea Luciana¹, Camen D.¹, Şumălan R.¹

KEY WORDS: apple, quality, pH, total sugar content.

ABSTRACT

Fruit maturation represent the vegetative phase from the beginning of fruit ripening and continuing with maximum accumulation of organoleptic qualities, in other words, the achievement of consumption maturity. In all this time, in fruits occur a lot of physiological and biochemical processes from which result modifications of color, consistency, juicy and taste of fruits.

Fresh fruits and vegetables are highly perishable commodities that can easily spoil or deteriorate during produce handling along the supply chain from the producer to the final retailer.

All fruits and vegetables are living parts of plants containing 65 to 95 per cent water. They continue their life metabolisms after harvest and thus change their characteristics depending on product handling, storage and treatment, all of wich have a decisive impact on the life of the product.

INTRODUCTION

In this experiment we studied some quality indices of four apple varieties present on the market in western part of Romania.

When buying apples, consumers are sometimes puzzled by how to choose high quality fruit. Fruit quality selection involves several considerations. A prime quality factor is maturity. A "mature" apple is one that has reached the stage of development on the tree where it has achieved its peak flavor potential. Once mature, the fruit is capable of ripening fully after harvest.

Apple growers try to pick their crop at a time that maximizes both flavor and storability of the fruit (http://www.nh.gov/agric/news/documents/reg-apple-quality.pdf).

Apple ranks first, in grown fruit species, from temperate zone. Fruits have a long term for storage (from 7-9 months, to some winter varieties) and they present resistance to handling and transport. The length of time apples remain good in storage depends on the apple cultivars, stage of maturity at picking, handling before storage, how soon they are cooled down, and the temperature and humidity of the storage area (www.extension.iastate.edu/Publications/PM1078.pdf).

Apples, peaches and pears have a wide range between climatic minimum and maximum level, in conclusion best possibilities of storage and transportation [1].

The ethylene is located in all plant organs, but in the largest amount is located in fruits and it is also used in artificial forms, producing forced ripening. The ethylene is also named senescenced hormone, being esential in developing plants [2].

¹ Banat's University of Agricultural Science and Veterinary Medicine Timisoara

MATERIAL AND METHODS

The biological material was represented by four varieties of apple, fruit which is sold on market in western Romania: Golden Italia, Golden Satu Mare, Idared Ungaria and Idared Satu Mare.

During the experiment the following quality parameters were studied: fruit's dimensions (diameter, weight), flesh firmness, pH of vegetable juice, total sugar content, dry matter [3]. To determine fruit firmness we used a digital penetrometer, removing the two small disks of peeled fruit in the middle of the dry flower stems and opposite sides of the apple.

Total sugar content was achieved with digital refractometer, Brix degrees was equate to the percentage depending on the temperature determination (for each 10°C we increase the percent of total soluble percent with 0,5 %). The percentage of dry fruit pulp was determined using Kern termobalance [4]. The determination was made immediately after fruit prelevation from market.

RESULTS AND DISCUSSION

For all cultivars studied, a linear relationship existed between the maximum and minimum size of fruit. The large variation in fruit size (diameter as well as height) indicates that apples should be sorted to improve quality. The uniformity of fruit marketed, from this point of view fits the category of "extra".

Table 1

Minimum standards to determine the weight of apples (http://www.acsa.md/public/publications/532252_md_458206_md_proto.pdf)

	Extra	Category I	Category II
Large fruited varieties	110 g	≤90 g	≥90g
Other varieties	90 g	80 g	70 g

Table 2

The minimum diameter values of apples determination (http://www.acsa.md/public/publications/532252 md 458206 md proto.pdf)

	Extra	Category I	Category II
Large fruited varieties	≥65 mm	≥60 mm	≤60 mm
Other varieties	60 mm	55 mm	50 mm

Table 3

Results on the physical characteristics of apple varieties

No.	Genotype	Diameter (mm)	Weight (g)
1.	Golden Italia	67 <u>+</u> 0.54	176.60 <u>+</u> 2.07
2.	Golden Satu Mare	67.5 <u>+</u> 1.07	150.44 <u>+</u> 2.57
3.	Idared Ungaria	66.5 <u>+</u> 0.82	162.40 <u>+</u> 1.74
4.	Idared Satu Mare	77.5 <u>+</u> 0.64	192.38 <u>+</u> 1.83

Comparing with the standard values, the imported varieties, and even the local varieties, are falling in the Extra category. The highest weight and diameter belongs to Satu Mare Idared variety, with the average weight of 192.38 g and 77.5 mm (Table 3).

During the experiment was performed and the starch-iodine test in order to assess the degree of ripeness of fruit from the four varieties studied. Looking at the charts it was found that all the fruit fall within the "super-maturated" in terms of development stage (Fig. 1).



Fig. 1 Apple maturity according AI test (http://www.acsa.md/public/publications/532252_md_458206_md_proto.pdf)

Comparing with AI (starch-iodine) diagram, usually all fruits with indicators of 3-4 AI, are suitable for long time storage in rooms with controlled atmosphere.

After the AI test performance, for starch/glucose observation was found that all samples present indicator 9, which indicates high levels of glucose. In this case all varieties are catalogated being as fruits of overripe category (Fig. 2).







Idared Ungaria



Golden Satu Mare



Idared Satu Mare

Fig. 2 Results of starch-iodine test

Regarding acidity (pH) of vegetable juice from fruits pulp, the values obtained from the pulp of the fruit were significantly similar between the four genotypes.

Table 4

Results regarding the fruits acidity and fruits firmly in tested genotypes

No.	Genotype	рН	Fruits Firmness
		1.00.1.01	(pound)
1.	Golden Italia	4.08 ± 1.34	4.83 ± 0.89
2.	Golden Satu Mare	4.20 ± 0.97	5.17 ± 1.02
3.	Idared Ungaria	4.08 ± 1.56	5.01 ± 1.35
4.	Idared Satu Mare	4.26 ± 1.25	5.76 ± 1.21

Apple pulp cell walls are related to one another of pectin, which is activated by calcium, which forms a very important component of cell walls of the fruit pulp. In addition to the varietals characteristics / genetic level of calcium in the fruit is also one of the most important factors determining fruit firmness. Thus, there was a reduction in fruit flesh

firmness at Golden Italy, while Idared Satu Mare recorded a larger firm, which leads to the possibility of preserving for a longer period of time (Table 4).

Table 5

Maturity varieties of apple based on Brix index (soluble glucose) (http://www.acsa.md/public/publications/532252_md_458206_md_proto.pdf)

	Brix guide	Low	Weak	Good	Excelent
	All varieties	<11	11	12	13
1	Honeycrisp	<12	12	13	>14

Table 6

Results regarding the dry matter percent and total content of soluble glucyds in tested fruits

No.	Genotype	Dry matter (%)	Total content of
			soluble glucyds (%)
1.	Golden Italia	15.32 ± 1.77	8.9 ± 1.58
2.	Golden Satu Mare	14.89 ± 0.98	14.2 ± 1.45
3.	Idared Ungaria	13.29 ± 0.74	$9.9\pm\ 0.88$
4.	Idared Satu Mare	15.50 ± 1.26	9.8 ± 0.71

Regarding to the total content of soluble glucyds, the Satu Mare Golden variety was showing a good percentage of glucose content, while Italy Golden exhibit a low of 8.9 % (Table 6).

Comparing with standard values of apple maturity varieties, we can observe that all varieties except one, presents a low maturity degree of Brix index (Table 5). The exception was registered in Golden Satu Mare variety, wich one represent the Excelent category.

Lowest value of dry matter was registered in Idared Ungaria variety, and the biggest value was registered in Idared Satu Mare variety with 15.50 percent (Table 6).

CONCLUSIONS

After establishing the content of starch/glucose using the AI test, the results show us that all samples present a number 9 indicator. In conclusion all varieties have a high level of glucose meaning that they belong to the overripe fruits category.

In comparison with standard maturity level values we can observe that apple varieties have a low value of maturity depending on the Brix index, excepting Satu Mare Golden variety, belonging to Excelent category.

As regarding the physical and biochemical parameters of the four apples varieties, we can observe that the Satu Mare Idared variety has the highest values in the matter of weight, diameter, firmness, acidity and dry matter.

REFERENCES

1. Belding Robert – 2008, Îndrumar al proiectului de dezvoltare a businessului agricol privind tratarea merelor după recoltare.

2. Taiz Lincoln, Zeiger Eduardo – 2006, Plant Physiology-Fourth Edition, Sunderland, Massachusetts.

3. Taya Pineiro, Rios Luz - 2007, Food quality and Standard Service Nutrition and Consumer Protection Devision, F.A.O.Rome.

4. Unay D., Gosselin B. – 2004, A quality grading approach for Jonagold apples, in Proc. of the IEEE Benelux Signal Proc. Symp., Hilvarenbeek, pp. 93-96.

* http://www.acsa.md/public/publications/532252_md_458206_md_proto.pdf

* www.nh.gov/agric/news/documents/reg-apple-quality.pdf

* www.extension.iastate.edu/Publications/PM1078.pdf

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

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

Vol. XVI (LII) - 2011

MORPHO-ANATOMICAL CONSIDERATIONS ON THE STEM FROM THE ALCHEMILLA FLABELLATA SPECIES

Boruz Violeta^{1,*}

KEYWORDS: Alchemilla flabellata, anatomy, stem, Romania

ABSTRACT

In this paper are presented morpho-anatomical characteristics of the underground stem (rhizome) and flowering stem from the Alchemilla flabellata Buser species (Rosaceae family). There were realized transversal sections through the rhizome and flowering stem, anatomical descriptions accompanied by micrometer measurements and original photographs.

INTRODUCTION

Knowledge morpho-anatomical features of *Alchemilla* species is a necessary objective dictated by the difficulties posed by this genre on the taxonomic level.

The anatomy of vegetative organs to *Alchemilla* species is less approached in the consulted literature. The first histo-anatomical investigations on a species of *Alchemilla* were made in Romania by Toma & Rugină 1998, and refers to *Alchemilla vulgaris* L. species. *A. vulgaris* is also presented in the work of synthesis "Anatomy of the Dicotyledons" (Metcalfe & Chalk 1950), but here we find only a few references on the structure of this species.

This paper analyzed morpho-anatomical aspects of the stem from the *Alchemilla flabellata* species, collected from Parâng Mountains (Romania).

Alchemilla flabellata is a perennial species, small, rarely medium size, quite thin but rigid, erect stalks, of 10-20 (-34) cm, covered with patent or erecto-patent hairs on the entire surface. Rhizomes 2-6 mm thick, densely covered with brown leaf remains. The stipules, the stalk bottom and the petioles are brownish.

MATERIAL AND METHODS

For identification of the *Alchemilla flabellata* species there been used the specialty literature (Assenov 1973, Buia 1956, Ciocârlan 2009, Walters & Pawłowski 1968).

The material of *Alchemilla flabellata* investigated from anatomical point of view, represented by rhizome and flowering stem, comes from the Parâng Mountains. It has been preserved in grain alcohol 70 % to the full flowering of the plants.

For making of sections and microscopic preparations was taken into account the methodology of Tarnavschi et al. 1974.

Making of microscopic preparations was made by cutting the hand microtome. There were realized transversal sections through the middle portion by rhizome and

¹ University of Craiova, "Al. Buia" Botanical Garden, C-tin Lecca Street, No. 26

^{*} Coresponding author: E-mail address: violetaboruz@yahoo.com

flowering stem. Clarification and coloring sections were made according to the methodology of Andrei & Paraschivoiu 2003.

Microscopic examination of preparations was made to Nikon microscope and photographs were made using a Nikon camera. Measurements were made on MC-3 microscope. There were about 10 measurements (epidermal cells, the wood vessels diameter, the phloem vessels diameter). Have been considered the maximum individual

value (V_M), the minimum individual value (Vm) and average (\overline{X}) which is the arithmetic average of the 10 individual values.

RESULTS AND DISCUSSIONS *Alchemilla flabellata* **Buser Rhizome** (Figure 1)



Figure 1. *A. flabellata* - Rhizome in transversal section: the endodermis, the suber, the secondary phloem, the secondary xylem; the medullary parenchyma (Oc. 10x, Ob. 40, Orig.)

The epidermis is unilayered, composed of tangentially elongated cells, with external walls much thickened. The epidermis has thickness of 15,75 μ m and is covered with a thick cuticle of 2,25 μ m.

The crust is pluri-layered, composed of 12-13 layers of polygonal-rounded cells, and with intercellular spaces. Inward the crust cells are slightly elongated in radial direction. Layer beneath the epidermis is slightly collenchymatic (the angular collenchyma) and other layers are parenchymal. In these layers can often reveal large air spaces, elongated tangentially. *The endodermis* is sometimes visible on the perimeter, with small cells, slightly elongated tangentially.

The central cylinder is lack of the pericycle. It highlights good the suber made up of 5-7 layers of tabular cells, arranged uniform some below others. The suber has an average thickness of $45 \,\mu\text{m}$.

The conducting tissues stands out clearly in section. The secondary phloem is outwards, with average thickness of 45 μ m, within which can be seen and elements with slightly collenchymatic walls. The secondary xylem is thickness has much larger (180 μ m) and consists of vessels, wood fibres (the libriform) and parenchyma. The xylem vessels ordered in rows are arranged more or less radial. Diameter xylem vessels: V_M = 18 μ m; Vm

= 6,75 μ m; \overline{X} = 11,25 μ m. In secondary xylem are present the wood fibres, much abundant in wood parenchyma. In the internal side a secondary xylem persist from place to place elements (vessels and parenchyma) of primary xylem.

The medullary parenchyma is composed of large cells, spheroidal or ovoid, with large intercellular spaces.

In the cortical parenchyma and in perimedullary area is observed in the cells with simple crystal of calcium oxalate.

Flowering stem (Figure 2)



Figure 2. *A. flabellata* - Flowering stem in transversal section: the epidermis with hairs, the crust collenchymatic; the crust itself, the endodermis, the secondary liber, the secondary wood; the medullary parenchyma (Oc. 10x, Ob. 20, Orig.)

Presents an obvious secondary structure in the central cylinder.

The epidermis consists of small isodiametric cells, with internal and external walls thicker, last obvious with striated cuticle. The epidermis have thickness of 15,75 μ m, and cuticle of 1,8 μ m.

The crust is pluri-layered, composed on average from eight layers of cells, with thickness of 157,5 μ m. The most external layer, under the epidermis, is easily

collenchymatic and the middle and internal area is a cellulosic parenchyma composed of polygonal-rounded cells, among which are numerous aeriferous cavities of various forms. The endodermis (the amilipherous sheath) is unilayered.

The conducting tissues: the secondary phloem (the secondary liber) is average thickness of about 36 μ m and consists mainly of liberian vessels. There can not be make a distinguish between primary and secondary liber. Diameter liberian vessels: V_M = 9 μ m;

Vm = 4,5 μ m; \overline{X} = 7,2 μ m. The secondary wood is shaped like a ring located internally to the liber and with it the same thickness (36 μ m). In the secondary wood stands strongly the wood vessels arranged in radial rows, together with wood fibres and less wood

parenchyma. Diameter the wood vessels: $V_M = 15,75 \ \mu\text{m}$; $Vm = 9 \ \mu\text{m}$; $\overline{X} = 11,025 \ \mu\text{m}$. Between the secondary wood and medullary parenchyma is a area of the

fundamental parenchyma in which are placed here and there the primary wood vessels.

The medulla is narrow, parenchymatous-cellulose, composed of large polygonal cells, with intercellular spaces.

CONCLUSIONS

Flowering stem, in transversal section, presents an obvious secondary structure in the central cylinder.

On the rhizome, in the cortical parenchyma and in perimedullary area is observed in the cells with simple crystal of calcium oxalate.

On the section of flowering stem, the medulla is narrow, parenchymatouscellulose, composed of large polygonal cells with intercellular spaces. There were not observed calcium oxalate crystals.

REFERENCES

- Andrei M., Paraschivoiu Roxana Maria. 2003. Microtehnică botanică. Edit. Niculescu. București. 222 pag.
- Assenov I. 1973. *Alchemilla* L. In Iordanov D. (edit.), Flora na Narodna Republica Bălgaria, Bălg. Acad. Nauc. Sofia. Vol. 5: 274-329.
- Buia A. 1956. Alchemilla. In: Săvulescu T. (ed.), Flora Republicii Populare Române. Edit. Acad. Rep. Pop. Rom. Bucureşti. Vol. 4: 680-697.
- Ciocârlan V. 2009. Flora ilustrată a României. Pteridophyta et Spermatophyta. Edit. Ceres. București. 1141 pag.
- Metcalfe C. R., Chalk L. 1950. Anatomy of the Dicotyledons. Claredon Press. Oxford. Vol. 1: 539-553.
- Tarnavschi I., Şerbănescu-Jitariu Gabriela, Mitroiu-Rădulescu Natalia, Rădulescu Didona. 1974. Practicum de morfologie şi anatomie vegetală. Edit. Tipografia Universității din Bucureşti. 411 pag.
- Toma C., Rugină Rodica. 1998. Anatomia plantelor medicinale. Atlas. Edit. Academiei Române. București. 320 pag.
- Walters S. M., Pawłowski B. 1968. Alchemilla L. In Tutin T. G. & al. (eds.), Flora Europaea. Cambridge University Press, Cambridge. Vol. 2: 48-64.

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

Seria:	✓ Biologie
	✔ Horticultură
	 Tehnologia prelucrării
	produselor agricole
	🖌 Ingineria mediului

Vol. XVI (LII) - 2011

THE LEAF MORPHO-ANATOMY OF ALCHEMILLA FLABELLATA SPECIES

Boruz Violeta^{1*}

KEYWORDS: Alchemilla flabellata, leaf, anatomy, Romania

ABSTRACT

In this paper are presented anatomical characteristics of the leaf on Alchemilla flabellata Buser species (Rosaceae family). We have performed a transversal sections (through the petiole in the middle portion, and through the lamina for the median nerve) and tangential section through the foliar limb (excoriations of the epidermis), analyzing the adaxial and the abaxial epidermis, in order to highlight the stomata, their form and dimensions, the epidermal cells and the hairs.

The descriptions of anatomical features of the leaf are accompanied by micrometer measurements and original photographs.

INTRODUCTION

Vertical and horizontal spread and ecology of numerous species of *Alchemilla* developed between wide limits. Vertically most of them are mountain, subalpine and lower alpine. They are spread from the beech forest sub-floor to the lower alpine beech, rarely in the higher alpine. I heliophilous species. Delimitation and concise description of many species of *Alchemilla*, of which the most of them are apomictic, based on morphological characters is quite cumbersome and extremely difficult to perform. *Alchemilla* genre consists in many microspecies, most of them could not be differentiated clearly through the morphological diagnems.

Therefore, at the morphological characters of vegetative and reproductive organs has been sought to include observations of histo-anatomy of vegetative organs.

For *Alchemilla*, the leaf is the organ which offers many diagnems, taking into consideration the fact that it has a higher variability as compared to other organs (the flower, the fruit and the seed) which are less variable. The leaf anatomy to *Alchemilla* is less approached in the consulted literature. The first histo-anatomical investigations on a species of *Alchemilla* were made in Romania by Toma & Rugină 1998, and refers to *Alchemilla vulgaris* L. species and the petiol structure is missing its description. *A. vulgaris* is also presented in the work of synthesis "Anatomy of the Dicotyledons" (Metcalfe & Chalk 1950), but here we find only a few references on the structure of this species.

In this context, the paper presents the anatomical aspects of the leaf at *Alchemilla flabellata* species, collected from Parâng Mountains (Romania).

At *Alchemilla flabellata*, the basal leaves have petioles of 0.5-1.5 mm thick, poorly canaliculated or flat on the adaxial side, all covered with erecto-patent or patent hairs. The lamina is 1.5-7 cm wide, reniform, sometimes suborbicular, slightly funneled to plain or

¹ University of Craiova, "Al. Buia" Botanical Garden, C-tin Lecca Street, No. 26

^{*} Coresponding author: E-mail address: violetaboruz@yahoo.com

folded, adaxial, of a green-brownish color, thickly haired on both sides, lobed 1/4-1/3 (-2/5) in 5-7 (9) lobes, which are almost always cut to the tip, rather broader than longer or almost squared, with long incisions among them, only to the tip with 4-8 (-12) little, obtuse teeth.

MATERIAL AND METHODS

For identification of the *Alchemilla flabellata* species we have used the specialty literature (Assenov 1973, Buia 1956, Ciocârlan 2009, Walters & Pawłowski 1968).

The material of *Alchemilla flabellata* investigated from anatomical point of view, represented by basal leaves, comes from the Parâng Mountains. It has been preserved in grain alcohol 70 % to the full flowering of the plants. For making of sections and microscopic preparations was taken into account the methodology of Tarnavschi et al. 1974.

Making of microscopic preparations was made by cutting the hand microtome. There were realized transversal sections from the basal leaf (through the petiole in the middle portion, and through the lamina for the median nervure) and tangential section through the foliar limb (excoriations of the epidermis), analyzing the adaxial and the abaxial epidermis, in order to highlight the stomata, their form and dimensions, the epidermal cells and the hairs. Clarification and coloring sections were made according to the methodology of Andrei & Paraschivoiu 2003.

Microscopic examination of preparations was made to Nikon microscope and photographs were made using a Nikon camera. Measurements were made on MC-3 microscope. There were about 10 measurements (epidermal cells, the stomata, the hairs) or 10 counts (the stomata and the hairs). There have been taken into consideration the

maximum individual value (V_M), the minimum individual value (Vm) and average (\overline{X}) which is the arithmetic average of the 10 individual values.

RESULTS AND DISCUSSIONS

Alchemilla flabellata Buser - the leaf anatomy

The petiole in transversal section (Figure 1) has a triangular visible shape, with the adaxial face almost flat and the abaxial one is strongly convex. Presents epidermis, parenchyma and three steles (polistellical structure).

The epidermis consists of small cells, isodiametric, with all walls equally thickened. Among epidermal cells are simple hairs with thickened bulb-based. The epidermis have thickness $20,25 \mu m$, and cuticle of $2,025 \mu m$.

The crust is a fundamental parenchyma pluri-layered. The first layer of cells under the epidermis has smaller cells, is easily collenchymatic. The other layers of the crust are composed of polygonal-rounded cells with slightly thickened walls, with intercellular spaces.

The three steles are arranged as follows: two smaller, placed opposite to adaxial epidermis, and the third largest to the abaxial epidermis that all form a triangle. Between the lateral and the medial bundles formed 2-3 aeriferous spaces. All steles have the same structure.

The structure of a stele (Figure 2): On the outside there is a ring of endodermis continuous, and under this is the pericycle, also unilayered. Under the pericycle found ring of liber, with thickness of 40,5 μ m and to the inside ring of wood of 67,5 μ m thickness.

Diameter liberian vessels: $V_M = 11,25 \ \mu\text{m}$; $Vm = 4,5 \ \mu\text{m}$; $\overline{X} = 7,65 \ \mu\text{m}$. Diameter the wood vessels: $V_M = 13,5 \ \mu\text{m}$; $Vm = 9 \ \mu\text{m}$; $\overline{X} = 11,025 \ \mu\text{m}$. Immediately below the liber (phloem), the wood consists of wood fibers with small lumen, below which are wood vessels with lumen greater, arranged in orderly radial rows and accompanied by wood parenchyma.

The central area of stele is occupied by the cellulosic medullary parenchyma.

The leaf lamina - in transversal section

Analyzing transversal section through the limb (Figure 3) shows that the leaf is bifacial type as in other species, with thickness of $180 \mu m$.

The adaxial epidermis is unilayered, with average thickness of 24,75 μ m, and cuticle of 1,35 μ m.

The mesophyll is differentiated in palisadic parenchyma and lacunose parenchyma. The palisadic parenchyma consists of two layers of cells strongly elongated, parallel to each other and perpendicular to the epidermis. It have thickness of 94,5 μ m. The lacunose parenchyma is less developed, composed of polygonal-rounded cells with intercellular spaces filled with air. Thickness: 33,75 μ m.

The median nerve (Figure 4) is less prominent on the abaxial face and adaxial face presents a superficial groove. In transversal section has a more or less circular form, with thickness of 166,5 μ m. The liber is placed to abaxial epidermis, has obvious crescent shape and average thickness of 33,75 μ m. The wood is to adaxial epidermis, keeps little crescent-shaped and made of the wood vessels arranged in radial rows, accompanied by wood

parenchyma. Diameter the wood vessels: $V_M = 9 \ \mu m$; $Vm = 4,5 \ \mu m$; $\overline{X} = 6,3 \ \mu m$.

The nerves which represent the conducting phloem-xylematic fascicles are surrounded by a slightly collenchymatic parenchyma, as in stem.

The abaxial epidermis is unilayered too, and have thickness of 18 μ m, and the cuticle has a thickness of 1,125 μ m.

Tangential section through the limb. The epidermis

a. *Adaxial epidermis* (Figure 5) is unilayered, composed of polygonal cells, elongated in the tangential direction, with straight walls, thin, pecto-cellulose.

Length of epidermal cells: $V_M = 60,75 \ \mu\text{m}$; $V_m = 27 \ \mu\text{m}$; $\overline{X} = 46,8 \ \mu\text{m}$. The width of epidermal cells: $V_M = 24,75 \ \mu\text{m}$; $V_m = 18 \ \mu\text{m}$; $\overline{X} = 21,825 \ \mu\text{m}$.

As annexes of the epidermis are the stomata of anomocytic type, and the hairs with known structure, less numerous than the abaxial epidermis.

Length of the stomata cells: $V_M = 29,25 \ \mu m$; $V_m = 27 \ \mu m$; $\overline{\chi} = 27,45 \ \mu m$.

Density of the stomata/mm²: $V_M = 106/mm^2$; $V_m = 42/mm^2$; $\overline{\chi} = 79/mm^2$.

Length of the hairs: $V_M = 765 \ \mu m$; $V_m = 405 \ \mu m$; $\overline{\chi} = 613.8 \ \mu m$.

Density of the hairs / mm²: $V_M = 23/mm^2$; $V_m = 5/mm^2$; $\overline{\chi} = 15/mm^2$.

b. *Abaxial epidermis* (Figure 6) is unilayered, composed of polygonal cells with thin walls, sinuous.

Length of epidermal cells: $V_M = 56,25 \ \mu\text{m}$; $V_m = 31,5 \ \mu\text{m}$; $\overline{X} = 44,1 \ \mu\text{m}$. The width of epidermal cells: $V_M = 31,5 \ \mu\text{m}$; $V_m = 18 \ \mu\text{m}$; $\overline{X} = 22,275 \ \mu\text{m}$.

As annexes of the epidermis are the stomata, and the hairs. Stomata are of anomocytic type, more numerous than the adaxial face and placed under the epidermis level, with room over- and substomatic.

Length of the stomata cells: $V_M = 31,5 \ \mu\text{m}; \ V_m = 27 \ \mu\text{m}; \ \overline{X} = 28,8 \ \mu\text{m}.$

Density of the stomata/mm²: $V_M = 255/mm^2$; $V_m = 127/mm^2$; $\overline{X} = 187/mm^2$.

Average width of stomata cells (\overline{X}): 24,464 μ m.

The hairs (Figure 7) are unicellular, elongated, with thickened bulb base. On hairs, more abundant on the abaxial face of nerves was counted only their root bulb-thickened.

Length of the hairs: $V_M = 918 \ \mu m$; $V_m = 603 \ \mu m$; $\overline{\chi} = 765 \ \mu m$.

Density of the hairs / mm²: $V_M = 45/mm^2$; $V_m = 27/mm^2$; $\overline{\chi} = 35/mm^2$.



Figure 1. Transversal section through the petiol of the *A. flabellata* leaf: the epidermis with hairs scrap; the crust itself; three steles: the endodermis, the liber, the wood and medullary parenchyma (Oc. 10x, Ob. 10, Orig.)



Figure 2. Transversal section through the petiol of the *A. flabellata* leaf. The central stele structure: the crust itself, the endodermis, the liber, the wood, medullary parenchyma (Oc. 10x, Ob. 40, Orig.)



Figure 3. Transversal section through the lamina of the *A. flabellata* leaf: the adaxial epidermis, the palisadic parenchyma, the lacunose parenchyma; the abaxial epidermis with stomata (Oc. 10x, Ob. 40, Orig.)



Figure 4. Median nerve structure of lamina to *A. flabellata* leaf: parenchymal sheath, the liber, wood as two springs with open adaxial (Oc. 10x, Ob. 40, Orig.)



Figure 5. Adaxial epidermis to *A. flabellata*: the epidermal cells, the stomata grouped together (Oc. 10x, Ob. 40, Orig.)



CONCLUSIONS

The petiole in transversal section has a triangular visible shape, with the adaxial face almost flat and the abaxial one is strongly convex.

Presents epidermis, parenchyma and three steles (polistellical structure).

Analyzing transversal section through lamina of the leaf, it is found that the leaf is bifacial type, as in other species of *Alchemilla*.

Analyzing the tangential section through lamina of the leaf shows that the adaxial epidermis is unilayered, composed of polygonal cells, elongated in the direction tangential, with walls straight, thin, pecto-cellulose. The abaxial epidermis is unilayered, composed of polygonal cells with thin walls, sinuous.

REFERENCES

- Andrei M., Paraschivoiu Roxana Maria. 2003. Microtehnică botanică. Edit. Niculescu. București. 222 pag.
- Assenov I. 1973. *Alchemilla* L. In Iordanov D. (edit.), Flora na Narodna Republica Bălgaria, Bălg. Acad. Nauc. Sofia. Vol. 5: 274-329.
- Buia A. 1956. *Alchemilla*. In: Săvulescu T. (ed.), Flora Republicii Populare Române. Edit. Acad. Rep. Pop. Rom. București. Vol. 4: 680-697.
- Ciocârlan V. 2009. Flora ilustrată a României. Pteridophyta et Spermatophyta. Edit. Ceres. București. 1141 pag.
- Metcalfe C. R., Chalk L. 1950. Anatomy of the Dicotyledons. Claredon Press. Oxford. Vol. 1: 539-553.
- Tarnavschi I., Şerbănescu-Jitariu Gabriela, Mitroiu-Rădulescu Natalia, Rădulescu Didona. 1974. Practicum de morfologie şi anatomie vegetală. Edit. Tipografia Universității din Bucureşti. 411 pag.

Toma C., Rugină Rodica. 1998. Anatomia plantelor medicinale. Atlas. Edit. Academiei Române. Bucureşti. 320 pag.
Walters S. M., Pawłowski B. 1968. *Alchemilla* L. In Tutin T. G. & al. (eds.), Flora Europaea. Cambridge University Press, Cambridge. Vol. 2: 48-64.

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

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

Vol. XVI (LII) - 2011

RESULTS OBTAINED IN APPLE BREEDING AT SCDP VALCEA

Botu Mihai¹, Botu Ion¹, Vicol Adina¹, Lazar Andreea¹, Alecu Anca¹

KEYWORDS: *breeding, apple, cultivars, columnar*

ABSTRACT

The apple breeding programs for cultivars have multiple and complex target objectives. Most of them are focused on increasing the yielding potential, high quality fruits and resistance to various diseases. At Fruit Research and Extension Station (SCDP) Valcea, which belongs to the University of Craiova, an apple breeding program has been launched. When the program started in 2004 enlarging of the existing genetic variability was prioritary, then study of the inheritance of important traits was tackled (resistance to apple scab, columnar habitus, reduced vigor and quality of fruits).

INTRODUCTION

Apple is the most important fruit tree crop from temperate zone. General trends for this culture are to meet the consumers demands, improving the food structure and quality through apple fresh consumption and different processing ways and ensuring constant production etc.

At world level a steady increase of apple production can be observed from one year to another in the same time with new cultivars introduction in the cultivar assortments (Cociu at al. 1986; Cociu, 1990; Dayton et al. 1993; Hough, 1994).

The apple breeding programs, which exists in various countries, have proposed multiple and complex breeding objectives. The most frequent are referring to increasing of production potential, high fruit quality and resistance to various diseases.

At Fruit Research and Extension Station (SCDP) Valcea, which belongs to the University of Craiova, an apple breeding program has been launched. When the program started in 2004 enlarging of the existing genetic variability was prioritary, then study of the inheritance of important traits was tackled (resistance to *Venturia inequalis*, columnar habitus, reduced vigor and quality of fruit).

MATERIAL AND METHODS

The biological material used in the breeding program comprises different apple cultivars of different origins and characteristics from the working collection existing at SCDP Vâlcea. The genitors used in used in controlled crosses are the following apple cultivars: 'Starkrimson', 'Granny Smith', 'Wagener Premiat'; 'Trident' and 'Wijcik' (columnar cultivars) and two selections from Russia (KV-8 and KV-42).

¹ Fruit Growing Research&Extension Station Vâlcea, University of Craiova, Râmnicu-Vâlcea, Romania

Genetic variability was obtained through natural hybridization (open pollination) and mutagenesis, using 3% and 2% Deuterium applied to 'Granny Smith' x open pollination hybrids.

The hybrids and mutants were obtained by sowing in pots kept in plastic tunnels. The resulted trees were planted in the field at 3 by 1 m. Threes were not trained, only the suckers were removed.

RESULTS AND DISCUSSIONS

At SCDP Vâlcea through hybridization and mutagenesis 501 new genotypes belonging to 8 families were obtained.

In the first year screening has been carried out for plants attacked by powdery mildew (*Podosphaera leucotriha*). 210 genotypes were selected for planting into the field (Table 1). These genotypes presents different habitus (specific growth). Out of the total number of plants, 75 (35.7%) show columnar habitus (*Co*); 15 plants (7.2%) semi-columnar habitus and 120 plants (57.1%) show standard or spread habitus.

The parent cultivars ('Trident', 'Wijcik' cultivars and KV8 and KV42 selections) with columnar habitus are transmitting this character from 49.0 to 59.0% of the offspring.

'Wagener Premiat' and 'Starkrimson' cultivars transmitted to 100% of their offspring the standard spread habitus. A special situation presented the 'Granny Smith' descendents whom inherited from 20.0 to 44.4% columnar habitus.

The "columnar + semi-columnar" trait indicates in the offspring a favorable ratio of 1.2 to 2.6 : 1.0.

In the first 5-7 years of growing the hybrid apple trees exhibited different trunk cross sectional areas (TCSA) and crown volume (Table 2).

Descendants with columnar port have a mean TCSA of 39.9 cm², those of 44.0 cm^2 semi-columnar habitus and the standard (spread) of 51.4 cm^2 .

The weighted-average of TCSA in each hybrid combination shows that the values are very close to each other (40.0 to 53.6 cm^2). The difference in value is caused by the habitus type of plants. The columnar and semi-columnar types show lower values of TCSA.

Crown volume of trees is differentiated depending on the tree habitus (Table 3). Columnar descendants present an average of 2.94 m³ per crown, the semi-columnar trees an average of 8.43 m³ and the standard ones 19.1 m³.

Trees with columnar habitus present very low TCSA and crown volumes, thus providing the possibility of their cultivation in super-intensive orchards with densities of 2000-4000 trees/ha.

Resistance to apple scab (*Venturia inequalis*) is a very important trait in apple culture. Resistance to apple scab was differently inherited depending the cross combination (Table 4). Scab resistance was inherited from 9.0% of the KV-8 descendants to 67.7% of those of KV-42. The genitors with scab resistance transmitted this trait to their descendents while those genitors without resistance produced from 6.6 to 11.1% resistant offspring due to pollination with pollen from resistant varieties. The most resistant to apple scab proved to be those descendents of the columnar genotypes (18.5%). This trait is transmitted relatively easy to columnar offspring, but in most cases it is linked with poor fruit quality (size, color, taste).

Selection work was performed on the offspring resulted from hybrid crosses. The 9 elites resulted are presented in Table 5. Five elites have standard habitus and four have columnar one. The columnar type elites have less vigorous growth then the standard type

elites. Out of the 9 elites, 3 have resistance to apple scab (*Venturia inequalis*). The other 6 elites have no resistance, the scab occurs sporadically on fruits from August to September.

The fruit size index of elites varies from 65.3 mm to 78.0 mm and average fruit weight (mass) from 143 g to 191g. Fruits are large enough to fulfill the standards for Extra and 1st Quality grades, are uniform and have good flesh firmness (5.6 to 7.5 kg).

The skin over color varies from green (HM-25-R4-2007 elite), yellow (H1-3-2005 and HM21-R4-2007) and yellow and red on various fruit sides for the other elites. Fruit taste is very good for most selections. Fruit ripening takes place in autumn – winter time.

This apple breeding program requires both continuity and more complex approach regarding breeding methods and genitors to be used for further crosses.

REFERENCES

Cociu V. et al., 1986. New applle varieties with genetic resistance to disease. Hortscience, 21(3): 376;

Cociu V.,1990. Soiurile noi - factor de progres în pomicultură. Edit. CERES București;

Cociu V., Botu I., Şerboiu L., 1999. Progrese în ameliorarea plantelor horticole în România. Vol. I, Ed. CERES, București;

Dayton D.F., et al., 1993. Disease resistance (Ch. 13). Methods in Fruit Breeding. Edit J. Janik and J. Moore, 189-215;

Hough L.F., 1994. A Survery of the scab resistance of the foliage on seedlings in selected apples progenies. An. Soc. Hort.Sci. 44:260-272.

	Hybrid code	Genetic origin	f	Tree habitus				Ratio per cross			in o
No.			nber o btaine	ids the	S	Columnars Semi-columnar	Standard	(%)			on ratio pring
			Total nur hybrids o	Total hybr planted in 1 field	Columnaı			Columnar	Semi- columnar	Standard	Transmissic the offs
1	H1-2007	Trident x open pol.	52	30	15	3	12	50,0	10,0	40,0	1,5/1,0
2	H2-2007	KV8 x open pol.	48	22	13	3	6	59,0	13,4	27,3	2,6/1,0
3	H3-2007	Wijcik x open pol.	112	53	26	4	23	49,0	7,5	43,5	1,3/1,0
4	H4-2007	KV42 x open pol.	64	31	16	2	13	51,6	6,5	41,9	1,4/1,0
5	M8-2006	Granny Smith3%D	25	9	4	1	4	44,4	11,2	44,4	1,2/1,0
6	M8-2006	GrannySmith20%D	22	5	1	2	2	20,0	40,0	40,0	1,5/1,0
7	H1-2005	Wagener premiat x o.p.	82	30			30			100,0	
8	H2-2005	Starkrimson x open pol.	96	30			30			100,0	
			501	210	75	15	120	35,7	7,2	57,1	1,5/1,0

The transmission mode of columnar habitus trait to the offspring

Table 1

	Hybrid cod	Genetic origin		Weighted						
No.			Columnar		Semi-columnar		Standard tree		average of	
			Average TCSA	Amplitude	Average TCSA	Amplitude	Average TCSA	Amplitude	hybrid combination (cm2)	
1	H1-	Trident x open pollination	42,7	23-63	42,7	26-51	48,9	34-61	45,2	
	2007									
2	H2- 2007	KV8 x open pollination	42,9	8-57	53,0	44-67	49,8	32-66	46,2	
3	H3- 2007	Wijcik x open pol.	36,4	12-61	38,0	35-69	55,0	24-80	44,6	
4	H4- 2007	KV42 x open pol.	42,7	8-70	39,5	36-43	65,4	32-102	52,0	
5	M8- 2006	Granny Smith3%D	34,5	31-38	52,0	-	50,2	39-58	43,4	
6	M9- 2006	GrannySmith20%D	27,0	-	45,5	35-56	41,0	24-58	40,0	
7	H1- 2005	Wagener premiat x open pol.	-	-	-	-	47,5	29-57	47,5	
8	H2- 2005	Starkrimson x open pol.	-	-	-	-	53,6	36-64	53,6	
Weighted average / Amplitude			39,9	8-70	44,0	26-69	51,4	24-102	-	

Trunk cross sectional area of apple hybrids with different habitus (5th to 7th leaf)

Table 2

		Genetic origin	Crown volume (m^3)							
No.	Hybrid code		Col	umnar	Semi-c	olumnar	Standard tree			
			Average	Amplitude	Average	Amplitude	Average	Amplitude		
1	H1-2007	Trident x open pollination	2,94	1,2-4,6	10,8	7,8-16,0	19,5	13,4-27,4		
2	H2-2007	KV8 x open pollination	3,92	1,0-5,8	6,3	2,8-8,1	16,0	11,9-22,8		
3	H3-2007	Wijcik x open pollination	3,72	1,1-9,8	5,5	3,2-7,4	14,6	8,5-25,5		
4	H4-2007	KV42 x open pollination	3,10	0,9-6,2	6,7	6,0-7,4	15,0	12,8-27,7		
5	M8-2006	Granny Smith3%D	2,76	1,2-5,5	10,1	-	14,1	11,5-19,6		
6	M9-2006	GrannySmith20%D	1,20	-	11,2	-	18,5	9,8-26,1		
7	H1-2005	Wagener premiat x open p.	-	-	-	-	28,1	12,9-36,7		
8	H2-2005	Starkrimson x open pollination	-	-	-	-	27,6	14,6-35,6		
Mean			2,94	0,9-9,8	8,43	2,8-16,0	19,1	8,5-36,7		

Crown volume of apple hybrids with different habitus (5th to 7th leaf)

Table 3

No.	Hybrid code	Genetics origin	Total	Res	Total resistant		
			in field	Columnar	Semi-columnar	Standard tree	trees
1	H1-2007	Trident x open pol.	30	16,7	-	3,3	20,0
2	H2-2007	KV8 x open pol.	22	4,5	-	4,5	9,0
3	H3-2007	Wijcik x open pol.	53	19,3	1,9	9,4	30,6
4	H4-2007	KV42 x open pol.	31	41,9	3,2	22,6	67,7
5	M8-2006	Granny Smith3%D	9	11,1	-	-	11,1
6	M9-2006	GrannySmith20%D	5	-	-	-	-
7	H1-2005	Wagener premiat x open pol.	30	-	-	10,0	10,0
8	H2-2005	Starkrimson x open pol.	30	-	-	6,6	6,6
				18,5	2,5	9,4	22,1

Transmission of apple scab (Venturia inequalis) resistance to the apple offspring from different hybrid combinations

Table 4

Resistance Fruit characteristics Trunck Crown to apple Hybrid cross Size Flesh Average No Habitus scab volume selection sectional fruit weight fermity index Over color Fruit taste (m^{3}) (Venturia area (cm²) (mm) (g) (kg) inequalis) Good-H9-3-2006 Standard 54,0 25,2 No 77,6 185 7,0 1/2 red 1 slightly acid H2-4-2005 45,0 33,8 73,3 Standard Yes 181 6,1 yellow/red Good 2 3 H1-3-2005 Standard 37,0 29,6 Yes 68,0 164 5,6 yellow Good (a) H1-16-2007 Columnar 32,0 78,0 7,0 2/3 red Medium 4 2,3 No 189 HM-21-R4-5 6,3 37,0 4,4 No 69,2 166 Good Columnar yellow 2007 HM-25-R4-41,0 143 7,0 6 Standard 6,6 No 68,0 Medium green 2007 H1-6-2007 23,0 65,3 159 7,5 7 Columnar 1,2 No 1/3 red Medium HM-27-R4-8 Standard 43,0 8,5 72,6 180 6,8 Red with stripes Good Yes 2007 KM-30-R4-9 Columnar 42,0 191 6,6 2,4 No 75,4 $\frac{1}{2}$ red Good 2007

The apple elites selected at University of Craiova - SCDP Valcea (2005-2007)

(a) - slightly aromatic

Table 5
UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

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

Vol. XVI (LII) - 2011

RESEARCH ON THE METHODOLOGY OF CHLOROPHYLL AND CAROTENE CONTENT EXTRACTION IN CUCUMBERS AND PEPPERS GROWN IN THE SOUTH OF ROMANIA AREA

Câmpeanu Gheorghe¹, Costache Manuela Adriana², Neață Gabriela¹

KEYWORDS: vegetables, quantitative determination, pigments, solvents, spectrofotometric method

ABSTRACT

The study is made on eight samples of vegetables grown in Romania and were elected three known organic solvents (diethyl ether, acetone and methanol). In order to analyze cucumbers and peppers extracts of chlorophyll and carotene was applied spectrophotometer dosing methodology. Values of chlorophyll a and b and carotene varied depending on species and cultivar vegetable and also on the solvent used. From experiences made rezulted that extraction in the determination pigments with acetone may be recommended for peppers and with methanol solvent for cucumbers.

INTRODUCTION

Although methods of extraction and isolation of carotenes were not changed significantly over the past 20 years, analysis and identification techniques have improved considerably (Britton et al., 2009). After Dobreanu (1979) the chlorophyll pigment content in greenhouse cucumbers is 5.2 μ g/g fresh product and the bell pepper is 8.9 μ g/g fresh product and the total content of carotenoid pigments is between 8.0 to 25.0 μ g/g to pepper, 25.0 to 35.0 μ g/g to Kapia pepper and 23.1 to 25.0 μ g/g in pepper fibber fresh product.

According to the USDA database (2010), fresh cucumber peel tests show that it contains 11 mcg (μ g) alpha carotene and 45 μ g beta/100 g carotene fresh product and yellow pepper contains 120 μ g beta carotene, the fresh green cucumbers contains 21 μ g alpha carotene and 208 μ g beta carotene, the yellow banana pepper 39 μ g alpha carotene and 184 μ g beta carotene and red pepper 20 μ g alpha carotene and 1.624 mg per 100 g fresh product beta carotene. It is known that during the ripening of fruit physiological changes occur that consist of the intensification of respiration and ethylene biosynthesis and the reduction of photosynthesis (Burzo et al., 2005).

Fruits that have not reached the stage of maturity that they contain chlorophyll photosynthesis process intensity high enough (Tanaka et al., 1974) and chlorophyll pigments were degraded, the process of photosynthesis stops when they have a full-grown.

Bernhard (2006) also presents issues relating to biochemistry, biophysics, functions and applications of chlorophyll.

¹ Faculty of Horticulture, USAMV, Bucharest, Romania; <u>campeanu0136@yahoo.com</u>

² PhD Candidate in Horticulture, USAMV, Bucharest, Romania; manuela_bth@yahoo.com

Chlorophyll is the most abundant pigment in existing plants (Bohn et al., 2004) and that gives green color to plants and algae. Plants use chlorophyll to capture light for photosynthesis needed (Matthews & van Hold, 1996), but perform functions other important biological (Henriques et al., 2005).

In the paper Chlorophylls and Carotenoids: Measurement, it described the procedure for determining amount of pigment - total chlorophyll and carotene. It present extracts from green plant tissue by UV-VIS spectroscopy (Lichtenthaler & Buschmann, 2001). Pepper fruit color is determined by the biodegradation of chlorophyll and accumulation of pigments carotene and lycopene (Kozukue and Friedman, 2003).

Hornero-Mendez and Minguez-Mosquera (2002) studied the pigment chlorophyll content changes during ripening in red peppers and found biodegradation and disappearance of chlorophyll pigments in the mature stage. Carotene in fruits of pepper is 0.1 μ g/g fresh products (Ciofu et al., 2003). The richest food carotenoids are yellow peppers and orange shades (Burzo et al., 2005).

Russo and Howard (2002) determined carotenoid pigment content of different varieties of peppers grown in the U.S. in the field and in greenhouses and have noticed about the content of carotenoids, it was higher in peppers grown in greenhouses, and in the mature stage (Gruenzweig, 1993). Functions of carotenoids in all living organisms and human activities on food and health, highlights their importance.

Biological studies on the pigments must be underpinned by a rigorous analysis. There are several books that describe the various analytical procedures used for quantitative analysis, identification of carotenoids and in complex trials. Were determined metabolic formation and role of carotenoids, structural characteristics, properties and biological roles of their roles in various color aspects and effect of color, photosynthesis and other photofuntions and also the role of protection. Carotenoids are naturally occurring pigments and very interesting studies are considering restoring high quality value added compared with the synthetic natural compounds.

Carotenoids makes it so special in interdisciplinary approaches and also to detailed research study of these complex and sophisticated systems (Britton et al., 2008).

MATERIALS AND METHODS

For research were collected 8 samples of vegetables from different cultivars and various types and sizes: 5 of cucumbers (Table 1) and 3 peppers samples (Table 2). As shown in Table 1, very early cucumbers with high production and adapted crops in greenhouses, greenhouses and field Mirabelle F1 were found to be analyzed twice because came from another area of cultivation.

The experiment was made into three repetitions. Cucumbers and peppers samples were cut and then were converted into a mashed with a blender and from the resulting puree about 1 g sample was weighed on analytical balance. This quantity was introduced in a 20 ml tube with glass stopper specific analysis. In the extraction were used three organic solvent petroleum ether (diethyl ether), methanol and acetone with an extraction ratio of 1:50. Samples were agitated for 10 minutes. Part of the supernatant was taken for dosing and was analyzed by spectrophotometer at $\lambda = 662$ wavelengths nm for chlorophyll b, 646 nm for carotene and 470 nm.

To calculate the results of chlorophyll a, b and carotene were used formulas presented by Dere et al. (1997).

RESULTS AND DISCUSSION

Table 1.

	Description of investigated cucumbers					
Nr.	Sample					
Crt.						
1.	Ekol F1 (Early spring-summer cucumbers, very resistant)					
2.	Amour F1 (Early cucumber, productive,					
	for greenhouses and solariums with fruit 8-10 cm)					
3.	Mirabelle 1 F1 (Very early					
	cucumbers, with high production, adapted for solariums, greenhouses and field)					
4.	Fabio (Early, long cucumber)					
5.	Mirabelle 2 F1					
	(Very early cucumbers with high production, adapted for solariums,					
	greenhouses and field)					

Table 2.

	Description of investigated peppers						
Nr.	Sample						
Crt.							
1.	Darovita F1 (Kapia red peppers, early protected crops)						
2.	Bianca F1 (Early pepper bright yellow, very productive)						
3.	Belladonna F1 (Fidelio) (Early yellow peppers with high production)						



*f.p. - fresh product Fig. 1. Cchlorophyll a variation content of analyzed cucumber cultivars

Analyzing **chlorophyll a** content in **cucumbers** was observed that after extraction with diethyl ether values were low, between 0.6986 to 0.928 μ g/g fresh product. Instead, after extraction with the other two organic solvents values were quite high.

After extraction with methanol, the values were within between 25.58 to 92.65 μ g/g f.p., the lowest occurring in Ekol F1. The remaining samples showed high values, the highest value finding at Mirabelle 1 F1. It was noted that the cucumbers Mirabelle F1 values are a little different in the two analized samples, this may due to the different growing conditions (soil, temperature, fertilizer, etc.).

Acetone extraction showed a content of chlorophyll a with the lowest values recorded in both samples of cucumber Mirabelle F1, respectively 32.19 μ g/g f.p. at Mirabelle 1 F1 and 57.57 1 μ g/g f.p. at Mirabelle 2 F1. The rest of the analyzed samples showed much higher values, ranging between 62.49 μ g/g fresh product in Fabio cucumbers and 97.99 to μ g/g fresh product in Amour F1.



Fig. 2. Chlorophyll b variation content of analyzed cucumber cultivars

Chlorophyll b content after extraction with diethyl ether solvent presented again low values, between 1.32 and 6.54 μ g/g f.p.

Values after extraction with methanol was the highest, recorded extremes also to the Mirabelle F1 cucumbers, between 81.15 in Mirabelle 2 F1 and 148.77 in Mirabelle 1 F1 μ g/g f.p. Differences were observed again for Mirabelle at both chlorophyll b and in the case of chlorophyll a where the values depending on growing conditions. The rest of values in chlorophyll b content were 91.97 μ g/g f.p. at the Fabio cucumbers, 108.2 to Amour F1 and respectively 121.72 μ g/g f.p. to Ekol F1.



Fig. 3. Carotene variation content of analyzed cucumber cultivars

Carotene analysis showed low values, between 1 and 4.98 μ g/g f.p. after extraction with diethyl ether.

The highest values in carotene content were found after extraction with methanol solvent ranging from 18.13 μ g/g f.p. (Mirabelle 2 F1) and 33.86 μ g/g f.p. (Mirabelle 1 F1), again extremes being found to this type of cucumber.

Also known from the literature that vegetables are strongly influenced by soil conditions, temperature, fertilizer use, frequent watering, etc. and was therefore to understand why different values occurred in all pigments analyzed in Mirabelle F1 cucumbers type. The other samples showed a carotene content ranged from 20.52 to 28.09 μ g/g fresh product.

After extraction using acetone solvent, the values were relatively the same to all cucumber samples analyzed.

These values were found to range from 13.94 to 27.49 μ g/g f.p. Following the results of analysis of pigments in cucumbers was observed much lower content of carotene compared with chlorophyll.

The highest value of carotene was found in Mirabelle 1 F1 cucumbers 33.86 μ g/g f.p. and to the maximum of chlorophyll b 148.77 μ g/g f.p. in Mirabelle 1 F1 cucumbers and respectively of chlorophyll a, of 97.99 μ g/g fresh product (Amour F1). This is to be expected given the green cucumbers.

Determination of chlorophyll content showed different values in chlorophyll a and b in cucumbers. According to analysis, chlorophyll b was mainly in cucumbers with values almost double compared to chlorophyll a, results found in other studies in the literature.



Fig. 1. Chlorophyll a variation content of analyzed peppers cultivars

After extraction with diethyl ether solvent, **chlorophyll a** values were equal to $0.928 \mu g/g$ f.p. in all the samples analyzed **peppers**, regardless of their color.

After extraction with methanol, chlorophyll a values ranged between 0.622 $\mu g/g$ f.p. to Darovita F1 (red pepper Kapia) and 18.14 $\mu g/g$ f.p. Bianca F1 (bright yellow). At Belladonna yellow pepper, chlorophyll a given a value of 11.54 $\mu g/g$ f.p. Was observed that the values of chlorophyll increased depending on the specific color: from bright yellow to yellow and then to red.

Chlorophyll content of the highest value was found in yellow peppers (Belladonna F1) after extraction with acetone namely 86.24 μ g/g f.p. The lowest value was recorded in red pepper Kapia (Darovita F1) of 9.63 μ g/g f.p., while Bianca F1 (bright yellow peppers) presented a content of 36.89 μ g/g pp of chlorophyll a.

After the extractions, red peppers again showed a lower but a higher yellow peppers unless extraction with methanol. Certainly is that after pigment analysis, samples of bright yellow and yellow peppers presented the highest values of chlorophyll content, while red pepper had lowest values.

Using diethyl ether solvent the analysis showed also the same low and equal values in case of the **chlorophyll b** at peppers, respectively $1.323 \ \mu g/g$ f.p.

Organic solvent extraction methanol revealed also low values between 8.11 μ g/g f.p. to the bright yellow Bianca F1 peppers and a maximum of 32.46 μ g/g f.p. to the yellow pepper F1 Belladonna (Fidelio), while Bianca F1 red Kapia pepper had a content of 13.52 μ g/g f.p. chlorophyll b. This showed that yellow pepper had a higher chlorophyll b content in than red pepper and bright yellow peppers.

After extraction with acetone solvent, still yellow peppers showed values of chlorophyll b, namely 145.55 μ g/g f.p. than bright yellow pepper content 73.09 μ g/g f.p. and lower than red pepper with a value of 21.7 μ g/g f.p. of chlorophyll b.

Chlorophyll a content had higher values in peppers, almost double, from the content in chlorophyll b.



Fig. 2. Chlorophyll b variation content of analyzed peppers cultivars



Fig. 3. Carotene variation content of analyzed peppers cultivars

Extraction of **carotene** from peppers samples using diethyl ether solvent showed again the results with the lowest values between 1.19 μ g/g f.p. to the red pepper and 8.96 μ g/g f.p. to the yellow pepper, bright yellow pepper showed a content of 1.59 μ g/g f.p.

After extraction with methanol, the lowest carotene content of 2.59 µg/g f.p. was determined at the bright yellow pepper, followed by Darovita F1 (Kapia red pepper) with a carotene content of 4.78 µg/g f.p. and by Belladonna F1 (yellow pepper) with 42.83 µg/g f.p. It was observed that the yellow pepper had the highest carotene content than bright yellow and red peppers. After extraction with acetone was again observed that the highest values were determined in bright yellow peppers 74.7, while yellow peppers showed a content of 35.46 and Kapia red peppers 11.95 µg/g f.p. The results of extraction with acetone and methanol were different in carotene content but showed high values at the same types of peppers, so used solvents was more effective than diethyl ether.

Analyzing the results that were obtained, the carotene content was higher in yellow pepper samples than in the bright yellow and respectively than in Kapia red peppers.

Following the results of analysis of the green pigments was observed much lower content of carotene compared with chlorophyll. Like cucumbers, this feature may be related to their green color. However, different values were analyzed according to the color of peppers. As in the case of cucumbers, chlorophyll b from peppers was determined as having higher values than chlorophyll a.

As an overall result, differences were showed much higher peppers carotene content than the cucumbers.

CONCLUSIONS

Analyzes the species and different cultivars of vegetables grown in southern Romania shows:

- 1. Both chlorophyll a and b and carotene of cucumber cultivars were extracted in larger quantities by methanol.
- 2. Chlorophyll b was extracted in big quantities ranging between 81.15 μ g/g f.p. and 148.77 μ g/g f.p. compared with chlorophyll a which presented values between 62.49 μ g/g f.p. and 97.99 μ g/g f.p.
- 3. Chlorophylls a and b values was high, providing good quality of cucumbers.
- 4. Cultivars with the highest content of chlorophyll is Amour F1 in chlorophyll b and Ekol F1 in clorophyll a.
- 5. Cucumbers pigments were better extracted with acetone.
- 6. Chlorophyll had values up to 86.24 μ g/g f.p. at Belladonna cultivars, chlorophyll b 145.55 μ g/g f.p. at the same cultivar and carotene 74.7 μ g/g f.p.
- 7. From experiences made rezulted that extraction in the determination pigments with acetone may be recommended for peppers and with methanol solvent for cucumbers.
- 8. Research will continue to establish a common solvent easily detected by spectrophotometric reading.

REFERENCES

Bernhard, Grimm, 2006, Chlorophylls and bacteriochlorophylls: biochemistry, biophysics, functions and applications, Vol. 25, pg. 603, ISBN: 1402045158, 9781402045158.

Bohn T., Walczyk S., Leisibach, S., Hurrell, R.F., 2004, Chlorophyll-bound magnesium in commonly consumed vegetables and fruits: relevance to magnesium nutrition, J. Food Sci., No. 69 (9), S347-S350.

Britton, George, Jensen, Synnove, Liaaen, Pfander, Hanspeter, 2009, Carotenoids: Nutrition and Health, Carotenoids Series, Vol. 5, pg. 431, ISBN: 3764375000, 9783764375003.

Britton, George, Jensen, S. L, Pfander, Hanspeter, 2008, Carotenoids: Natural Functions, Carotenoids Series, Vol. 5, pg. 370, ISBN 3764374985, 9783764374983.

Burzo, I., Voican, V., Luchian, V., 2005, Fiziologia plantelor de cultură, vol. V., Fiziologia plantelor legumicole, Editura ELISAVAROS, București, ISBN: 973-99369-9-7.

Ciofu, R., Stan, N., Popescu, V., Chilom, Pelaghia, Apahidean, S., Horgoş, A., Berar, V., Lauer, K. F., Atanasiu, N., 2003, Tratat de legumicultură, Ed. Ceres. București.

Dere, Şükran, Gunes, Tuhit, Sivaci, Ridvan, 1998, Spectrophotometric Determination of Chlorophyll - A, B and Total Carotenoid Contents of Some Algae Species Using Different Solvents, Tr. J. of Botany, Vol. 22, pg. 13-17.

Dobreanu, M., Lucrări științifice, 1979, ICPVILF, Vol. X, pg. 55.

Gruenzweig, J. M., Rabinowitch, H. D., Katan, J., 1993, Physiological and developmental aspects of increased plant growth in solarised soils, Annals of Applied Biology, Vol.122, Issue 3, pg. 579–591.

Henriques, M. H. F., Simões, A. M. A., Rocha, J. M. S., 2005, Identification of carotenoids and other pigments: New approach in experimental teaching, Chemical Engineering Department - University of Coimbra, Portugal.

Hornero-Mendez, D., Minguez-Mosquera, M.I., 2002, Chlorophyll disappearance and chlorophyllase activity during ripening of Capsicum annuum L fruits, J. Sci. Food Agric., Vol. 82, No. 13, pg. 1564-1570.

Kozukue, N., Friedman, M., 2003, Tomatine, chlorophyll, β -carotene and lycopene content in tomatoes during growth and maturation, J. Sci. Food Agric., Vol. 83, No. 3, pg. 195-200.

Lichtenthaler, H. K., Buschmann, Claus, 2001, Chlorophylls and Carotenoids: Measurement, Current Protocols in Food Analytical Chemistry, F4.3.1-F4.3.8.

Mathews, C. K., Van Holde, K. E., 1996, Biochemistry, 2nd ed. Menlo Park, The Benjamin/Cummings Publishing Company.

Russo, V.M., Howard, L.R., 2002, Carotenoids in pungent and non-pungent peppers at various developmental stages grown in the field and glasshouse, J. Sci. Food Agri., Vol. 82, No. 6, pg. 615-624.

Tanaka, A., Fujita, K., Kikuchi, K., 1974, Nutrio-physiological studies on the tomato plant, III. Photosynthetic rate of individual leaves in relation to the dry matter production of plants, Soil Sci. Plant Nutr. 20, pg. 173-183.

United States Department of Agriculture, 2010, Agricultural Research Service, Nutrient Data Laboratory, USDA Nutrient Database for Standard Reference, Release 23.

AKNOWLEDGEMENT

Many thanks for Scientific Secretary of Craiova Faculty, Asistent Professor PhD. Cosmulescu Sina.

These researches were made on the POSDRU/88/1.5/S/52614 Programme from the University of Agronomical Sciences and Veterinary Medicine Bucharest, Romania.

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

Seria:	🖌 Biologie
	🖌 Horticultură
	 Tehnologia prelucrării
	produselor agricole
	🖌 Ingineria mediului

Vol. XVI (LII) - 2011

STUDY OF SUNFLOWER OIL QUALITY UNDER DIFFERENT CONDITIONS OF STORAGE

Căpruciu Ramona¹

KEY WORDS: the sunflower oil, the organoleptic indices, quality

SUMMARY

Starting from the fact that the sunflower oil is a nutriment with highly important characteristics for human health, it becomes necessary to use a high quality raw material and to perform the technological flow steps in optimal conditions in order to achieve superior qualitatively sunflower oil and in the same time to improve the storage period, according to STAS. This study shows aspects related to the organoleptic and physico-chemical behaviour of sunflower oil during storage under different conditions and storage spaces (storage in refinery, laboratory room). In this respect the organoleptic indices (appearance, taste, smell, and colour) and physico-chemical indicators are analyzed in order to provide reliable data regarding the analyzed oil quality and its suitability for storage.

INTRODUCTION

After the consumer was informed regarding the physico-chemical properties of vegetable oils and their consumption impact on human health, it was observed an increased number of consumers who want quality products that meet every point of STAS in force. In this respect it is important to introduce vegetable oils with a high quality level on the market, required by the organoleptic aspects and by a physico-chemical balance rigorously followed (after www.bioproduct.ro). These issues concern primarily the use of healthy raw materials (Vrânceanu Al.V., 2000) and the raise of the technologic level in the production department (after Tenu I., 2008).

The sunflower oil is today one of the most important sources of elements (minerals, vitamins and organic substances) necessary for the proper functioning of the human body (Căpruciu Ramona, 2009).

Of these, fatty elements and their accompanying substances are one of the main components of human food intake, with a special role in the intermediary and physiological metabolism, constituting the substances of deposit, the potential energy accumulators, storing a double amount of energy in comparison to the carbohydrates and proteins (after Maria Treben, 2001, Marcela Elena Badea et al. -2001).

¹ University of Craiova, Str. A.I Cuza, No. 13, Craiova

^{*}Corresponding author: E-mail address: ramonacapruciu@yahoo.com

MATERIAL AND METHOD

In order to determine the quality of the oil mass for storage for a period of six months in the spaces mentioned above, the sampling was done to assess the organoleptic features on one hand and physico- chemical analysis on the other hand. The oil quality in terms of organoleptic indices take into consideration the appearance, taste, smell and colour of the analyzed oil (after Racolta E. et al. 2002). The oil samples for analysis were obtained for the sunflower oil from the higher category (refined oil from the first pressing). The analysis was conducted in normal laboratory conditions at a constant temperature of 20°C and natural light. The obtained data were recorded in a register especially created for this purpose. The qualitative analysis of sunflower oil was done with the help of the main physico - chemical indices recorded in STAS (acidity index, saponification index, iodine index).

The acidity index (AI) is the amount of KOH in mg, required to neutralize the free fatty acids in a gram of fat. The samples of sunflower oil at room temperature, consistent and clear are titrated in ethanol with a 0.1n NaOH solution in the presence of phenolphthalein. The saponification index (SI) - is the amount of KOH in mg, necessary to the saponification of a gram of fat / oil. For determination, the sample is neutralized with an alcoholic solution of KOH in excess (known volume) and the unreacted amount is determined by titration with HCI. The iodine index (II) indicates the degree of unsaturation of oils and fats and is expressed in g absorbed iodine per 100 g product. The working mode and the calculation of quality indicators are according to STAS.

OBSERVATIONS AND DETERMINATIONS

In Table 1 there are observed organoleptic differences between the samples of oil from the two storage spaces. Note that in the refinery storage, the storage conditions (light, temperature, humidity) are those stated in STAS, and in the laboratory the storage is done under environmental conditions.

Taking into account these considerations, the organoleptic analysis reveals differences in terms of appearance and taste, smell and colour. Thus, after the visual analysis of samples there is noticed a normal, non-sediment aspect with a semi-fluid consistency at the oil sample from the refinery storage while the sample from the laboratory shows a slight sediment on the bottom of the bottle having a more fluid consistency. In addition when tasting the oil from the storage there was noted the flavour of sunflower seeds while at that from the laboratory the flavour was not perceptible.

The same was done to determine the smell, achieving the same results as for taste. The sunflower oil colour from the storage is specific (light lemon yellow). At the both categories there have not been noticed spots or colour layers in the mass of the analyzed oil (table 1).

Figure 1 presents the main physico - chemical indices greatly affecting the quality of the analyzed oils, being able to determine the storage duration and mode of sunflower oil depending on their values.

It is interesting to note the differences between different types of oils (sunflower oil stored in optimal conditions and sunflower oil stored in improper conditions) regarding these indices.

Regarding the acidity index there is known that the refined oils must not contain more than 0.4% free acidity expressed in oleic acid. In the case of the analyzed oil in this study there is shown that at the oil samples from the storage the acidity index exceeds the

critical threshold. From the oil sample kept in laboratory conditions the acidity increased above the threshold stated in STAS for the acidity expressed in oleic acid, according to Table 1.

Table 1

Storage	Organoleptic indices				
mode	Appearance	Taste	Smell	Colour	
Refinery storage	Clear, without sediment. There are no suspensions in the oil mass. Average fluid consistency	Sweet, with slightly perceptible flavour of sunflower seeds. Has not rancid or bitter taste.	Pleasant, specifically, with tones of sunflower seeds. Without foreign smell.	Lemon yellow, pleasant, without observing other spots or shades of colour.	
Laboratory room	Clear at the top of the bottle. Presents easy sediment at the bottom of the bottle. There are no suspensions in the oil mass. Watery consistency	Pleasant, no flavour of seeds. Presents easy rancid taste. No bitter taste.	Pleasant. Slightly rancid smell	Light lemon yellow, pleasant, without observing other spots or shades of colour.	

The main organoleptic indices of sunflower oil under different conditions of storage

In figure 1 there are observed major differences from one oil type to another regarding the saponification index. Thus, in the case of the sunflower oil there is found that from the oil sample from the storage it was obtained a saponification index lower than the oil sample kept under laboratory conditions (182 mg KOH in comparison to 191 mg KOH).



Figure 1. The determination of the main physico- chemical indices (AI-acidity index, ISsaponification index, II - iodine index) of sunflower oil under different conditions of storage.

The determination of the iodine index for all the analyzed types of oil shows the lower degree of unsaturation of sunflower oil from the storage and from this point of view it is considered of higher quality and with increased storage suitability.

CONCLUSIONS

The undertaken study for the two samples of sunflower oil highlights important issues concerning both their quality and suitability for storage, so in order to exclude the risk that in their composition to occur degradation phenomena below the limit of validity stated on the package.

After analyzing the samples we can say that the type of oil kept in optimal storage conditions (temperature 4°C, low humidity and diffused light) is considered stable from the organoleptic point of view after 6 months of storage. The type of oil kept under environmental conditions (temperature 20-25°C, relative humidity 50-70%, and natural light) is considered unstable after 6 months of storage due to the organoleptic changes occurred.

As a result, from the two types of analyzed oils it is considered edible from the organoleptic point of view, the one from the storage since it meets the corresponding quality requirements specified in STAS: it is clear and without suspensions and sediment, the colour is lemon yellow, no spots, no different coloured layers; the taste and smell is pleasant, specifically, without foreign tones (bitter or rancid).

In terms of physico- chemical analysis, there was found that the sunflower oil from the storage has high quality standards, the storage duration extension could be performed safely, while the oil samples, kept for a long time (6 months) in improper conditions, are denied for the food consumption due to the obtained quality indices.

BIBLIOGRAPHY

Elena Marcela Badea, Daniela Săndulescu, 2001- Biotehnologii vegetale. Fundația Biotech. București

C. Banu, 2009-Tratat de industrie alimentară (vol II). Editura Asab. București

C. Banu, Camelia Vizireanu, Daniela Ianitchi, 2011, LIVING FOOD - DEAD FOOD (Alimente vii - Alimente nevii) GOOD FOOD - BAD FOOD (Alimente bune -Alimente rele). Editura Asab. București

Căpruciu Ramona, 2009 -Basil flavoring of the sunflower oil. Lucrare științifică. Analele Universității din Craiova.

Gupta, Monoj K., 2007- Practical guide for vegetable oil processing AOCS Press, Urbana, Illinois.

Racolța E., Crina Mureșan, 2002 – Tehnologia uleiului și margarinei. Caiet de lucrări practice. Editura AcademicPres, Cluj-Napoca,

Ţenu I., 2008 – Operații si aparate pentru indusria alimentara, Ed. Ion Ionescu de la Brad Iasi.

Vrânceanu Al. V., 2000- Floarea-soarelui hibridă. Ed Ceres, Bucuresti www.bioproduct.ro

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

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

Vol. XVI (LII) - 2011

AGROBIOLOGICAL AND TECHNOLOGICAL POTENTIAL OF SOME TABLE GRAPE VARIETIES IN THE BANU MARACINE VINEYARD

Daniela Doloris Cichi¹, Monica Vintilescu², Giugea N.¹, Costea D.C.¹, Camelia Popa³

KEYWORDS: Grapevine, agrobiological descriptors, varieties

ABSTRACT

This paper shows the results of the research studies made in 2008-2010 on the assessment of the biological, productive and qualitative potential of some table grape varieties, newly introduced to cultivation in the Banu Mărăcine vineyard in order to establish their potential of ecological adjustment to the pedoclimatical conditions of this viticultural area and to diversify its table grape varieties.

INTRODUCTION

It is common knowledge that *grapes* are noble excellence fruits (This et al. 2006). The elegance of their look, aside with their organoleptic characteristics, their high energetic value and their therapeutic importance turn them into highly appreciated and demanded products (Dobrei A., 2003, Ţîrdea & Rotaru 2003, Cichi 2010, Dejeu L.C., 2010).

Under such conditions, during the last decades, a continuous policy has been promoted to sensiblise viticultural manufacturers worldwide, with view to increasing table grape cultivated areas on one hand, and to sensibilise viticultural researchers to diversify table grape varieties (Indreaş Adriana 1974, Olteanu 2000, Sestraş 2004, Damian Doina et al. 2006, Popa Camelia et al. 2009), as well as to strictly separate high quality grape manufacturing areas, on the other hand (Teodorecu et al. 1987, Oşlobeanu M.et al 1991, Tonietto 1999, Rotaru Liliana et al. 2008, Stroe Vicuța et al. 2009, Vaudour 2003).

MATERIAL AND METHOD

Research studies were made during 2008-2010 in a $2^{nd} - 4^{th}$ ripening yearvineyard from the Banu Mărăcine viticultural centre, located in the Dealurile Craiovei vineyard, part of the Dealurile Olteniei viticultural subregion. The viticultural centre of Banu Mărăcine is situated in the Southern part of the Getic Plateau, between 44°19' Northern latitude and 23°48' Eastern longitude, 6 km away from the city of Craiova and 176-190 m high above the sea level (Giugea & Olteanu 2001).

Seven table grape varieties with different maturation period were studied as biological material, namely Muscat Perlă de Csaba, Auriu de Ștefănești, Augusta, Victoria, Chasselas doré, Argessis and Muscat d'Adda. They were grafted from the Berlandieri x

¹ University of Craiova, Faculty of Horticulture, E-mail: danielacichi@yahoo.com

² University of Craiova, Faculty of Horticulture

³ National Research and Development Institute for Biotechnology in Horticulture Ștefănești-Argeș

Riparia Kober 5 BB parent stock, and planted at $2 \ge 1.2$ m distance, thus resulting in average 4166 stocks / ha in unprotected cultivation system and semi-tall growing.

The field layout of experimental varieties was made according to the block dispersal method. 10 typical stocks were selected from each variety for further observation and determination.

In order to assess the bioproductive and qualitative potential of the varieties under study, several specific observations were made and several specific measurements were taken. The technological and agrobiological descriptors were determined: the proportion of fertile shoots (%), the absolute (c.f.a.) and relative (c.f.r.) fertility indexes, the relative (I.p.r.) and absolute (I.p.a.) productivity index in accordance with the O.I.V. and I.C.V.V. methods.

RESULTS AND DISCUSSIONS

As for the climatic *resources in the viticultural* centre under study, during the related period, they were analysed vs the requirements for the table grape varieties and the climatic conditions imposed by the Area cultivation of table grape varieties in Romania (see Table 1).

Table 1

The evolution of climatic resources during the vegetation period (1.IV.-30.IX.) in the winegrowing centre of Banu Mărăcine (2008-2010)

Voor	$\Sigma t^0 a$	$\Sigma t^0 u$	\sum ir(ore)	Σа	$\Sigma P.v.$	IH _r	IH	Ibev
i cai				(mm)	(mm)	Branas	Huglin	Constantinescu
2008	3463	1693	1354	481,4	272,8	2,29	2397	9,39
2009	3555	1755	1451	675	267,6	2,54	2491,6	9,88
2010	3463	1663	1416	826,9	346,2	2,35	2063,4	7,26
Average 2008-2010	3494	1704	1407	661,1	295,5	2,39	2317,3	8,84
Average 1994-2003	3395	1677	1614	523,0	320,3	2,68	2318,9	8,73

 $\Sigma t^0 a - \Sigma (T > 10 \text{ °C})$ during the during the vegetation period

 $\Sigma t^0 u$ – growing degree-days base of 10 °C (GDD= Σ (T> 10 °C - 10 °C))

 Σ ir- amount of hours of insolation during the vegetation period (hours)

 $\Sigma a(mm)$ -annual precipitation

 $\Sigma P.v.(mm)$ - precipitation during the vegetation period

Analysing the data shown at Table 1 and setting the light resources as independent parameter, one could notice that the whole three years of study at the Banu Maracine viticultural centre showed average favourability for the cultivation of table grape varieties, while in terms of temperature resources, we appreciate that the Banu Mărăcine viticultural centre fitted into the category of favourable areas.

According to the classification of the world geo-viticultural climate, considering Huglin's heliothermal index values, the Banu Mărăcine viticultural centre fits the category of *temperate climate* (2010-IH3), *warm temperate climate* (IH4 - 2008) and *warm climate* respectively (IH5 – 2009), with no heliothermal restrictions on the maturation of grape varieties from the entire variety conveyor of our country.

The percentage of fertile shoots, as indicator of the real fructification potential of varieties in a certain viticultural area, offers information on the specific genetic potential of varieties, as well as on the good use of pedoclimatic resources and on the value of the

cultivation system, mostly depending on the photo-periodicity characteristics, as well as on the nutrient reserves accumulation.

The comparative study of the average percentage of fertile shoots of the varieties under study shows significant differences both amongst varieties and amongst the studied viticultural years.

Table 2

Varieties	Proportion of fertile shoots (%)	The fertility coefficients Min. – Max.	
	Min. – Max.	Aver	age
	Average	Absolute (c.f.a.)	Relative (c.f.r.)
Muscat Perla de Csaba	57,63-75,64	1,33–1,66	1,03-1,14
	67,91	1,51	1,09
Augusta	50,42-64,25	1,00-1,50	0,57-0,79
	57,40	1,28	0,65
Auriu de Stefanesti	79,32-85,43	1,44–1,66	1,08-1,42
	82,46	1,56	1,21
Victoria	63,67-82,54	1,37-1,68	0,84-1,06
	71,30	1,50	0,92
Chasselas doré	70,30-80,82	1,33–1,65	0,96-1,23
	75,90	1,44	1,10
Argessis	62,84-86,00	1,43-1,65	0,72-1,32
	73,26	1,54	1,00
Muscat d'Adda	59,20-64,30	1,11-1,46	0,67-0,93
	62,33	1,23	0,76

The fertility potential	of some varieties	of table grape	s in win	negrowing	center
F	anu Mărăcine (20	08-2010)			

For the time period under study, given the conditions of the Banu Mărăcine viticultural centre, the following varieties distinguished themselves, as follows (see table 2):

- The varieties Auriu de Stefanesti, Chasselas doré, Argessis and Victoria with a superior shoot fertility;
- The varieties Muscat Perlă de Csaba, followed by Muscat D'Adda with an average fertility.
- The Augusta variety with the lowest percentage of shoots on the stock (57.4 %), fitted the small-average shoot fertility category.

The ratio between the number of grapes and the number of fertile shoots on the stock, known as the absolute fertility index (c.f.a.), as well as the ratio between the number of grapes and the total number of shoots on the stock, also known as the relative fertility index (c.f.r.), confirm the conclusions resulting from the study of the average percentage of fertile shoots and indicate the fructification possibilities of the cultivated varieties, shown by the average number of fertile shoots on the stock and the average number of grapes on the fertile shoots.

In order to better express the productivity potential of varieties vs. the cultivation conditions, the relative productivity index was determined (I.p.r. = the average weight of a grape x c.f.r.) and the absolute productivity index was also calculated (I.p.a. = the average weight of a grape x c.f.a.). The relative productivity index, indicating how much a shoot

produces in average has, besides the value significance of the cultivation conditions, also the function to determinate the load of buds per surface unit or per stock in order to determine the planned production.

Table 3

Varieties	Relative productivity (I.p.r.) Min. – Max.	Absolute productivity (I.p.a.) Min. – Max.	
	Average	Average	
Muscat Perla de Csaba	163-201	203-302	
	179	250	
Augusta	204 - 245	380 - 504	
	223	438	
Auriu de Stefanesti	349-467	466-648	
	412	535	
Victoria	336-437	580-696	
	380	619	
Chasselas doré	200-271	259-364	
	228	300	
Argessis	252-548	500-676	
	373	564	
Muscat d'Adda	186-334	297-525	
	259	410	

Relative (I.p.r.) and absolute productivity index (I.p.a.) in some varieties of table grapes in winegrowing center Banu Mărăcine (2008-2010)

At Banu Mărăcine very good productivity results were found in the following varities: Auriu de Ștefănești with I.p.r. of 412 and I.p.a. of 534.66 respectively, as average values for 2008-2010, followed by the Victoria variety with an average value of the I.p.r. of 380 in 2008-2010, and the Argessis variety with average values of the I.p.r. between 252 (in 2009) and 548 in 2010 (see Table 3).

The *quantitative production of grapes* results in the presence of a complex of factors, amongst which the variety, the ecological conditions and the fito-technical measures hold a significant place. Hence, by selecting and placing varieties in the most favourable areas, considering the ecological requirements of different varieties, one could get the expectation of high productions (Cichi & Costea 2008).

Under the same given ecological and technological conditions, it is the variety and its adaptation capacity that determine the level of grape production.

In order to show a comparative presentation of the productive potential of the newly introduced table grape varieties at Banu Maracine, the following varieties were selected as witness varieties, namely the Chasselas doré for the white grape varieties and the Muscat d'Adda for the red grape varieties Argessis.

Table 4

Production (kg / vine) in some varieties in some varieties of table grapes in winegrowing center Banu Mărăcine (2008-2010)

Varieties	Production (kg/vine)	Differences	Segnificance
	(Kg/VIIIe)	.,	

Muscat Perlă de Csaba	2,3	-0,83	0		
Augusta	3,44	+0,31	ns		
Auriu de Ștefănești	4,50	+1,37	***		
Victoria	3,66	+0,53	ns		
Chasselas dore (Witness 1)	3,13	-	-		
DL 5 % = 0,62 DL 1% = 0,90 DL 0,1 % = 1,36					
Argessis	4,27	+1,41	**		
Muscat d'Adda (Witness 2)	2,86	-	-		
DL 5	DL 5 % = 0,51 DL 1% = 1,19 DL 0,1 % = 3,79				

Under the climatic conditions of the Banu Mărăcine viticultural area, from the data recorded between 2008-2010 on the average production / stock in the four white grape varieties under study vs. the witness Chasselas doré, it came out that only the Auriu de Stefanesti variety registered a higher production (+1.37 kg / stock) vs. the witness variety, significantly positive.

The Augusta variety (+0.31 kg / stock) and the Victoria variety (+0.53 kg / stock), although with bigger productions than the witness variety, they were not statistically covered and proved to be insignificant (see Table 4).

As for the average production (kg / stock) during the three experimental years on the red table grape varieties, from the data recorded for Argessis vs the witness Muscat d'Adda, it came out that Argessis provided bigger, significantly positive productions.

CONCLUSIONS

Under the same technological conditions, the variety with its numerous intrinsic features, genetically transmitted, represents the most important factor in defining the fertility and productivity potential, strictly correlated with the ecological offer.

The scarce character of the hydric regime in the Southern Oltenia can represent the main obstacle in expanding the cultivation of certain table grape varieties. In this respect, the investigations regarding the adaptation of the varieties and the new reorientation in utilising resistant stocks must continue.

The conditions of the viticultural agroeco-system of Banu Mărăcine were best turned into account by getting superior production levels in Auriu de Ștefănești, Victoria and Argessis varieties.

The investigations must continue and expand to other viticultural areas in Romania with different pedo-climatic conditions, as well, in order to have sufficient data basis for a scientific argumentation of the area classification of the new table grape varieties on one hand, as well as for the determination of the most convenient technological measures to provide their bio-productive, qualitative and economic efficiency.

BIBLIOGRAPHY

Cichi Daniela Doloris, D,C Costea, 2008- Soiuri de viță-de-vie cultivate și cultivabile în România, Editura Arves, Craiova

Cichi Daniela Doloris, Camelia Popa, Necula Cezarina, 2010- Ghid ampelografic al soiurilor de struguri pentru masă, Editura Universitaria, Craiova

Damian Doina, Calistru Gh., Savin C., Vasile Ancuța, Zaldea Gabi, 2006- Valoarea agrobiologică și tehnologică a unor soiuri noi și clone de viță de vie create la SCDVV Iași, Lucrări științifice, seria Horticultură, vol. 49, U.S.A.M.V. Iași, p. 499-504

Dejeu L.C., 2010- Viticultura, Editura Ceres, București

Dobrei A., 2003 – Soiurile de struguri pentru masă, Editura Waldpress, Timișoara

Giugea N., Olteanu I., 2001 – Banu Mărăcine –tradiție și vocație viticolă. Edit. Universitaria, Craiova.

Indreaș Adriana, 1974 – Studiul ampelografic al soiurilor apirene din sortimentul României. Teză de doctorat I.A.N.B., București.

Olteanu I., 2000-Viticultură, Editura Universitaria, Craiova.

Oșlobeanu M., Macici M., Magdalena Georgescu, Stoian V.,1991 - Zonarea soiurilor de viță de vie în România, Editura Ceres, București

Popa Camelia., Necula C., Cichi D., Giugea N, 2009 - Argessis and Golden Stefanesti new varieties for table grapes with high biological strenght. Proceedings of the 32st World Congress of Vine and Wine, Verona, Italy.

Rotaru Liliana, Mustea M., Zamfir C., Cotea V.V., Vasile Ancuţa, 2008- New vinifera creations for table grapes in the restrictive conditions of culture in the North-Eastern area of Romania, XXXIth – World Congres of Vine and Wine OIV, Verona, 15-20 june.

Sestraș R., 2004- Ameliorarea speciilor horticole, Editura Academic Pres, p.9-66.

Stroe Marinela Vicuța, Ispas Sofia, Damian I., Bucur Georgeta Mihaela, 2009-*Comparative study on the behavior of clonal selection of the main varieties grown in the vineyard Pietroasa*, Lucrări științifice, seria Horticultură, vol. 52, U.S.A.M.V.Iași, Editura Ion Ionescu de la Brad, Iași, p.743-748

Teodorescu Șt., Popa A., Sandu Gh., 1987 – Oenoclimatul României. Editura Științifică și Enciclopedică, București

This P., Lacombe T., Thomas M.R., 2006- *Historical origins and genetic diversity of wine grapes*, Trends in Genetics, Volume 22, No. 9, p. 511

Tonietto J., 1999 – Les macroclimats viticoles mondiaux et l'influence du mesoclimat sur la typicité de la Syrah et du Muscat de Hambourg dans le sud de France. Thèse de Doctorat E.N.S.A. Montpellier, France.

Ţîrdea C., Rotaru Liliana, 2003 - *Ampelografie, vol.II*, Editura Ion Ionescu de laBrad, Iași Vintilescu Monica, Cichi Daniela, Giugea Nicolae, Necula Cezarina, Popa Camelia, 2010-*Behavior assessment of newly germoplasm sources of culture growing in viticultural center Banu Maracine*, Annals of Food Science and Technology, Valahia University, Faculty of Environmental Engineering and Biotechnologies, vol.11, Issue 2, p. 70-73

Vaudour Emanuelle, 2003 – *Les terroirs viticoles : definition, caracterisation et protection.* Ed. Dunod, Paris-France.

***Buletinul I.C.V.V., nr. 7 (2/1988), ICVV Valea Călugărească.

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

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

Vol. XVI (LII) - 2011

BEHAVIOUR OF GRAFTED WATERMELON HYBRIDS UNDER DIFFERENT PROTECTION

Elena Ciuciuc, Toma V.¹

KEYWORDS: watermelon, grafting, polythene tunnel, agril

ABSTRACT

In sandy soils in southern Oltenia conditions were followed three hybrids of watermelons (Crisby F1, Lady F1 and Red Star F1) in culture protected polyethylene tunnel and protected with Agril culture. Protection method used to influence the microclimate causing growth and development of watermelon plants. By protecting the culture of watermelon with Agril obtain an increase of production of 12.5 t / ha to protecting the polyethylene tunnel.

In protected culture polyethylene tunnel between production obtained of watermelon from 35.9 to 48.6 t / ha, and crop production Agril between are obtained 54.5 to 55.8 t / ha.

INTRODUCTION

Growing watermelons is a tradition in the area with sandy soils in southern Oltenia, but adapting to the competitive environment in complying with a suitable cultivation technology. Natural fertility poor sandy soils, thermal and hydric stress factors specific to the area, plus the increased virulence of the attack of pathogens due to failure of proper rotations are factors limiting the production of watermelons (Târcomnicu Marina, Ion Daniela, 1 984, Şearpe Doina, 2000).

Numerous studies conducted in the country internationally as grafting have demonstrated the need to remove these shortcomings (Boughalleb N. et al., 2008, Bogoescu M. et al., 2004, 2009). More than 95% of the watermelons grown in Japan, Korea and Taiwan are grafted on gourd roostocks. (Lee et al., 1998). Ioannou et al., 2000 stated that, in horticultural practice over 80% of watermelons grown in the open field and under low tunnels are grafted on various rootstocks.

Another factor in obtaining high yields it is necessary to study hybrid beings cultivated in several geographical and climatic conditions (Toma V. et al., 2007). Also, obtaining early production to ensure market supply products offer off-season when demand is low compared was necessary. The watermelon crop protection can be achieved early and higher quality productions (Elena Ciuciuc et al., 2010).

Experiences from Dabuleni pursued had the following objectives: establishing the best way to protect watermelons to obtain early production on sandy soils and establishment of watermelons hybrids grafted on Lagenaria siceraria suitable culture protected.

¹ Research – Development Center for Agricultural Plants on Sands Dabuleni, E-mail: <u>ciuciucelena@yahoo.com</u>

MATERIALS AND METHODS

In order to achieve its goals established a two-way experience with the following factors: factor A - method of protecting: a1 - protected crop under polythene tunnel; a2 - Agril protected crop and factor B –hybrid:Crisby F1 grafted onto the rootstock of the species *Lagenaria siceraria* (Sintosa F1); b2 - Lady F1 grafted onto the rootstock of the species *Lagenaria siceraria* (Sintosa F1); b3 - Red Star F1 grafted onto the rootstock of the species *Lagenaria siceraria* (3001 F1).

Field planting was done on April 16 following the planting distance of 1.8 m between rows and 1 m between plants per row. Along with planting was installed and the system of protection as the variants studied. Control of weeds and soil loosening and mechanical work was done by hand, and fertilization was application of manure fermented in a quantity of 30 t / ha. In addition to technological factors have a decisive role is the climatic conditions in particular

Temperature, which contributes to the microclimate in housing. We determined the temperature and relative humidity inside the shelter at 8 hours, 14 and 17 hours.

RESULTS AND DISCUSSIONS

Temperatures gradually increased from 8 to 17 hours, maintained is higher under polyethylene tunnel any time of day (table1).

Table 1

Specification	Temperature ⁰ C		
Specification	8 hours	12 hours	17 hours
In air	12,6	23,4	24,1
In tunnel	16,3	37,6	39,2
Under agril	15,5	35,3	37,1

The average temperatures recorded in different conditions to protect

Under cloth type Agril temperatures are lower than those recorded under polyethylene tunnel due to its property to allow air circulation, but to maintain higher temperatures in the atmosphere.

Relative humidity was influenced by the culture medium (table 2).

Table 2

in anterent conditions to protect					
Specification	Relative humidity %				
Specification	8 hours	12 hours	17 hours		
In air	67,8	38,5	32,5		
In tunnel	83,7	45,6	34,8		
Under agril	68,1	27,0	23,9		

The average relative humidity recorded in different conditions to protect

Inside the tunnel of polyethylene to the highest relative humidity as condensation formed to maintain a high air hygroscopicity. Under agril foil type relative humidity was very close to the external nature of its microscopic nature. Relative humidity decreased during the day, decrease being higher in protected areas due to increasing temperatures. The growth rate of watermelon plants was influenced by the microclimate created (table 3).

Table 3

Haulm length of watermelons depending	
on the method of protection	

on the method of protection					
Method of	Hybrid	Haulm length	Average length of		
cultivation		(cm)	haulm (cm)		
	Crisby F1 + Sintosa	110,8			
Polyethylene tunnel	Lady F1+ Sintosa	187,4	140.7		
	Red Star F1 + 3001	123,8			
	Crisby F1 + Sintosa	166,8			
Agril protected	Lady F1+ Sintosa	181,0	172.9		
	Red Star F1 + 3001	170,8			

Haulm length of watermelons in the removal of protection system (26 May) was higher in protected plants agril. Also, haulm growth was specific to each. Lady hybrid was grafted on Sintosa higher haulm length, followed by Red Star hybrid grafted on 3001.

Microclimate created in different conditions of protection contributed to the production (table 4).

Protection of watermelon culture with agril contributed to increase productions given the protection obtain of polyethylene tunnel. By protecting culture watermelons with agril ensure a distinct increase production significantly to protecting the polyethylene tunnel.

Table 4

Influence of cultivation method on the production of watermelons

Method of cultivation	Production (t/ha)	Relative	Difference (t/ha)	Significance
Polyethylene tunnel	42.8	100	Mt.	
Agril protected	55.3	129	+12.5	**

DL 5% = 5.8 t/ha

DL 1% = 10.6 t/ha

DL 0,1% = 23.6 t/ha

Protection of watermelon culture with Agril contributed to increase productions given the protection obtain of polyethylene tunnel. By protecting culture watermelons with agril ensure a distinct increase production significantly to protecting the polyethylene tunnel.

In table 5 presented productions of watermelons are obtained by the three hybrids studied.

Table 5

Influence of hybrid on the production of watermelons							
HybridProduction (t/ha)Relative production (%)Difference (t/ha)Hybrid(t/ha)Significand							
Crisby F1 + Sintosa	51,6	100	Mt.				
Lady F1+ Sintosa	50,0	97	-1.6				
Red Star F1 + 3001	45,9	89	-5.7				
DI 50/ 0	-						

DL 5% = 9.5 t/ha

DL 1% = 13.3 t/ha

The increase productions he has obtain Crisby F1 hybrid followed by Lady F1 hybrid, but the differences are small production.

At the same method to protect the three hybrids behaved differently (Table 6).

Table 6

Method of		Production	Relative	Difference	
cultivation	Hybrid	(t/ha)	production	(t/ha)	Significance
			(%)		
	Crisby F1	48,6	100	Mt.	
Polyethylene	+ Sintosa				
tunnel	Lady F1+	43,9	90	-4.7	
	Sintosa				
	Red Star	35,9	74	-12.7	
	F1+3001				
	Crisby F1+	54,5	100	Mt.	
Agril	Sintosa				
protected	Lady F1+	55,6	102	+1.1	
	Sintosa				
	Red Star	55,8	102	+1.3	
	F1+3001				
DI 50	124/1			· · · · · · · · · · · · · · · · · · ·	

Influence of	hybrid on	the production	of watermelons
in	the same n	nethod of cultiv	vation

DL 5% = 13.4 t/ha

DL 1% = 18.8 t/ha

DL 0,1% = 26.6 t/ha

In culture protected polyethylene tunnel hybrid Crisby F1 highest production achieved, followed by hybrid Lady F1. Red Star F1 hybrid achieved the lowest production in culture protected polyethylene tunnel. The protection of all hybrids tested agril had good behavior, differences in production of the three hybrids are very small. Red Star F1 hybrid has used best conditions created by protecting the agril.

CONCLUSIONS

1. The watermelon crop protection creates a microclimate favorable to plant growth and development differently depending on the method used By protecting the culture of watermelon with agril obtain an increase of production of 12.5 t / ha to protecting the polyethylene tunnel.

2. In protected culture polyethylene tunnel between production obtained of watermelon from 35.9 to 48.6 t / ha, and crop production agril between are obtained 54.5 to 55.8 t / ha. The highest production was obtained in Red Star F1 hybrid watermelons grafted on 3001 agril protected (55.8 t / ha) and Lady F1 hybrid grafted on Sintosa.

BIBLIOGRAPHY

1. Bogoescu M., Madalina Doltu, Dorin Sora, Angela Mohora, Iordache B. (2009) "Results On Establishing The Technology For Obtaining The Watermelons Grafted Seedlings". Bulletin UASVM Horticulture, 66(1)/2009

2. Boughalleb N., Mhamdi M., Ascadi B.L. (2008) "Rezistence evaluation of grafted watermelon (Citrulus I.) Agoist Fusarium wild and Fusarium Crown and root rot". Asiaon journal of plant pathology, p. 24-29.

3. Ciuciuc Elena, Toma V., Mihaela Croitoru, Marieta Ploae 2010 "Research on the behavoir of hybrids of watermelons grafting on different rootstocks in different conditions to culture". Lucrări științifice Facultatea de Agricultură Craiova. Scientific Conferences with International Participation "Durable agriculture – Agriculture of the future" (the 6th edition) and The National Mycology Symposium (the 22nd edition).

4. Ioannou N., Poullis C and Heale J.B. (2000) "Fusarium wilt of watermelon in Cypru and its management by solarization combined with fumigation or ammonium fertilizers". EPO Bul. 30, p. 223-230.

5. Lee J. M., Bang H. J., and Ham H. S. (1998) "Grafting of vegetables". J. Japan Soc. Hort. Sci.67, p.1098-1104.

6. Țârcomnicu Marina, Daniela Ion, (1984) "Fusarium species involved in withering and spoting watermelons and melons". Scientific worcks SCCCPN Dabuleni. Vol. VI, p. 235-243. București.

7. Şearpe Doina,(2000) "The main pathogens and pests of watermelons in the south of Oltenia and some ways to limit their attack"... Scientific worcks CCDCPN Dabuleni. Vol. XII, p. 27-33. ISBN, Craiova.

8. Toma V., Elena Ciuciuc, Mihaela Croitoru, Marieta Ploae 2007 Behavior of hybrids grafted watermelons growing on sandy soils in southern Oltenia. Scientific works. Vol. XVI, p. 129-140. SITECH. Craiova.

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

Seria: ✓ Biologie ✓ Horticultură ✓ Tehnologia prelucrării produselor agricole

🖊 Ingineria mediului

Vol. XVI (LII) - 2011

QUANTITATIVE DETERMINATION OF KAMPFEROL AND MYRICETIN FROM OCIMUM BASILICUM AND THYMUS VULGARIS SPECIES USING HIGH PERFORMANCE LIQUID CHROMATOGRAPHY

Dumitru Condrat^{1,*}, Florin Crișan², Florian Harja¹

KEY WORDS: phenolic compounds, kampferol, HPLC, ethanol extracts.

ABSTRACT

The aim of this paperwork is the quantitative determination of kampferol and myricetin from the Ocimum basilicum and Thymus vulgaris plant extracts.

The quantitative analysis of kampferol and myricetin was made using high performance liquid chromatography (HPLC).

The researched species were: Ocimum basilicum – sweet basil; Thymus vulgaris - common thyme.

From the results obtained after the analyses one can see that the highest content in myricetin and kampferol (0.0603 mg/mL; 0.044 mg/mL) is found in the Ocimum basilicum extract, while the Thymus vulgaris has a lower content in myricetin and kampferol (0.0108 mg/mL; 0.021 mg/mL).

INTRODUCTION

Kampferol and myricetin are two representatives of the flavonoids class having multiple actions such as: antioxidant, antiallergic, anticancerous, anticataract, antidiabetes, anti-inflammatory, anti-mutating, bactericide and vasodilator (Eleanor et al 1996, Hoffer 1999, Mindell 1996, Null 2000).

Chemically kampferol and myricetin are phenolic compounds that contain 15 carbon atoms, having a condensed hetero-cycle (benzopyrene) in their molecule, in which the heteroatom is oxygen. At this double cycle another benzene nucleus is condensed.

Due to the fact that kampferol and myricetin contain in their structure a variable number of phenolic groups and due to their property to form chelates with iron and other transitional metals, they present a high antioxidant activity (Herdan et al 1995).

Their antiradical activity is manifested against the hydroxyl and superoxide radicals that are involved in the initiation of lipid peroxidation, their ability to modify the synthesis of eicosanoids, to prevent platelet aggregation (anti-microbial activity) and to protect the base lipoproteins from oxidation.

The specialized studies do not offer precise information in regards to quantitative composition in kampferol and myricetin of the studied plant extracts in spite of the fact that their therapeutic properties are well known (Ciulei 1993, Duță 2007).

¹ "Aurel Vlaicu" University, Arad, România

² The bureau for Agriculture and Rural Development, Laboratory for pesticides quality control, Arad, România

Due to these aspects a study regarding the content in kampferol and myricetin of the two studied plant species becomes necessary.

MATERIALS AND METHODS

Vegetal material from Ocimum basilicum - sweet basil and Thymus vulgaris common thyme was used.

Reagents: kampferol (≥ 99%) and myricetin (≥ 99%) – Roth; ethanol p.a., methanol, acetonitrile and phosphoric acid for HPLC – Merck.

Preparation of the hydro alcoholic extracts:

Dried and minced vegetal material was subjected to static extraction (maceration) with ethylic alcohol for 10 days at room temperature, stirring it three times a day, kept in a dark place and with a vegetal material: alcohol ratio of 5:50.

The extracts were filtered through 4 layers of cloth, the residue washed with ethylic alcohol and brought to a volume of 50 mL.

Clear hydro alcoholic extracts having specific color were obtained.

The extracts obtained as above were stored in the dark (in order to avoid the active substances which are light sensitive).

High performance liquid chromatography

A Varian Pro Star 240 HPLC having a ternary pump, automated injection system, thermostat set at room temperature and UV-VIS Varian 345 detector was used for the analyses. The chromatographic separation was made on an Omnispher 5-C18, 150x4.6 mm chromatography column.

The mobile phase consisted of a mixture of acetonitrile:phosphate buffer pH=2.5, in a volumetric ratio of 40:60 for kampferol while for myricetin a mixture of methanol:phosphate buffer in a 50:50 volumetric ratio was used (Condrat 2010).

Detection was at 360 mn for kampferol and at 300 nm for myricetin.

The UV spectra of the two standards were made using the above wavelength values.

The mobile phase flow-rate was of 1mL/minute.

The injection volume was 5µL.

Calibration curves using standard concentrations were made for each compound using 7 standard concentrations solutions (0.1500; 0.0750; 0.0400; 0.0187; 0.0150; 0.0100; 0.0075) for kampferol and myricetin.

RESULTS AND DISCUSSIONS

The quantitative determination of kampferol and myricetin was based on the retention time and at the selected wavelength from the UV-VIS domain for the analyzed standards. The correlation coefficients and the equations of the calibration curves are presented in table 1:

Table 1

	Correlation coefficients and	equations of the calibration curves
Kampferol	$r^2 = 0.99999$	$y = 2.7071 \cdot 10^7 x + 6.3479 \cdot 10^4.$
Myricetin	$r^2 = 0.99999$	$y = 2.3552 \cdot 10^7 x + 5.1750 \cdot 10^4.$
T1 (· · · 1 · 1 1	

The retention times and the kampferol and myricetin concentrations from the researches alcoholic extracts are presented in table 2.

Table 2

Plant name/Specie	Analyzed compound	Retention time t _r	[mg /mL]
Sweet hasil /Ocimum hasilicum	kampferol	4.220	0.0044
Sweet basit /Octmum basilicum	myricetin	4.058	0.0603
Common thyme / Thymus	kampferol	4.234	0.0021
vulgaris	myricetin	4.023	0.0108

Kampferol and myricetin content for the studied alcoholic extracts

From the results presented in table 2 one can see a significant difference in the content in kampferol and myricetin of the studied extracts. The content in kampferol of sweet basil extract is double compared to the common thyme extract while myricetin is five times higher.

CONCLUSIONS

High performance liquid chromatography coupled with an UV-VIS spectrophotometer allowed the quantitative determination of the two flavonoids in parallel with their separation from the extract.

The presence of the two compounds in the studied extracts confirms the fact that these plants are a natural rich source in kampferol and myricetin.

BIBLIOGRAPHY

Ciulei I., Grigorescu E., Stănescu U., Plante Medicinale, Fitochimie și Fitoterapie, vol. 1, Editura Medicală, 1993.

Condrat D., Contribuții la obținerea unor extracte din plante (phanerogame) cu efect antioxidant, Editura Politehnica, Timișoara, 2010.

Duță V., Tratamente naturiste, Editura Ștefan, București, 2007.

Eleanor N.W., Sharon, R.R., Understanding Nutrition, 7th Ed. West Publ. Co., Minneapolis/ St. Paul, 1996.

Herdan J.M., Giurginca M., Meghea A., Antioxidanți, Editura Tehnică, București, 1995.

Hoffer A., Dr. Hoffer's ABC of Natural Nutrition for Children, Quarry Press Inc., Kingston (ON), 1999.

Mindell E., Dr. Earl Mindell's What You Should Know About The Super Antioxidant Miracle, Keats Publ. Inc., New Canaan, Connecticut, 1996.

Null G., Garrz Null's Ultimate Lifetime Diet, Broodway Books, New York, 2000.

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

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

Vol. XVI (LII) - 2011

AGROECOSYSTEMS PROTECTION IN AREAS AFFECTED BY ASHES FROM THERMAL POWER STATIONS

C. Cotigă¹, Cr. Nuță², A. Ciobanu¹

KEYWORDS: performance, quality, mixing, ashes, grasses and legumes

ABSTRACT

Grassland agriculture is a farming system which emphasizes the importance of grasses and legumes in livestock and land management. It covers the land to protect it from the weather; as a rotation crop it enriches the soil to boost the yields of other crops that follow it.

INTRODUCTION

Results from perennial grasses and legumes biology shows that these plants are not spring crops, but excellent autumn crops (Bărbulescu C., 1971; Motcă Gh., 1992, 1994). They are on the one hand, the raw material to determine the animal body through the quantity and quality of the finished product, on the other hand is one method of rehabilitation of the ash heaps (Blanc C., 1977; Moga I., 1993; Cotigă C., 2004).

MATERIAL AND METHOD

The experiments were placed in the experimental field Craiova Işalniţa from being tracked in 2008-2010. Its location made using blocks, taking into study 13 types of mixed perennial grasses and legumes and pure cultures of perennial grasses or legumes.

RESULTS AND DISCUSSION

If we analyze the performance of the 13 types of studied mixture is found that all simple blends, based only on two components perennial grasses and legumes that were located well above the level of harvest given the complex mixture. Also, the harvest of 8.5 t / ha complex mixture on the production level is below average, namely 10.4 t / ha.

Some simple mixtures studied is detached at Medicago sativa and Dactylis glomerata comprises both in terms of production (13.2 t / ha) but better to dump the cover laying herbaceous vegetation which is an impediment dissipation ash (Rotar I. and colab., 1995; Moga I., Schitea Maria, 2005).

¹ University of Craiova, Faculty of Agriculture

² SC Glissando, PhD Candidate in Agronomy

Table 1

Absolute production Average Difference Difference with Mixtures 2008-2008 2009 2010 with related related to 2009 to control average Medicago sativa Dactylis glomerata 8,7 9,6 7,2 8,5 -4,7 -1,9 Festuca pratensis Lolium hybridum 10,3 13,2 Mt Medicago sativa 13,4 15,8 2,8 Dactylis glomerata 10,1 Medicago sativa 11,2 13,7 11,7 -1.5 1,3 Lolium hybridum 9,7 Medicago sativa 10,6 11,3 10,5 -2,7 0,1 Festuca pratensis 12,5 11,2 **Onobrychis viciifolia** 11,8 9,4 -2,0 0,8 Dactylis glomerata Onobrychis viciifolia 10.9 11,7 9,1 10.6 -2,6 0.2 Lolium perene Onobrychis viciifolia 9,6 11,1 -2,1 0,7 11,0 12,8 Festuca pratensis Onobrychis viciifolia 10,2 11,1 9,3 10,2 -3,0 -0,2 **Bromus inermis** Lotus corniculatus 11,3 12,1 9,0 10,8 -2,4 0,4 Dactylis glomerata 9,7 Lotus corniculatus 10,1 11,0 8,1 -3,5 -0,7 Lolium perene 9,3 9,2 -4,0 -1,2 Lotus corniculatus 10,4 8,0 Lolium perenne -1,0 Lotus corniculatus 9,5 10,7 8,1 9,4 -3,8 Lolium hybridum Lotus corniculatus 9,2 10,6 7,5 9,1 -4,1 -1,3 Festuca pratensis 11,8 8,9 10,4 Average 10,6 -

Performance of mixtures of grasses and legumes

Of perennial legumes in pure culture (table 2) detach Medicago sativa (13.8 t / ha dry matter) that Onobrychis viciifolia (12.5 t / ha dry matter).

Table 2

Production of perennial forage legumes grown on ash dumps (3 year average)

Species	Absolute production d.m. t/ha	Relative production	Difference	Significance
Medicago sativa	13,8	100	Mt	-
Trifolium pratense	10,6	77	-3,2	00
Onobrychis viciifolia	12,5	90	-1,3	-
Lotus corniculatus	9,1	66	-4,7	000

DL 5% = 1,4 t/ha d.m. DL 1% = 2.5t/ha d.m.

DL 0,1% = 3,8 t/ha d.m.



Figure 1. The yield of biomass in some perennial forage legumes (average 3 years)

When referring to perennial grasses in pure culture (table 3) is found that the best behaved is Dactylis glomerata 12.8 t / ha respectively Lolium hybridum 11.4 t / ha, and in terms of forage quality, all content of these two species PB has the highest values: 17.5% PB Dactylis glomerata respectively Lolium hybridum 18.4 (table 4).

Table 3

(3 year average)						
Species	Absolute production d.m. t/ha	Relative production	Difference	Significance		
Dactylis glomerata	12,8	100	Mt	-		
Lolium perene	10,7	84	-2,1	0		
Lolium hybridum	11,4	89	-1,4	-		
Festuca pratensis	9,5	74	-3,3	000		
Bromus inermis	10,3	80	-2,5	00		

Production of perennial forage grasses grown on ash dumps

DL 5% = 1,5 t/ha d.m.

DL 1% = 2,4 t/ha d.m.

DL 0,1% = 3,2 t/ha d.m.



Figure 2. Biomass harvest levels in some perennial forage grasses (average 3 years)

Table 4

The chemical composition of perennial forage grasses grown on the dumps of ash (% of d.m.)

(/ • • • • • • • • • • • • • • • • • • •							
Species	Crude protein	Cellulose					
Dactylis glomerata	17,5	25,1					
Lolium perenne	15,8	27,4					
Lolium hybridum	18,4	25,7					
Festuca pratensis	16,1	25,8					

CONCLUSIONS

One of the methods of rehabilitation of the ash heaps of Isalnita - Craiova is their cover lying exclusively by using simple mixtures of legumes and perennial grasses.

Also, the two species Medicago sativa and Dactylis glomerata can be exploited both in pure culture but mostly mixed.

REFERENCES

1. Bărbulescu C., 1971. Producerea și păstrarea furajelor. Editura Didactică și Pedagogică, București.

2. Blanc C., 1977. Nouvelles des fourrages a l'INRA, Paris.

3. Cotigă C., 2004. Plante furajere. Editura Sitech, Craiova.

4. Moga I., 1983. Plante furajere perene. Editura Academiei R.S.R..

5. Moga I., Schitea Maria, 2005. Cultura plantelor furajere pentru sămânță. Editura Ceres, București.

 Motcă Gh. şi colab., 1992. Influența structurii amestecurilor de graminee şi leguminoase perene furajere asupra compoziției chimice. Lucrări ştiințifice ICCP Măgurele, Braşov, XV.
 Motcă Gh. şi colab., 1994. Pajiştile României. Editura Tehnică Agricolă, Bucureşti.

8. Rotar I. și colab., 1995. Cultura pajiștilor și a plantelor furajere. Tipo Agronomie Cluj Napoca.

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

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

Vol. XVI (LII) - 2011

STUDY REGARDING EXTENSION THE TEMPORARY PASTURES OF POWER STATION ASHES FROM OLTENIA

C. Cotigă¹, Cr. Nuță², A. Ciobanu¹

KEYWORDS: temporary pastures, ashes, pollution, fertilization, power station

ABSTRACT

Pastures and meadows must be made more productive by growing the best – adapted grasses and legumes; by property of seed beds when new pastures are established. Experience has been placed in the experimental field plots method Isalnita Craiova after subdivided into four repetitions.

Following the separate influence of the mixture is found that the factor averaged over the three years of production experience was obtained when statistically we used with Medicago sativa + Dactylis glomerata and Lolium hybridum .

After chemical analysis conducted on plants in the laboratory we find a smaller percentage of protein was obtained which was used in mixture with Lolium hybridum which explains by way of a higher percentage of cellulose.

INTRODUCTION

Through the establishment of seeded pastures, are realize the second main objective: reducing pollution effects due to ash and dissipation aside playing surfaces covered in ash. The ash resulting from burning fuels in power plants can't do anything other than that set aside new areas of arable land and pollute the area (Cotigă C., 2010).

MATERIAL AND METHOD

Experience has been placed in the experimental field plots method Isalnita Craiova after subdivided into four repetitions. Agro used was $P_{50}K_{50}$. The level of nitrogen fertilization was distinguished: N₀, N₆₀, N₁₂₀, N₁₈₀, N₂₄₀.

Two mixtures were tested: a_1 : Medicago sativa 70% + Dactylis glomerata 30% and a_2 : Medicago sativa 70% + Dactylis glomerata 20% + Lolium hybridum 10%. Sprinkler irrigation was performed, with rules ranging from 500-600 m³ / ha water for each mowing.

RESULTS AND DISCUSSONS

Analyzing the dry substance obtained on average three years of research (table 1) depending on factors in the study it is found that the level ranged between 3.1 t / ha variant:

¹ University of Craiova, Faculty of Agriculture

² S.C. Glissando, PhD Candidate in Agronomy

Medicago sativa + Dactylis glomerata with unfertilized (N_0) and 12.2 t / ha in variant: $\begin{array}{l} \mbox{Medicago sativa + Dactylis glomerata + Lolium hybridum fertilized with N_{180}. \\ \mbox{Maximum crop growth rate as in the case of $9.1 t / ha, very significant statistically} \end{array}$

compared with control.

Table 1

Mixing type	Nitrogen doses	Absol 2008	ute Prod 2009	uction 2010	Average 2008- 2010	Relative production	Diffe- rences	Significant
	N ₀	3.1	3.6	2.7	3.1	100	Mt.	-
Medicago								
stativa	N ₆₀	6.0	7.3	5.1	6.1	197	3.0	*
+								
Dectulis	N ₁₂₀	8.2	8.9	7.4	8.2	265	5.1	*
glomerata	N	10.6	11.7	0.5	10.6	2.12		ste ste ste
·	N ₁₈₀	10.6	11.7	9.5	10.6	342	7.5	* * *
	N	0.4	10.2	0.6	0.4	202	6.2	**
	1 240	9.4	10.2	9.0	9.4	303	0.5	
Medicago	No	3.3	3.9	2.8	3.3	106	0.2	-
stativa	.0							
+	N ₆₀	6.7	8.1	6.0	6.9	223	3.8	*
_ //								
Dactylis glomerata	N ₁₂₀	9.4	10.2	7.8	9.1	294	6.0	**
8								
+	N ₁₈₀	12.8	13.6	10.3	12.2	394	9.1	***
Lolium	100				-			
hybridum	N ₂₄₀	12.1	13.0	10.0	11.7	377	8.6	***
L		DL	5%	2,	7 t/ha d.m.			

Influence of mixed type and level of nitrogen fertilization on the production of dry matter

5.5 t/ha d.m. DL 1% DL 0.1%

6.8 t/ha d.m.



Figure 1. The nitrogen doses effect on the production of dry matter (t / ha), in average on 3 years

Table 2

	Absolute Production			Average	Relative	Diffe-	
Mixing type	2008	2008 2009 2010		2008-	production	rences	Significant
				2010	production	Tenees	
Medicago sativa +	7.5	8.3	6.7	7.5	100	Mt.	-
Dactylis glomerata							
Medicago sativa +							
Dactylis glomerata +	8.9	9.8	7.4	8.7	116	1.2	*
Lolium hybridum							
		DI	5%	1.0 t/ha d	m		

Influence on the production of mixed type dry matter (t / ha)

DL 2.4 t/ha d.m 1%

0.1% DL 3.1 t/ha d.m.

Following the separate influence of the mixture is found that the factor (table 2) averaged over the three years of production experience, namely the maximum increase of 1.2 t / ha s.u. was obtained when statistically we used with Medicago sativa + Dactylis glomerata and Lolium hybridum .



Figure 2. The mixing type effect on the production of dry matter (t / ha), in average on 3 $\,$

years

On average three years of experimentation, the level of harvest depending on nitrogen fertilization system ranged between 3.3 t / ha in the fertilized variant (N₀) and 11.4 t / ha s.u., when the dose used N₁₈₀ (table 3). Maximum growth rate very statistically significant was 8.1 t / ha.

Table 3

				Average			()	
Nitrogen doses	Absol 2008	2009	2010	2008- 2010	Relative production	Differences	Significant	
N ₀	3.2	3.8	2.8	3.3	100	Mt.	-	
N ₆₀	6.4	7.7	5.6	6.6	100	3.3	*	
N ₁₂₀	8.8	9.6	7.6	8.7	264	5.4	**	
N ₁₈₀	11.7	12.7	9.9	11.4	345	8.1	***	
N ₂₄₀	10.8	11.6	9.3	10.6	321	7.3	**	

Influence the level of nitrogen fertilization on the production of dry matter (t / ha)

DL 5% 3,1 t/ha d.m.

DL1%5.2 t/ha d.m.DL0.1%8.0 t/ha d.m.

Table 4

Mixing type	Nitrogen	Protein	Ca	Р	Р	Cellulose	Ca/P
	doses	%	%	%	%	%	
	N ₀	12.30	0.55	0.36	1.75	30.42	1.50
	N ₆₀	13.25	0.58	0.37	1.90	30.01	1.57
Medicago sativa							
+	N ₁₂₀	14.60	0.61	0.37	2.11	29.50	1.65
Dactylis glomerata	N ₁₈₀	15.26	0.66	0.38	2.20	29.74	1.74
	N ₂₄₀	15.74	0.70	0.38	2.21	28.12	1.84
	N ₀	11.05	0.65	0.43	1.61	31.90	1.51
Medicago sativa							
	N ₆₀	12.35	0.70	0.44	1.65	31.75	1.59
+							
Dactylis glomerata	N ₁₂₀	14.95	0.80	0.40	1.74	30.66	1.85
+							
Lolium hybridum	N ₁₈₀	14.95	0.80	0.40	1.80	29.25	2.07
	N ₂₄₀	15.40	0.85	0.41	1.82	29.25	2.07
	2.0						

Sowing grasslands depending on chemical composition of mixed type and level of nitrogen fertilization

After chemical analysis conducted on plants in the laboratory we find that (table 4) depending on the percentage of protein factors studied ranged from 11.05% to 15.74%, increasing as increasing doses of nitrogen (Moga I., 1996; Varga P., 1973; Sin Gh., 2005)

A smaller percentage of protein was obtained which was used in mixture with Lolium hybridum which explains by way of a higher percentage of cellulose.

Other elements Ca, P, K were present within the limits of normal (Cotigă C., 1998 and 2010)

In terms of nutritional value of feed is on the Ca / P is found that it was located within the limits of a proper high quality fodder (1.5-2.07) in all experimental variants.

Following analysis of the floristic composition (table 5) can be noticed that in both types of blends investigated the percentage of participation to the bean harvest has increased from one cycle to the next harvest, while the grasses took part in an increasing degree of reduced the impact on production levels.
Table 5

		Scyt	he I			Scytl	he II		5	Scyth	e III		5	Scyth	e IV	
Mixing type	М	D	L	В	М	D	L	В	М	D	L	В	М	D	L	В
	s	g	р		s	g	р		s	g	р		s	g	р	
Medicago sativa + Dactylis glomerata	70	28	-	2	72	27	-	1	72	28	-	-	74	26	-	-
Medicago sativa + Dactylis glomerata + Lolium hybridum	70	17	10	3	71	17	10	2	73	16	9	2	75	15	8	2

The floristic composition at seeded lawns (%) (second year of exploitation)

CONCLUSIONS

- 1. Sown pastures in intensive culture conditions behave very well both the reduction of pollution in the area for several years due to heaps of green and economic point of view.
- 2. Especially the mineral fertilization and nitrogen is one of the rings in order to maintain a good vegetation cover over.
- 3. Irrigation constitutes the main factor in the success of a good sown pasture on these dumps.

BIBLIOGRAPHY

- 1. Anghel, Gh., 1984 Pajişti intensive. Editura Ceres, Bucureşti.
- Bărbulescu, C. ş.a., 1991 Cultura pajiştilor şi a plantelor furajere. Editura Didactică şi Pedagogică, Bucureşti.
- 3. Cotigă, C., 1998 Lucerna. Editura Sitech, Craiova.
- 4. Cotigă, C., 2010 Cultura plantelor furajere. Editura Sitech, Craiova.
- 5. Cotigă, C., 2010 Ecologie și protecția mediului. Editura Sitech, Craiova.
- 6. Moga, I. ş.a., 1996 Plante furajere. Editura Ceres, București.
- 7. Sin Gh. și colab., 2005. Managementul tehnologic al culturilor de camp. Editura Ceres, București.
- 8. Varga P. și colab., 1973. Lucerna. Editura Ceres, București.

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA Seria: ✓ Biologie ✓ Horticultură ✓ Tehnologia prelucrării produselor agricole

🖌 Ingineria mediului

Vol. XVI (LII) - 2011

RESEARCH ON THE INFLUENCE OF WATER STRESS ON PHOTOSYNTHETIC PARAMETERS AT SOME SPECIES OF SUCCULENT FLOWER PLANTS

Cristescu Mihaela^{1*}, Anton Doina¹, Nicu Carmen¹, Mandă Manuela¹

KEYWORDS: succulent plants, water stress, fluorescence

ABSTRACT

It is known that various stress factors such as water deficit, temperature, nutrient deficiency, pathogen attack, affect the physiological processes, including photosynthesis.

The researches has been aimed establish the influence of water stress on photosynthesis at 17 species of succulent flower plants.

Measurements made at determined intervals revealed that total removal of watering not affect photosynthetic activity a period of 5-7 weeks, the morpho-anatomical and physiological characteristic insuring the maintain of an optimum water content allowing the normal physiological processes.

INTRODUCTION

The succulent plants coming from dry climates are able to support long periods of drought, and those that originate in temperate climates from the northern hemisphere have sufficient reserves of water to resist for a long time without being watered (Schulte, Nobel, 1989; VanWoert et al. 2005).

Since in recent years the succulent plants has great interest in terms of horticulture, many of the physiological research conducted focused on the water content and their water needs (Nyffeler and Eggli, 2009).

The succulent plants' leaves presents high values for water content, ranging from 90-94% (Barrera, 2009), or even over 95% (Capon, 2010). Morpho-anatomical and physiological characteristics (thickness cuticle, low density of stomata, the composition of vacuoles, high percentage of absolute water) provide water reserves to ensure the normal physiological processes.

In drought conditions, when the water reserves are decreasing from the plant's organs, a slowing in the metabolic processes takes place, which maintains, until the water supplies restore (Proctor and Tuba, 2002).

The analyses of the chlorophyll's fluorescence is one of the most used techniques for determining the physiological characteristics of plants. Of the parameters that can be

¹ University of Craiova, Faculty of Horticulture

^{*}Corresponding author: E-mail address: <u>cristescu_miha@yahoo.com</u> - PhD Candidate in Horticulture through POSDRU/6/1.5/S/14 Project "Increasing the attractiveness, quality and efficiency of university doctoral studies by doctoral scholarships"

analyzed in this way, the photochemical quantum yield is one of the most useful ones (Fracheboud, 2009).

This index indicates us the amount of light energy that is converted into chemical energy, energy which is then used in CO2 metabolism and synthesis of the organic substances (Maxwell and Johnson, 2000).

Studies in various categories of plants showed a decrease in the photochemical quantum yield, in water stress conditions (Griffiths, 2002; Fodorpataki et al., 2006).

Cerovic et al. (1996) studied the effect of water stress, light radiation and temperature on the fluorescence in three species which present different photosynthetic types namely including *Kalanchoe sp.*(CAM). Research has found that after ten daysof water stress the value of photochemical quantum yield no obvious changes recorded, in both cases values were recorded between 0,31and 0,55. This illustrates that, in succulent plants, the water stress influence less the normal physiological processes

MATERIAL AND METHOD

The biological material was represented by young plants (one year old), from the collection of the discipline Floriculture and the analysis were performed using the MINI-PAM analyzer.

The Mini-Pam (productivity) photosynthesis efficiency analyzer specializes in the rapid evaluation of the effective quantum efficiency of photochemical energy's conversion in photosynthesis. The chlorophyll's fluorescence is an indicator of the energy conversion in the photosynthesis process and enters in the physiological measurements category which quantifies the efficiency of the lights absorption associated with the photosystem II (PS II).

Using the MINI-PAM device were determined the following parameters: Fo- the minimum fluorescence which appears while the leaves were adapted to darkness (15-20 minutes), Fm- maximum fluorescence recorded after exposure to the excitation source (the luminous spot the fluorine-meter) and Fv / Fm (the ratio of the fluorescence amplitude variation and the maximum fluorescence is calculated using the formula: Fv / Fm = (Fm-Fo) / Fm) which is an indicator of the maximum efficiency of the energy transfer (photochemical quantum yield). The fluorescence measurements were carried out in parallel with the analysis that observed the variation in leaves' water content, in water stressed plants but ended with a week earlier because wilting plants did not allow analyzes.

The analyses were made before and after the application of the water stress, from the apparition of the first signs of wilting for some species until the final wilting of the last species. After total removal of watering, determinations were made in stages, at determined time intervals (3, 5, 7, 9, 11, 13, 15 and 17 weeks).

RESULTS AND DISCUSSION

The analyses of the initial water content from leaves to 17 species of succulent flower plants indicated values between 91,53% in *Crassula lycopodioides* and 98,24% in *Aichryson domesticum*. The initial determinations of photochemical quantum yield indicated values between 0,44 in *Aichryson tortuosum* and 0,73 in *Crassula lycopodioides*, which varies according to species (table 1).

The analyses of water content in different stages of water stress (at 3,5,7,9,11,13,15 and 17 weeks), indicate that water losses by evapotranspiration from leaves are constantly (values recorded from one stage to another does not differ significantly) at some species (*Crassula rupestris, Echeveria carnicolor, Senecio*

jacobsenii) or varied in different stages (*Delosperma pruinosum, Kalanchoe rhombopilosa, Kalanchoe tubiflora*), the differences from one stage to another exceeds 2-3%.

The determinations made after three weeks of water stress have shown that the highest value of photochemical quantum yield was registered in *Crassula lycopodioides* (0,7) and the lowest in *Aichryson tortuosum* (0,35). Compared to the initial determinations, it was observed that, for most of the species, the value of this index decreased slightly, the smallest differences occurring in *Kalanchoe rhombopilosa* (from 0,55 to 0,53) and highest in *Senecio articulatum* (from 0,69 to 0,43). Another species to which the value of this index was significantly decreased was *Senecio kleiniformis* (from 0,58 to 0,36).

At some species, the values recorded at this stage were slightly higher than the initial analysis, for example *Aichryson domesticum* (from 0,56 to 0,58), *Ceropegia woodii* (from 0,49 to 0,51), *Delosperma pruinosum* (from 0,46 to 0,49) and *Monanthes anagensis* (from 0,58 to 0,61).

The determinations made after five weeks showed values of the photochemical quantum yield ranging from 0,21 in *Senecio articulatum* and 0,71 in *Echeveria carnicolor* and *Crassula lycopodioides* (table1). Compared to the previous stage, the smallest decrease was recorded in *Aichryson domesticum* (from 0,58 to 0,55) and the highest in *Sedum mexicanum* (from 0,46 to 0,31). An important decrease was observed in species such as *Crassula rupestris* (from 0,48 to 0,34), *Delosperma pruinosum* (from 0,49 to 0,33) *Kalanchoe rhombopilosa* (from 0,53 to 0,39), *Kalanchoe tubiflora* (from 0,48 to 0,25), *Senecio articulatum* (from 0,48 to 0,21) *Senecio kleiniformis* (from 0,36 to 0,22) and *Senecio rowleyanus* (from 0,48 to 0,3) (table 1). In *Sedum morganianum* the recorded value was identical to that from the previous stage and in other four species even slightly higher, namely in *Aichryson tortuosum* from 0,35 to 0,39, in *Crassula lycopodioides* from 0,70 to 0,71, in *Echeveria carnicolor* from 0,65 to 0,71 and in *Sedum pachyphyllum* from 0,57 to 0,58.

The analyses made at seven weeks showed values of the photochemical quantum yield between 0,2 in *Senecio articulatum* and *Senecio rowleyanus* and 0,65 in *Echeveria carnicolor*. From this stage on, the important decrease in the value of the photochemical productivity index is evident also in species less affected so far.

Compared with the previous stage, the smallest differences were observed in *Sedum mexicanum* (from 0,31 to 0,3), *Senecio articulatum* (from 0,21 to 0,2) and *Delosperma pruinosum* (from 0,33 to 0,31) and the highest in *Crassula lycopodioides* (from 0,71 to 0,45).

Measurements performed at nine weeks indicate values between 0,19 in *Kalanchoe tubiflora* and 0,57 in *Echeveria carnicolor*. Compared to the previous period, the smallest differences were recorded in *Senecio kleiniformis* (from 0,22 to 0,2) and the highest in *Ceropegia woodii* (from 0,37 to 0,21).

Measurements made at eleven respective thirteen weeks showed a progressive decrease in the value of photochemical quantum yield and hence of the photosynthetic activity. It should be noted that in *Echeveria carnicolor* this index shows a significant decrease only after 11 weeks of water stress.

The data from table 1, in which are presented, on stages of water stress, the values of the water loss in leaves and the value of the photochemical quantum yield, indicates that, on stages, a direct interdependence cannot be establish between the percentage of water lost and its value.

SDECIES	Parameters	Initial	Week	Week	Week	Week	Week	Weels	Week	Week
SPECIES	anaryzeu	values	<i>з</i>	5 vveek	7	9 vveek	11	13	15	17
Aichryson	% water	98,24%	-0,99	-1,26	-1,77	-0,35	-1,54	-1,22	-0,72	
domesticum	yield	0.56	0.58	0.55	0.42	0.34	0.32	0.15		
Aichryson	% water	96,88%	-2,14	-1,79	-1,92	-1,74	-1,28	-1,45		
tortuosum	yield	0.44	0.35	0.39	0.35	0.24	0.19			
Ceropegia	% water	96,32%	-2,78	-1,64	-4,64	-2,64	-1,55			
woodii	yield	0.49	0.51	0.45	0.37	0.21	0.12			
Crassula	%water	91,53%	-2,82	-2,48	-2,17	-1,34	-3,34			
lycopodioides	yield	0.73	0.7	0.71	0.45	0.31	0.2			
Crassula	% water	96,63%	-2,7	-2,02	-2,58	-2,12	-2,1			
rupestris	yield	0.52	0.48	0.34	0.28	0.21	0.18			
Delosperma	% water	96,2%	-2,74	-4,37	-2,55	-4,12	-4,59			
pruinosum	yield	0.46	0.49	0.33	0.31	0.23	0.19			
Echeveria	% water	97,5%	-0,19	-0,92	-0,92	-0,89	-0,98	-0,85	-0,93	-0,71
carnicolor	yield	0.69	0.65	0.71	0.65	0.57	0.28	0.2		
Kalanchoe	% water	93,11%	-0,56	-5,1	-2,65	-4,96	-3,42			
rhombopilosa	yield	0.55	0.53	0.39	0.25	0.22	0.11			
Kalanchoe	% water	96,35%	-0,5	-4,8	-0,85	-2,01	-3,2			
tubiflora	yield	0.57	0.48	0.25	0.22	0.19	0.14			
Monanthes	% water	95,07%	-1,02	-0,75	-0,33	-1,33	-1,77	-2,22		
anagensis	yield	0.58	0.61	0.52	0.36	0.3	0.28	0.18		
Sedum	% water	96,39%	-0,74	-1,37	-1,15	-2,35	-1,05	-1,04		
mexicanum	yield	0.5	0.46	0.31	0.3	0.25	0.2			
Sedum	% water	97,29%	-0,44	-1,37	-0,4	-0,6	-0,97	-1,7	-0,63	
morganianum	yield	0.53	0.5	0.5	0.44	0.35	0.31	0.14		
Sedum	% water	97,25%	-0,32	-0,78	-0,63	-1,41	-0,86	-0,91	-0,86	
pachyphyllum	yield	0.61	0.57	0.58	0.47	0.4	0.27	0.12		
Senecio	% water	96,76%	-0,68	-1,76	-1,72					
articulatum	yield	0.69	0.43	0.21	0.2					
Senecio	% water	97,29%	-0,71	-0,41	-1,03	-0,7	-1,15	-0,9	-0,73	
jacobsenii	yield	0.65	0.6	0.53	0.46	0.4				
Senecio	% water	96,31%	-2,54	-3,07	-1,85	-3,5	-4,50			
kleiniformis	yield	0.58	0.36	0.22	0.22	0.2	0.15			
Senecio	% water	95,58%	-1,28	-0,8	-1	-2,03	-1,76	-1,18		
rowleyanus	vield	0.45	0.48	0.3	0.2	0.22	0.1			

The percent of lost water and the values of photochemical quantum yield in different stages of water stress

Table 1

In the graphics 1 - 17 is presented for each species, the variation of the photochemical quantum yield, in various stages of water stress, depending on the water content from the leaves.

The value of index determination of the two parameters indicates, for all studied species a significant positive correlation. However, the important decrease of the photochemical productivity index and implicitly of the photosynthetic activity is the result of cumulative water losses, progressively recorded during the different stages.



Graphic 7 Echeveria carnicolor

Graphic 8 Kalanchoe rhombopilosa



Graphic 15 Senecio jacobsenii

Graphic 16 Senecio kleiniformis



Graphic 17 Senecio rowleyanus

Compared to initial photochemical quantum yield values, is noted that the photosynthetic activity records a slight decrease after 3 weeks of water stress in *Senecio articulatum* and *Senecio kleiniformis* and after 5 weeks in *Crassula rupestris*, *Delosperma pruinosum*, *Kalanchoe rhombopilosa*, *Kalanchoe tubiflora*, *Sedum mexicanum*, *Senecio rowleyanus*, after 7 weeks in *Aichryson*, *Ceropegia woodii*, *Crassula lycopodioides*, *Monanthes anagensis*, *Sedum pachyphyllum*, *Senecio jacobsenii*, *Sedum morganianum*.

In *Echeveria carnicolor* the biggest difference was recorded after 11 weeks of water stress.

CONCLUSIONS

The value of the photochemical quantum yield value is characteristic of each species, ranging in studied species from 0,44 in *Aichryson tortuosum* to 0,73 in *Crassula lycopodioides*.

Under water stress the photochemical quantum yield ranged from one stage to another, differently, depending on the species. Compared to the initial values, the photochemical quantum yield decreased after 3 weeks of hydrous stress in *Senecio articulatum* and *Senecio kleiniformis* after 5 weeks in *Crassula rupestris*, *Delosperma pruinosum*, *Kalanchoe rhombopilosa*, *Kalanchoe tubiflora*, *Sedum mexicanum*, *Senecio rowleyanus* after 7 weeks in *Aichryson*, *Ceropegia woodii*, *Crassula lycopodioides*, *Monanthes anagensis*, *Sedum pachyphyllum*, *Senecio jacobsenii*, *Sedum morganianum*.

Based on the results we can say that for the succulent plant studied, the total removal of watering does not significantly affect the photosynthetic activity for a long time (5-7weeks), the morpho-anatomical and physiological characteristic insuring the maintain of an optimum water content allowing the normal physiological processes.

BIBLIOGRAPHY

Barrera E. Smith W. 2009. Perspectives in biophysical plant ecophysiology. Ed. Springer. Amazon.com, pp. 60.

Capon B. 2010. Botany for gardeners . Ed. Springer. Amazon.com, pp.130.

Cerovic Z. G, Goulas Y.,Gorbunov M., Briantais J.M., Camenen L., Moya I.1996, "Fluorosensing of water stress in plants. Remote Sensing of Environment, vol. 58, nr.3 pp.311-321. Ed. Elsevier. Fodorpataki L., Vass I., Bartha L. 2006. Usefulness of chlorophyll fluorescence in the investigation of environmental stress responses in plants In: Mócsy, I., Néda, T. (eds.), Environmental Sciences Ed.Scientia Cluj-Napoca, pp. 195-206.

Fracheboud Y., 2009. Using Chlorophyll Fluorescence to Study Photosynthesis. Journal of the Torrey Botanical Society, nr. 136(1), pp. 57-69.

Griffiths H., 2002. Plant responses to water stress. Annals of Botany nr. 89, pp 801-802.

Maxwell K., Johnson G.2000.Chlorophyll fluorescence - a practical guide. Journal of Experimental Botany, Vol 51, nr. 345, pp. 659-668.

Nyffeler R., Eggli U.2009. Living under temporarily arid conditions: Succulence as an adaptive strategy. Bradleya nr. 27, pp. 13–36.

Proctor M.C., Tuba Z. 2002. Poikilohydry or homoihydry: Antithesis or spectrum of possibilities" New Phytologist nr.156, pp. 327–349.

Schulte P.J, Nobel P.S.1989.Responses of a CAM plant to drought and rainfall: capacitance and osmotic pressure influences on water movement. Journal of Experimental, pp. 61–70.

Van Woert N.D, Rowe D.B., Andresen J.A., Rugh C.L., and Xiao L.2005. Watering regime and green roof substrate design affect Sedum plant growth. Hort. Science 40(3), pp.659-664.

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

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

Vol. XVI (LII) - 2011

RESEARCH ON THE INFLUENCE OF PROCESSING FACTORS ON QUALITY OF POTATO TUBERS ON SANDY SOILS IN SOUTHERN OLTENIA

Croitoru Mihaela, Aurelia Diaconu, Milica Dima¹

KEYWORDS: potato, quality, powerful technology, sandy soils.

ABSTRACT

The results on the influence of variety and fertilization system on the nutritional quality of potato tubers as revealed differences depending on variety and fertilizer according to the applied doses. The best results were obtained for varieties Magic, Astral, Tresor, Ruxandra, Dumbrava, Dacia, which were posted by a total solids content above 20% and soluble solids content of between 5.14 -5.85%. Astral varieties, Virgo, Tresor, Almera and Cosmos were noted with vitamin C content ranges from 15.70 to 18.72 mg/100g f.s. also studied species groups responded differently to fertilization applied. In potato tubers was determined a higher content of vitamin C in the fertilized variants N150P50K50, the species from Brasov. The varieties of foreign origin have reacted better N200P100K100 fertilization.

INTRODUCTION

Quality potato is a complex notion, determined by the character variety which includes genetic and influenced by external factors. It refers to a series of internal and external features related to the nutritional and commercial tubers. (Muresan et al., 1980).

Research conducted abroad by: Anastazia Ginterova, 1960, W. Lisinski Leszczyński and G. W., 1988, Cieslike, 1994. Tony Kelloch, Toolangi, 1995, A.K. Alvara, T. Hodges et colab., 2002, Z. Yildrim and Ö.Tokuşoğlu, 2005, Dinesh Kumar, R. Ezekiel, 2006, Qiang Lin, Richard Tarn, Dermot Lynch, Neil M. Skyodt, 2007, EB Geremew, JM Steyn, JG Annandale, 2007 etc. highlighted the role of the chemical composition of tubers of potato cultivars to distinguish the influence of climatic conditions in the culture of sugar content and dry matter in potato tubers (climate, variety, growing conditions and increases su content production potato and drought and high temperatures affect leaf area development and resistance, and in turn this limits the photosynthetic activity of culture). Also, given fertilizers to increase soil fertility, leading to a low level of dry matter. Increased nitrogen levels, by promoting economic growth, leading to a low dry matter content, by extending the growing season.

In our country were carried out research on the nutritional quality of potato tubers depending on the variety under study, the system of fertilization, planting density, climatic conditions in the culture (S. Muresan, Gheorghe Olteanu, Tanasescu Eugenia , 1980, Ana Crăciun, 1994, Lorincz Adina, 1997, Chichea I., 2000, Aurelia Diaconu, 2007).

Research- Development Station for Agricultural Plants on Sands- Dabuleni, e-mail: mhlcroitoru@yahoo.com

On sandy soils in southern Oltenia culture have been promoted a number of foreign varieties of potato provenință from Targu Secuiesc, in Brasov and Suceava. We studied the behavior of these varieties depending on the variety and system of fertilization on production elements and determination of nutritional quality.

MATERIAL AND METHODS

To determine the role that has variety and fertilization system on the biochemical composition of potato tubers was established experience, which was placed in randomized blocks in four repetitions. Were tested a total of 11 varieties from different geographical areas.

Watch the factors in the experiment on fertilization and influence of the studied variety were:

- factor A - the variety of potato:

1. Soiuri of foreign origin (Virgo, Tresor, Almera, Impala),

2. Varieties obtained from Brasov (Tampa, Ruxandra, Dacia, Grove, Cosmos),

3. Varieties obtained from Suceava (Magic, Astral).

- factor B - The dose of fertilizer:

b1 - N100P50K50

b2-N150P75K75

b3 - N200P100K100

Of potato tubers at maturity consumption following determinations were made:

- water and total dry matter (SUT) (%) - Gravimetric method,

-soluble dry matter (UP) (%) - refractometry,

- total carbohydrate (%) - method Soxhlet Fehling,

-vitamin C (mg/100g fresh matter) - iodometric method,

-titratable acidity (g malic acid in 100g sp) - titration method.

RESULTS AND DISCUSSION

Potato plants have an average consumption of minerals, but intense throughout the period of vegetation, favored by the depth and power of the root system. Experience has been placed low on the ground in total nitrogen, extractable phosphorus and normally supplied in small to medium exchangeable potassium supplied. The results reveal an unevenness of the soil, sandy soil specific. The state of soil organic matter supply was reduced, and soil pH which was located experiences, values ranged between 6.69 and 6.74 indicating moderately acidic to neutral reaction.

Potato quality is a complex notion, determined by variety by genetic characters that includes and influenced by external factors. It refers to a series of internal and external features related to the nutritional and commercial tubers. (Muresan et al., 1980).

The results highlight differences depending on variety, depending on the fertilization system, and depending on climatic conditions. The group of foreign varieties, total dry matter content showed the highest values in the fertilized variants and N150P75K75 N100P50K50 at Tresor and Almera varieties (Table 1).

Fertilizers managed to increase soil fertility, leading to a low level of dry matter. Increased nitrogen levels, by promoting economic growth, leading to a low dry matter content, due to extended growing season (Tony Kellok et al., 1995).

Accumulation of total dry matter is influenced by both variety and fertilizer dose of climatic conditions in that period. High temperature due to atmospheric drought, the

summer months characteristic for sandy soils, leading to increasing the amount of total dry matter and low levels of water. Dry matter accumulation in potato tubers soluble varieties of foreign origin was less influenced by the amount of fertilizer.

Table 1

Variety	Agrofound	Total dry %	Water %	Soluble solids %	Glucid e %	Titrabile acid g acid malic la 100g f.s.*	C Vitamine mg/100g f.s.*
	N100P50K50	19,40	80,60	5,25	2,50	0,17	22,44
Virgo	N150P75K75	20,85	79,15	5,05	2,23	0,17	19,36
viigo	N200P100K100	17,65	82,35	5,00	2,25	0,19	14,35
	Average	19,30	80,70	5,10	2,32	0,18	18,73
	N100P50K50	23,00	77,00	4,95	2,24	0,15	15,62
Trasor	N150P75K75	21,25	78,75	5,00	2,01	0,12	16,73
TIESOI	N200P100K100	19,95	80,05	5,25	2,02	0,15	16,72
	Average	21,40	78,60	5,07	2,09	0,14	16,3
	N100P50K50	19,00	81,00	5,00	2,04	0,18	14,74
Almara	N150P75K75	21,65	78,35	5,20	2,56	0,13	18,64
Annera	N200P100K100	18,70	81,30	5,40	2,37	0,18	15,62
	Average	19,79	80,21	5,20	2,32	0,16	16,32
	N100P50K50	20,35	79,65	4,85	1,73	0,19	16,72
Impala	N150P75K75	15,25	84,75	5,20	1,95	0,18	16,06
inipaia	N200P100K100	14,95	85,05	4,50	1,96	0,16	11,22
	Average	16,85	83,15	4,85	1,88	0,18	14,67

Biochemical composition of potato tubers depending on	the variety and fertilization system
variety foreign origin	

* f.s- fresh substance

Carbohydrate accumulation occurs by translocation their assimilation into the storage organs, mostly in the form of sucrose, sometimes in the form of D-sorbitol, raffinose or heptuloză. The total carbohydrate content of potato is an average of 1.2% with a range of 0.4 to 3.4%. (Gherghe A. et al., 1983).

In this case, the carbohydrate content ranged from 1.73% in the variant fertilized with Impala variety N100P50K50 and 2.56% in the variant fertilized with variety Almera N150P75K75. Although reducing sugars (glucose, fructose) is a small proportion of total dry matter, are of particular importance, because they even at these concentrations, causes brunificarea products fries.From this point of view it is preferable that potato tubers have a low content in these components as (Crăciun Ana, 1994).

The titratable acid content of potato tubers is low, less than 1%, which is characteristic of species is a tendency of increasing acidity with increasing dose of fertilizer. Vitamin C content of vegetables and fruit varies very large, depending on the species, variety and conditions agropedoclimatic.

The literature highlights the potato tubers of vitamin C content of between 15mg and 22 mg/100g f.s with an average of 17 mg/100g f.s. Cieslike, 1994, resulted in an average of 16.4 potatoes mg/100g. Vitamin C content in potato varieties of foreign origin, studied depending on fertilization system presented the highest values in the variant fertilized with Virgo variety N150P75K75.Differences between the three doses of fertilizer are not huge, but it can be seen in this area specific climatic conditions a reduction in dry matter content, total carbohydrates and vitamin C with increasing dose of fertilizer.

The climate, variety, growing conditions increases the dry matter content and production of potato. If the soil temperature is high dry matter can be lost through excessive breathing. In a warm but wet season in the soil, dry matter will remain high due to the reduction in intensity of the process of breathing. (Tony Kellock et al., 1995, EB Geremew et al., 2007).

In the case of varieties of Brasov, the content of total and soluble solids showed higher values on the N100 and N150 fertilization levels, and the best results were obtained in varieties: Dumbrava 25.15%, Ruxandra 25.40% and Dacia 24.75% in the variant fertilized with N100P50K50.

The highest content of vitamin C was obtained from varieties Dacia 20.40 mg, Dumbrava 18.48mg, and Ruxandra 16.94 mg all the variant fertilized with N100P50K50 (Table 2). The best results were obtained in varieties: Dumbrava, Ruxandra and Dacia have been noted by a high content of total and soluble solids. This group of species presented a lower content of vitamin C in tubers.

In the case of varieties of Suceava, total dry matter content and soluble presented values above the level of fertilization N150, and the best results were obtained in the variant fertilized with Astral variety N150P75K75 (24.70% total solids, 5.25% soluble dry matter and 18.48 mg vitamin C), (Table 3).

Groups of species studied behaved differently in terms of nutritional quality, depending on the origin of the variety. From the results it can be seen that the varieties of the group in Brasov have accumulated a larger amount of total solids. The lowest total dry matter content was determined at the group of foreign varieties.

For industrialization, it is preferable that the tubers have a high and uniform level of dry matter, the ideal is between 22 and 24%. Analytical results suggest that differences in chemical composition may help to differentiate cultivars based on these properties (Qiang Lin, Richard Tarn, Dermot Lynch, Neil M. Skyodt, 2007).

Also, groups of species studied responded differently to fertilization applied. In potato tubers was determined a higher content of vitamin C in the fertilized variants N150P50K50, the species from Brasov. The varieties of foreign origin have reacted better N200P100K100 fertilization.

CONCLUSIONS

1. The rezulths obtained on the influence of variety and fertilization systems on the nutritional quality of potato tubers as revealed differences depending on variety and fertilizer according to the applied doses.

2. Groups of species studied behaved differently in terms of nutritional quality, depending on the origin of the variety. Group of varieties from Suceava and Brasov have accumulated a larger amount of total and soluble solids and sugars and vitamin C content was lower. The lowest total dry matter content was determined at the group of foreign varieties.

3. Also, groups of species studied responded differently to fertilization applied. In potato tubers was determined a higher content of vitamin C in the fertilized variants N100P50K50, the species from Brasov, Suceava. The varieties of foreign origin have reacted better N150P75K75 fertilization.

4. On sandy soils in southern Oltenia, varieties with the best nutritional quality indicators are:Almera, Tresor, Virgo, Astral, Magic, Ruxandra, Dumbrava and Dacia.

				Solu		Titrabile	С
		Total	Water	ble	Gluci	acid	Vitamine
Variety	Agrofound	dry		solid	de	g acid	
		%	/0	S	%	malic la	mg/100g
				%		100g f.s.*	f.s.*
	N100P50K50	20,15	79,85	5,35	2,11	0,17	14,08
Tâmna	N150P75K75	18,40	81,60	5,25	1,93	0,14	13,42
1 ampa	N200P100K100	19,65	80,35	5,00	1,96	0,20	16,28
	Average	19,40	80,60	5,20	2,00	0,17	14,59
	N100P50K50	25,40	74,60	5,55	2,07	0,19	16,94
Ruxand	N150P75K75	21,95	78,05	6,35	2,04	0,19	16,28
ra	N200P100K100	21,70	78,30	5,65	2,32	0,21	10,34
	Average	23,02	76,98	5,85	2,14	0,20	14,56
	N100P50K50	24,75	75,25	5,15	2,11	0,17	20,24
Dacia	N150P75K75	23,45	76,55	5,15	1,57	0,19	12,76
Daela	N200P100K100	21,35	78,65	5,80	1,71	0,22	14,90
	Average	23,19	76,81	5,37	1,80	0,19	14,30
	N100P50K50	25,15	74,85	4,90	1,57	0,17	18,48
Dumbra	N150P75K75	23,70	76,30	5,15	1,60	0,17	11,88
va	N200P100K100	22,20	77,80	5,80	1,57	0,16	9,68
	Average	23,69	76,31	5,28	1,58	0,16	13,35
	N100P50K50	19,00	81,00	5,20	2,32	0,19	15,84
Cosmos	N150P75K75	19,85	80,15	5,45	2,10	0,15	16,50
0031103	N200P100K100	17,20	82,80	5,50	2,08	0,20	14,87
	Average	18,35	81,65	5,38	2,17	0,18	15,74

Table 2 Biochemical composition of potato tubers depending on the variety and fertilization system Variety in Brasov

* f.s- fresh substance

Table 3

Biochemical composition of potato tubers depending on the variety and fertilization system Variety in Suceava

Variet y	Agrofound	Total dry %	Water %	Solu ble solid s %	Glucide %	Titrabile acid g acid malic la 100g f.s.*	C Vitami ne mg/10 0g f.s.*
	N100P50K50	22,35	77,65	4,50	1,94	0,16	17,38
Magic	N150P75K75	22,70	77,30	5,60	1,64	0,17	14,08
wiagic	N200P100K100	20,90	79,10	6,00	1,50	0,16	13,36
	Average	21,98	78,02	5,33	1,69	0,17	14,94
	N100P50K50	24,10	75,90	4,75	1,83	0,15	18,26
Actrol	N150P75K75	24,70	75,30	5,25	1,52	0,15	18,48
Asual	N200P100K100	22,80	77,20	5,40	1,44	0,17	12,32
	Average	23,87	76,13	5,14	1,60	0,16	16,35

* f.s- fresh substance

REFERENCES

1.A.K. Alvara, T. Hodges et colab., 2002 - Dry matter and nitrogen accumulations and partitioning in two potato cultivars, Journal of Plant Nutrition, Volume 25, ISSUE8, p. 1921-1630.

2. Cieslike,1994 - The effect of Naturally occurring vitamin C in potato tubers on the levels of nitrates and nitrites, Food chemistry ISSN 0308-8146, CODEN Fochidj, Vol 49, No. 3, p. .233-235

3. Chichea I., 2000 - Cartoful timpuriu și de vară, Editura ALMA, Craiova

4. Crăciun Ana, 1994 - Densitatea optimă de plantare și unele măsuri fitotehnice la cartofs - Lucrări științifice - Anale ale Institutului de cercetare și producție a cartofului, vol. XXI, Brașov.

5. Aurelia Diaconu, 2007, Rezults corcerning the influence of main technological factors (variety, the level of water ensurange, soil) on the content of potato tuber in dry substance, starch and mineral substance, Lucrări științifice, CCDCPN Dăbuleni, vol. I (XVII), Editura SITECH Craiova, ISSN 1016-4820

6. Dinesh Kumar, R. Ezekiel, 2006, Developmental changes in sugars and dry matter content of tuber under in tropical climates potapo, Scientia Horticulturae, vol.110, Issue 2, p.129-134.

7. Geremew E. B., Steyn J.M., Annandale J.G., 2007, Evaluation of growth performance and dry matter partitioning of four processing potato (Solanum tuberosum) cultivars, New Zealand Journal of Crop Science and grow, Vol 35, 385-393.

8. Anastazia Ginterova, 1960, Content of different forms of vitamin C in potatoes, Treated with ethylene chlorhidrin, Biology Plantarum, Praha, 2 (1), 19-26

9.Gherghi A. Și colab., 1983, *Biochimia și fiziologia legumelor și fructelor*, Ed. Academiei RSR, București.

10. Kellock Tony, Toolangi,1995, Potatoes: Factors affecting dry matter, Agriculture Notes, ISSN 1329-8062.

11.Lorinczi Adina, 1997, *Calitatea cartofului, concepte și cerințe*, Lucrări științifice(Anale ale Institutului de cercetare și producție a cartofului, vol. XXIV, Brașov.

12.W. Leszczyński and G. Lisińska W., 1988, Influence of nitrogen fertilization on chemical composition of potato tubers, Food Chemistry, vol.28, ISSUE, pages 45-52, available online 1 October 2003

13. Mureșan S., Olteanu Gh., Tănăsescu Eugenia, 1980, Controlul calității cartofului, Îndrumări tehnice, 96-106.

14.Z. Yildrim and Ö.Tokuşoğlu, 2005, Some Characteristics of Analytical quality potato (Solanum tuberosum L.) minitubers (cv.nif) developed via in vitro cultivationhot! The Electronic Journal of Environmental, Agricultural and Food Chemistry, vol 4.

15. Qiang Lin, Richard Tarn, Dermot Lynch, Neil M. Skyodt, 2007, Physicochemical properties of dry matter and starch from potatoes grown in Canada, Food Chemistry, vol.105, ISSUE 3, p.897

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

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

Vol. XVI (LII) - 2011

THE INFLUENCE OF THE QUALITY OF WHEAT FLOUR GLUTEN UPON THE WAY OF ACTION OF CERTAIN ENZYMATIC IMPROVERS IN BAKERY

Daniela Diaconescu¹, Monica Zdremtan¹, Lucian Halmagean¹

KEYWORDS: gluten, quality, enzymes, breadmaking, bread

ABSTRACT

Within the same type of flour, the flour quality may vary within very large limits, for various reasons. The effects of this phenomenon have an impact on the quality of bread, which is not allowed to vary, so they must be counteracted. A natural and effective way is the addition of enzymes. This study used the following enzymes: a-amylase extracted from Aspergillus oryzae, glucose oxidase from Aspergillus niger and two proteases extracted from Bacillus amyloliquefaciens, and respectively, Carica papaya. We have comparatively observed the effects of addition of these enzymes in two flours of the same type but different quality: one with normal bakery features and the other with strong gluten. The results show that the used enzymatic compositions act differently upon the quality of bread, depending on flour quality. Also, there is a difference in the quantity of enzymatic compositions where maximum positive effects occur, depending on flour quality.

INTRODUCTION

As a consequence of the socio-political changes in recent years many "neighbourhood" bakeries have been opened, which, among other things, constantly face the phenomenon of variability in the quality of wheat flour of the same type. One of the quality attributes of flours that vary most is the quality of gluten, well represented by the deformation index (Diaconescu & Balint 2010). It can vary in quite wide limits in flour with about the same content of wet gluten, fact hidden to the bakers who are unable to determine this index: the lack of a basic equipped laboratory, the lack of specialist engineer. Thus, bakers usually wrongly use, commercial improvers in fixed recipes, regardless of the quality of flour, which does not always remove the negative effects brought about by changes in flour quality on finite products. There is little evidence in field literature with regard to this issue. For this reason, it becomes important to demonstrate that the use of improvers, regardless of their type, must be adapted to each batch of flour, depending on its quality, which we have tried to reveal in this paper.

We have displayed here some of the results on the effects brought about by some enzymatic improvers in dough and bread when flours of the same type have been used but in different quantity. The main difference between the two was the quality of gluten flour: the first flour had normal bakery features and the second had very strong gluten. If with the first flour we obtained bread that meets the quality requirements in the case of the second

¹ "Aurel Vlaicu" University from Arad, Romania, Faculty of Food Engineering, Tourism and Environmental Protection

we obtained bread with low volume, very convex, with dense crumb, with low porosity and elasticity (Diaconescu 2008).Gluten proteins are particularly important for breadmaking quality and consist of two major fractions: the monomeric gliadins and the polymeric glutenins (Singh et al. 2001). Gluten properties are influenced by various factors observed both during plant growth and grain processing (Wooding et al. 2000). So, gluten quality of wheat is affected by genotype, environment and their interaction, including fertilizer levels and precipitation during the grain filling period (Đurić et al. 2005).

So we have comparatively observed, in these two cases, the effects brought about by the following enzymatic improvers: α -amylase extracted from *Aspergillus oryzae*, glucose oxidase extracted from *Aspergillus niger*, proteases derived from genetically modified bacteria such as Bacillus amyloloquefaciens and extracted and purified proteases from *Carica papaya*. α -Amylase increases the bread volume and reduces the staling rate. As a secondary result crust colour quality substantially improves.

Glucose oxidase is an oxidizing enzyme that has an effect similar to that of chemical oxidants: the improving of dough by increasing the resistance and decreasing the extensibility of the dough, the increasing of bread volume and the improving of crumb grain of bread.

It appears that oxidation of water-soluble SH groups and the oxidative gelation of pentosans is the mechanism by which glucose oxidase improves the rheological properties of the dough (Vemulapalli et al. 1998, Diaconescu 2009). The addition of proteases regulates the rheological properties of dough. They are designed to soften the hard gluten (deformation index: 2-5mm) from the wheat flour, reduce the tendency of gathering and hard dough viscosity. The effect is different for different proteases, depending not only on the source of enzymes, but also on the quality of flour (Diaconescu 2008).

In a previous paper, we have observed the effects of exogenous enzymes as hemicellulases extracted from different microbial sources, xylanase and mixture of xylanase and cellulases, upon the quality of bread depending on the quality of bread flour (Diaconescu 2005). We concluded that the effects of exogenous enzymes used in that study are different, depending on the flour used. Moreover, except for the xylanase and cellulase mixture, even the dose of enzyme composition in which maximal effects occur differs, depending on the quality of flour used.

MATERIALS AND METHODS

We have used the following materials:

Flour I – 13.43% water content, 60.37% hydration percentage, mineral substances 0.65%, 13.35% proteins, wet gluten content 28%, gluten index* 56, extensibility index** under 30cm, deformation index*** 10mm,

Flour II – 13.65% water content, 62.12% hydration percentage, mineral substances 0.65%, 14.85% proteins, wet gluten content 28,8%, gluten index* 79, extensibility index** under 15cm, deformation index*** 2mm,

*The gluten index is defined as the percentage of wet gluten that passes through the special sieve of the Gluten Index Centrifuge. The index characterizes gluten quality as weak or strong. The gluten index parameter can take values between 0 and 100. The optimal value is considered to be between 65 and 80 (Diaconescu & Balint 2010).

**Wheat gluten extensibility is measured by the gluten extensibility index. A high degree of extensibility is usually desirable. The gluten extensibility index is represented by the

length of a wet gluten wick extended until it reaches its breaking point. Measurements are made in centimetres. A distinction is made between weakly extensible (under 25 cm) and elastically extensible glutens (over 35 cm) (Diaconescu & Balint 2010).

*** The deformation index of wheat gluten is measured thru the shape change of a wet gluten ball on a horizontal plane at 30° C, by determining the difference between diameters before and after an 1 hour period. The optimal values for the deformation index range between 6-13 mm. A value lower than 6 mm shows evidence for a strong, tenacious type of gluten and a value larger than 20 mm defines a weaker gluten, characterized by a very rapid process of proteolytic degradation (Diaconescu & Balint 2010).

Yeast – Pakmaya (from shops),

Salt – extra fine table salt (from shops),

Water - potable water from the water network,

The following enzyme preparations were used:

Alpha Amylase (α -A) – a pure concentrate of α -amylase extracted from Aspergillus oryzae (Danisco Ingredients Romania, G&G International SRL Sibiu),

Fermizyme GO1500 (G) – an enzyme extracted from *Aspergillus niger* which contains glucose oxidase with an enzymatic activity of 1500 SARRET UNIT /g (Overseas Bakery & Ingredients Romania SRL București),

Fermizyme BP 1500 (P1) – an enzyme extracted from the *Bacillus amyloliquefaciens*, which comprises of protease with an enzymatic activity of 210000 LYX/g (Overseas Bakery & Ingredients Romania SRL București),

Fermizyme V 100 (P2) – an enzyme extracted and purified from the *Carica papaya*, which comprises of protease with an enzymatic activity of 6500 NF/mg (Overseas Bakery & Ingredients Romania SRL București).

The usage limits for the enzyme preparations were determined through a trial error process and only intervals in which the enzymes registered effects were chosen. Addition levels for each enzyme preparations represent arithmetical averages of the double trials results. Only levels with maximum impact on sample quality were chosen (i.e. maximum sample volume, porosity and elasticity of the crumb, suitable crust colour).

Flour and bran quality analysis was carried out in accordance with STAS 90-77 and STAS 6283/1-83 regulations. Bread quality analysis was made according to STAS 91-83 regulations (***Romanian Professional Standards Collection: Milling – Breadmaking). *Baking tests:*

For each enzymatic composition there were carried out two series of samples, series 1 of flour I (with normal baking features) and series 2 of flour II (with strong gluten). Each series contained a controller/witness (without enzymatic composition) and six samples with different levels of enzymatic composition.

Only levels with maximum impact on sample quality were chosen.

Bread samples of 900g were obtained by direct procedure using the following recipe: 800g flour, 13g yeast, 13g salt, 450ml water – for series 1 - respectively 500ml - series 2. The yeast underwent a suspension in 50ml water, the salt was dissolved in 50ml water, enzymatic compositions were added to flour.

The dough was kneaded with the aid of a laboratory mixer for 3 minutes. After 60 minutes of fermentation at $25-30^{\circ}$ C, 1000g dough pieces were hand shaped into elongated forms and were left in the leavening chamber for 60 minutes at $25-30^{\circ}$ C. The end product was baked for 35 min. at 250° C.

RESULTS AND DISCUSSIONS

Upon the finite products we have determined the following quality parameters: specific volume, crumb porosity and elasticity. In table no 1 we have shown the maximum values of these parameters and the values of enzymatic compositions where these values occur.

Table 1

		Maximum	values of quality pa	arameters	
En	zyme	Level	Specific volume	Crumb porosity	Crumb elasticity
prep	aration/	[g/100kg flour]	$[cm^{3}/100g]$	[%]	[%]
Use	d flour				
None	F1	-	261	72.3	97
	F2	-	245	69.5	96
α-Α	F1	5	296	84.7	98
	F2	4	267	78.7	97
G	F1	10	270	79.3	98
	F2	15	245	72.6	97
P1	F1	3	335	91.2	98
	F2	5	328	89.8	98
P2	F1	115	337	91.8	98
	F2	130	325	88.7	98

In table no 2 we have revealed the percentage increases of maximum values of quality parameters as opposed to controllers/witnesses.

Table 2

	neuse in pe	reents of the maxin	num vulues of quu	ity purumeters
En	zyme	Volume	Porosity	Elasticity
prep	aration/	increase	increase	increase
Use	d flour	[%]	[%]	[%]
α-A	F1	13.4	17.1	1.0
	F2	11.2	13.2	1.0
G	F1	3.4	9.7	1.0
	F2	2.0	4.5	1.0
P1	F1	28.3	26.1	1.0
	F2	33.8	29.2	2.1
P2	F1	29.1	28.3	1.0
	F2	32.6	27.6	2.1

Increase in percents of the maximum values of quality parameters

Effects of α -amylase extracted from *Aspergillus oryzae*

As expected, fungal α -amylase had positive effects on bread quality, regardless of the flour used, results obtained also by Kim et al. 2006. However, percentage increases for specific volume and crumb porosity were significantly higher for bread made from flour with normal bakery traits.

Effects of glucose oxidase extracted from Aspergillus niger

The results obtained here for bread of flour with normal bakery traits are comparable to those obtained previously (Diaconescu 2009, Vemulapalli et al. 1998) for flour of comparable quality. But it seems that also glucose oxidase reacts weaker in bread obtained of strong gluten flour as well as α -amylase. Higher differences in percentage increases compared to the controller occur in core porosity compared with those occurring in specific volume, also as in the case of α -amylase. We can say that the lowering of effect intensity of these two enzymes added to strong gluten flour is higher in terms of crumb pore volume than bread volume, which is explained by the dense structure of gluten. Effects of protease extracted from *Bacillus amyloliguefaciens*

As seen in table no 1 and 2, bacterial protease used here gave very good results for both types of flour, the percentage increase is visibly higher for strong gluten flour, and especially in terms of dough elasticity (growth elasticity doubles!). Stoica et al. 2009 used a fungal protease to improve the quality of strong gluten flour (deformation index 4mm), obtaining lower percentage increase (for volume ~ 20% versus 33.8%, for porosity ~ 10% compared to 29.2 %). However, the effects of these proteases are better than those of α -amylase and of the glucose oxidase for both types of flour.

Effects of protease extracted from Carica papaya

Also the protease extracted from *Carica papaya* gave good results for both types of flour; the percentage increase is visibly higher for strong gluten flour, except the increase of porosity (see table 2.). Compared to bacterial protease, the effects are weaker. Compared to the results obtained previously when we used hemicellulases, xylanase and cellulase to improve strong gluten flour (Diaconescu 2005), those presented here are superior.

CONCLUSIONS

Analyzing the results, we observe that enzymatic compositions used in this study improve bread quality derived from both types of flour: flour with normal bakery traits and flour with strong gluten, but the effects are different depending on the flour used: α -amylase and glucose oxidase have weaker effects in bread made of strong gluten flour while proteases have stronger effects. Moreover, except for α -amylase, there are great differences in the dose of enzymatic composition in which maximal effects occur, depending on the quality of flour used.

The following conclusion should be reached: when choosing and using an enzymatic composition one should take into consideration not only its effect on bread quality, but also the quality of flour used and the characteristics of the finite product that one wants to improve.

BIBLIOGRAPHY

Diaconescu D., Balint M., 2010. *Metode de evaluare a calitatii în panificației*, Editura Universității "Aurel Vlaicu" din Arad, ISBN 978-973-752-271-9, pg. 29.

Diaconescu D. 2009. *The Glucose Oxidase Using in Breadmaking Biotechnology*. Revista de Chimie, 60, no. 5, pg. 454-457.

Diaconescu D. 2008. *Tehnologii și calitate în panificației*, Editura Universității "Aurel Vlaicu" din Arad, ISBN 978-973-752-271-9, pg. 199.

Diaconescu, D. 2005. *Efectele unor enzime exogene în pâine, în funcție de calitatea făinii folosite*. Buletinul informativ pentru industriile de morarit și panificatie, no. 16, ISSN 1222-

1120, pg. 103-109.

Đurić V., Malešević M., Panković L., 2005. *Mineral Nutrition as a Factor of Stabilty of Technological Quality in Winter Wheat Cultivars*. Plant Breeding and Seed Production, Serbia, no. 11, pg. 33-39.

Kim J. H., Maeda, T., Morita, N. 2006. Effect of Fungal α -Amylase on the Dough Properties and Bread Quality of Wheat Flour Substituted with Polished Flours. Food Research International, no. 39, pg. 117-126.

Singh H., MacRitchie F., 2001. *Aplication of Polymer Science to Properties of Gluten*. J.Cereal Sci. no. 33, pg 231–243.

Stoica A., Popescu E. C., Iordan M., Bărăscu E. 2009. *Influence of a Fungal Protease on the Physical Properties of Bread Made from Short Gluten Flours*. Journal of Agroalimentary Processes and Technologies no. 15, pg. 301-304.

Vemulapalli, V., Miller, K.A., and Hoseney, R.C. 1998. *Glucose Oxidase in Breadmaking Systems*. Cereal Chem. no. 75, pg. 439-442.

Wooding A.R., Kavale S., MacRitchie F., Stoddard F.L., A. Wallace A., 2000. *Effects of* Nitrogen and Sulfur Fertilizer on Protein Composition, Mixing Requirements, and Dough Strength of Four Wheat Cultivars. Cereal Chem. no. 77, pg. 798-807.

***Romanian Professional Standards Collection: Milling - Breadmaking.

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

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

Vol. XVI (LII) - 2011

STUDIES ON INFLUENCE OF ANTHROPIC FACTORS ON AQUATIC ENTOMOFAUNA IN JIU RIVER

Oliver Cristian Dumitrașcu¹, Ion Mitrea²

KEYWORDS: entomofauna, species, index

ABSTRACT

The human impact on aquatic ecosystems, caused quantitative and qualitative imbalances on the aquatic entomofauna. For knowledge of aquatic insects fauna of the river Jiu, six sections were chosen for harvesting distributed along the river from springs and flows into the Danube, in all forms of relief.

Following parameters were calculated: total taxa, total number of individuals per m^2 , Simpson diversity index (1-D), Margalef diversity index (IM), ShannonWiener diversity index (I_{S-W}), EPTI (no.) and EPTI (%). After studying the samples collected along the river Jiu, aquatic insects were identified from 7 systematic groups, 39 families and 109 species. It was noted that aquatic insect communities respond to changes in habitat quality by adapting their structure.

Information obtained on the state of aquatic habitats in the study area, allow the realization of the degree of change in the aquatic environment associated measures for their protection and conservation.

INTRODUCTION

Current natural and anthropic changes are souch that the situation of limnofil ecosystems from rivers and natural lakes, it must bear considerable external pressure, dangers warning solutions being a major requirement, both in terms of management of these resources and that of conservation and protection of these ecosystems.

For restoration, conservation and rational exploitation of these ecosystems is necessary to know the structural and functional changes as measured by quantitative biological state.

This can be achieved by prospective monitoring of bodies characteristic signs of a particular habitat (algae, bentofauna, zooplankton, fish). Of these organisms, aquatic insects use (as indicator organisms) in assessing the state of ecosystems Limnos is best, because they live in almost all waters and do not have extensive changes in population structure.

Besides faunistic data, the list of species and their inventory, we wanted to provide data on some elements of the population ecology and aquatic insect communities addressed through analytical and synthetic indicators.

¹ National Administration "Romanian Waters" - Jiu Basinal Water Administration, Corresponding address:

O.C.Dumitrascu, E-mail: oliver.dumitrascu@daj.rowater.ro

² University of Craiova, Faculty of Horticulture

MATERIALS AND METHODS

Geographically the Jiu river is located in south-west of the country with a length of 339 km. Distribution of Jiu river from north to south in relation to altitude is as: over 21% of the surface, namely the north part, is occupied by mountain areas, hills belonging to the Getic Plateau occupies approximately 47%, and the plain area assuming over 32%, with a temperate continental climate (annual average temperature is 10,5°C) and average annual rainfall between 400 mm and 1200 mm per year.

Geographical location of each station is shown in the map from Figure 1.



Figure 1. Repartitia sectionilor de prelevare

The water quality was analyzed by parameters witch influencing the entomofauna, both directly and indirectly. For elaboration of this study were used data results from samplings organized in 2010 on the river Jiu in sections Campu lui Neag, Lupeni, Sadu,

Balteni, Podari and Zaval. (fig.1). Were used harvesting tools (handnet, dredge) respecting STAS sampling sites (SR EN 27828/2000, SR EN 28265/2001), allowing the calculation of certain indices. Harvesting was conducted during spring-autumn, especially in summer. This period of maximum corresponds in fact a period of maximum activity of the growing season. On the field were performed also measurements of physical and chemical factors (temperature, pH, dissolved oxygen). For *chemical analysis* were used the following methods:

- pH SR ISO 10523/1997
- conductivity SR EN 27888/1997
- dissolved oxygen and saturation SR EN 25813/2000
- CCOCr SR ISO 6060/1997
- total nitrogen (N) calculated from the concentration of ammonium,
- total phosphorus (P) SR EN 1189/2000

Table 1.

	11	rysicoenen	near ci	laracteri	sties of the	studicu se	cuons		
Date	Air temp. (°C)	Water temp. (°C)	Hq	Cond. (μS/cm)	Diss. oxygen (mgO2/l)	Saturation (%)	CCOCr (mgO2/l)	Total nitrogen N (mgN/l)	Total phosph. (P) (mgP/l)
	I	L		Câmpu l	ui Neag	L			
17.05.10	9	8	7.59	87.3	10.19	88.84	4	0.24	0.022
26.06.10	14	9	7.53	95.4	10.19	91.06	4	0.313	0.017
				Lup	eni				
17.05.10	11	9	7.44	101.1	9.65	94.6	7	0.369	0.047
22.07.10	15	10	8.1	156.5	9.24	94.67	8	0.498	0.042
				Sa	du				
18.05.10	7	6	7.8	133.8	10.5	83.33	-	2.8	0.06
27.07.10	15	13	8.13	169.2	8.8	86.27	-	2.8	0.061
17.08.10	30	26	6.82	163.8	9	112.64	-	2.8	0.054
				Balt	teni				
18.05.10	18	13.5	7.76	181.3	7.8	77.3	12.28	2.8	0.076
27.07.10	25	22	7.72	23.8	6.9	80.89	5	2.8	0.06
17.08.10	32	22	7.87	189.9	8.3	97.3	10.6	2.8	0.104
				Poc	lari				
06.05.10	25	19.5	7.75	321	9.81	118.9	12.8	1.867	0.051
04.08.10	35	24	7.53	317	7.28	88.24	32.4	2.23	0.058
22.09.10	25	15	7.16	23.8	8.78	89.95	14.8	1.288	0.131
				Zav	val			_	
18.05.10	11	13	7.45	246	9.36	91.76	11.4	1.5	0.068
22.07.10	37	30	7.78	270	7.52	99.86	12.6	1.98	0.099
16.09.10	19	20	7.5	339	9.51	107.57	10.2	1.656	0.066

Physicochemical characteristics of the studied sections

For *biological analysis* the samples were collected with Surber sampler and handnet sampler, fixed in 3% formalin, sorted and preserved in alcohol 70% to determination. Guides for species determination used are listed in the bibliography.

For organic pollution, the component "general degradation" will be evaluated based on a set of indices. Indices for assessing the ecological status of rivers based on insect communities are:

- Number of taxa;
- Number of individuals/m²; •
- Simpson diversity index (1-D)
- . Margalef diversity index (I_M) ;
- . Shannon-Wiener diversity index (ISH);
- Index **EPT** – no. of individuals Ephemeroptera-Plecoptera-Trichoptera.

		Parameter	s calculated	for each sec	tion studied		
Date	Total taxa	Total individuals /m ²	Simpson diversity index (1-D)	Margalef diversity index (I _M)	$\begin{array}{c} ShannonWiener\\ Simpson\\ diversity index\\ (I_{S-W}) \end{array}$	EPTI (nr.)	EPTI (%)
			Campu	lui Neag			
17.05.10	25	1266	0.917	3.36	2.815	1023	80.81
26.06.10	18	540	0.86	2.70	2.372	495	91.67
			Lu	ipeni			
17.05.10	24	886	0.925	3.39	2.843	490	55.3
26.06.10	18	559	0.922	2.69	2.696	374	66.91
			S	adu			
18.05.10	23	877	0.906	3.25	2.729	535	61
27.07.10	15	373	0.904	2.36	2.519	262	70.24
17.08.10	14	486	0.851	2.10	2.251	419	86.21
			Ba	lteni			
18.05.10	17	579	0.916	2.52	2.638	268	46.29
27.07.10	13	443	0.882	1.97	2.314	351	79.23
17.08.10	15	572	0.889	2.21	2.4	364	63.64
			Рс	odari			
06.05.10	15	574	0.903	2.20	2.509	172	29.96
04.08.10	15	377	0.903	2.36	2.531	150	39.79
22.09.10	10	241	0.871	1.64	2.146	112	46.47
			Z	aval			
18.05.10	17	582	0.916	2.51	2.636	227	39
22.07.10	26	877	0.942	0.369	3.04	328	37.4
16.09.10	20	482	0.93	3.08	2.815	217	45.02

alculated for each section studied

Table 2.

Selected indices are considered sufficiently sensitive to reflect changes in the composition, structure and functioning of aquatic ecosystems and main types of pressure-response relationships faced by communities of aquatic insects, are easily calculated and user-friendly, easy to apply and allow obtaining reliable data and easy to interpret.

RESULTS

After studying zoocenosis from river were identified seven systematic groups of aquatic insects. Dominant taxonomic groups in number of species are: Ephemeroptera, Trichoptera and Diptera. Most species identified in these groups are species that live in the shore area of standing water or flowing smoothly, where the current is very weak.

Heteroptera are present in almost all sections of the studied basin, in the muddy facies and in macrophytes, at a reduced speed of rivers. Heteroptera species identified in the study area has a wide distribution also in other rivers and stagnant water in the country.

Odonatele are components of the phytophile zoocenosis and of detritus accumulated among vegetation from riverbanks.

Ephemeroptera species are characteristic of slow flowing water with preference for banks vegetation, detritus and sometimes sandy facies-Malo and plateau areas of rivers, the facies with sand, gravel, detritus and water at higher speeds. These conditions explain the presence of species in reofil, stenoterm, litophil and stenoxibiont zoocenosis.

Tabel 3

	Insecte			Pur	icte de	prelev	vare	
Ordin	Familie	Specie	C. lui Neag	Lupeni	Balteni	Sadu	Podari	Zaval
Ephemeroptera		Baetis alpinus	Х	Х				
		Baetis buceratus						Х
		Baetis muticus	Х	Х	Х	Х		Х
		Baetis rhodani		Х	Х	Х		
		Baetis scambus			Х			Х
	Baetidae	Baetis vernus		Х	Х		Х	Х
		Centroptilum luteolum						Х
		Centroptilum						v
		gr.pennulatum						Λ
		Cleon dipterum			Х		Х	Х
		Cleon gr simile						Х
		Caenis macrura					Х	
		Caenis rivulorum			Х			
	Caenidae	Caenis robusta						Х
		Caenis belfiorei						x
		gr.pseudorivulorum						
		Ephemerella	x					
	Ephemerellidae	krieghoffi Ulm						
		Seratella ignita		Х	Х	Х		
	Heptagenidae	Ecdyonurus auranticus				Х		
		Ecdyonurus dispar	Х			Х		
		Ecdyonurus lateralis				Х		

Lista macronevertebratelor bentale din sectionile de monitorizare

		Ecdyonurus venosus	Х	Х		Х		
		Electrogena				v		
		rivuscellana				Λ		
		Heptagenia sulphurea						Х
		Rhitrogena alpestris	Х					
		Rhitrogena hibrida						
		Rhitrogena		v				
		semicolorata		Λ				
	I and a la ala list day a	Habroleptoides			v			
	Lepionebiliade	confusa			л			
	Chlonenoviidae	Chloroperla	v					
	Chioroperiidae	susemicheli	А					
	Leuctridae	Leuctra albida				Х		
DI .	Nemouridae	Protonemura intricata	Х			Х		
Plecoptera	D 111	Dinocras cephalotes	Х					
	Perlidae	Perla marginata	Х	Х				
	P. I. I. I.	Isoperla rivulorum	Х		1			
	Perlodidae	Perlodes intricata	X					
	Calontervoidae	Caloptervx splendens						X
	Catopierygiaae	Gomphus flavines					X	X
	Gomnhidae	Gomphus					11	
	Gomphiaac	vulgatissimus			Х			
Odonata	Lastidaa	Lestes viridis						v
Ouonaia	Lesilule	Libellula depressa						X
	Libabullidaa	Libelula						Λ
	Liberundue	quadrimaculata					Х	
	Platvenemididae	Platyonamis panninas			v		v	v
	Tulychemialaae	Coriva punctata			Λ		Λ V	Λ V
	Corixidae	Conxa punctata					Λ V	A V
	Comidao	Sigala sullata					Λ	A V
	Gerriaae	Gerris odontogaster					v	Λ
Heteroptera	Hyaraeniaae	Hydraena riparia			v		X	v
	Naucoridae	Ilyocoris cimicoides			Х			X
	Nepidae	Nepa rubra						X
		Ranatra linearis						X
	Pleidae	Plea leachi						X
Trichoptera	Beraeidae	Berea maurus	Х	Х		Х		
		Hydropsyche						x
		exocelata						
	Hydronsychidae	Hydropsyche ornatula			Х			
	11yar opsychiade	Hydropsyche				x		
		pellucidula				Λ		
		Hydropsyche tenuis	Х					
		Drusus discolor	Х					
		Eclisopterix madida		Х				
	Limnonhilidae	Limnephilus coenosus		Х				
	Linnephiliade	Limnephilus lunatus					Х	Х
		Mesophylax	37					l
		impunctatus	X					
		Philopotamus	v	1		1		İ
	Philopotamidae	montanus	X					
	Psychomidae	Psychomyia pusilla	1	1	Х	1		
	Rhvachophilidae	Rhyacophila dorsalis	Х	Х				İ —
	, <u>r</u>	· · · · · · · · · · · · · · · · · · ·	1		i		1	·

Rhyacophila X X X Sericostomatidae Sericostoma X X X Dytiscidae Platambus maculatus X X X Eliminhidae Liminius opacus X X X Halphidae Petoides caesus X X X Diptera Athericidae Atherix bis X X X Diptera Athericidae Atherix bis X X X Brillia modesta X X X X X Brillia modils X X X X X Cricotopus tremulus X X X X X Brillia modils X X X X X X Cricotopus tremulus X X X X X X Cricotopus tremulus X X X X X X Cricotopus tremulus X X X X </th <th></th> <th></th> <th>Physicaphile facaista</th> <th>v</th> <th></th> <th></th> <th>1</th> <th></th> <th></th>			Physicaphile facaista	v			1		
$ \left \begin{array}{c c c c c c c c c c c c c c c c c c c $			Rhyacophila lasciata	Λ					
$ \left \begin{array}{c c c c c c c c c c c c c c c c c c c $			Rnyacopnila				Х		
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$			Praemorsa Samia astanta						
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$			Sericostofila				Х		
Seriesotima personatumXXXXDytiscidaePlatambus maculatusXXHaliplidaePettoides caesusXXHaliplidaeHydraen ripariaXXDipteraAthericidaeAtherix ibisXXCeratopogonidaeBezzia spp.XXXBrillia imaculataXXXXXBrillia imaculataXXXXXBrillia modestaXXXXXCratopogon sppXXXXXCoronous thummiXXXXXChionomus thummiXXXXXCictoopus bicinetusXXXXXCricotopus tremulusXXXXXCricotopus treffaciataXXXXXCricotopus treffaciataXXXXXCricotopus treffaciataXXXXXEukiefferiellaXXXXXXEukiefferiella similisXXXXXEukiefferiella similisXXXXXCritotopus trenulusXXXXXEukiefferiellaXXXXXXEukiefferiella similisXXXXXMetriconemus sc		Sericostomatidae	Carrieseterres						
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$			Sericostoma	Х	Х		Х		
$Coleoptera \begin{tabular}{ c c c c c c } \hline Palaunous maculaus & A X X \\ \hline Haliplidae Peltoides caesus & X & X \\ \hline Haliplidae Peltoides caesus & X & X \\ \hline Hydraenidae Hydraena riparia & X & X \\ \hline Ceratopogonidae \\ \hline Ceratopogonidae \\ \hline Ceratopogon spp & X & X & X \\ \hline Ceratopogon spp & X & X & X \\ \hline Ablabesmyia monilis & X & X \\ \hline Trillia maculata & X & T \\ \hline Brillia maculata & X & T \\ \hline Brillia maculata & X & T \\ \hline Brillia monilis & X & X \\ \hline Chironomus thurmi & X & C \\ \hline Corynoneura & X & X \\ \hline Cricotopus bicinctus & X & T \\ \hline Cricotopus trifasciata & X & X \\ \hline Cricotopus trifasciata & X & X \\ \hline Cricotopus trifasciata & X & T \\ \hline Cricotopus trifasciata & X & T \\ \hline Cricotopus trifasciata & X & T \\ \hline Critoropus trifasciata & X & T \\ \hline Critoropeura & X & X & X \\ \hline Cricotopus frictian & X & T \\ \hline Cricotopus frictian & X & T \\ \hline Cricotopus trifasciata & X & T \\ \hline Critoropus trifasciata & X & T \\ \hline Critoropeura & X & X & X \\ \hline Cricotopus frictian & X & T \\ \hline Critoropeura & X & X & X \\ \hline Cricotopus frictian & X & T \\ \hline Critoropus frictian & X & T \\ \hline Chironomus & X & X & X \\ \hline Critoropus frictian & X & T \\ \hline Critoropus frictian & T & T \\ \hline Critoropus frictian & T & T \\ \hline Critoropus frictian & T & T \\ \hline Critoropus frictian & T & T $		Dutinaidur	personatum Distombus measulatus					v	v
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $		Dylisciade					v	Λ	Л
Indipidade Prioritores caesus Image: Comparison of the image	Coleoptera		Limnius opacus				Λ		v
Injuracentale Hydracentale X X Diptera Athericidae Atherix ibis X X X Ceratopogonidae Bezzia spp. X X X Brilla inaculata X X X X Brilla inaculata X X X X Brilla inaculata X X X X Brilla monilis X X X X Chironomus thummin X X X X Chriononeura X X X X Cricotopus fuscus X X X X Cricotopus tremulus X X X X Cricotopus trefasciata X X X X Cricotopus trefasciata X X X X Giptotendipes X X X X X Giptotendipes X X X X X Metriocnemus scirpi X X X X X Microspectra	-	Halipliaae	Peitoides caesus						X
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	DI	Hydraenidae	Hydraena riparia	37					X
CeratopogonidaeBezzia spp.XXCeratopogon sppXXAblabesmyia monilisXBrillia inaculataXBrillia modestaXBrillia monilisXBrillia monilisXChironomus thummiXCladotanytarsusXgr.mancusXCorryonoeuraXscutellataXCricotopus bicinctusXCricotopus fuscusXCricotopus tremulusXXXCricotopus tremulusXXXCricotopus tremulusXXXCricotopus tremulusXCripotopic fincomusXdefectusXEukiefferiellaXgripekoveniXMetriocnemusXfuscipesXMicrospectraXMicrospectraXMicrospectraXMicrospectraXMicrospectraXMicrospectraXMicrospectraXMicrospectraXMicrospectraXMicrospectra spp.XMicrospectra spp.XPolypedilumXbicrenatumXPolypedilumXkienemaniXPolypedilumXkienemaniXPolypedilumXkienemaniXPolypedilumXkienemaniXRecosmitiaXRe	Diptera	Athericidae	Atherix ibis	X					
Ceratopogon sppXXAblabesmyia monilisXXBrillia inaculataXIBrillia modestaXIBrillia modestaXIBrillia monilisXXChironomus thummiXXCladotanytarsusXIgr.mancusXICorjononeuraXXScutellataXICricotopus bicinctusXXCricotopus trifaciataXICricotopus trifaciataXICrippechironomusXXdefectusXIEukiefferiellaXIGlyptotendipesXIgripekoveniXIMetriocnemusXIfuscipesXIMicrospectraXIMicrospectraXIMicrospectraXIMicrospectraXIMicrospectraXIPolypedilumXXPolypedilumXXPolypedilumXXPolypedilumXXPolypedilumXXProdianesa olivaceaXX		Ceratopogonidae	Bezzia spp.		X				
Ablabesmyia monilisXBrillia imaculataXBrillia modestaXBrillia modestaXBrillia molisXChironomus thummiXCladotanytarsusXgr.mancusXCorynoneuraXScutellataXCricotopus bicinctusXCricotopus fuscusXCricotopus trifasciataXCricotopus trifasciataXCrippennisXCryptochironomusXdefectusXEukiefferiellaXEukiefferiellaXGlyptotendipesXgripekoveniXMetriocnemusXfuscipesXMicrospectra <td></td> <td></td> <td>Ceratopogon spp</td> <td></td> <td>Х</td> <td></td> <td></td> <td></td> <td>X</td>			Ceratopogon spp		Х				X
Brillia imaculataXBrillia modestaXBrillia monifisXChironomus thummiXChironomus thummiXCladotanytarsusXgr.mancusXCorynoneuraXscutellataXCricotopus bicinctusXCricotopus bicusXCricotopus tremulusXXXCricotopus tremulusXXXEukiefferiellaXGlyptotendipesXGripekoveniXMetriocnemus scirpiXMicrospectraXMicrospectra spp.XMicrospectra spp.XMicrospectra spp.XMicrospectra spp.XMicrospectra spp.XPolypedilumXXPolypedilumXXPolypedilumXXPolypedilumXX			Ablabesmyia monilis				X		
Brillia modestaXBrillia monilisXChironomus thummiXCladotanytarsusXgr.mancusXCorynoneuraXScutellataXCricotopus bicinctusXCricotopus tremulusXXXCricotopus trefasciataXXXCricotopus trifasciataXXXCricotopus trifasciataXXXCricotopus trifasciataXXXCripptochironomusXdefectusXEukiefferiellaXGlyptotendipesXgripekoveniXMetriocnemus scirpiXMicrospectraXMicrospectraXMicrospectraXMicrospectraXMicrospectraXMicrospectraXMicrospectraXMicrospectraXPolypedilumXNicrospectraXPolypedilumXNorospectraXNorospectraXMicrospectraXMicrospectraXMicrospectraXXXPolypedilumXNorospectraXNorospectraXNorospectraXNorospectraXNorospectraXNorospectraXNorospectraXNorospectraXNorospectraX <tr< td=""><td></td><td></td><td>Brillia imaculata</td><td></td><td></td><td></td><td>X</td><td></td><td></td></tr<>			Brillia imaculata				X		
Brillia monilisXChironomus thummiXChironomus thummiXCladotanytarsusXgr.mancusXCorynoneuraXscutellataXCricotopus bicinctusXCricotopus trifasciataXXXCricotopus trifasciataXCricotopus trifasciataXXXCricotopus trifasciataXXXCrippechironomusXdefectusXEukiefferiellaXclarippennisXGlyptotendipesXgripekoveniXMetrioenemusXMicrospectraXatrofasciataXMicrospectraXMicrospectraXMicrospectraXMicrospectraXMicrospectraXMicrospectraXMicrospectraXMicrospectraXPolypedilumXPolypedilumXNicrospectraXPolypedilumXXXPolypedilumXNorospectraXXXPolypedilumXXXNorospectraXXXPolypedilumXXXPolypedilumXNorospectraXXXYXYXYXYXY			Brillia modesta				Х		
Chironomus thummiXCladotanytarsusXgr.mancusXCorynoneuraXScutellataXCricotopus bicinctusXCricotopus tremulusXXXCricotopus tremulusXXXCricotopus tremulusXXXCricotopus tremulusXXXCricotopus trifasciataXXXCricotopus trifasciataXXXEukiefferiellaXEukiefferiellaXGlyptotendipesXgripekoveniXMetriocnemus scirpiXMicrospectraXMicrospectraXMicrospectra spp.XMicrospectra spp.XOrthocladiusXVienemaniXYXPolypedilumXNXPolypedilumXXXPolypedilumXXXProdiamesa olivaceaXXX			Brillia monilis					Х	
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$			Chironomus thummi					Х	
gr.mancusXXCorynoneura scutellataXXCricotopus bicinetusXXCricotopus bicinetusXXCricotopus trifasciataXXCricotopus trifasciataXXCricotopus trifasciataXXCricotopus trifasciataXXCricotopus trifasciataXXCricotopus trifasciataXXCriptochironomusXXCriptochironomusXXEukiefferiellaXIEukiefferiella similisXIGlyptotendipesXIgripekoveniXIMetriocnemus scirpiXIMicrospectraXIMicrospectraXIOrthocladiusXIDothocladiusXXEnemaniXIMicrospectra spp.XIOrthocladiusXXEnemaniXIPolypedilumXXPolypedilumXXPolypedilumXXProdiamesa olivaceaXXProdiamesa olivaceaXX			Cladotanytarsus			Х			
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$			gr.mancus						
scutellataXCricotopus bicinctusXCricotopus tremulusXCricotopus trifasciataXCricotopus trifasciataXCricotopus trifasciataXCricotopus trifasciataXCricotopus trifasciataXCricotopus trifasciataXCricotopus trifasciataXCrippennisXEukiefferiellaXClarippennisXEukiefferiella similisXClarippennisXEukiefferiella similisXClarippennisXGlyptotendipesXgripekoveniXMetriocnemusXfuscipesXMicrospectraXMicrospectraXIbbatifronsXMicrospectra spp.XOrthocladiusXtienemaniXPolypedilumXbicrenatumXPolypedilumXNorcospectinaXPolypedilumXXXPolypedilumXXXPolypedilumXXXPolypedilumXXXPolypedilumXXXPolypedilumXXXPolypedilumXXXPolypedilumXXXProdiamesa olivaceaXNetosmittiaXNorthocladiusXXX <td></td> <td></td> <td>Corynoneura</td> <td></td> <td></td> <td></td> <td></td> <td>Х</td> <td>v</td>			Corynoneura					Х	v
Cricotopus bicinctusXXCricotopus fuscusXXXCricotopus trifasciataXXXCricotopus trifasciataXXXCryptochironomusXXXdefectusXXXEukiefferiellaXXXclarippennisXXXGlyptotendipesXXXgripekoveniXXXMetriocnemusXXXfuscipesXXXMicrospectraXXXIobatifronsXXXOrthocladinae gen sp.XXXPentapedilum sordensXXXPolypedilumXXXPolypedilumXXXProdiamesa olivaceaXXXProdiamesa olivaceaXXX			scutellata						Λ
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$			Cricotopus bicinctus					Х	
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$			Cricotopus fuscus		Х				
Cricotopus trifasciataXICryptochironomus defectusXXEukiefferiellaXIclarippennisXIEukiefferiella similisXIClyptotendipes gripekoveniXIMetriocnemus fuscipesXIMetriocnemus scirpiXIMicrospectra lobatifronsXIMicrospectra lobatifronsXIOrthocladius tienemaniXIOrthocladius tienemaniXIPentapedilum sordensXIPolypedilum bicrenatumXXPolypedilum bicrenatumXXProdiamesa olivaceaIXRheosmittiaIXRheosmittiaIX			Cricotopus tremulus		Х	Х		Х	
Cryptochironomus defectusXXXEukiefferiella clarippennisXXIEukiefferiella similisXIIEukiefferiella similisXIIGlyptotendipes gripekoveniXIIMetriocnemus fuscipesXIIMetriocnemus scirpiXIIMicrospectra lobatifronsXIIMicrospectra lobatifronsXIIOrthocladius tienemaniIXIPentapedilum sordensXIIPolypedilum bicrenatumXXIPolypedilum bicrenatumXXIProdiamesa olivaceaIXXProdiamesa olivaceaIIXRheosmittiaIIIX			Cricotopus trifasciata	Х					
defectusXXEukiefferiella clarippennisXXEukiefferiella similisXXEukiefferiella similisXXGlyptotendipes gripekoveniXXMetriocnemus fuscipesXXMetriocnemus scirpiXXMicrospectra atrofasciataXXMicrospectra lobatifronsXXMicrospectra spp.XXOrthocladius tienemaniXXOrthocladius tienemaniXXPolypedilum bicrenatumXXPolypedilum convictumXXProdiamesa olivaceaXXProdiamesa olivaceaXX			Cryptochironomus					v	v
Eukiefferiella clarippennisXXEukiefferiella similisXIGlyptotendipes gripekoveniXIMetriocnemus fuscipesXIMetriocnemus scirpiXIMetriocspectra atrofasciataXIMicrospectra lobatifronsXIMicrospectra orthocladius tienemaniXIOrthocladius tienemaniXIPentapedilum bicrenatumXIPolypedilum bicrenatumXXPolypedilum convictumXXPrologendilum convictumXXPrologendilum convictumXXPrologendilum convictumXXRheosmittiaIXX			defectus					Λ	Л
clarippennisImage: Second constraintsImage: Second constraintsEukiefferiella similisXImage: Second constraintsGlyptotendipesXImage: Second constraintsgripekoveniImage: Second constraintsXMetriocnemusXImage: Second constraintsMetriocnemus scirpiXImage: Second constraintsMetriocnemus scirpiXImage: Second constraintsMicrospectraXImage: Second constraintsMicrospectraXImage: Second constraintsIbatifronsImage: Second constraintsImage: Second constraintsMicrospectra spp.XImage: Second constraintsOrthocladiinae gen sp.XImage: Second constraintsOrthocladiusImage: Second constraintsXPentapedilum sordensXImage: Second constraintsPolypedilumImage: Second constraintsXPolypedilumImage: Second constraintsXProdiamesa olivaceaImage: Second constraintsRheosmittiaImage: Second constraintsImage: Second constraints			Eukiefferiella			Х			
Eukiefferiella similisXIGlyptotendipes gripekoveniXXMetriocnemus fuscipesXIMetriocnemus scirpiXXMicrospectra atrofasciataXIMicrospectra lobatifronsXIMicrospectra lobatifronsXIMicrospectra lobatifronsXIMicrospectra lobatifronsXIMicrospectra spp.XIMicrospectra spp.XIOrthocladius tienemaniXIPentapedilum sordensXIPolypedilum bicrenatumXXPolypedilum bicrenatumXXPolypedilum bicrenatumXXPolypedilum bicrenatumXXPolypedilum bicrenatumXXPolypedilum bicrenatumXXPolypedilum bicrenatumXXPolypedilum bicrenatumXXPolypedilum bicrenatumXXPolypedilum bicrenatumXXPolypedilum bicrenatumXXPolypedilum bicrenatumXXProdiamesa olivaceaXXProdiamesa olivaceaXXProdiamesa olivaceaXXProdiamesa olivaceaXXProdiamesa olivaceaXXProdiamesa olivaceaXXProdiamesa olivaceaXXProdiamesa olivaceaXX <tr< td=""><td></td><td></td><td>clarippennis</td><td></td><td></td><td></td><td></td><td></td><td></td></tr<>			clarippennis						
Glyptotendipes gripekoveniXIMetriocnemus fuscipesXIMetriocnemus scirpiXIMicrospectra atrofasciataXIMicrospectra lobatifronsXIMicrospectra spp.XIOrthocladiinae gen sp.XIOrthocladius tienemaniXIPentapedilum bicrenatumXIPolypedilum convictumXXPolypedilum convictumXXProdiamesa olivaceaIXName ConvictumXX<			Eukiefferiella similis	Х					
gripekoveniMetriocnemus fuscipesXMetriocnemus scirpiXMicrospectra atrofasciataXMicrospectra lobatifronsXMicrospectra spp.XOrthocladiinae gen sp.XOrthocladius tienemaniXPentapedilum sordensXPolypedilum bicrenatumXPolypedilum convictumXProdiamesa olivaceaXName ConvictumXNa			Glyptotendipes			Х			
Metriocnemus fuscipesXXMetriocnemus scirpiXXMicrospectra atrofasciataXIMicrospectra lobatifronsXIMicrospectra spp.XIOrthocladiinae gen sp.XIOrthocladius tienemaniXIPentapedilum sordensXIPolypedilum bicrenatumXXPolypedilum bicrenatumXXProdiamesa olivaceaIXProdiamesa olivaceaIXRheosmittiaII			gripekoveni						
fuscipesAXMetriocnemus scirpiXMicrospectra atrofasciataXMicrospectra lobatifronsXMicrospectra spp.XMicrospectra spp.XOrthocladiinae gen sp.XOrthocladius tienemaniXPentapedilum sordensXPolypedilum bicrenatumXPolypedilum convictumXXXProdiamesa olivaceaXXXXXXXXXYYY<			Metriocnemus		v				
Metriocnemus scirpiXMicrospectra atrofasciataXMicrospectra lobatifronsXMicrospectra spp.XMicrospectra spp.XOrthocladiinae gen sp.XOrthocladius tienemaniXPentapedilum sordensXPolypedilum bicrenatumXPolypedilum convictumXXXProdiamesa olivaceaXXXXXXXXXYY <tr< td=""><td></td><td></td><td>fuscipes</td><td></td><td>Λ</td><td></td><td></td><td></td><td></td></tr<>			fuscipes		Λ				
Microspectra atrofasciataXIMicrospectra lobatifronsXIMicrospectra spp.XIMicrospectra spp.XIOrthocladiinae gen sp.XIOrthocladius tienemaniIXPentapedilum sordensXIPolypedilum bicrenatumXXPolypedilum convictumXXProdiamesa olivaceaIXRheosmittiaII			Metriocnemus scirpi				Х		
atrofasciataXImage: Constraint of the second			Microspectra		v				
Microspectra lobatifronsXXMicrospectra spp.XOrthocladiinae gen sp.XOrthocladius tienemaniXXPentapedilum sordensXXPolypedilum bicrenatumXXPolypedilum convictumXXProdiamesa olivaceaXXRheosmittiaXX			atrofasciata		Λ				
IobatifronsXMicrospectra spp.XOrthocladiinae gen sp.XOrthocladius tienemaniXPentapedilum sordensXPolypedilum bicrenatumXPolypedilum convictumXProdiamesa olivaceaXRheosmittiaX			Microspectra			Х			
Microspectra spp.XIOrthocladiinae gen sp.XIOrthocladius tienemaniXXPentapedilum sordensXIPolypedilum bicrenatumXXPolypedilum convictumXXProdiamesa olivaceaIXRheosmittiaIX			lobatifrons						
Orthocladiinae gen sp.XXOrthocladius tienemaniXXPentapedilum sordensXXPolypedilum bicrenatumXXPolypedilum convictumXXProdiamesa olivaceaXXRheosmittiaXX			Microspectra spp.		Х				
Orthocladius tienemaniXXPentapedilum sordensXPolypedilum bicrenatumXPolypedilum convictumXProdiamesa olivaceaXRheosmittiaX			Orthocladiinae gen sp.			Х			
tienemaniXPentapedilum sordensXPolypedilum bicrenatumXPolypedilum convictumXProdiamesa olivaceaXRheosmittiaX			Orthocladius					Х	v
Pentapedilum sordensXPolypedilum bicrenatumXPolypedilum convictumXXXProdiamesa olivaceaXXX			tienemani						Λ
Polypedilum bicrenatumXPolypedilum convictumXXXProdiamesa olivaceaXRheosmittiaX			Pentapedilum sordens				Х		
bicrenatum X Polypedilum convictum X X Prodiamesa olivacea X X Rheosmittia X X			Polypedilum					v	
Polypedilum convictumXXProdiamesa olivaceaXRheosmittia			bicrenatum					А	
convictum X X Prodiamesa olivacea X Rheosmittia X			Polypedilum	v			v		
Prodiamesa olivacea X Rheosmittia			convictum	A			A		
Rheosmittia			Prodiamesa olivacea						Х
\mathbf{v}			Rheosmittia		v			v	v

		spinicornis						
		Stempellina bausei						Х
		Stempellinela brevis				Х		
		Tanypus punctipennis			Х			Х
		Tanitarsini spp.			Х			
		Tanytarsus spp.		Х				
	Culicidae	Chaoborus flavicans					Х	Х
	Cuiiciaae	Chaoborus pallidus	Х		Х			
	Dixidae	Dixa spp.		Х				
	Empididae	Hemerodromia spp.	Х					
	Limoniidae	Hexatona eriocera fultonensis				Х		
		Scleroprocta spp				Х		
	Simulidae	Simulium spp.		Х	Х	Х	Х	

Regarding the obtaining data, note that the Ephemeroptera abundence on the Jiu river is maximum al the Campu lui Neag station, because of some species characteristic to the clean watercourses from upstream. Starting to Lupeni station reveals a drastic decrease thanks to anthropogenic influences, followed by an increase in abundance at Sadu station, thanks to the phenomenon of natural treatment from the Jiu valley. Although small in number, the Ephemeroptera species are present in others stations too (Balteni, Podari, Zaval), their presence is beneficial, indicating that the river have sections that manages to rebuild the quality from contamination caused by anthropogenic factor.

The Plecoptera species are reported mainly in sections from the mountain and Getic Plateau, with a limited spread, as a consequence of environmental conditions in these areas. (Figure 2a)



Figure 2a. Ordinul Plecoptera - Perla sp.; b. "Căsuțe" ale larvelor de trichoptere

Plecoptera species are very abundant upstream of Campu lui Neag station, who appear only after the Lupeni and Sadu in a small numbers and disappear completely downstream of Jiu gorge. The cause of this phenomenon is explained by the fact that these organisms are very sensitive to water loading with organic matter and lack of oxygen.

All Trichoptera species from the studied surface prefer facies with rocks and gravel from river bed and high water speeds. They avoid rivers areas where organic substances found in high concentrations, their low frequency of Oltenia Plain being not accidental. (Figure 2b)

The abundance of Trichoptera species reflect fairly also the anthropogenic pressure, respectively the charge of water with organic substances for Balteni, Podari and Zaval stations, restoring a density similar to the Lupeni station for Sadu station, where the water is purified naturally.

Coleoptera, Heteroptera and Odonata species are also present, with a strong stagnofil and phytophile character. Most inhabit biotopes with emerged and submerged macrophytes. They are present in relatively large sample in the hilly sections, especially in the plain (eg. the Podari and Zaval sections).

Regarding Diptera species, their presence is very high in almost all harvest stations, except in the mountains, where they are present in very low numbers.

CONCLUSIONS

Because the research, both in prelevation phase and in processing phase, were made with respect of the modern principles, nationally and internationally agreed.

The hydrological regim alteration of river Jiu and the deterioration of water quality caused by the domestic/industrial discharges, have profound effects on the aquatic insects.

The anthropogenic changes produced by increased industrialization are becoming more evident by damage to the habitats and natural ecosystems therefore. The human impact on aquatic ecosystems caused quantitative and qualitative imbalaces on aquatic entomofauna. The aquatic insect communities respond to changes in habitat quality by adapting their structure.

The research of entomofauna leads to determining the composition of river Jiu entomocenosis, of density, of frequency, of abundance and geographical spread of each species, and the reporting of environmental changes, witch reflecting the multiple effects of human action on the environment. So, the numerous hydro works like, dams, diversion, correction and adjustment works on the riverbeds, or the ontensification of grazing, the use of chemical fertilizers, sometimes have destructive effects on river Jiu entomocenosis, jeopardizing the existence of some species of insects, but the most important factors that contributed to the depopulation were:

- Deforestation, which in recent years have made quite intense in the upper basin of the river Jiu, made the streams that cross these areas are poor in nutrition and fauna with a population much lower, even threatened with extinction due to strong erosion;
- The flash floods of water, which has ravaged the river bed, had negative effects on insect populations;
- Discharges of domestic and industrial wastewater, especially in big cities in the basin analysis;
- The accidental pollutions arising mainly due to the great industrial plants, refineries, farms, livestock, etc.

REFERENCES

ANTONESCU, C., S., 1967: Biologia apelor. Ed. Didactica și Pedagogica, Bucuresti;

ANTONESCU, C. S. (1938) – Elemente noi in fauna apelor dulci din Romania, Volumul jubiliar "Gr. Antipa, hommage à son oeuvre", Bucureşti, 85-91;

AUBERT et al., (1959): Plecotera, Insecta Helvetica, Fauna Band 1, Series : Insecta Helvetica 1 (pag.91-140), Musèe d'Histoire Naturelle de Neuchatel;

- BARNARD, P., MALICKY, H., 2004, Trichoptera, Fauna Europaea version 1.1, http://www.faunaeur.org;
- BOTOSANEANU, L., 1953, Asupra unor larve inca nedescrise apartinand genului Rhyacophila Pict (Trichoptera), Bul. Sti. Biol., 5(1):34-48;

BOTOŞĂNEANU, L., 1955, Note trichopterologice (I), Bul.Şti.Biol., 7, (3):791-802;

- CHIRIAC, E., UDRESCU, M., 1965: Ghidul naturalistului in lumea apelor dulci, Ed. Stiintifica Bucuresti;
- CONSIGLIO C., (1980): Plecotteri (Plecoptera). Guide per il riconoscimento delle specie animali delle acque interne italiene;
- DIACONU, C., 1971 Raurile Romaniei Ed..IMH București;
- DINULESCU, G. (1966): Diptera.Fam.Simuliidae (Mustele Columbace). Fauna R.S.R. Insecta Vol.XI, fasc.8;
- ELLIOTT, J.M., (1996): British freshwater Megaloptera and Neuroptera: A key with ecological notes, Freshwater biological association Scientific publication Ambleside, Cumbria;
- GODEANU, S.P. (2002): Determinator ilustrat al florei si faunei Romaniei, vol.I-II, Editura Bucura Mond, Bucuresti;
- SR EN 27828/2000 : Water quality. Methods of biological sampling. Guidance on handnet sampling of aquatic benthic macro-invertebrates ;
- SR EN 28265/2001 : Water quality. Design and use of quantitative samplers for benthic macro-invertebrates on stony substrata in shallow freshwaters.

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

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

Vol. XVI (LII) - 2011

SOIL TYPES FROM SEGARCEA AND THEIR FAVOURABILITY FOR WINE-GROWING

Păun (Genoiu) Elena¹, Popa Aurel²

KEYWORDS: viticultural area, soils, profiles, favourability

ABSTRACT

If we are considered that the climate is homogenous into a viticultural area, general characteristics of each type of soil provides favourability for wine-growing, making differences from quality and quantity point of view. In Segarcea, vineyard, between limits of current viticultural area the main types of soils has been investigated in order to establish their favourability for winegrowing. The generosity and delicacy of red and aromatic wines produced at Segarcea are determined by the favourable climate and the presence of soils with good physical and chemical properties.

INTRODUCTION

It can be appreciate that, in a homogeneous area from climate point of view, soil has a great influence on quality and so, only certain types of soils are able to provide high quality wines.

Soil and wine quality are closely related. It's well known that wines from limestone plantations have a special delicacy, and on skeletal and ferruginous soil it can be obtained bright red wines with remarkable generosity.

It is also known that (Murgoci G., 1910; Sardine, 1929; C.N. Cernescu, 1934; Tudor St. et col., 1964) a higher production is obtained on pronounced fertile soils than the poor ones, especially when water supply is ensured and the sun provides a good warming. However so far, researches (St. Teodorescu and col., 1987; Ribera Gayon P. and colab., 2004; Popa Aurel, 2007, 2008; Cotea Valeriu V. and col., 2009; Dejeu Liviu, 2010) have shown in a lesser degree the importance of soil in defining composition and quality of grapes and wines, a soil which reaches level of obvious favourability in order to obtain certain valuable traits of quality.

For last 7-8 centuries, at Segarcea quality wines have been obtained, especially red and flavoured wines.

Observations made over time and less systematic studies revealed that a large contribution at quality favourability is brought by weather conditions (amount of degrees of active temperature, sunlight period of time, small amount of precipitation during grapes

¹ PhD Candidate in Horticulture 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

ripening final stage), but the generosity and delicacy of wines is dependent on soil types present in this area.

Based on these observations, we decided that, during 2007-2010 viticultural years, to make systematic studies on the main types of soil in the vineyard area in order to establish their favourability for wine- growing.

METHOD AND MATERIAL

Researches have been conducted between limits of current viticultural area, where soil types and their physical and chemical characteristics were established using methods recommended by the International Society of Soil Science. Three soil profiles to 150 cm depth were made for this study.

RESULTS AND DISCUTIONS

These three soil profiles revealed two types of soil, relatively closed in terms of their physical and chemical characteristics: pseudorenzinic leached chernozem, argic moderate leached chernozem.

In point called vineyard-village (the plot is planted with Cabernet Sauvignon), which belongs to Dealul Viilor, pseudorenzinic leached chernozem has been identified (data sheet no. 1), formed on parental deposits: limestone and loess deposits.

The sequence of genetic horizons is: Am; A/B; C/cr; D.

Am horizon has 52 cm, black colour, loam texture, sandy and loam texture, rarely loam and clay texture, glomerular well-developed aggregate structure, intense biological activity, gradual transition from one horizon to another. A / B horizon has 29 cm, brown with reddish hues colour, loam and clay texture, polyhedral or prismatic structure. C/cr horizon is 49 cm thick, from 81cm depth to 130 cm, has yellow colour, different texture, poorly structured, calcareous neoformation with medium and high frequency, high or very high effervescence. D horizon starts at 130 cm, formed by limestone and loess deposits.

General characteristics of the soil type can be detached from profile data sheet. It can be seen that the clay fraction less than 0.002 mm ranges from 47.7% (0-10 cm layer) to 37.5% at 110-120 cm depth, soil reaction is slightly acidic (pH = 6 37 to 6.86) to a depth of 35 cm and slightly alkaline (pH = 7.53 to 7.87) at a depth of 50-120 cm. Active calcium is varying between 0.40 and 11.30% in deep horizons (50-120 cm). Active iron (ppm) ranges from 94 ppm (in the horizon 0-10 cm) to 25 ppm at a depth of 110-120 cm. The highest humus percent (4.16%) is found in depth of 0-10 cm and decreases from 0.82% at a depth of 110-120 cm. Soil is rich in phosphorus and potassium (especially to 50 cm deep). Degree of basis saturation is between 91.1% and 97.3%.

With these morphological and compositional features available, we can appreciate that soil is suitable for the cultivation of vine varieties with black, flavored and even white grapes (Fetească alba, Sauvignon) for controlled denomination of origin and even quality steps.

Soil profile no. 2 (Data sheet no. 2) was conducted at the point Cerăt-Malaica, where it is assumed that vine cultivation can be extended. The altitude of this point is 145 m. Area type of soil is argic moderate leached chernozem. The sequence of genetic horizons is as follows: Ap; Am; Bt_1 ; Bt_2 ; B/C; C.

Ap horizon has a depth of 28 cm (0-28), the colour is dark brown grayish, clayey loam texture, polyhedral structure and less developed glomerular structure, plasticity, stickiness, medium porous, thin roots frequently, dry, gradual transition to the next horizon.

Am horizon starts from 28 to 49 cm, colour is dark brown, clayey loam texture, medium polyhedral and glomerular structure, well developed, plasticity, stickiness, less porous, roots frequently, moist, gradual transition.

 Bt_1 horizon lies between 49 and 82 cm, with brown dark yellowish colour, clayey loam texture, medium polyhedral structure, well developed, very good plasticity and stickiness, fine pores, presence of very fine roots (60-70 mm long), clay film covering structural aggregates, moist.

 Bt_2 horizon ranges from 82 to 110 cm, with brown yellowish light reddish colour, clayey loam texture, medium polyhedral structure, well developed, very good plasticity and stickiness, fine pores, clay film covering structural aggregates, moist, gradual transition to the next horizon.

From 110 to 140 cm there is B/C horizon, with reddish light yellow colour, clayey loam texture, massive structure, very plastic, very adhesive, fine pores, moderately compacted, moist, gradual transition to the next horizon.

C horizon is present below 140 cm, reddish orange colour, clayey loam texture, massive structure, very plastic, very adhesive, strong effervescence, alkaline earth carbonates disseminated throughout the soil mass, weighted to heavily compacted, moist.

General characteristics of this type of soil, which provides favourability for winegrowing, are also interesting.

The percentage of clay less than 0.02 mm size is between 44% and 52.2% in 0-150 cm depth, relatively constant. Soil reaction is slightly acidic at a depth of 100 cm and slightly alkaline from 120 to 150 cm. Active calcium carbonate appears at a depth of 45cm (6%) and reaches to 16.9% at 150 cm. Active iron content is high at the depth of 10-20 cm (124 ppm) and varies between 82% and 28% from 45 cm to 150 cm deep. Humus content varies from 3.96% (in layer 10-20 cm) to 1.30% (at 150 cm). The soil is rich in phosphorus and potassium, and base saturation degree varies between 78% (upper layers) and 98.2% (profound layers).

Argic moderate leached chernozem, clayey loam and loam clay texture generated by in situ decomposition-altering material, consisting of medium-fine materials, having eubasic rocks, like loams and calcareous clays (including loess), as underlying material, is favourable for the wine growing, especially black and flavored varieties, but, unlike previous area, soil agricultural technique should ensure a better soil aeration.

SOIL PROFILE SHEET PROFILE NO. 1 Vineyard: Segarcea Vineyard Center Independent: Segarcea Area: Dealul Viilor Point: Vie - Sat, old plantation of Cabernet Sauvignon Viticultural area: Delimited DOC-IC Ownership: Domeniul Coroanei Segarcea Altitude: 145 m Exhibition: Southern Parental Deposits: limestone and loess deposits The type and subtype of soil: pseudurendzinic leachate chernozem The sequence of genetic horizons: Am; A/B;C/pr; D

Am 0-52 cm	52 cm thickness, black colour, loam texture, sandy and loam texture, rarely loam and clay texture, glomerular well-developed aggregate structure, intense biological activity, gradual transition from one horizon to another.
A/B	29 cm thickness, brown with reddish hues colour, loam and clay
52-81 cm	texture, polyhedral or prismatic structure
C/pr	49 cm thick, yellowish colour, different texture, poorly structured,
81-130 cm	calcareous neoformation with medium and high frequency, high or
	very high effervescence.
D	Below 130 cm
130 cm	

Comoral	abarastaristics	oformia	looohoto ohormorrom
Ucherai	characteristics	or argic,	

Deer	Class	II	0-00	Actions	IDC	11	Niture and a	Dll.	V	C-tti	X/A1-0/
Deep	Clay	рн	CaCO ₃	Active	IPC	Humus	Nitrogen	Phosph.	ĸ	Saturation	VAN%
(cm)	<		activ.	Iron		%	(N%)	(Pppm)	(Kpp)	level of	
	0.002		%	(feppm)						bases	
0-10	41,0	6,26	0,0	102	0,0	3,24	0,166	120	212	91,1	86,4
30-40	40,8	6,84	0,0	76	0,0	1,44	0,080	36	64	95,7	94,4
80-90	36,0	7,85	9,2	26	136,1	0,76	0,048	34	44	97,3	-

Favourability: It is advisable to cultivate the vine varieties with black, aromatic and white grapes for controlled denomination of origin and even quality steps.

Vocation: the long tradition of vine cultivation, composition of wines and their olfactory and gustatory characteristics nationally and internationally recognized.

SOIL PROFILE SHEET PROFILE NO. 2 Vineyard Center Independent: Segarcea Area: Dealul Viilor – extend Point: Cerat Malaica Ownership: Domeniul Coroanei Segarcea Altitude: 145 m Eastern Longitude: between the meridian of $23^{\circ}41^{1}15^{11}$ and $23^{\circ}47^{1}00^{11}$ Northern Latitude between parallels The type and subtype of soil: argic, moderate leachate chernozem The sequence of genetic horizons: Ap; Am; Bt₁; Bt₂; B/C; C

Ар	dark brown grayish, clayey loam texture, polyhedral structure and less
0-28 cm	developed glomerular structure, plasticity, stickiness, medium porous,
	thin roots frequently, dry, gradual transition to the next horizon.
Am	dark brown, clayey loam texture, medium polyhedral and glomerular
28-49 cm	structure, well developed, plasticity, stickiness, less porous, roots
	frequently, moist, gradual transition.
Bt_1	brown dark yellowish colour, clayey loam texture, medium polyhedral
49- 82 cm	structure, well developed, very good plasticity and stickiness, fine pores,
	presence of very fine roots (60-70 mm long), clay film covering
	structural aggregates, moist.
Bt ₂	brown yellowish light reddish colour, clayey loam texture, medium
82-110 cm	polyhedral structure, well developed, very good plasticity and

	stickiness, fine pores, clay film covering structural aggregates, moist,
	gradual transition to the next horizon.
B/C	reddish light yellow colour, clayey loam texture, massive structure,
110-140 cm	very plastic, very adhesive, fine pores, moderately compacted, moist,
	gradual transition to the next horizon.
С	reddish orange colour, clayey loam texture, massive structure, very
bellow 140 cm	plastic, very adhesive, strong effervescence, alkaline earth carbonates
	disseminated throughout the soil mass, weighted to heavily compacted,
	moist.

General characteristics of argic, moderate leachate chernozem

Deep	Clay	pН	CaCO ₃	Active	IPC	Humus	Nitrogen	Phosph.	K	Saturation	VAh%
(cm)	<		activ.	Iron		%	(N%)	(Pppm)	(Kpp)	level of	
	0.002		%	(feppm)						bases	
0-20	44,0	5,60	0,0	124	0	3,96	0,184	87	238	78,0	83,5
35-45	46,2	6,54	6,0	82	0	4,20	0,194	38	244	86,9	91,8
60-70	52,2	6,86	11,0	62	0	2,00	0,112	27	236	89,5	93,9
90-100	48,1	6,93	13,8	62	0	1,40	0,082	15	271	91,3	94,6
120-130	44,6	7,52	16,9	44	2	1,35	0,080	15	111	95,2	97,4
140-150	44,2	8,09	16,9	28	96	1,30	0,065	14	84	98,2	99,1

Favourability: Argic moderate leached chernozem, clayey loam and loam clay texture generated by in situ decomposition-altering material, consisting of medium-fine materials, having eubasic rocks, like loams and calcareous clays (including loess), as underlying material, is favourable for the wine growing, especially black and flavored varieties for controlled denomination of origin and even quality steps.

Favourability: Vine cultivation has been present in this area for last 6-7 centuries. Composition of wines and their olfactory and gustatory characteristics has been nationally and internationally recognized.

CONCLUSIONS

1. Studies concerning soils present in the current viticultural area of Segarcea shown the presence of two types of soil: pseudorenzinic leached chernozem and argic moderate leached chernozem.

2. Those two soil types are recommended as favorable for wine growing by their morphological characteristics and chemical composition, mainly by appreciable proportions of humus and activ lime.

3. Those two types of soil are easily heated, well aerated, but it is needed moisture intake during dry period.

4. High content of calcium carbonate forces us to choose carefully rootstock (resistant to limestone), and also, high content of active iron points out about chlorosis that may arise in vineyard.

5. The generosity and delicacy of red and aromatic wines produced at Segarcea are determined by the favourable climate and the presence of soils with good physical and chemical properties.

REFERENCES

1. Cotea D. Valeriu, Cristinel Zănoagă Valeriu V. Cotea, 2009, Tratat de oenochimie, vol Iși II Editura Academiei Române, București.
2. Cernescu C.N., 1934 Facteurs du climat et zones de sol en Roumanie, Inst. Geolog. Rom. St Telin S.C. Nr 2, București.

3. Dejeu Liviu, 2010 Viticultură. Editura Ceres, București

4. Murgoci G., 1910 Die Bodenzonen Rumanieus. An. Inst. Geolog. al României Vol IX, 2010.

5. Popa Aurel, 2007, Areale viticole din Oltenia- România cu vocație pentru obținerea vinurilor de calitate cu denumire de origine controlată (D.O.C.). Analele USAMV Cluj Napoca- Seria Horticultură.

6. Popa Aurel, 2008. Secretul vinului bun. Editura Alma Craiova

7. Ribereau Gayon P., Glories Y., Marijean A, Dubordieu D, 2004, Traite d"oenologie, vol II. Chimie du vin. Stabilisation et traitements, Dunod, Paris

8. Saidel T., 1928, Etude chimique des principaux types des sols de Roumanie, vol XIV e Congr. Intern. d''Agriculture, București

9. Teodorescu Șt., Popa A, Sandu Ghe, 1987., Oenoclimatul României. Editura Științifică și Enciclopedică București.

10. Tudor Șt., Condei Gh., 1964, Cercetări privind îmbunătățirea unor însușiri ale solului și productivității viței de vie, sub influența aplicării lucrărilor superficiale și a îngrășămintelor. Analele ICHV, vol VIII București.

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

Vol. XVI (LII) - 2011

RESEARCHES CONCERNING SOILS TYPES FROM DRANIC –DOLJ IN ORDER TO EXTEND VINES CULTIVATION FOR PRODUCTION OF HIGH QUALITY WINES

Păun (Genoiu) Elena¹, Popa Aurel²

KEYWORDS: soils, physico-chemical characteristics, profiles, wine, quality

ABSTRACT

Climate and soil deeply influence the quality and quantity peculiarities of grapes and wines. In a region homogenous from climate point of view, a similarity of soils from two different area can shows the same favourability for wine -groing. Features and characteristics of soil type from Segarcea vineyard was compares with a similar soil from near area (Dranic)in order to establish the level of real vocation for obtaining specific quality traits of high value.

INTRODUCTION

Almost all soil characteristics influencing wine quality are closely related or conditioned by climate. Chemical and, especially, physical characteristics of soil and subsoil, which regulate air, water and temperature regime, permeability of soil and water retention capacity, are the most important. In cooler wine-growing areas, gravel provides a better drain water excess and easier heat, allowing heat retention and a better ripening of grapes. Also, torretial rains occurred after veraison are less unfavourable for vines if the soil is permeable and allows a rapid and deep infiltration of water. Well drained soils are a first major condition of quality, especially in cooler wine-growing areas. A good drainage is an outcome of two facts: peculiarities of soils (sand, gravel etc.) and slope (the higher slope, the easier dranage). It contributes to the rapid heating of soil during the day.

Drainage has a high importance - not only in cooler regions but also in others encouraging the installation of the noble variety of mold, protecting plantations of grapes for red and flavored wines.

Systematic researches (Condei Gh., 1971, 1977; Dejeu L., 1984, 2010; Fregoni M., 2005; Carbonneau A. and colab., 2007; Popa A., 2007, 2008) have highlighted the importance of soil peculiarities in defining composition and quality of grapes and wine, meaning that the soil reaches the level of real vocation for obtaining specific quality traits of high value.

It is noted that, in the same favourable climate area, even for the same variety, the wine ceases to be excellent and becomes common, if the soil, different from the traditional one, is an inconvenience.

¹ PhD Candidate in Horticulture 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

Based on these realities and taking into account the desire to cultivate at Dranic – Dolj vines for high-quality wines, during 2007-2010 we developed a study on soil types present in this area in order to prove their vocation a quality wine-growing.

METHODS AND MATERIAL

Researches had been conducted in an area of 18 ha from Dranic-Dolj. Here, soil types and their physico-chemical characteristics had been established using methods recommended by the International Society of Soil Science. The results of soil profiles were compared with those of a similar soil from the vineyard area of Segarcea.

RESULTS AND DISCUTIONS

Three soil profiles were made and the study of physical-chemical properties of each profile shows the presence of a main type of soil: cambic chernozem, limestone, epicalcaric, moderately deep with clayey loam texture. The profile from Valea Fântâniței point (Profile soil no. 2) shows that this type of soil has genetic horizons in the following sequence: Am, Bv; C/C(ca); C(ca); C(ca); C(ca); C(ca); over 130 cm.

Am horizon (0- 43 cm) is 43 cm high, brow-gray colour, clayey loam texture, weak grainy structure, plasticity, stickiness, poorly compacted, rare roots, gradual transition to the next horizon. Bv horizon lies from 43 cm to 70 cm, with dark yellowish - brown colour, clayey loam texture polyhedral structure, plasticity, stickiness, rare roots, poorly compacted, gradual transition

C(ca) horizon is present from 70 cm to 90 cm, yellowish brown-gray colour, gray clayey loam texture, polyhedral structure, weak plasticity, stickiness, fine pores, poorly compacted, rare thin roots, gradual transition, strong effervescence, presence of alkaline earth carbonates disseminated throughout the soil mass (inflorescences).

SOIL PROFILE SHEET 1

Vineyard: Segarcea Vineyard Independent Center: Segarcea Area: Vine Hill Point: Wine Cellar (North part), new plantation of Cabernet Sauvignon Viticultural area: Delimited DOC-IC Ownership: Domeniul Coroanei Segarcea Altitude: 145 m Exhibition: Southern Parental Deposits: limestone and loess deposits The type and subtype of soil: leachate chernozem The sequence of genetic horizons: Am, B, C, D.

Am	Thickness 42 cm, brown, dark gray, clayey loam texture, medium or large
0-42 cm	glomerular structure, well-formed glomerula, almost porous, frequently
	coprolites.
В	35 cm thick, dark brown, yellowish brown, clayey loam or clay texture,
42-77 cm	prismatic structure, average compact porosity.
С	53 cm thick, yellowish, more or less white depending on the limestone
77-130 cm	concretions, average effervescent, different textures, poorly structured.
D	Over 130 cm
130 cm	

Deep	Clay	pН	CaCO ₃	Active	I.	Humus	Nitrogen	Phosph.	K	Saturation	VAh%
(cm)	<		activ.	Iron	PC	%	(N%)	(Pppm)	(Kpp)	level of	
	0.002		%	(feppm)						bases	
0-10	41,0	6,26	0,0	102	0,0	3,24	0,166	120	212	91,1	86,4
30-40	40,8	6,84	0,0	76	0,0	1,44	0,080	36	64	95,7	94,4
80-90	36,0	7,85	9,2	26	136,1	0,76	0,048	34	44	97,3	-

General characteristics of soil type: leachate chernozem (profile II)

Favourability: It is advisable to cultivate the vine varieties with black, aromatic and white grapes for controlled denomination of origin and even quality steps.
Favourability: the long tradition of vine cultivation with black, white and aromatic grapes. Composition of wines and their olfactory and gustatory characteristics provide a genuine personality.

SOIL PROFILE SHEET 2

Vineyard: Segarcea Vineyard Independent Center: Segarcea

Area: Dranic Point: Valea Fantanitei (S = 18.4 ha) Viticultural area: Delimited DOC

Ownership: SC V.INC SRL - Comuna Dranic

The typee of soil: Cambic chernozem, limestone, epicalcaric, deeply moderate The sequence of genetic horizons: Am, Bv, C/C(ca); $C(ca)_1$; $C(ca)_2$

Am	Brown gray color, clayey loam texture, weak, grainy structure, plasticity,
0 - 43 cm	plasticity, stickiness, poorly compacted, rare roots, gradual transition to
	the next horizon.
Bv	Dark yellowish - brown colour, clayey loam texture polyhedral structure,
43- 70 cm	plasticity, stickiness, rare roots, poorly compacted, gradual transition
C(ca)	Yellowish brown-gray colour, gray clayey loam texture, polyhedral
70-90 cm	structure, weak plasticity, stickiness, fine pores, poorly compacted, rare
	thin roots, gradual transition, strong effervescence, presence of alkaline
	earth carbonates disseminated throughout the soil mass (inflorescences).
$C(ca)_1$	Light yellowish-brown colour, with white spots, middle loam texture,
90-130 cm	polyhedral structure, moderately compacted, strong effervescence,
	presence of alkaline earth carbonates disseminated throughout the soil
	mass as effervescent forms and accumulations in nests downward.
$C(ca)_2$	Light yellowish-brown colour, with white spots, medium clayey texture,
130-150 cm	structure polyhedral, moderately compacted, strong effervescence,
	presence of alkaline earth carbonates disseminated throughout the soil
	mass as inflorescences.

General	characteristics	of cambic	chernozem so	l, limestone	, epicalcaric,	deeply moderate
					, , ,	

Deep	Clay	pН	CaCO ₃	Active	I.	Humus	Nitrogen	Phosph.	K	Saturation	VAh%
(cm)	<		activ.	Iron	PC	%	(N%)	(Pppm)	(Kpp)	level of	
	0.002		%	(feppm)						bases	
0-43	43,1	6,53	0,00	107,0	0,0	3,00	0,158	55,1	146	77,1	95,0
43-70	41,3	7,55	0,70	66,0	0,7	1,52	0,086	22,7	144	86,0	85,0
70-90	34,8	8,18	13,40	48,0	31,3	1,08	0,60	14,4	118	91,2	85,0
90-	31,8	8,25	19,80	32,0	79,1	0,80	-	12,2	92	93,4	-
130											
130-	31,8	8,28	18,60	24,0	163,2	0,52	-	9,6	85	95,0	-
150											

• Favourability: cambic chernozem, limestone, epicalcaric, deeply moderate, clayey loam texture, formed on loess deposits and carbonate rocks, compaction is moderately, deep horizons rich in limestone, rich in potassium and phosphorus and active iron. It is preferably planted with vine, but using rootstocks resistant to limestone.

• Favourability: vine plantations used to be in this area, but from other point of view than level of suitability, they abandon its.

Soil is suitable for cultivation of black and aromatic varieties of grapes.

Horizon $C(ca)_1$ immediately follows with characteristics: a light yellowish-brown colour, with white spots, loam texture, middle polyhedral structure, moderately compacted, strong effervescence, presence of alkaline earth carbonates disseminated throughout the soil mass as effervescent forms and accumulations in nests downward.

 $C(ca)_2$ horizon has light yellowish-brown colour, with white spots, lies from 130 cm deep to 150 cm, medium clayey texture, structure, polyhedral, moderately compacted, strong effervescence, presence of alkaline earth carbonates disseminated throughout the soil mass as inflorescences.

Analyzing general particularities of soils from various depths we find that clay fractions with size less than 0.002 mm oscillate from 43.1% at depth of 0-43 cm to 28, 9% at 150-197 cm depth. Soil reaction ranges from slightly acid soil (pH = 6.53) at 0-43 cm depth, up to pH = 8.37 (slightly alkaline reaction). The soil has an appreciable proportion of the active calcium carbonate, especially at depth of 43-197 cm. The presence of active iron is evident, proportions ranging from 107 to 48 ppm are found in up to 90 cm, at greater depths (150-197 cm) iron does not exceed 21 ppm. Humus content decreases from 3% (0-43 cm depth) to 0, 28% (150-197 cm depth). The soil has sufficient proportions of phosphorus and potassium, especially in horizons up to 130 cm. Saturation level of bases varies from 77, 1% (horizon 0-43 cm) to 97% (maximum depth of 150-197 cm). Comparing features and characteristics of this soil type from Segarcea Vine Hill area, we find an obvious similarity (data sheet no. 2), obviously with some, but not significant nuances. There is a difference in terms of percentage of humus: less humus content at Dranic than at Segarcea.

Cambic chernozem, limestone, from Dranic is currently epicalcaric deeply moderate, clayey loam texture, formed on loess deposits and carbonate rocks, moderate compaction, deep horizons rich in limestone, rich in potassium and phosphorus and active iron. It is preferably planted with vine, but using rootstocks resistant to limestone.

It is advisable to use chlorosis resistant varieties of vine.

CONCLUSIONS

1. In the area of Dranic - Dolj cambic chernozem is the predominant soil type having morphological and physico-chemical properties which are suitable for vine cultivation using black and aromatic varieties of grapes for quality wines.

2. Features and characteristics of soil type from Dranic Dolj are relatively similar to those of Segarcea-Vine Hill area.

3. For vine plantations must have regard to the use of resistant limestone rootstocks and noble varieties resistant to chlorosis.

REFERENCES

1. Carbonneau A., Delorie A., Jailard B., 2007, La vigne- physihologie, terroir. culture. Edition Dunod, Paris 442p

2. Condei Ghe., 1971, Rezintența viței de vie la unele condiții nefavorabile și boli parazitare sub influența îngrășămintelor chimice. Analele ICVV Valea Călugărească vol. VIII București

3. Condei Ghe., Popa A., 1977, Testarea fertilității solului din podgoriile Drăgășani și Miniș, prin analiza agrochimică și diagnoza vegetală. Analele ICVV Valea Călugărească vol VIII

4. Dejeu L., 1984, Caracterizarea solurilor în legătură cu cultura viței de vie în centrul Valea Călugărească. Teză de doctorat IANB București.

5. Dejeu L., 2010, Viticultură. Editura Ceres București.

6. Fregoni M., 2005, Viticultura di qualita. Editare phytoline affi.

7. Popa A., 2007, Arealele viticole din Oltenia-România cu vocație pentru obținerea vinurilor de calitate cu denumire de origine controlată (DOC). Analele USAMV Cluj Napoca- Seria Horticultură.

8. Popa A., Secretul vinului bun. Editura Alma, Craiova

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

Vol. XVI (LII) - 2011

SURVEY ON THE CHROMATIC CHARACTERISTICS OF RED WINES OPRISOR MEHEDINTI

Nicolae Gheorghiu, Veronica Gheorghiu, Liviu Grigorica, Aurel Popa

SUMMARY

Between 2008 and 2010 several notices and determinations were carried out regarding the color intensity and color shade (tonality). These are distinct features of the wines obtained under various climatic conditions at the vineyards at Oprisor. Survey emphasized the chromatic features of red wines, obtained from varieties such as: Shiraz, Primitivo and Dornfelder, recently introduced in cropping, in order to enlarge the black grapes assortment, used for obtaining red wines.

Our surveys pointed out that Shiraz and Primitivo wines have the color intensity and tonality similar to Merlot and even Cabernet Sauvignon. Taking into account that their composition features are similar to famous wine varieties, and having intense colors and discreet tonality, the wine varieties that we are dealing with were awarded with silver and gold medals.

INTRODUCTION

As synthetic notions for characterizing the chromatic of red wines, the color intensity (CI) and color shade (CS) depend on the genetic structure of the wine varieties and cropping conditions. Phenolic maturity points out the evolution of the grapes when rippening. This fact provides the quality and authenticity of red wines, by phenolic constituents preserved in the grape beans, in different stages influenced by the genetic nature of wine varieties, cropping area and climatic features.

Taking into account that the quality of red wines depends on the chromatic composition of the grapes and on the quality of the wine varieties in certain cropping areas (there are not many quality cropping areas in the world), but also on the climatic conditions in the cropping years, several surveys have been carried out by Alexia Alexandra, in 1965;Amroni Joutei, K.in 1993 and 1994; Augustin, M. in 1986; Badea, P., in 1998; Berenete B. And co-operators in 2000; Cagnasso, E. And co-operators in. 2003 and 2008; Cayla, L., in 2000; Peyron Dominique in 1998. The surveys had as subject matters the wine varieties capacity to stock coloring substances and their qualitative structure; climatic conditions that influence the accumulation of color substances; technological methods for shifting the color substances from the grape to the wine; factors that determine the maintaining of the color intensity and tonality on a long period of time; methods for investigating the color substances.

Taking into account that at Oprişor-Mehedinţi quality red wines were obtained, such as Cabernet Sauvignon, Merlot, Pinot noir, Fetească Neagră, and, due to the fact that, lately new black grapes varieties were cropped for red wines (Shiraz, Primitivo, Dornfelder), between 2008 and 2010, we aimed at pointing out the chromatic features of these wine varieties.

METHOD AND MATERIAL

In order to determine the color intensity (CI) and color shade (CS), the following wine varieties have been studied: Cabernet Sauvignon, Merlot, Shiraz, Primitivo and Dornfelder, which were obtained by using classic technologies for red wines. Determinations were made at the beginning of the wine maturation period.

Color intensity (CI) was influenced by knowing the optical density of wavelengths: 420 nm; 520 nm; 620 nm. Color shade (Nc) was defined by establishing the proportion between 420 nm wavelength absorbtion and 520 nm wavelength absorbtion. Determinations were made by using spectrophotometer UV.VIS GBC CINTRAL 101.

The organoleptic approach of wines was determined by experts, by using the quality compensation system, by points, from 1 to 20.

RESULTS

Wines obtained in 2009 and 2010 at Oprişor-Mehedinţi by their chromatic features prove that this area has auspicioius features for vineyards cropping, especially for red wines (as shown in table 1).

For Merlot-type wines the color intensity increased to 12, both in 2009 and in 2010. Color shade is also constant (0,32-0,33). Wine impresses by its intense brownish-red color. The fragrance is delicate and lasting, wild-fruit like taste, or similiar to mature wines. The pleasant taste is unique, soft chocolate-like. From an organoleptic approach, this wine variety got 19-19.50 points.

Of all studied wine varieties, Cabernet Sauvignon, given its structure is part of the red wines category and impresses by its delicacy and generosity, and also its unique personality. It is brownish-red, high and constant color intensity, between 12 and 13.

The taste of the wine is soft, sweet-viola like fragrance. When matured, the wine generosity and delicay increase. From an organoleptic approach, it got the highest appreciation, i.e. silver and gold medal (19,50-20,00).

Wines obtained from the Dornfelder varieties have a high color intensity (CI) and tonality, but less persoanlity. This is the reason why it got little score when tasted (18-18,50). When not matured, the color intensity is high. Considerăm că în cupaj cu alte vinuri se va obține un vin roșu de foarte bună calitate. When blended with other wines, the result is a good quality red wine.

From a chromatic approach, Shiraz wines are similar to Merlot, regarding the organoleptic features. It is reddish-rubly like, with brownish shades. The fragrance is vanilla, wood, cherries or carob-like. Wines are firm and balanced.

A similary qualitative wine to Shiraz is the one obtained from the Primitivo grape variety. It is discreet, delicate and tasteful. Due to its harmonious, delicate and inviting taste it was awarded for similar Shiraz taste. It impresses not only by its color intensity, but also its color tonality. It is a must that this wine variety to be used for obtaining quality red wines at Oprisor.

CONCLUSIONS

1. Chromatic characteristics of the res wines at Oprisor give them a good color intensity and tonality.

- 2. The color intensity, as well as the color shade depend on the genetic structure of the variety, and especially on the soil and climatic conditions of the vineyard area.
- 3. The most constant stability regarding color intesnity and color shade is spread at Cabernet Sauvignon, Merlot, Shiraz and Primitivo varieties.
- 4. Shiraz and Primitivo varieties are considered the most cropped at Oprisor, in order to enlarge the black soil assortment for red wines.

BIBLIOGRAPHY

- 1. Alexandra, Alexia, 1965-Comparative survey of the methods for the chromatic characterization of red wines. Scientific works, I.C.H.V., vol. IX
- Amrani Joutei, K., 1993-Localisation des anthocyanes et des tanins dans la boie.de raisin, e' tude de leur extractibilité. These de doctorat. Université de Bordeaux Ii, France
- Amrani Joutei, K., Glories, Z.-1994-E'tude en conditions modéles de extractibilité des composés phénoliques des pellicules et des pépins de raisins rouges. Journal International de Sciences de la Vigne et du Vin, no. 28, pag. 303-317
- 4. Augustin, M., 1986-E'tude de infleunce de certains facteurs sur les composés phenoliques du raisin et du vin. These Doctorat. Université de Bordeaux II.
- Badea, P., 1998. Contributions on the study of the oenological potential of the Pinot noir variety in the vineyard Podgoria Dealul Mare and the optimization of the polyphenolic extraction during the fermentation stage. PhD Thesis. U.S.A.M.V., Bucharest
- Besente B., Garcia D.D.C., Reichen M., Janger, K.-Method development for the dtermination of anthocyanins in red wines by high-performance liquid chromotographz and classification of German red wines bz means of multivarieties statistical methods. Journal Chromotographz, nr. 871 (1-2), p. 95-103
- Cagnosso E., Caudana E., Rolle L., Gerbi V., 2003, Contributo allo studioi de la maturitá fenolica in ...piemontesi. Viticoltora, Enologia.Universita di Torino, nr. 26, pag. 61-80
- Cagnasso E., Rolle L., Candana A., Gerbi V., 2008- Relationship between grape phenolic maturiz and red wine phenolic composition. Italia Jorunal Food Sciences, vol 3, nr. 20, pag. 365-380
- Cayla L., 2000- Caractérisation du potentiel poliphénolique des raisins rouges. Comparaison de méthodes et réalisation concréte. Mondiaviti Bordeaux, C.R. techniques, I.T.V. France, Paris, pag. 95-104
- Peyron Dominique, 1998-Le potentiel poliphénolique du Pinot noir. Re.... Française d'Oenologie, nr. 170, pag. 40-42

No	Wine	Viticultural	A 420	A 520	1620	Ic(A420, A520,	Nc	Tasting
INU.	variety	year	A420	A320	A020	A620)	(A420/A520)	point
		2000	2.560-2.700	8.6313-8.6360	0.9359-0.9406	12.128-12.537	0.30-0.34	19.50
1	Marlat	2009	2.685	8.6356	0.9371	12.431	0.33	
1.	I. IVICIIO	2010	2.447-2.945	8.6330-8.6354	1.1736-1.1768	12.459-12.401	0.31-0.33	10.00
		2010	2.7243	8.6337	1.1742	12.532	0.32	19.00
		2000	2.4140-2.6056	8.6331-8.6395	0.8935-0.8977	12.111-12.141	0.28-0.30	20.00
2	Cabernet	2009	2.5846	8.6323	0.8974	12.064	0.29	20.00
Ζ.	Sauvignon	2010	2.7716-2.9344	8.6308-8.6337	2.1756-2.2016	13.582-13.752	0.32-0.33	10.50
		2010	2.8056	8.6335	2.1856	13.588	0.33	19.30
		2009	3.7394-3.9179	8.6326-8.6347	3.1736-3.2701	15.554-15.805	0.43-0.45	18 50
2	Dornfalder		3.9052	8.6338	3.2123	15.741	0.45	18.30
5.	Donneider	2010	2.6647-2.8401	8.6319-8.6343	2.3805-2.4079	13.687-13.873	0.31-0.32	18.00
			2.7186	8.6340	2.4012	13.732	0.32	18.00
		2009	3.1535-3.3048	8.6325-8.6345	1.0540-1.0555	12.840-12.995	0.37-0.38	10.00
4	Shiroz		3.2362	8.6339	1.0554	12.923	0.38	19.00
4.	Sillaz	2010	2.3689-2.9892	3.2557-3.5438	0.8060-0.8074	6.669-6.807	0.68-0.92	10.00
			2.6813	3.3179	0.8066	6.719	0.80	19.00
		2000	2.3734-2.5343	3.0977-3.5741	0.6064-0.6091	6.241-6.711	0.7-0.82	18 50
5.	Primitivo	2009	2.5295	3.3765	0.6081	6.358	0.76	10.30
		2010	-	-	-	-	-	-

Chromatic features of the red wines obtained at Oprişor-Mehedinți, between 2008 and 2010 (Ic și Nc-minimum limits, maximum and average)

Table 1

155

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

Vol. XVI (LII) - 2011

THE VALUE OF THE POLYPHENOLS INDEX AT THE RED WINES OBTAINED FROM MEDITERRANEAN GRAPE VARIETIES CROPPED AT OPRIŞOR-MEHEDINŢI

Veronica Gheorghiu, Nicolae Gheorghiu, Liviu Grigorica, Aurel Popa

KEYWORDS: optical density, variety, absorbance, structure, astringent, slim, framing, quality, balance.

SUMMARY

After 1990, in some vineyards in Mehedinti, therefore at Oprişor there had been planted the grape varieties: Shiraz, Primitivo, Dornfelder, aiming at enlarging the assortment of the red grape varieties, similiar to Cabernet Sauvignon and Merlot. These wine varities have become famous due to their ample structure and olfactory and gustatory features.

INTRODUCTION

Polyphenoles in grapes are represented by two large groups of substances: color substances și crystal-like substances, which are color substances and chemical vegetal astringent substances, which are colourless plyphenols.

Polyphenols in grapes, after sugars and acids proved to be the most effective. They give the colour to the wine, the soft or astringent taste, structure and corpulence, and even phisical-chemical stability. Therefore, especially in countries where red wines are produced, surveys were carried out, in order to notice polyphenols absorbance in grapes; the technological means to extract these substances from the grapes and shifting them to thr wine; their part in shaping the quality of wines, the way they keep the nutritious features of wines on long term (Teodorescu Stefan and co-operators. 1987; Teodorescu Ştefan, 1977, Țârdea Constantin and co-operators. 2000, Gheroghiță M. and co-operators. 2006; Popa A., 2008; Croitoru Constantin, 2009; Saint-Cricq şi colab., 1998, Ribereau Gayon şi colab. 1998, Gheorghiță M. and co-operators. 1978; 1983; Cotea V. and co-operators. 2009).

Taking into account the polyphenols content, there can be estimated the capacity of a grape variety to convert solar energy in color substances, whose structure and size influence the quality of red wines.

Severin vineyards (Oprişor-Drâncea; Oreviţa-Vânju Mare, Stârmina) are famous for the soil and climatic conditions, where famous red wine varieties are obtained, such as: Cabernet Sauvignon, Merlot, Pinot Noir, Fetească Neagră.

In order to enlarge the black grape variety of which red wines are obtained, Medieranean black grape varieties have been cropped in these varieties, for the last 10 years, such as Shiraz, Dornfelder, Primitivo.

Taking into account these wine varieties have not been cropped in Romania so far, between 2008 and 2010, we aimed at carrying a survey about the way these varieties can

value the soil and climatic conditions in the area, and if they can help obtaining quality red wines, suh as Cabernet Sauvignon, Merlot, Pinot Noir, Fetească Neagră.

In this survey, there is presented a part of the results on the polyphenols index at the recently cropped grape varieties.

WORK METHOD AND USED MATERIAL

Surveys were carried out on the wines obtained of the Shiraz, Dornfelder and Primitivo grape varieties in 2009 and 2010, using the same wine technology, i.e. the callsic technology for obtaining red wines.

After the primary wine stage has finished, and alcholic and malolactic fermentation has perfected samples from wines were taken and studied (alcohol, total and volatile acidity, PH, free and total SO2, unfermented sugars). In order to carry these experiments, methods agreed by the O.I.V. were followed.

Meanwhile, the values of the polyphenols index were established, by finding the optical or absorbant density measured for a wave length of 280 mm(DO280).

Determinations were carried out using a spectophometer UV-VIS GBC CINTRA 101, controlled by Cintral software, on the external Compaq computer.

Total polyphenol index was calcultated, by using the following equations:

IPT=DO280x 100

100=dilution coefficient of the wine sample

coeficientul de diluție a probei de vin

IPT<30, corresponds to soft taste wines;

IPT between 30 and 50 well-structured wines;

IPP>50, astringent wines, excessive polyphenols content.

After laboratory experiments perfected, experts determined the olfactory and gustatory features of wines.

RESULTS

Phisical and chemical analyses on the red wines obtained between 2008 and 2010, at Oprişor determined the location where grapes variety can use the soil and climatic conditions at Oprişor-Mehedinţi (see table1).

Of all wine components that influence their quality the most common is alcohol, acids percentage, especially tartaric acid, the concentration value of hydrogen ions, sulfur dioxide concentration.

Results that were obtained pointed out that at Oprişor-Mehedinţi all 5 black grape varieties are rich in sugars content and maintain total acidity at a high levels, facilitating the maturation of the wine. This way, wines become generous and refined.

Wines with a balanced structure are Cabernet Sauvignon-type, meaning that the location of this black grape variety provides the quality of the wine.

There must be noticed that Merlot, Shiraz and Primitivo wine varieties are similar, due to their structure, and are able, by their organoleptic structure to help obtaining new quality red wine varieties, that can compete other wines, i.e. Mehedinți-Oprișor wine variety. Taking into account the importance that polyphenols have in framing the structure of red wines (soft or astringent taste and phisical-chemical balance), we suggested to determine the total value of polyphenol index for red wines obtained of black grapes varieties, in order to establish the structure of these wines, which indicate the flexibility of red wines. Results obtained between 2008 and 2010 are shown in table no. 2. Taking into account these results, there have been noticed thatt well-structured wines are the ones similar to Cabernet Sauvignon, Primitivo și Merlot, obtained of the grape varieties Dornfelder, with a high level of polyphenols. After degustation, these wine varieties 6.7 points.

CONCLUSIONS

1. At the wine area at Oprişor-Mehedinți soil and climatic conditions helped at obtaining good quality red wines.

2. By introducing grape varieties like Shiraz, Primitivo and Dornfelder, there was noticed that of the two grape varieties quality red wines can be otained. By their olfactory and gustative features they are similiar to the famous Cabernet Sauvignon and Merlot varieties;

3. There is a chance to obtain at Oprişor, by introducing the grape varieties Shiraz and Primitivo in the crop, new wine varieties, which can comepete to famous wine varieties.

4. It is necessary to continue the surveys about cropping Shiraz and Primitivo, in order to delimitate the cropping areas in Mehedinți vineyards.

BIBLIOGRAPHY

- 1. Cotea, V, Zănoaga V., Cristinel, Cotea V. Vaclesiu, 2009. *Oenology Treaty*, vol I,II, Academia Romana Printing House, Bucharest;
- 2. Croitoru, Constantin, 2009, Science and oenological engineering treaty. Product development and maturation of wines, Agir Printing House, Bucharest;
- 3. Gheorghiță, M., Popa A., Grigoriu Elgida, 1983, *The influence of technological factors on the maceration and fermentation process at red wines*; Annals of Craiova University, vol. XIV;
- 4. Gheorghiță M., Popa A., Pintilie, I, 1978, *Results on obtaining red wines by high capacity rotary containers process*. Annals of Craiova University, vol IX;
- Gheorghiță M., Constantin Băducă Câmpeanu, Camelia Muntean, Nicolae Giugea, 2006.Oenology. vol I, *Wine industry fundaments*, Sitech Printing House, Craiova;
- 6. Popa A., 2008. The secret of good wine, Alma Printing House, Craiova;
- Ribereau, Gayon P., Dubourdieu D., Doneche B., Lonvaud A., 1998. Trailé d'oenologie. 1 Microbiologie du vin. Vinifications. Editions la Vigne. Editure Durrod, Paris;
- 8. Ribereau, Gayon P., Dubourdieu D., Doneche B., Lonvaud A., 1998 *Traite d'Oenologie*, Ed. Durrod, Paris
- 9. Saint-Cricq de Gaulegne Nathalie, Vivas N., Glories Y., 1998, Maturité phenolique: définitions et controle. Rezue Française d'Oenologie, nr.173, pag. 22/25
- 10. Teodorescu Ștefan, 1977, Les vinglobes et les vins de Roumanie, Trav. Simpozion intern d'oenologie, Bordeaux, Franța
- 11. Teodorescu Ștefan, Poa Aurel, Sandu Gheorghe, 1987, *Oenology climate in Romania.*, Scientifical and Encyclopedia Printing House, Bucharest;
- 12. Țârdea C., Sârbu Gh., Țârdea Angela, 2000, Vinification Treaty, Ion Ionescu de la Brad Printing House, Iași.

	e e	1 * * .			1				
No	Wine type	Alchocol	Total acidity g/l	Volatile acidity g/l	nh	Free SO2	Total SO"	Sugar	Degustation mark
INU.	while type	vol%	Tartaric acid	Acetic acid	рп	Mg/l	mg/l	g/l	1-20
		13.5	5,65	0,72	3,29	22	90	3,8	17,50
1.	Dornfelder	13.45	4,84	0,53	3,12	12	50	4,0	17,00
		13	4,96	0,48	3,16	14	56	3,2	17,00
		12.3	6,48	0,86	3,16	18	78	4,2	18,50
2.	Primitivo	12.8	6,35	0,70	3,10	16	60	3,5	19,00
		12	6,40	0,72	3,12	17	68	9,0	18,00
		13.2	5,80	0,82	3,38	11	80	4,0	19,50
3.	Shiraz	13.3	5,20	0,50	3,12	17	68	3.8	18,50
		13	5,26	0,66	3,13	18	72	3,5	18,00
		14.5	5,41	0,84	3,30	26	140	3,8	19,00
4.	Merlot	13.8	6,05	0,41	3,13	18	130	2,8	18,50
		13.6	5,11	0,52	3,15	19	138	2,8	18,00
	Cabarnat	13.1	5,34	0,62	3,50	25	103	3.9	19,50
5.	Sauvignan	13.5	5,20	0,30	3,40	20	70	3.6	19,00
	Sauvignon	12.9	5 27	0.35	3 41	22	96	34	19.20

Organoleptical phisical and chemical features of red wines at Oprişor-Mehedinți, obtained between 2008 and 2010

Table 2

Table 1

Value of the total polyphenols index of red wines at Oprişor-Mehedinți, obtained between 2008 and 2010 (minimal, maximum and average limits)

No.	Wine type	Registered value	Total polyphenol index value
1	Dornfaldor	0,845-0,7445	74,45-84,50
1.	Dofffelder	0,7735	77,35
2	Primitivo	0,319-0,322	31,9-32,2
۷.	Fillinitvo	0,310	31,0
2	Shiroz	0,586-0,569	56,9-58,6
5.	Siliaz	0,5717	57,17
4	Marlat	0,53-0,385	38,5-53,0
4.	Wenot	0,430	43
5	Cohornot Souvignon	0,5076-0,4054	40,54-50,76
5.	Cabernet Sauvignon	0,3947	39,47

159

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

Vol. XVI (LII) - 2011

STUDIES REGARDING PHENOLOGY OF SEVERAL WOODY SPECIES IN CULMEA PRICOPAN AREA

Gherghişan Ecaterina¹

KEY WORDS: climatic diagrams, phenological aspects, leafing, flowering drought.

ABSTRACT

The studies performed in Culmea Pricopan between 2005 and 2009, saught to emphasize the corelation between specific climatic elements of the area and the phenological phases of several woody species within the park. Phenological observations were carried out continuously in the researched area and climatic diagrams were created using the Gaussen-Walter system for climate representation.

The data obtained was expressed quantitatively which is more conclusive than a descriptive expression. The results of the study shows that the differences in phenological phases are evident, however not profound, and their occurence is correlated to the higher or lower levels of arid climate within the studied periods of time.

INTRODUCTION

The studies performed in Culmea Pricopan between 2005 and 2009, saught to emphasize the corelation between specific climatic elements of the area and the phenological phases of 25 woody species within the park.

Currently, in the Macin Mountains National Park area, there are only descriptive research studies regarding flora and vegetation, as well as their distribution based on physical and geographical factors(Andrei *et al.*, 1967, Dinu 1990, Petrescu 2000). An analytical study of environmental factors and their relationship to the vital processes of the plants has been carried out on the Babadag Plateau (Bîndiu, 1971, Dihoru et al., 1970).

Showing a cause-effect relationship between ecological factors and vegetation is difficult (Doniță și Bîndiu, 1963, Bîndiu, 1971). Therefore, this research study is special, in that it offers statistical information for the park, but the results can only be utilized for the northern part of Dobrogea Plateau.

The research ensures the scientific basis necessary in creating maps of phenological aspects useful in planning ecological reconstruction of natural eco-systems, and of the exploitation of natural resources within the park area. These observations may also be used to restrict tourists access in designated areas during certain periods of time, in the *strict protected areas* and *whole protected areas* and to preserve local biodiversity (Petrescu, 2007).

¹ "Brad Segal" High School Tulcea

METHODS

Phenological studies carried out between 2005 and 2009, were correlated with two local climatic factors: temperature and precipitation.

The study of phenological aspects involved continuous collecting of plants in the field. This was mainly performed in designated ,, key zones" of vegetation, mainly the pontic and petrophilic steppes which are characteristic to this area (Ivan 1979, Dihoru *et al.*, 1970). Following their collection, plants were processed and the species determinations were done using plants catalogues (Beldie 1979, Ciocârlan, 1990; Săvulescu, 1952-1976).

The method used was similar to that performed in practical works (Bândiu *et al.*, 1971, Dihoru *et al.*, 1970, Ivan 1979, Rațiu 1973).

Data regarding climatic factors was provided by *Tulcea Agency for Environment Protection*, located close to the Macin Mountains research area.

For climate representation, climatic diagrams were created using the *Gaussen-Walter system* (Walter 1960-1963). For the temperate climate, the right scale for temperature representation (T) and precipitation (P) is T/P = 1:2 which defines humid and arid periods, and T/P = 1:3 scale which allows for the separation of the dry periods (Bândiu *et al.*, 1971, Ivan 1979).

RESULTS AND DISCUTIONS

1. Interpretation of climatic diagrams

An analysis of the diagrams for 2005-2009 shows the humid, arid and semi-arid periods which are correlated to the corresponding variation of the sampled phenological aspects.

A comparative analysis of the temperature between 2005-2009 shows that 2007 was characterized by the highest isothermal values: 10 % higher than the average of 2005, 12 % higher than 2006 and 2009 and 4,6% higher than 2008. Regarding the monthly mean temperature, 2007 had the highest values, while the differences between the other years was 1-2°C.

The mean monthly rainfall curve has 2 maximum, one in June, when summer begins and another one in autumn. For Dobrogea, multiannual climatic tables shows the first wet maximum in June as well (Monografia. 1960).

According to the clasification system of the climates (Gaussen 1958, Walter 1960), Culmea Pricopanului is characterized by moderate continental climate, with submediteraneean influences due to the distribution in precipitation, with two annual maximums, at the begining and at the end of the vegetation phase and relatively high mean annual temperature (11 °C).

The results of the climate analysis, the number and lenght of dry periods shows that 2007 and 2009 had a climate less favorable to vegetation.



Fig. 1-Gaussen-Walter climatic diagram for Macin Mountains area:

a- meteorological station; b- altitude; c- years of observation; d- annual mean temperature; e- annual mean precipitations; f- monthly mean temperature of the coldest month; g- absolute minimum temperature; h- average temperature of the hottest day; i- absolute maximum temperature; k- period of minimum temperatures, below 0°C; l- monthly mean temperature curve; m- precipitation curve $\frac{1}{2}$ scale; n- precipitation curve, 1/3 scale; o-drought periods; p- dry periods; r- wet periods.

2. Phenological results

Vegetative phase. This phenological phase usualy begins in February. In 2007 it was observed comencing in January. The early start in 2007 may be due to the very mild $(5,2^{\circ}C \text{ average})$ and humid winter $(159,5 \text{ l/m}^2)$ of 2006 and high average temperatures recorded in January 2007 $(5,3^{\circ}C)$, compared to the average temperature in 2006 (-3,9), 2008 and 2009 (below 1 °C), (courtesy Tulcea Agency for Environment Protection).



Fig. 2-Peak leafing during 2005-2009

Peak leafing of trees and shrubs occurs between March and April for approximatively 85% of the species. Late leafing occurs in *Tilia platyphyllos* and *Ailanthus altissima* between April and May, while *Clematis vitalba* leaves form until the end of October.

The variable length of this phenopahse in number of days: 98 (2005), 87 (2006), 90 (2007), 91 (2008), 95 (2009), may be explained by minor differences of monthly mean temperatures during this period of time.

Budding phase begins in January with *Cornus mas* and *Ulmus minor* (2007-2008), and in March in *Cerasus mahaleb*, *Pyrus pyraster*, *Prunus spinosa*.

Flower buds continue to be present on *Tilia platyphyllos* in June, and on *Clematis vitalba* in July.

Flowering phase. The data collected reveals no significant variations in flowering onset between 2005 and 2009. First flowers appear in woody plants such as *Cornus mas* in February, *Ulmus minor* began flowering in March, followed by *Cerasus mahaleb* and *Cytisus hirsutus*.

For approx. 35% of species such as *Celtis glabrata*, *Morus alba*, *Ulmus minor*, peak flowering occurs in April while for approx. 41% of the species, such as *Sambucus nigra*, *Cotinus coggygria*, *Rosa gallica*, *Spiraea crenata*, *Cytisus hirsutus*, *Cotoneaster integerrimus*, flower in May. Flower loss occurs at the end of May, however it is only then when *Clematis vitalba* starts flowering and retains flowers even in August.

The end of flowering occures in June for approx. 97% of species, except for *Amorpha fruticosa* which continues to flower in July and *Clematis vitalba* which is flowering towards the second half of August.

The data show differences related to the length of flowering recorded in days as follows: 121 (2007), 119 (2009) 184 (2006, 2008) and 166 (2005). The shorter flowering interval recorded for 2009 and 2007, may be correlated with early dry periods during April-May which accelerated the flowering phase.

Fructification phase in woody species begins in March with *Cornus mas*, *Ulmus minor*, *Cerasus mahaleb*. Late fructification occurs in July with *Clematis vitalba*.



Fig. 3-Peak fructification between 2005-2009

Peak fructification occurs in most of the species (80%) at the end of May and begining of June, with minor differences of 10 to15 day from year to year.

Peak ripening occurs in more than 45% of woody species between the last half of September and October.

The earliest fruit drop occured in May with *Ulmus minor*, the latest in November with *Pyrus pyraster*, *Prunus spinosa* and in December with *Ailanthus altissima*, *Crataegus monogyna*, and *Rosa gallica*.

End of vegetative phase. The autumn leaf colouring process as well as leaf fall in woody species usually starts at the same time with ripening and fruit drop. This was observed in *Cotinus coggygria*, *Acer tataricum*, *Cerasus mahaleb*, *Tilia platyphyllos*, *Spiraea crenata*, *Cotoneaster integerrimus* and *Cerasus mahaleb*. For *Cytisus hirsutus* and *Cornus sanguinea*, after fruit drop, leaves continue to stay green for a period, after which they become rusty in color.



Fig. 4-Begining of vegetation pause between 2005-2009

Leaf coloring began earliest in 2007 (10.06 la *Cytisus hirsutus*). This phenomenon was related to the prolongued dry periods and average monthly temperature, that was reported to be at least 1°C higher than the temperature of the other years to which comparisions were done.

The leaf fall rate is highest (approximately 60% of species), from the second half of October towards the second half of November. During the comparitively hot and humid autums of 2007 and 2009, leaves were present on *Cytisus hirsutus*, *Clematis vitalba*, *Cotinus coggygria*, *Pyrus pyraster*, *Celtis glabrata* and *Ligustrum vulgare*.

Vegetation pause. Within this phase, trees and shrubs are characterised by absence of leaves, the few that retain green leaves are: *Ligustrum vulgare*, *Clematis vitalba*, sau uscate *Quercus pubescens*, *Eeleagnus angustifolia*.



Fig. 5–Vegetation pause between 2005-2009

CONCLUSION

Multiannual variations of ecological factors influenced the phenological phases of vegetation having a well known ability to adapt to changing ecological factors. Differences in phenological phases are evident, however not profound, and their occurrence is correlated to the higher or lower levels of arid climate within the studied periods of time.

No doubt, the dynamic character of the climate constitutes one of the main causes of changes within the phenological phases. However, the process itself may be as well influenced by other factors such as: wind direction and intensity, athmospheric humidity, changes in landscape, sudden variations in temperature, and pollution.

Abbreviations AEP = Agency for Environment Protection

BIBLIOGRAPHY

 Andrei M, Popescu A, Caracterizarea floristică a Culmii Pricopan şi împrejurimi, Studii şi Cercetări Biologice, Seria Botanică, T.19, Nr. 1, Bucureşti, 33-40, 1967.
 Beldie Al, Flora României, I-II, Editura Academiei R.S.R., Bucureşti, 1979.

- Bîndiu C, Dihoru GH, Doniţă N, Drăguţ N, Eliescu GR, Hondru N, Ionescu M A, Mărgărit GR, Mocanu V, Niculescu-Burlacu F, Popescu-Zeletin I, Zamfirescu A, Cercetări ecologice în Podişul Babadag, Edit. Acad. R.S.R., 1971.
- Bîndiu C, Doniţă N, L'humidité du sol dans les phytocénoses naturelles et de culture, situées sur différents types de sol du Plateu de Babadag, Rev. Biol., VIII, 3, 269-280, 1963.
- Ciocârlan V, Flora ilustrată a României, I-II, Editura Ceres, București, 1990
- Dihoru Gh, Doniță N, Flora și vegetația Podișului Babadag, Edit. Academiei RSR, București, 1970.
- Dinu C, Necesitatea conservării florei și vegetației din zona Cheia, Munții Măcinului, Ocrotirea naturii și a mediului înconjurător, T. 34, 1-2, București, 45-49, 1990.
- Gaussen H., 1965, *Délimitation des aires de végétation selon le climat*, XII-e Congrès de l'Union internationale des Instituts de recherches forestières, Oxford, Rapport, vol.I, Londra, p. 323-342, 1958.
- Ivan D, Fitocenologie și vegetația R.S.R., Edit. Did. și Pedagogică, București, 1979.
- Petrescu M, Das Măcin Gebirge-Flora und Vegetation, Carinthia II, Klagenfurt, 87-101, 2000.
- Petrescu M, Dobrogea and the Danube Delta, flora and habitat conservation, Seria Stiințele Naturii, Nr.2. Tulcea, 2007.
- Rațiu O, *Geobotanica-Fitocenologie și ecologie*, Centrul de multiplicare al Univ. "Babeș Bolyai, Cluj-Napoca. 1977.
- Săvulescu T, Flora Republicii Populare Române, I-XIII, București, 1952-1976.
- Walter H, Standortslehre. Einführung in die Phytologie, vol III/2, Ulmer-Verlag, Stuttgart, 1960.
- *** Monografia geografică a Republicii Populare Române, vol I, 1960.
- *** Raportul privind starea mediului în județul Tulcea, 2005, APM, Tulcea
- *** Raportul privind starea mediului în județul Tulcea, 2006, APM, Tulcea
- *** Raportul privind starea mediului în județul Tulcea, 2007, APM, Tulcea
- *** Raportul privind starea mediului în județul Tulcea, 2008, APM, Tulcea
- *** Raportul privind starea mediului în județul Tulcea, 2009, APM, Tulcea.

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

Vol. XVI (LII) - 2011

INFLUENCE OF THE AGROPEDOCLIMATIC CONDITIONS ON THE FRUCTIFICAITON OF STUDIED REDDISH BIOTYPES

Giugea Nicolae, Olteanu Cristinel Narcis¹

KEYWORDS: agropedoclimatic conditions, biotypes, Reddish, grape production

SUMMARY

In this paper there are presented the aspects regarding the results of some researches that set sights on studying the agrobiological properties of some Reddish biotypes, planted on the sands from South Oltenia. Due to the fact that the climate system's characteristic element is its variability, the analysis of climate parameters over many years was made, resulting the influence they exert on the fructification of the studied Reddish biotypes.

INTRODUCTION

The Reddish type has the quality of developing a strong radicular system, sustaining a big strength even in the conditions of high sand drifts. The balanced foliar mosaic ensures an appropriate grape shading against summer heats and a good exposure to treatments and insolation during ripening.

The grape production is one of the significant elements as regards to the behaviour of studied Reddish biotypes. As well as the other elements, it is influenced by the climate conditions, but also the genetic characters of each biotype.

MATERIAL AND METHODS

Researches regarding the influence of agropedoclimatic conditions on the fructification of Reddish biotypes were made in the Tâmburești winegrowing centre, following the grape production and the influence of climate conditions for the three Reddish biotypes, during 2007 and 2010.

As biological material the Reddish type was used, because it figures as basic type in the sort of winegrowing area set on the sands from South Oltenia, being one of the well adapted types on sand culture.

Reddish is a type that comes from Bulgaria where, for some centuries, is known under the name of Pamid.

The Reddish type is part of the Proles pontica - subproles balcanica. It does not distinguish for a high qualitative potential, but it valorizes well the ecological conditions offered by the sandy soils from South Oltenia. It is planted on large areas in the originating region, but it is also grown in Turkey and Albania.

¹ University of Craiova, Faculty of Horticulture

In Romania it is grown for a very long time on the sands from South Oltenia, where we find various biotypes and where it was kept in the culture before the phylloxera attack. It was spread in Dobruja and in some centres from Walachia and Moldovia.

For making the production over the unit of area (hectare), first there was made the grape production related to vine, by weighting the grapes from 10 vines with a small scale. In order to increase the guarantee, the production from 50 vines was also weighted, which was then divided by their number.

The value obtained from the grape production related to vine was multiplied with the number of vines on hectare, thus obtaining the *production over the unit of area* (hectare).

RESULTS AND DISCUTIONS

In order to see the differences given by the influences of climate elements, we have chosen the years 2003 and 2004, different years from the climate's point of view. The dynamics and differences which appear between the climate elements are graphically featured in figure no. 1.

Table 1

GRAPE PRODUCTION (t/ha)							
Reddish	Rosé Biotype	Green Biotype	Black Biotype	Average			
2007	23.0	23.6	20.5	22.36			
2008	23.8	24.1	21.3	23.06			
2009	22.9	23.4	21.8	22.70			
2010	22.3	23.3	20.0	21.86			
Average	23.00	23.60	20.9				

Grape production for the Reddish biotypes during the years 2007 and 2010, at Tâmburești



Figure 1. Dynamics of grape production for the Tâmburești Reddish biotypes

From the graphic representation no. 2 and the table's data, it is noticed that the average grape production for the Reddish type with the three biotypes had a value of **22.5** t/ha. The average production (2007 - 2010) for the Reddish biotype with rosé berry was of 23.00 t/ha (34%), for the biotype with green berry was of 23.6 t/ha (35%) and for the biotype with black berry of 20.9 t/ha (31%). It is noticed that there are differences between the three Reddish biotypes, these being of 600 kg between the biotype with green berry and the one with rosé berry and big enough between the green biotype and the one with black berry (2.7 t/ha).



Figure 2. Percentage distribution of grape production for the three Reddish biotypes

The biggest production (23.6 t/ha) was registered for the biotype with green berry, the values varying between 23,3 t/ha in the year 2010 and 24.1 t/ha in the conditions of the year 2008. For the biotype with rosé berry, the maximum value of the grape production was in the year 2008, when it registered the value of 23.8 t/ha and the minimal production value was in the year 2010 (22.3 t/ha). The grape production for the biotype with black berry registered the maximum value of 21.3t/ha (2008) and the minimal value of 20.0 t/ha (2010).

It is noticed that all the three Reddish biotypes are quite productive; the biggest production was registered for the biotype with green berry, followed by the biotype with rosé berry and the smallest production was registered for the biotype with black berry, phenomenon encountered in all the studied years. The differences that appear between the grape productions, for the thres Reddish biotypes, are influenced by their genetic characters.

The registered production values were influenced by climate conditions, specific to each studied year, thus in the year 2008 the three Reddish biotypes registered the biggest production, followed by the year 2007 and the year 2009. In the climate conditions of the year 2010 it was registered the smallest production.

It is known that the climate elements most hall - mark the growth and development of grape vines, as back as the herbaceous growth until the full maturity phase when the berries modify their composition: sugar is gathering, acidity decreases, the flavour compounds are formed, etc.

It can be noticed that the grape production over the unit of area is different from one biotype to another and is influenced by the soil and climate conditions and is in inverse ratio to the sugariness gathered in the grape berry (for a big grape production, the sugar quantity is small and vice versa).

CONCLUSIONS

- the genetic characters make every Reddish biotype to interact differently in the same environment conditions, appearing differences on the quantity (grape productions over the unit of area) but also on the quality (sugariness, acidity, flavours, etc.).
- the biggest grape production was registered for the biotype with green berry, followed by the biotype with rosé berry and the smallest production was registered for the biotype with black berry, phenomenon encountered in all the studied years;
- the climate conditions have significant influence on the grape production, but also the on the evolution of the qualitative parameteres of the grape berry;
- in the year 2010, the rains fallen in moderate quantity over the vegetation period, but low in september, led to the registration of some small productions, in comparison to the other studied years, the sugar concentration through the evaporation of the water gathered in the berries, thus leading to quality potentiation;
- the grape production over the unit of area is different from one biotype to another and is influenced by the soil and climate conditions and is in inverse ratio to the sugariness gathered in the grape berry (for a big grape production, the sugar quantity is small and vice versa).

BIBLIOGRAPHY

Baniță P. M. and Colab. 1981 - Culture of plants on sands. Scrisul Românesc Publishing House, Craiova

Bulencea A., 1956 - Grape vine culture on the sandy grounds in the North - West winegrowing area, "Garden, vineyard and orchard" Magazine no. 3.,

Dvornic V and Teodorescu A, 1968 – *The extension perspective of some grape vine soils in the conditions from the South of the country.* "Horticulture and viticulture" Magazine no. 10/1968

Maxim I. and colab., 1964 - *Main physical and chemical properties of the sands at the Tâmbureşti experimental centre*. Paper published in the "Tudor Vladimirescu" Agronomical Institute Scientific Bulletin, Craiova;

Muntean Camelia, 1999 - Rosé wines. Procurance technological characteristics and possibilities. Universitaria Publishing House Craiova

Opreanu M and Colab, 1972 - *Results regarding grape vine culture on the sands in Oltenia, in natural pedoclimatic conditions.* "Horticulture and Viticulture" Magazine No. 4;

Tută V., Mischie V., 1975 - Researches regarding the growth and fructification of garpes on the Tâmburesti sands. Annals of the University of Craiova, vol. VI

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

Vol. XVI (LII) - 2011

CLIMATE CONDITIONS ON THE PHENOPHASE EVOLUTION OF STUDIED REDDISH BIOTYPES

Giugea Nicolae, Olteanu Cristinel Narcis¹

KEYWORDS: phenophases, climate conditions, biotypes, evolution, Reddish

SUMMARY

In this paper there are presented the aspects regarding the results of some researches that set sights on studying the agrobiological properties of some Reddish biotypes, planted on the sands from South Oltenia. The analysis of climate parameters over many years was made and also the influence they exert on the phenophase evolution of the three Reddish biotypes, in the Tâmbureşti winegroing centre.

INTRODUCTION

In the forming and evolution of grape berries we find four different stages: *herbaceous growth of grapes, ripeness, maturation and super - maturation.* The duration of this period, for types of wine grapes, is between 95 and 120 days, depending on the type, vineyard and evolution of annual climate conditions.

The first stage, of herbaceous growth, corresponds to the period of grape forming when the growth of the cluster and berries takes place. It starts with tying the flowers and it lasts until the grapes go in ripeness, having a duration of 50 to 60 days. Next comes a growth of the berries for about 3 - 4 weeks, when the grapes behave like all the green organs of plants managing to integrate part of the large requirement of plastic compounds. towards the end of this stage, the berries modify their composition: sugar is gathering, acidity decreases, the flavour compounds are formed, etc.

In years with bad climate conditions, the forming of grapes is accompanied, for some types, by the strong manifestation of berry phenomena: the grape vine does not flower or fertilize. The climate elements (temperature, rainfall, relative air humidity and number of hours of sunshine) determine the evolution of grape phenophases and their characteristic climate parameters.

MATERIAL AND METHODS

Researches regarding the influence of climate conditions on the phenophase evolution of Reddish biotypes have been made in the Tâmburești winegrowing centre, following their onset dates, as well as the evolution period, for the three Reddish biotypes, during the years 2007-2010.

¹ University of Craiova, Faculty of Horticulture

For the phenophase evolution there were made *ampelographic observations during the main phenophases*: bud break period (when 50% of the buds are in *"villous,*, stage), flowering period (when 50 % of the flowers are open), grape ripeness (when 50 % of the berries become elastic), grape maturation (high sugar content, leaves falling), duration of the vegetation period – from bud break until physiologic leaves falling).

RESULTS AND DISCUTIONS

In order to establish the main moments of phenophase evolution of each biotype observations were made and there resulted the calendar dates of each phenophase as well as the vegetaiton period of that biotype.

From table no. 1's dates where the phenophase evolution stages of the three Reddish biotypes are presented over the research period (2007-2010) in the Tâmburești vinegrowing centre, it was noticed that they aggregate to the ones known in the professional literature, with some lead imposed by the climate specific to the sands in the South of the country.

Analysing the data in table no. 1 we can notice that there are differences regarding the length of the vegetation period, but also the dates of onset of each phenophase, depending on biotype and on climate.

Thus, from the three studied biotypes, the biotype with rosé berry has the shortest *vegetation period*, being comprised between 165 - 167 days and the longest period is registered for the biotype with black berry (165 - 170 days).

In regard to *bud break* and *flowering onset*, it is noticed that the biotype with green berry starts the earliest, followed by the rosé biotype, then the one with black berry, thing observed in all the studied years.

In relation to the duration of flowering period, we observe for the Reddish type that:

 \triangleright green biotype: flowering starts in the period 13 - 20 of May and ends between 01 - 06 of June, the evolution perioda being of 13 days minimum and 17 days maximum.

 \triangleright black biotype: flowering starts in the period 17 - 21 of May and ends between 02 - 06 of June, the evolution period being of 14 - 15 days.

> rosé biotype: flowering starts in the period 23 - 31 of May and ends between 01 - 08 of June, the evolution period being of 14 - 17 days.

Climate elements (temperature, rainfall, relative air humidity and number of hours of sunshine) characteristic to each studied year, has determined and influenced the phenophase evolution of grapes and their characteristic chemical parameters.

Thus, from the four years in which the studies were made, we can see that the shortest *vegetation period* comprised between 163 - 165 days was noted in the conditions of the year 2008, followed by the year 2009 (164 - 167) and the longest period is registered in the year 2007 being of (167 - 170 days).

Bud break and flowering started the earliest in the conditions of the year 2007 (07 - 09 of May) and the latest, in the year 2010 (12 - 17 of May).

The Reddish type grapes reached their full ripeness in September between 23 - 27, in the year 2007 and 26 - 30 in the conditions of the year 2010.

In the year 2007 the grapes go in ripeness on July 24th, 3 days early then in the year 2009 and 8 days early then in the years 2008 and 2010. The grape earliness in the year 2007 is due to the average air temperature (in July) higher with approximately 4° C, in comparison with the other studied years (2008, 2009, 2010).

Regarding the date when the grapes go in ripeness, we notice that:

- for all the three Reddish biotypes it takes place much early in the climate conditions of the years 2007 and 2008, followed by the year 2009. In the conditions of the year 2010, the grapes go into ripeness a little later.

- the onset dates are different from one biotype to another, existing differences of some days between them

From the dates in table no.1 we observe that Reddish type grapes reach their full ripeness in September, the earliest in the conditions of the year 2008 (21.09. green biotype) and the latest in the climate conditions of the year 2010 (biotype with black berry).

Table 1

Year	Reddish Type	Bud break	Flowe	ring	Date when grapes go into ripeness	Physiologic maturity	Vegetation period (bud - maturation)
		Dates	Beginning	Ending	Date	Date	Days
			date	date			
2007	Rosé biotype	08.IV	16.V	01.VI	25.VII	23.IX	167
	Black biotype	09.IV	17.V	02.VI	24.VII	27.IX	170
	Green biotype	07.IV	15.V	01.VI	20.VII	23.IX	168
2008	Rosé biotype	13.IV	21.V	04.VI	25.VII	24.IX	163
	Black biotype	16.IV	19.V	10.VI	02.VIII	29.IX	165
	Green biotype	11.IV	13.V	06.VI	01.VIII	21.IX	163
2009	Rosé biotype	15.IV	20.V	04.VI	28.VII	27.IX	164
	Black biotype	12.IV	18.V	02.VI	27.VII	26.IX	166
	Green biotype	10.IV	20.V	02.VI	23.VII	24.IX	167
2010	Rosé biotype	17.IV	24.V	08.VI	03.VIII	30.IX	165
	Black biotype	13.IV	21.V	08.VI	02.VIII	28.IX	167
	Green biotype	12.IV	19.V	06.VI	01.VIII	26.IX	166

The phenophase evolution of studied reddish biotypes

CONCLUSIONS

- the phenophase evolution of dry Reddish biotypes takes place normally in regard to the data registered in the professional literature.

- we notice a lead of the phenophases imposed;
 - by the climate specific to the sands in the South of the country;
 - by the genetic characteristics of the studied type and biotype;

- the duration of the vegetation period, but also the dynamics of flowering show the variability that there is between the studied Reddish biotypes, regarding the flowering period, the evolution duration and its intensity;

- the flowering period is comprised between 13 - 17 days depending on the biotype and the climate conditions;

- the Reddish grapes go in ripeness towards th end of June and beginning of August, depending on biotype and climate year;

- full maturity of grapes takes place in different dates, being influenced by biotype and climate conditions; thus the biotype with green berry reaches first the full maturity, followed by the biotype with rosé berry, then the one with black berry; - we can conclude that the phenophase evolution and their course is influenced by the climate conditions of each year and last but not least by the genetic characters of each biotype, being differences of 2 - 5 days between biotypes and 9 - 11 days between studied years.

BIBLIOGRAPHY

Baniță P. M. and Colab. 1981 - *Culture of plants on sands*. Scrisul Românesc Publishing House, Craiova

Baniță P. M, 1970- *Technology of starting winegrowing plantations on the sands from Oltenia* - Horticulture and Viticulture Magazine No. 5;

Matei I., Popescu I.C., 1964 – Sands of Oltenia from Stânga Jiului and their exploitation – "Tudor Vladimirescu" Agronomical Institute Scientific Bulletin, Craiova, vol. VII supplement.

Olteanu I and colab, 2007 – Evaluation of some phenotype properties for some inland grape vine types - Annals of the University of Craiova, Agriculture, Montanology, Cadastre, Universitaria Publishing House;

Opreanu M and Colab, 1972 - *Results regarding grape vine culture on the sands in Oltenia, in natural pedoclimatic conditions.* "Horticulture and Viticulture" Magazine No. 4;

Rățoi I., 2000 – Pedologic andi agroproductive characterization of sandy soils planted with grape vine in South Oltenia – Scientific papers S.C.C.C.P.N. Dăbuleni, vol XII, Sitech Publishing House Craiova, Page 181

Rățoi I., 2001 – Influence of some climate factors on grape vine on the sandy soils in South Oltenia. Scientific papers. S.C.C.C.P.N. Dăbuleni, vol.XIII.

Teodorescu Șt. and colab. 1987 – Romania's oenoclimate, Scientific and Encyclopedic Publishing House, Bucharest

Seria:	✓ Biologie
	✔ Horticultură
	 Tehnologia prelucrării
	produselor agricole
	🖌 Ingineria mediului

Vol. XVI (LII) - 2011

THE PREVALENCE OF ARTERIAL HYPERTENSION IN OBESITY

Adina Glodeanu¹

KEYWORDS: Obesity, hypertension, risk factors

ABSTRACT

The prevalence of obesity grew significantly over the past decades, being noticed a real epidemic of obesity due to a sedentary life style with a high-caloric food intake, thus leading also to an increased prevalence of the metabolic syndrome. It is estimated that 55% of the patients with arterial hypertension have obesity and approximately 50% of the patients with obesity have arterial hypertension. Considering this data, we evaluated the prevalence of arterial hypertension and metabolic disorders in a group of obese patients. The results of our study showed a high prevalence of hypertension (74,4%), of carbohydrate metabolism disorders and of lipoprotein disorders. These findings confirm the fact that obesity represents an important risk factor for atherosclerosis, the risk being increased when other risk factors are associated.

INTRODUCTION

Obesity is a chronic disease defined as excessive adipose tissue accumulation in the body, with adverse effect on health, leading to the development of some very serious diseases and to reduced life expectancy (Carr DB et al., 2004). Obesity is a major health problem in the twenty first century, because it increases the risk for cardiovascular diseases 2-3 times (Ahima RS, Flier JS, 2000) and it increases the risk for diabetes mellitus type II approximately 5 times (Blaj Ş., 2003), serious diseases that significantly shorten the life expectancy and life's quality in patients who also receive expensive treatments. The prevalence of obesity grew significantly over the past decades, being noticed a real epidemic of obesity due to a sedentary life style with a high-caloric food intake, thus leading also to an increased prevalence of the metabolic syndrome (Bistriceanu Marian, 2000)The data received from OECD (Organisation for Economic Cooperation and Development) between 1999-2002 indicate that the prevalence of overweight and obesity in Europe reaches 22% of the adult population. It is also estimated that in Europe are 135 million persons with overweight or obesity (ARSO, 2001).

MATERIAL AND METHOD

After studying the epidemiological reports presented above, we have done a prospective study on a group of 89 patients admitted in the Department of Cardiology at Filantropia Clinical Hospital from Craiova between march 2007 – march 2010. The cases were investigated through anamnesis, clinical examination according to a standardize examination form and paraclinical tests (blood glucose levels, full lipid profile). Blood

¹ University of Medicine and Pharmacy of Craiova, Romania; Department of Cardiology, Filantropia Clinical Hospital, Craiova, Romania

pressure dynamic measurements, cardiovascular risk being appreciated according to the recommendations of ESC(table 1).

Table 1

Curui0029, 2007)											
	Blood pressure (mm Hg)										
Other risk	Normal	High normal	Grade 1 HT	Grade 2 HT	Grade 3 HT						
factors,OD	SBP 120-	SBP 130-139	SBP 140-159	SBP 160-179	SBP≥180						
or disease	129	Or DPB 80-84	Or DPB 90-99	Or DPB 100-	Or DPB≥110						
	Or DBP 80-			109							
	84										
No other	Average	Average risk	Low added risk	Moderate	High added						
risk factors	risk			added risk	risk						
1-2 risk	Low added	Low added	Moderate added	Moderate	Very high						
factors	risk	risk	risk	added risk	added risk						
3 or more	Moderate	High added	High added risk	High added	Very high						
risk factors,	added risk	risk		risk	added risk						
MS, OD or											
Diabetes											
Established	Very high	Very high	Very high added	Very high	Very high						
CV or renal	added risk	added risk	risk	added risk	added risk						
disease											

Cardiovascular risk and its relationship to blood pressure in adults (European S	ociety of
Cardiology, 2009)	

The degree of the obesity was established calculating BMI(represents the individual's body weight divided by the square of his or her height) and measuring waist circumference. According to WHO's and International Obesity Task Force's criteria the body weight is considered normal when the BMI values range between 18,5 and 24,9 kg/m². A person with a BMI greater than 25 kg/m² is overweight and above 30 kg/m² is considered obese. Obese class I ranges from 30 kg/m² to 35 kg/m², obese class II from 35 kg/m² to 40 kg/m² and obese class III is defined as a BMI equal or over 40 kg/m². The waist circumference values obtained are related with the abdominal adipose tissue. According to IDF's recommendations values of 94 cm or higher for men and values of 80 cm or higher for women are associated with a greater cardiac risk (Klein I. Braunwald, 2008).

RESULTS AND DISCUSSIONS

The age distribution in our group of patients was as follows: the mean age was 60.65 years, with a minimum of 42 years old and a maximum of 81 years old, with a standard deviation of 9.98. Sex distribution: 50 women (56,18%) and 39 men (43,82%).Out of the 89 patients included in our study, 36 patients (40,45%) had obesity class I (BMI=30-34,9 kg/m²), 39 patients (43,82%) obesity class II (BMI=35-39,9 kg/m²) and 14 patients (15,73%) obesity class III (BMI equal to or over 40 kg/m²) (table 2).

Table 2

Patients distribution by obesity classes					
BMI BMI 1 BMI BMI 3 Total					
Group of patients	40.45%	43.82%	15.73%	100.00%	

We measured the blood glucose levels after fasting: 47 patients (52,81%) had normal glycaemia (<110 mg/dl); 20 patients (22,47%) had impaired fasting glycaemia, with

blood glucose levels ranging from 110 to 125 mg/dl; 22 patients (24,72%) had blood glucose levels over 126 mg/dl and were diagnosed with diabetes mellitus type II. We observed at our patients an important tendency (p<0,001) of blood glucose levels to go higher as the obesity class gets higher and as the values of waist circumference (WC) increase (table 3).

Table 3

Patients distribution by blood glucose values						
Blood glucose 110-125 mg/dl >126 mg/dl <110 mg/dl Total						
Group of patients	22.47%	24.72%	52.81%	100.00%		

Table 4

Total cholesterol – mean, minimum and maximum values				
Cholesterol	Group of patients			
Number of patients	89			
Minimum value	160			
Maximum value	380			
Mean value	238.81			
Standard deviation	46.56			
CV	19.50%			
Test Student	L1-L2			
р	< 0.0001			

71 patients (79,78%) had total blood cholesterol >200 mg/dl and 18 patients (20,22%) had normal values (<200 mg/dl); the total cholesterol mean value in our group was 238,81 mg/dl for a standard deviation of 46,56. It was noticed a significant tendency for the total cholesterol values to go higher as the waist circumference increased (p<0,01, confidence 99%) (table 4).

82 patients (47,67%) had high LDL and 7 patients (4,07%) had LDL values between 100-129 mg/dl; the patients had a mean LDL value of 143,53 mg/dl with a standard deviation of 32,59 (table 5).

Table 5

LDL	Group of patients			
Number of patients	89			
Minimum value	89			
Maximum value	230			
Mean value	143.53			
Standard deviation	32.59			
CV	22.70%			
Test Student	L1-L2			
р	0.00566			

1			1	•	1
1.1.)	mean	minimiim	and	maximiim	values
LLLC	moun,	minimum	unu	mannann	varaes

HDL-cholesterol was measured with following results: mean value 44,31 mg/dl, with a minimum of 32 mg/dl and a maximum of 65 mg/dl, for a standard deviation of 7,60. Low levels of HDL-cholesterol were noticed more frequently in men than in women (that equals with a higher risk for atherosclerotic disease in men). The class of obesity and the presence of abdominal adiposity represent a risk factor for low HDL-cholesterol. This happens because elevated free fatty acid concentrations in the liver stimulate large VLDL synthesis, those are rich in triglycerides and will be released in the blood stream causing an increase in small, dense LDL values and lowering HDL_c blood values (table 6).

Table 6

Group of
patients
89
32
65
44.31
7.60
17.15%
L1-L2
0.29406

HDLc - mean, minimum and maximum values

Values for blood triglycerides: mean value - 245,47 mg/dl, minimum value - 125 mg/dl, maximum value - 515 mg/dl, for a standard deviation of 100,45 (table 7). 82 patients (92.13%) had high triglycerides blood levels and 7 patients (7,87%) had triglycerides blood levels <150 mg/dl. We noticed in this case also an important tendency (p<0,001) of the triglycerides blood levels to go higher when BMI and WC increased. It means that, for the obese patients, the class of obesity and the abdominal adipose tissue are directly proportional with the risk of having an increased triglycerides blood levels. This happens due to the dietary habits of the obese patients (excessive consumption of cakes rich in fat creams, chocolate, and pastry products for women and excessive consumption of bread, fat meat and alcohol in men). These habits are responsible for high calories intake and a diet rich in triglycerides. More than this, in the case of the obese patients with associated metabolic syndrome, the insulin resistance causes an increase in the quantity of free fatty acids in the liver, where they stimulate the synthesis of large VLDL which contain an important amount of triglycerides, those will be released in the blood stream and will also play a part in the increasing of the overall blood levels of triglycerides. In the metabolic syndrome, the adipocytes' insulin resistance stimulates the lipolysis and that also increases the free fatty acids concentrations in the liver with subsequent increase in the synthesis of VLDL rich in triglycerides.

Table 7

T · 1 · 1		1 1	
Triglycerides -	mean, minimum a	and maximum val	lues
0.2	,		

Triglycerids	Group of patients
Number of patients	89
Minimum value	125

Maximum value	515
Mean value	245.47
Standard deviation	100.45
CV	40.92%
Test Student	L1-L2
р	0.15539

Blood pressure values that were recorded: 5 patients (5,62%) had normal blood pressure, 11 patients (12,36%) had high normal values, 11 patients (12,36%) had grade I HT, 39 patients (43,82%) had grade II HT and 23 patients (25,84%) had grade III HT (table 8).

Patients distribution by blood pressure values

Table 8

HT Grade	High normal	Ι	II	III	Normal	Total
Number of patients	11	11	39	23	5	89

We can observe from this study an increase of the blood pressure values directly proportional with the degree of obesity and with the increase in the waist circumference: 15,4% of the patients with first class obesity were hypertensive, so were 26,8% of the patients with second class obesity and 32,2% of the patients with third class obesity.

The prevalence of hypertension in Europe is 44,2%. NHANES III (1988-1994) showed that in USA the prevalence of hypertension is 25%, being lower than in Europe. The last NHANES reported for the 1999-2004 time interval an increase in the prevalence of hypertension in USA to 28,9%. The frequency increased more in women. According to NHLBI, the increasing prevalence of overwight and obesity in USA played an important role in increasing the prevalence of hypertension. In Canada, the prevalence of hypertension was 27% and in North America its prevalence was 27,6%.

In our study the prevalence of hypertension was 74,4%.

There are many epidemiological studies that evidence the relationships obesity – hypertension and diabetes mellitus type II – hypertension (Blaj Ş., 2003). It is estimated that 55% of the patients with arterial hypertension have obesity and approximately 50% of the patients with obesity have arterial hypertension. According to NHANES 1999-2000 report, the prevalence of the hypertensive amongst obese patients was 41,9% for men and 37,8% for women.

WHO 2002 report estimated that approximately 60% of the hypertension cases in developed countries appear at patients with increased body weight.

Recently, the relationship obesity – hypertension was linked to a common physiopathological disturbance: insulin resistance and hyperinsulinemia (Fernandez-Real et al. 2003). Ferraninni proved in a study that blood glucose levels and blood insulin levels after OGTT (Oral Glucose Tolerance Test) were higher in hypertensive patients than in those with normal blood pressure (Beckman et al. 2002). Further investigations showed that the apparently healthy individuals with higher blood levels of insulin, also have higher blood pressure than those with normal or low blood insulin.

CONCLUSIONS

1. In our study the prevalence of hypertension was 74,4%. This high percentage compaired with other studies is due to the fact that the study took place in a cardiology unit. In this study we noticed that the increase in blood pressure is directly proportional with the degree of obesity.

2. This study proves that there is an important tendency (p 0.001) for the glucose blood levels to increase, as the obesity degree goes higher and as the waist circumference increases, this proving that obesity, especially abdominal obesity is an important risk factor in the development of type II diabetes mellitus.

3. The obese patients included in our study had lipoprotein disorders, with a directly proportional relationship between the serum levels of total cholesterol, LDL-cholesterol and triglycerides on one side and the degree of obesity on the other side; an inversely proportional relationship between the levels of serum HDL and the degree of obesity was also observed.

4. The presence of carbohydrate metabolism disorders and of lipoprotein disorders confirm the fact that obesity represents an important risk factor for atherosclerosis, the risk being increased when other risk factors are associated.

5. We consider that the threshold in defining hypertension should be flexible, higher or lower according to the global cardiac risk of the individual, that is why as far as the obese persons are regarded, the notion of normal high blood pressure should be considered authentic hypertension.

6. The prophylactic long-term objectives for hypertension that develops in obese patients are: decreasing the body weight and diminishing the risk factors. To accomplish this we advise patients to lower the percentage of animal fat in their diet, to practice well dosed physical exercise and use the pharmacological therapy with the least adverse reactions.

BIBLIOGRAPHY

1. Ahima RS, Flier JS, 2000. Adipose tissue as an endocrine organ. Trends in Endocrinology and Metabolism; 11:327-332.

2. ARSO, 2001. Recommendations in the management of overweight and obesity in adults; *The* Romanian Journal *of* Diabetes Nutrition & Metabolic Diseases, vol 2, 7-8.

3. Beckman JA, Creager MA, Libby P, 2002. Diabetes and atherosclerosis: Epidemiology, pathophysiology, and management. JAMA; 287: 2570.

4. Bistriceanu Marian, 2000. Clinical Endocrinology – text-book 2nd edition, South Publishing House, Craiova.

5. Blaj S, 2003. X Metabolic Syndrome – a problem in internal medicine, Amalteea Medical Publishing House.

6. Carr DB, Utzschneider KM, Hull RL, et al., 2004. Intra-abdominal fat is a major determinant of the National Cholesterol Education Program Adult Treatment Panel III criteria for the metabolic syndrome. Diabetes; 53: 2087–94.

7. Fernandez-Real J, Ricard W, 2003. Insulin resistance and chronic cardiovascular inflammatory syndrome. Endocr. Rev.; 24: 278.

8. Klein I. Braunwald, 2008. Heart Disease: a textbook of cardiovascular disease 8th ed; 2033.

- Seria: 🖌 Biologie
 - ✔ Horticultură ✔ Tehnologia prelucrării
 - produselor agricole
 - ✓ Ingineria mediului

Vol. XVI (LII) - 2011

THERAPEUTIC PARTICULARITIES OF ARTERIAL HYPERTENSION MANAGEMENT IN PATIENTS WITH OBESITY AND METABOLIC SYNDROME

Adina Glodeanu¹, Elena Ionescu¹, A. P.Cârstea¹, Doina Cârstea¹, Mirela Zaharie²

KEYWORDS: Arterial hypertension, obesity, metabolic syndrome, treatment

ABSTRACT

Population studies have proved o close correlation between obesity and the BP level and a much higher incidence of arterial hypertension in the obese. Frequently, patients with arterial hypertension and obesity come under the metabolic syndrome criteria, characterized through abdominal obesity, atherogenic dyslipidemia, insulin resistance, microalbuminuria, proinflammatory and prothrombotic state.

All these aspects, through complex mechanisms, predispose the patient to arterial hypertension and obesity, to accelerated atherosclerosis and implicitly, to a more rapid evolution towards cardiovascular complications. The study represents a review of the main evaluation forms of the obese patients as well as the particularities of antihypertensive therapy for them.

INTRODUCTION

Arterial hypertension is the most frequent cardiovascular disease in developed countries, being, along with the coronary disease, the cardiac failure and the stroke, the disease group that forms the "cardiovascular explosion" in the XXIst century. Along with the population's ageing process, it is estimated that the hypertension's prevalence will grow more and more, as long as efficient prevention methods will not be implemented on a wide scale (ESH/ESC. Guidelines for the Management of Arterial Hypertension,2007). Data provided by recent studies suggest that the normotensive at the age of 55 have a 90 % risk of becoming hypertensive afterwards.

The relation between blood pressure (BP) and the risk of cardiovascular events is continuous and constant. The higher the BP values, the more it increases the risk of myocardial infarct, cerebral vascular accident, cardiac failure or renal disease. For subjects with ages between 40 and 70 each increase with 20 mmHg of systolic BP or with 10 mmHg of diastolic BP doubles the cardiovascular risk. Population studies have proved a close correlation between obesity and the BP level and a much higher incidence of arterial in the obese (Gherasim L., Dorobanțu Maria, 2004).

It is estimated that 55 % of the hypertensive have obesity and approximately 50 % of the obese are hypertensive. Frequently, patients with arterial hypertension and obesity

¹ University of Medicine and Pharmacy in Craiova

² Filantropia Clinical Hospital in Craiova, Cardiology Department
come under the metabolic syndrome criteria, characterized through abdominal obesity, atherogenic dyslipidemia, insulin resistance, microalbuminuria, proinflammatory and prothrombotic state.

All these aspects, through complex mechanisms, predispose the patient to arterial hypertension and obesity, to accelerated atherosclerosis and implicitly, to a more rapid evolution towards cardiovascular events.

CARDIOVASCULAR RISK OF OBESITY AND METABOLIC SYNDROME

The term metabolic syndrome designates a series of manifestations associated with insulin resistance which facilitate atherosclerosis and increase the risk of onset of cardiovascular events (Blaj S, 2003).

According to IDF, abdominal obesity is a fundamental criterion of metabolic syndrome, the values of abdominal circumference running between certain limits dependent on the features of the ethnic groups the evaluated persons form part of (>94 cm for European men and >80 cm for European women). The diagnosis of metabolic syndrome implies the existence of central obesity associated with at least two of the following 4 criteria:

- Increased triglyceride level > 150 mg/dl or specific treatment for this type of dyslipidemia;
- Low HDL-cholesterol level < 40 mg/dl or specific treatment for this type of dyslipidemia;
- ➤ Increased blood pressure: systolic BP ≥130 mm Hg or diastolic BP ≥85 mm Hg, or treatment for arterial hypertension previously diagnosed;
- ➤ Increased level of glycemia on an empty stomach ≥ 100 mg/dl or type 2 diabetes mellitus previously diagnosed (Alberti KG et al., 2006).

In the etiology and pathogeny of the metabolic syndrome, the endocrine function of the adipose tissue has the most important part. Multiple epidemiologic studies have shown the strong connection that there is between obesity and the other components of metabolic syndrome.

Obesity, especially the abdominal one, conduces to arterial hypertension production, by means of associated risk factors: dyslipidemia, impaired glucose or hyperglycemia tolerance. Insulin resistance, central pivot of the metabolic syndrome, associates with atherogenic dyslipidemia, proinflammatory and prothrombotic state.

The importance of the metabolic syndrome for pathology results from the fact that by means of its components it is a cardiovascular and hyperglycemia disease predictor and the therapeutic interventions can reduce this risk (American Diabetes Association, 2003). The cardiovascular risk given by obesity is presented in table 1.

Obesity as well as insulin resistance is pathogenically involved in producing arterial hypertension through at least two mechanisms: stimulating the sympathetic nervous system's activity and increasing the water and sodium reabsorption. Both mechanisms along with reducing the physiologic vasodilator action of insulin lead to vasoconstriction and arterial hypertension.

Table 1

Weight astagory	DMI (l_{rg}/m^2)	Obesity	Risk of onset of cardiovascular diseases, hypertension and type 2 diabetes mellitus		
weight category	degree degree		Men < 102 cm Women < 88 cm	$Men \ge 102 \text{ cm}$ Women \ge 88 cm	
Underweight					
	<18.5				
Normal					
	18.5-24.9				
Overweight			Increased	High	
	25-29.9				
Obesity		Ι	High	Very high	
	30-34.9				
		II	Very high	Very high	
	35-39.9				
Extreme obesity		III	Extremely high	Extremely high	
	≥40				

Cardiovascular risk given by the correlation BMI (body mass index)–waist circumference (according to Blaj St., 2003)

ARTERIAL HYPERTENSION THERAPEUTIC PARTICULARITIES IN THE HYPERTENSIVE OBESE PATIENT

The first step in obesity management must be represented by the evaluation of each particular patient. This evaluation conduces to identifying the diseases and the factors involved in the onset and complications of obesity, being the basis of therapeutic strategy. After the complete evaluation of the patient, the treatment indication is established, also the limits of attaining and maintaining the recommended body weight, the treatment of complications associated with obesity (Alberti KG et al., 2006). If the estimation of the whole adipose tissue quantity doesn't need sophisticated techniques that cannot be used in the current medical practice, the clinical diagnosis of obesity shouldn't represent a major difficulty.

Measuring the body weight, the height and the BMI count, evaluating the waist circumference should be part of the general clinical examination of the patient, whatever the service he or she addresses and the scale and centimeter shouldn't lack in any medical office. We remind that, simplistically, a BMI>25 kg/m² defines overweight and the clinical diagnosis of obesity is established at a BMI >30 kg/m².

Apart from the extremely simple measurements, a complex anamnesis must be performed, a complete clinical examination and some supplementary paraclinical investigations for the diagnosis of secondary forms, for distinguishing the comorbidities and complication of obesity and for stratifying the cardiovascular risk (table 2).

Table 2

Elements o	of diagnosing	the	overwe	eight	t or ol	oese	pati	ent
(according to	Blaj	2003,	mo	dified)		

•	Diagnosis (BMI, waist circumference)
•	Causal factors or risk factors (nutritional input, endocrine causes, genetic
	syndroms, family history, physiologic factors-pregnancy, lactation,
	menopause)
•	Life style (dietetic anamnesis, smoking, chronic drinking, sedentarism,
	psycho-social stress)

- Family history (obesity, diabetes, hypertension, dyslipidemias, ischemic coronary disease, cerebral vascular accidents)
 - Associated chronic diseases
 - Measuring blood pressure and performing ECG
 - Laboratory examinations (glycemia on an empty stomach, OGTT (oral glucose tolerance test), complete lipidogram, uric acid)
 - BMI correction (according to waist and associated risk factors)
 - Estimating the cardiovascular eisk and setting a risk group.

Defining these aspects is essential for customizing the treatment, having as final objective the reduction of morbidity and cardiovascular mortality. This objective can be attained through BP control up to the target values imposed by the medical practice guides in force and through the systematic approach of cardiovascular complications. Apart from the non-pharmacologic measures and the proper antihypertensive treatment, associating platelet antiaggregant and hypolipemiant medication proved its efficiency in reducing cardiovascular events in these patients.

MODIFYING THE LIFE STYLE

Adopting a healthy life style is an extremely important measure for preventing BP increase. As major recommendations for the hypertensive overweight or obese, we mainly find losing weight through appropriate diet modifications (reducing the caloric and saturated fats input, the cholesterol and refined sweets, increasing the fruit and vegetable input), cutting smoke as well as regular physical exercises. It is worth to emphasize the importance of reducing body weight and practicing regular physical activities (rapid walking, at least 30 minutes daily, as many days as possible every week) in decreasing BP level and reducing the insulin resistance as well as in the favorable influencing of atherogenic dyslipidemia and prothrombogenic tendency (Whelton SP et al., 2002).

PHARMACOLOGICAL TREATMENT

ANTIHYPERTENSIVE TREATMET. The proper antihypertensive treatment needs the evaluation of the global risk, being orientated in relation to the risk level. The target values are $\leq 130/\leq 80-85$ mm Hg.

The large groups of antihypertensive drugs-angiotensin-converting enzyme inhibitors

(ACE-I) / angiotensin receptor blockers (ARB), beta-blockers, calcium antagonists,

diuretics, central sympathetic inhibitors are used individually, in relation to the risk degree, rarely in monotherapy and more often in combined therapy .

Angiotensin–converting enzyme inhibitors (ACE-I) represent the first therapeutic option in the hypertensive obese. By means of their inhibitor effect over SRA, they reduce the

cardiovascular risk, lower the microalbuminuria, the cardio and renoprotection being class effects (ESH/ESC. Guidelines for the Management of Arterial Hypertension, 2007). These pharmacologic agents improve at the same time the insulin sensibility.

Angiotensin receptor blockers (ARB) are indicated in the initial treatment in the diabetic obese or as alternative to ACE-I (Lindholm LH et al., 2002). ARB are very well tolerated and in patients with extended cough they can replace ACE-I. Some recent studies suggest that the association IECA-I and ARB in small doses would be superior in renoprotection (Lewis EJ, 2002).

There are some cautions that must be considered when treating arterial hypertension in obese patients or with metabolic syndrome. Beta-blockers are efficient, especially because

they have cardioprotective actions in patients with pectoral angina or post myocardial infarction and they are not contraindicated in diabetes. We must take into account that thiazide diuretics and beta–blockers can aggravate the insulin resistance and atherogenic dyslipidemia (ESH/ESC, 2007. Guidelines for the Management of Arterial Hypertension). The calcium antagonists can determine neuroendocrine activation. The presented types of antihypertensive agents are used in the hypertensive obese patient in most cases in combination. The clinician will opt for the most appropriate combination taking into account the associated pathology and the individual risk degree. ANTIPLATELET THERAPY. The patient with obesity and metabolic syndrome is defined by a prothrombotic tendency, what makes him or her susceptible of coronary and cerebral ischemic complications (Kaplan NH, 2002). The new hypertension arterial treatment guides recommend low doses aspirin (80-325 mg/day) at patients with cardiovascular risk at 10 years over 10% (Framingham score).

HYPOLIPEMIANT THERAPY. The ,,atherogenic" dyslipidemia of the obese patient and with metabolic syndrome, characterized by hypertriglyceridemia, HDL–low cholesterol, LDL small and dense, is an important risk factor, that along with arterial hypertension predisposes to atherotrombotic events. That is why, current arterial hypertension treatment guides recommend statin therapy in obese patients with high cardiovascular risk. The benefit of the statin treatment is first of all related to the atherosclerosis regression, the effects of this medication being of stabilization of the atheromatous plaque and improvement of the endothelial dysfunction. According to NCEP guides, the target of the treatment in the dyslipidemic obese or with proved cardiovascular disease is reducing the LDL–cholesterol at values under 100 mg/dl as well as increasing the serum level of HDL–cholesterol over 40 mg/dl (NCEP. Third Report of the National Cholesterol Education Program Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults, final report, 2002).

CONCLUSIONS

- 1. The coexistence of arterial hypertension-obesity in the same patient predisposes, through the contribution of other risk factors, to high risk of atherothrombotic events;
- 2. The metabolic syndrome, having abdominal obesity as central element, is at the present day a well defined clinical entity and represents one of the most frequent health problems of the third millennium. The specific pathologic modifications are extremely complex, but all approach the direction of substantial increase of the cardiovascular disease and diabetes mellitus risk.
- 3. Before setting up the treatment, the obese hypertensive patient needs a careful evaluation, defining other associated risk factors, the existent cardiovascular pathology and the setting in a risk group;
- 4. In the management of the obese hypertensive patient, apart from the nonpharmacologic measures and the proper antihypertensive treatment, the antiplatelet and hypolipemiant medication (low doses aspirin and statins in standard doses) have proved effect of reducing the cardiovascular risk, that is why they must included individually in the therapeutic plan of the high risk hypertensive obese patient;

- 5. The angiotensin–converting enzyme inhibitors represent the first therapeutic option in the obese diabetic patient or with metabolic syndrome. The central sympathetic inhibitors can safely be prescribed. For thiazide diuretics and beta–blockers there will considered the aggravation effects on insulin resistance and atherogenic dyslipidemia and for calcium antagonists , the neuroendocrine activation effects;
- 6. Considering the deficitary control of arterial hypertension worldwide, it is suggested a better implementation of arterial hypertension prevention and control programs and the clinician's concern must be that to find the most appropriate therapeutic solutions for reducing the cardiovascular risk in hypertensive obese patients, taking into account the associated pathology and the individual risk degree.

BIBLIOGRAPHY

- 1. Alberti KG, Zimmet P, Shaw J, 2006. Metabolic syndrome a new world wide definitions. A Consensus Statement from the IDF. Diabet Med; 23(5):469-480.
- 2. American Diabetes Association, 2003. Treatment of hypertension in adults with diabetes. Diabetes Care; 26 (suppl. 1):580-582.
- Blaj S, 2003; X Metabolic Syndrome a problem in internal medicine, Amalteea Medical Publishing House.
- 4. ESH/ESC, 2007. Guidelines for the Management of Arterial Hypertension. Journal of Hypertension; 25:1105-1187.
- 5. Gherasim L., Dorobanțu Maria, 2004. Arterial hypertension treatment: principles and practice. Infomedica Publishing House, Bucharest.
- 6. Kaplan NH, 2002. Management of hypertension in patients with type 2 diabetes mellitus: guidelines based on current evidence. Ann Intern Med ; 135:1079-1083.
- Lewis EJ, 2002. The role of Angiotensin II receptor blockers in the preventing the progression of renal disease in patients with type 2 Diabetes. Am J Hypertens; 15:123S-128S.
- 8. Lindholm LH et al., 2002. Cardiovascular morbidity and mortality in patients with diabetes in the Losartan Intervention for End Point Reduction in Hypertension Study (LIFE). Lancet; 359:1004-1010.
- 9. NCEP. Third Report of the National Cholesterol Education Program Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adults Treatment Panel III) final report, 2002. Circulation; 106:3143-3421.
- 10. Whelton SP et al., 2002. Effects of aerobic exercise on blood pressure. Ann Intern Med; 35:838-843.

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

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

Vol. XVI (LII) - 2011

USEFUL DESCRIPTORS FOR IDENTIFYING OLD VINE VARIETIES FROM DRAGASANI VINEYARD

Gorjan Sergiu Stefan¹

KEY WORDS: woody shoot, varieties, descriptors, lenticels

ABSTRACT

After the phylloxera disaster in our country, and other social events aimed to the viticulture over time, local varieties of the most ancient vineyards of Romania began to be less multiplied and used, being endangered.

This study aims, first of all, identifying these old varieties in private plantation from Dragasani vineyard in order to conserve them "on farm". The study was carried out between December 2010 – march 2011 and aimed at identifying old native varieties during the dormant period using "woody shoot" morphological descriptors according the groups O.I.V., U.P.O.V., I.B.P.G.R., ampelographic descriptors, which can have useful discriminant capacity in the identification of the grape varieties.

INTRODUCTION

Romanian is one of the European countries with the oldest viticulture (Popa & Dicu, 2010).

The locations that have created fame and kept the Dragasani Vineyard's prestige are Dealul Olt, Calina, Mitrofani but the grandiose character of this "country's great and unique temple" as I. C. Teodorescu calls this vineyard, is given by the mixed orography, which brings together the vines of seven hills parallel to the old river Olt, namely: Olt Hill, Mitrofani, Pietroasa, Creteni – Olteanca, Gusoieni – Bishopric, Beicii and Dobrusa. (Ciolacu & Condei, 1965)

The ampelographic study of vine species and varieties and elaboration of methodology to ease their recognition have been the subject of many concerns for well known ampelographers. The large number of vine varieties, the polymorphism manifested in culture and the complexity of character recognition used in practice may cause some misunderstanding and errors (Olteanu et al., 2002).

MATERIAL AND METHOD

The biological material studied comprised varieties like: 'Braghina', 'Carloganca', 'Tamaioasa Romaneasca', 'Feteasca regala', 'Feteasca alba', 'Coarna alba', 'Coarna neagra', 'Coarna rosie'.

Was studied the varieties identification after the woody shoot characters, because the viticulture is facing more often with the identification of this morphological character.

¹ PhD Candidate in Horticulture, University of Craiova

^{*} Corresponding author: E-mail address: gorjansergiustefan@yahoo.com

During the dormant period were collected ten woody shoots of each variety. The study was done on ten internodes placed in the middle third of the woody shoots, studying cross section, structure of surface, the main color of woody shoot, lenticels and density of erect hairs on nodes and internodes. Also, were observed and studied trough measurements the length and the diameter from ten internodes from the middle third of the woody shoots. Were recorded the maximum diameter of the median internode area. The study was realized using the O.I.V., U.P.O.V., I.B.P.G.R. descriptors, because the description of varieties should be made by accredited standards from international organization in this domain, in order to eliminate the confusion and the loss of valuable genetic background. (Mandrila, 2010).

RESULTS AND DISCUSSIONS

The main varieties identified during this period were: 'Braghina', 'Carloganca', 'Tamaioasa Romaneasca', 'Feteasca regala', 'Feteasca alba', 'Coarna alba', 'Coarna neagra', 'Coarna rosie'. These varieties have been identified in several areas of the Dragasani Vineyard namely: Dragasani - Dealul Olt, Gusoieni, Balsoara.

The varieties were very carefully studied, resulting the descriptors showed in the table 1.

At 'Braghina' grape variety the cross section of the woody shoot is circular, the structure of surface is striated, brown-yellow, the lenticels are absent, the erect hairs on nodes and internodes are absent, the length of internode is short, about 9 cm. and the diameter of internodes is small, about 8 mm.

At 'Tamaioasa romaneasca' we have the following characters: the cross section is circular; the structure of surface striated; yellow-reddish; the lenticels, the erect hairs on nodes and internodes are absent; the length and the diameter of nodes and internodes are middle, about 12cm respective 11 mm.

It can be observed that the characters of 'Feteasca regala' and 'Feteasca alba' are identical (the cross section is circular, the structure of surface is striated, the lenticels are absent, the erect hairs on nodes and internodes are absent, the length of internodes is middle, about 12 cm. and the diameter of internodes is small, about 8 mm) except the main color of woody shoot ('Feteasca regala' is brown-yellow and 'Feteasca alba' is brownish).

At 'Carloganca' grape variety the cross section of woody shoot is elliptic, the structure of surface is striated, yellow-brown, the lenticels are absent, the erect hairs on nodes and internodes are absent, the length of internodes is longer, about 15 cm and the diameter of internodes is large, about 14 mm.

The 'Coarna' sortogrup presents identical characters except the woody shoot color. The identical characters of 'Coarna alba', 'Coarna neagra' and 'Coarna rosie' are: the cross section of woody shoot is elliptic, the structure of surface is striated, the lenticels are absent, the erect hairs on nodes of internodes are absent, the length of internodes is longer, about 15 cm., and diameter of internodes is big, about 14 mm. The 'Coarna alba' and 'Coarna rosie' woody shoot main color is brown-reddish, compared to 'Coarna neagra' which is reddish.

All varieties have the lenticels, erect hairs on nodes and internodes are absent. The structure of surface is striated and the cross section of the woody shoot is circular or elliptic. The main color is different according to the specific character of each variety.

Table 1

		morphological descriptor	s of woody shoot	ines	C 1
No	TT T T		Character		Codes
crt	Variety	Character	expression	Notes	OIV,UPOV
					IBPGR
1.	Braghina	- cross section	- circular	1	101, -, -
		 structure of surface 	- striate	3	102, -, 6.1.41
		- main color	 brown/yellow 	2/1	103, 44, 6.1.42
		- lenticels	- absent	1	104, -, -
		- erect hairs on nodes	- absent	1	105, -, -
		- erect hairs on internodes	- absent	1	106
		- length of internodes	- short	3	353 - 7112
		- diameter of internodes	- small	3	354
2	T		-in-ulan	1	101
Ζ.	Tamaioasa	- cross section	- circular	1	101, -, -
	Romaneasca	- structure of surface	- striate	3	102, -, 6.1.41
		- main color	- yellow/reddish	1/3	103, 44, 6.1.42
		- lenticels	- absent	1	104, -, -
		 erect hairs on nodes 	- absent	1	105, -, -
		- erect hairs on internodes	- absent	1	106, -, -
		- length of internodes	- middle	5	353, -, 7.1.12
		- diameter of internodes	- middle	5	354, -, -
3.	Feteasca	- cross section	- circular	1	101
	regala	- structure of surface	- striate	3	102 6.1.41
	8	- main color	- brown/yellow	2/1	103.44.6.1.42
		- lenticels	- absent	1	104
		- erect hairs on nodes	- absent	1	105
		- creet hairs on internodes	- absent	1	105, -, -
		- elect hairs on internodes	- absent	5	252 7112
		- length of internodes		5	555, -, 7.1.12 254
-		- diameter of internodes	- small	3	354, -, -
4.	Feteasca	- cross section	- circular	1	101, -, -
	alba	- structure of surface	- striate	3	102, -, 6.1.41
		- main color	- brownish	2	103, 44, 6.1.42
		- lenticels	- absent	1	104, -, -
		 erect hairs on nodes 	- absent	1	105, -, -
		- erect hairs on internodes	- absent	1	106, -, -
		- length of internodes	- middle	5	353, -, 7.1.12
		- diameter of internodes	- small	3	354, -, -
5.	Carloganca	- cross section	- elliptic	2	101, -, -
	U I	- structure of surface	- striate	3	102, -, 6.1.41
		- main color	- vellow/brown	2/1	103, 44, 6, 1, 42
		- lenticels	- absent	1	104
		- erect hairs on nodes	- absent	1	105
		- arect hairs on internodes	- absent	1	106
		length of internodes	longor	7	252 7112
		- lengui of internodes	- longer	4	333, -, 7.1.12 254
	C	- unameter of internodes	- 01g	2	334, -, -
0.	Coarna	- cross section	- emptic	2	101, -, -
	alba	- structure of surface	- striate	3	102, -, 6.1.41
		- main color	- brown/reddish	2/3	103, 44, 6.1.42
		- lenticels	- absent	1	104, -, -
		- erect hairs on nodes	- absent	1	105, -, -
		- erect hairs on internodes	- absent	1	106, -, -
		- length of internodes	- longer	7	353, -, 7.1.12
		- diameter of internodes	- big	7	354, -, -

7.	Coarna	- cross section	- elliptic	2	101, -, -
	neagra	- structure of surface	- striate	3	102, -, 6.1.41
		- main color	- reddish	3	103, 44, 6.1.42
		- lenticels	- absent	1	104, -, -
		- erect hairs on nodes	- absent	1	105, -, -
		- erect hairs on internodes	- absent	1	106, -, -
		- length of internodes	- longer	7	353, -, 7.1.12
		- diameter of internodes	- big	7	354, -, -
8.	Coarna	- cross section	- elliptic	2	101, -, -
	rosie	- structure of surface	- striate	3	102, -, 6.1.41
		- main color	- brown/reddish	2/3	103, 44, 6.1.42
		- lenticels	- absent	1	104, -, -
		- erect hairs on nodes	- absent	1	105, -, -
		- erect hairs on internodes	- absent	1	106, -, -
		- length of internodes	- longer	7	353, -, 7.1.12
		- diameter of internodes	- big	7	354, -, -

CONCLUSIONS

In Dragasani vineyard there are genetic resources extremely valuable represented by old, traditional grape varieties. This germplasm should be preserved *in situ*, *on farm* and *ex situ*, in ampelographic collections in order to use it in current and future genetic improvement programs, but also commercially for enhancing the traditional assortment of varieties. For this germplasm to be correct and uniform identified and described is necessary to appeal to the descriptors agreed by the accredited international organizations for the benefit of Romanian viticulture and beyond. Therefore, continuing this type of approach regarding the description of grape varieties is necessary also for the others "original" Romanian grape varieties.

ACKNOWLEDGMENT

"This work was supported by the strategic grant POSDRU/CPP107/DMI1.5/S/78421, Project ID 78421(2010), co-financed by the EUROPEAN SOCIAL FUND – INVESTING IN PEOPLE, within the Sectorial Operational Programme Human Resources Development 2007-2013".

REFERENCES

Ciolacu T., Condei. G., - Statiunea experimentala viticola Dragasani, 1965, p 3.

Mandrila G. - Studiul caracterelor morfologice si al insusirilor biotehnologice, la unele soiuri de vita de vie, prin sisteme bazate pe ampelometrie – Teza de doctorat, Universitatea din Craiova, Facultatea de Horticultura, 2010. p 5.

Popa A., Dicu C. - Viticultura si Vinurile Romaniei, 2010, p. 230

Olteanu I., Cichi D., Costea D.C., Maracineanu L.C. - Viticultura speciala. Zonare, Ampelografie, Tehnologii specifice, 2002, p. 79.

*** Code des caractères descriptifs de variétés et espéces de *Vitis*, 2009, 2eme édition de la liste des descripteurs OIV.

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA Seria: ✓ Biologie ✓ Horticultură ✓ Tehnologia prelucrării produselor agricole ✓ Ingineria mediului

Vol. XVI (LII) - 2011

PHYSICOCHEMICAL SOIL PROPERTIES IN WILD TYPE OREGANO GROWTH AREAS

Nikolaos Gougoulias¹, Alexandros Papachatzis¹, Helen Kalorizou¹, Eleni Wogiatzi¹, Nikolaos Chouliaras¹

KEYWORDS: Oregano, soil physical properties, plant tissue elements, soil micronutrients

ABSTRACT

In the present work soil and plant tissues samples from 12 geographical sites, where wild type populations of oregano occur, were collected. The soil analysis showed that wild oregano grows in soils with medium texture, slightly calcareous, with low content in salts, increased content in nitrogen, adequate availability in P, K, Fe, Mn and Zn, and therefore increased cation exchange capacity. Analysis of oregano plant tissues showed high content in Mg, Fe, Cu, Zn and Mn and deficiency in N, P and K.

INTRODUCTION

Aromatic and medicinal plants are a subject of many high value activities on industrial sector. Numerous reports are focused on essential oils antimicrobial and insecticidal activities or their possible use in food, pharmaceutical, cosmetic, and aromatherapy industries (Vasilakoglou, 2007; Wogiatzi *et al.*, 1999, 2001; Gravanis *et al.*, 2004, 2005; Tassiopoulos *et al.*, 2000; Chouliaras *et al.*, 2007). In this work the physical and chemical properties of soil in native growing areas of oregano was studied in order to exploit this information in cultivation process.

MATERIALS AND METHODS

Soil samples at the depth of rhizosphere and oregano plants shoots were take from 12 areas throughout Greece (Polidroso Parnassos, Kallindromo Fthiotidas, Kamena Vourla Fthiotidas, Souli and Pagoni (Ipiros), Didymoticho, Kilkis, Ampelakia, Leptokarya, Olympus, Petrochori Trikala and Kastania (Limni Plastira).

The soil and plant samples were air dried while the soil was grinded to pass through a 2 mm sieve. The soil and plant samples were analyzed using the method of Page *et al.*, (1982). Organic carbon was calculated by chemical oxidation with 1 mol I^{-1} K₂Cr₂O₇ and titration of the remaining reagent with 0.5 mol I^{-1} FeSO₄. Soil organic matter was estimated by multiplying soil organic carbon by 1.724 as reported by Hesse (1972). Determination of total soil nitrogen was performed by digesting soil samples with sulfuric acid (95%), salicylic acid (4%), Na₂S₂O₃.5H₂O and catalyzing agent (100 g K₂SO₄, 10 g

¹ Department of Plant Production, Technological Educational Institution of Larissa, Greece

CuSO₄. 5H₂O and 1 g Se) following by distillation with NaOH 45% in H₃BO₃ 2% in presence of N and titration with H₂SO₄ 0.05 N. Available P (P-Olsen) was extracted with 0.5 mol 1^{-1} NaHCO₃ and measured by spectroscopy. Exchangeable forms of potassium were extracted with 1 mol 1^{-1} CH₃COONH₄ and measured by flame photometer (Essex, UK). Available forms of Mn, Zn and Cu were extracted with DTPA (Diethylene-Triamine Penta Acetic Acid 0.005 mol 1^{-1} , CaCl₂ 0.01 mol 1^{-1} and Triethanolamine 0.1 mol 1^{-1}) and measured by atomic absorption. (Victoria, Australia). Cation exchange capacity was determined by extraction with CH₃COONa.3H₂O 1N, CH₃CH₂OH and CH₄COONH₄ 1N and measured by flame photometer. The minerals in plant tissues were determined by dry ash combustion according to AGCD (1992) method.

RESULTS AND DISCUSSION

The soil collected from sites where oregano occurs naturally was found to be alkaline as the 65% of the soil samples had pH 7.5-8.5. The electrical conductivity in soil solution (soil: H_2O 1:5) in the 72% of the soil samples was 1.15- 0.4 dS/m. The 60% of the soil samples had organic matter content higher than 5% while the 70 % of them had CaCO₃ content between 4 to 7% (Fig 1).

In addition, the 58% of soils had moderately coarse texture and the cation exchange capacity of the 72% of soil samples was 30 - 55 cmol/kg (Fig 2).





Figure 1. Classification of soil samples according to their pH, electrical conductivity, percentage of organic mater and CaCO₃.



Figure 2. Classification of soil samples according to their texture and Cation exchange capacity.

Concerning soil samples taken from wild oregano occurring areas, 72% of them had total nitrogen 2-11 g/Kg, 68% found with available phosphorus (P – Olsen) higher than 15 μ g/g and 50% had exchangeable K more than 250 μ g/g (Fig 3, 4). Regarding available forms of micronutrients, 70% and 72% of the soil samples had available Fe-DTPA and Zn-DTPA content higher than 2.5 μ g/g and 1.5 μ g/g respectively, while in the 40% of them the available Mn-DTPA form ranged between 20-40 μ g/g. Finally, the concentration of the available form of Cu-DTPA was in the 90% of samples lower than 0.5 μ g/g.



Figure 3. Classification of soil samples according to their total nitrogen and available P content.



Figure 4. Classification of soil samples according to their content in available forms of K, Fe, Zn, Mn and Cu.

The plant tissues mineral elements content are presented in figure 5. The nitrogen was lower than 3.5 % in all samples. The 80% and 70% of the plant samples had P and K lower than 0.35% and 2% respectively, while the Mg content in the 70% of the samples was between 0.3-0.7 %. In addition, the wild oregano tissues were high in Fe, Cu, Zn and Mn. The mean concentration of mineral elements in dry mass of all oregano samples are shown in table 1.

Ι	a	bl	le	1
I	а	b	le	I

	Ν	fean concer	ntration of m	inerals in or	egano tissu	es	
Ν	Р	K	Mg	Fe	Zn	Mn	Cu
	0	6			μ	g/g	
1.87	0,28	1.77	0.53	0,20	46.9	67.4	38.5



According to general evaluation criteria of plants nutrients content (Bould *et al.*, 1983) the oregano plants used for analysis had very low content in N and K, moderate concentration of P, adequate content of Mg and high values of Fe, Cu, Zn and Mn.

Figure 5. Concentration of basic elements in oregano tissues.

CONCLUSION

The oregano plants occurred naturally in soils with medium to coarse texture, alkaline with increased concentration in organic matter. In addition the soil samples demonstrate an increased cation exchange capacity by been low in salt concentration. The most of the soil samples was considerably adequate in N, available P (Olsen), exchangeable K and available forms of Fe, Mn and Zn. In the contrary, low content of available Cu was observed. Finally, the wild population of oregano plants were found to have high concentration of P, Mg, Fe, Zn and Mn and be deficient in N and K.

REFERENCES

- 1. AGCD: 1992. Manuel de laboratoire de pedologie. Administration Générale de la Coopération au Développement, Royaume de Belgique, 266p.
- Bould C., Hewit E.J., Needman P., 1983. Diagnosis of Mineral Disorders in Plants. Vol: 1, MAFF/ARC, Ed: Robinson, p. 174.
- Chouliaras N., Gravanis F., Vasilakoglou I., Gougoulias N., Vagelas I., Kapotis T., Wogiatzi E., 2007. The effect of basil (*Ocimum basilicum* L.) on soil organic matter biodegradation and other soil chemical properties. Journal of the Science of Food and Agriculture, 87: 2416-2419.
- Gravanis F.T., Vagelas I.K., Paraschi D., Palamiotou 2004. Effect of essential oils on soilborne tomato pathogens. The BCPC Seminars: Crop Science and Technology, Glasgow, Scotland, UK.
- Gravanis F.T., Chouliaras N., Vagelas I.K., Gougoulias N., Sabani, Wogiatzi E., 2005. The effect of oregano as an alternative soiborne pathogen control on soil organic matter biodegradation and other soil chemical properties. The BCPC international Congress: Proceedings of an international congress held at the SECC, Glasgow, Scotland, UK, pp 105-108.
- 6. Hesse P. R., 1972. A textbook of soil chemical analysis. Ed John Murray, pp 520.
- 7. Page A.L, Miller R.H., Keeney D.R., 1982. Methods of Soil Analysis. Part 2, Chemical and Microbiological properties. Agronomy (9), ASSSA, Mad. Wisc. USA.
- 8. Tassiopoulos D., Wogiatzi E., Bingel S., und Marquard R., 2000. Growing Trials Camomile Cultivars from Germany at the Location of Larissa, Breeding Research on Medicinal and Aromatic plants, Chania-Creta-Greee PA15.
- Vasilakoglou, I., Dhima K., Wogiatzi E., Eleftherohorinos I., Lithourgidis A., 2007. Herbicidal potential of essential oils of oregano or marjoram (Origanum spp.) and basil (*Ocimum basilicum*) on Echinochloa crus-galli (L) P. Beauv. and Chenopodium album L. weeds. Allelopathy journal, 20:297-306.
- 10. Wogiatzi E., Tassiopoulos D. und Marquard R., 1999. Untersuchungen an Kamille-Wildsammlungen aus Griechenland, Arznei-und Gewurzpflanzen, Kohler Glessen, 186-191.
- 11. Wogiatzi E., Tassiopoulos D., Bingel S., and Marquard R., 2001. Content and composition of essential oil in wild chamomile from different locations of Grecce. World Conference on Medicinal and Aromatic Plants Breeding Budapest, Hungary 208.

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

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

Vol. XVI (LII) - 2011

VALIDATION OF DAS-ELISA RESULTS FOR THE DETECTION OF GRAPEVINE LEAFROLL-ASSOCIATED VIRUS 1+3

Ionela Cătălina Guță¹, Elena-Cocuța Buciumeanu¹

KEYWORDS: Vitis, ampelovirus, DAS-ELISA, precision, robustness

ABSTRACT

Grapevine leafroll-associated virus 1 (GLRaV-1) and grapevine leafroll-associated virus 3 (GLRaV-3) are the most important components in the leafroll disease complex. The most common serological technique for routine diagnosis of grapevine viruses is DAS-ELISA The reliably of the analysis was verified by intra-laboratory validation of the results, by checking the suitability for the circumstances of use of the reagent kit for the detection of both GLRaV-1 and GLRaV-3 in a single test. The performance criteria as: repeatability, reproducibility, accuracy and robustness were explored. For this purposes, two types of positive and negative controls (reference material of the kit and virus- infected /virus-free grapevines tissue) have been performed. The data of laboratory-performed validation and the results of proficiency tests (inter-laboratory comparisons), provided together indications of the robustness of the test.

INTRODUCTION

Leafroll is probably the most widespread virus disease of grapevine, its occurrence in viticultural areas being worldwide. Affected vines display yellowing (white varieties) or reddening (red varieties) of the leaves, with veins remaining green, as well as downward rolling of the leaf borders. Moreover, grapevine leafroll disease affects phloem anatomy, delays ripening and decreases vigour and yield (by 15-20% on average). To date, nine different viruses with filamentous particle, called grapevine leafroll-associate virus (GLRaV), which are differentiated from one another by progressive number, have been found in leafroll –infected vines Laimer et al. 2009). Some of these viruses have been recognized as belonging to definitive species in the genera *Closterovirus* (GLRaV-2) and *Ampelovirus* (GLRaV-1, -3, -4, -5, -9) or unassigned species in the family *Closteroviridae* (GLRaV-7), whereas several viruses/variants (i.e., GLRaV-6, -7, 8) still await official taxonomic assignment (Gugerli 2003).

The species GLRaV-1 and GLRaV-3 are the most prevalent ones out of the viruses associated with leafroll disease in grapevine (Martin et al. 2005, Rakhshandehroo et al. 2005, Golino 2008). For long time after discovery, diagnostis and detection of plant viruses was mainly based on their biological properties (host range, typical symptoms). Detection and diagnosis of plant viruses has included serological laboratory tests since the 1960s. The most common serological technique for routine diagnosis is double antibody sandwich-

¹ National Research and Development Institute for Biotechnology in Horticulture Ștefănești-Argeș E-mail: gutaionelacatalina@yahoo.com

enzyme-linked immunosorbent assay (DAS-ELISA. Since reliable ELISA protocols for diagnostic purposes were described (Clark & Adams 1977), grapevine has been one of the first species to take benefits from this technique The presence of the antigen in infected sap is indirectly detected through a colorimetric reaction that develop because of the reaction of an enzyme (e.g., alkaline phosphatase, horseradish peroxidase) conjugated to antibodies in the presence of an appropriate substrate (p-nitrophenylphosphate, tetrametylbenzidine) (Boscia et al. 1997). The use of antibody mixture for multiple detection of GLRaVs in a single assay has suggested (Zimmermann et al. 1990). This study deals with the intra-laboratory validation of ELISA results for GLRaV 1+3 detection in a single test. Validation is considered a review of quality assurance, usually done by an independent part in order to achieve a high level of confidence for the management and staff of the regulatory sphere. Validation is the process of assessment of the products and analytical methods to ensure the compliance with the requirements of product or method.

MATERIAL AND METHOD

ELISA is performed in the grapevine virology laboratory with the aim to detect the most damaging and widespread grapevine viruses: arabis mosaic virus+ fanleaf virus – (ArMV+GFLV), leafroll associated virus 1+3 (GLRaV-1+3), fleck virus (GFkV) and virus A (GVA), both for routine diagnosis and research purposes (Buciumeanu et al. 2009).

The accuracy of ELISA results for the detection of GLRaV 1+3 – infected grapevines is proved by intra-laboratory validation of the method, by checking the suitability for the circumstances of use of each new reagent kit. The performance criteria as: repeatability, reproducibility, accuracy, and robustness were explored.

Validation was performed using reference material (positive - PC and negative controls - NC of the kit and samples taken from GLRaV-1+3-infected grapevine (*Vitis vinifera* L., cv. Fetească neagră), belonging to the collection of the laboratory. Virus-infected plants from the collection of grapevine viruses are used as PC in ELISA test, their sanitary status being periodically verified and well known. Also, healthy grapevine (GLRaV-1+3-free) as negative control was used. Commercial ELISA reagents which allow in a single test the detection of both GLRaV-1 and GLRaV-3 are purchased from BIOREBA, Switzerland. Certified NUNC F-96 maxisorp microtiter plates were used.

Two types of PC and NC (reference material and infected/non-infected samples) and, also, three kind of plant tissue (leaf, petiole, cane) have been used. Eight repetitions of each extract have been performed. The reproducibility was assessed on samples from a grapevine infected plant; aliquots of the extract were stored at -20°C and tested again after two weeks. The accuracy was estimated taking into consideration several values of PC. The robustness was investigated by: variation of grinding time (20; 30; 40 sec.); using different source of virus (leaf, petiole and phloem); reading with single and dual filter (at 405 nm and 405/492 nm, respectively); blanking against air and without empty well.

The minimum limit of detection is the cut-off value. The cut-off value was calculated for each plate individually, being as three times the mean value of NC (all values above this cut-off were regarded as positive).

RESULTS AND DISCUSSIONS

Validation involves all processes that determine the performance of an assay to achieve a defined set of objectives. Only when actual data have been obtained can test parameters be assessed and confidence in results be assigned in a statistical sense. Validation is a continuous process, in which increasing knowledge about an assay is gained each time it is run. The continuous process also involves data obtained when the test is performed in hitherto untried scenarios. Since most assays begin in the research arena, the use of validated assays in the form of kits by a wider range of scientists in laboratories varying widely in expertise, equipment, and climatic conditions can cause problems. The objective in validation is to be able to define an assay in terms of statistically quantifiable parameters with measured confidence. The designation of "validated assay" is only merited when it has been defined in terms of its capacity to classify samples with regard to the presence or absence of a particular analyte. Validation relies on examination of as many factors as possible (Crowther 2002).

Precision (**repeatability, reproducibility, accuracy**). The validation must be an ongoing process consistent with the principles of internal quality control. Continuous evaluation of repeatability and reproducibility are thus essential for helping to ensure that the assay is generating valid test results.

Evidence that an assay is repeatable is necessary for further development. This is accomplished by calculating the intra-and interplate variation using the same samples run in different plates and on different days.

Repeatability (Precision intra-determination). In order to verify the repeatability of ELISA test have been used two types of controls: positive and negative control of Bioreba kit and positive and positive and negative control of biological material collected from GLRaV1+3-infected grapevine and virus-free plant, respectively. Thus, three types of biological material (leaf, petiole, cane) have been used (Table1).

Table 1

Sample	Bioreba		Leaf		Petiole		Cane	
	PC	NC	PC	NC	PC	NC	PC	NC
	1.480	0.124	1.129	0.127	1.547	0.121	1.605	0.120
$OD_{405 nm}$	1.481	0.123	1.176	0.125	1.540	0.122	1.609	0.129
values	1.480	0.123	1.159	0.124	1.529	0.121	1.613	0.118
	1.480	0.126	1.178	0.125	1.553	0.121	1.600	0.120
	1.480	0.123	1.192	0.125	1.552	0.120	1.609	0.120
	1.484	0.122	1.195	0.123	1.540	0.121	1.596	0.117
	1.483	0.121	1.187	0.132	1.555	0.126	1.610	0.120
	1.482	0.119	1.227	0.128	1.544	0.130	1.614	0.118
Mean	1.48125	0.12262	1.18037	0.12612	1.54500	0.12275	1.60700	0.12025
S	0.00147	0.00193	0.02666	0.00266	0.00809	0.00323	0.00587	0.00349

Repeatability of ELISA results when eight repetitions have been analyzed from one extract

In this case cut-off value was 0.366 (3x0.122), standard deviations (s) of the average readings are lower than the cut-off, which demonstrates the repeatability of results.

Repeatability of measurements when two extractions of a sample have been analyzed in two repetitions (the sample consisted of pieces of GLRaV-1+3- infected cane from which two phloem tissue extracts have been analyzed) is presented in Table 2. The results were positive, GLRaV-1 was detected every time.

Reproducibility (precision inter-determinations). Reproducibility was verified on samples (leaf, petiole, cane), collected from a GLRaV-1+3 infected plant (PC) and from a virus-free plant (NC). Aliquots of extracts used in the first test were frozen at -20°C and used for the second test, after two weeks (Table 3).

Table 2

Repeatability of ELISA measurements (two extractions of a sample have been analyzed in two repetitions)

Extraction	OD _{405nm}	Mean	S	Result
	(cane)			(Cut-off = 0.339)
1	1.453	1 468	0.015	
	1.483	1.408		т
2	1.503	1 477	0.026	
	1.451	1.4//	0.020	+

Table 3

Reproducibility of ELISA measurements on GLRaV-1+3- infected and healthy grapevine samples

Sample		Test 1		Test 2		
_		(Cut-off = 0.36)	6)	(Cut-off = 0.33)	9)	Result
		OD mean	S	OD mean	S	
Leaf	PC	1.180375	0.026664	0.6145	0.0685	+
	NC	0.126125	0.002666	0.102	0	-
Petiole	PC	1.545	0.008093	1.3275	0.0185	+
	NC	0.12275	0.003231	0.1	0	-
Cane	PC	1.607	0.005874	1.463	0.002	+
	NC	0.12025	0.003491	0.1025	0.0005	-

In the second test was recorded the decreasing of PC readings but ELISA results were identical in the both tests.

Accuracy. Accuracy is the ability of a test to give correct results (diagnostic sensitivity). It was estimated taking into consideration several values of PC, e.g.:

PC 1 = control 1(first reading was registered immediately after control rehydration, the next reading was obtained after two weeks of storage of the frozen aliquot at -20° C).

 $OD_{405 \text{ nm}} = 1.48125 \pm 0.00147; OD_{405 \text{ nm}} = 1.51650 \pm 0.00850$

PC 2 = control 2 (reading after rehydration): $OD_{405} = 1.4645 \pm 0.00350$

While the target OD value of PC mentioned in the insert kit is 3.0, its repeatable readings with values between 1.4645 and 1.5165 determined the laboratory validation and thus, the acceptance of PC included in the kit.

Robustness (variation of grinding time, influence of the type of plant tissue, influence of the filter of the spectrophotometer)

Variation of grinding time. The sample was constituted of petiole fragments collected from GRLaV-1+3-infected grapevine, grinded with extraction buffer for different times, 20; 30 and 40 sec (Table 4). In all cases the test result was positive which shows that grinding time does not influence significantly the result.

Influence of the type of plant tissue. The samples were represented by different types of plant material (leaf, petiole, phloem tissue) collected from GLRaV-1+3-infected plant. In all cases the test result was positive, which demonstrates the robustness of the detection method (Table 5).

Influence of the filter of the spectrophotometer. The influence of the filter of the plate reader on the ELISA results was assessed by comparing the readings of two known samples at OD405/492nm and OD405nm. Test results were identical (Table 6).

Table 4

The verification of the robustness of ELISA test by variation of grinding time

Grinding time	$OD_{405} \pm s$	Result
(sec)		(cut-off = 0.366)
20	1.545 ± 0.00809	+
30	1.479 ± 0.00454	+
40	1.493 ± 0.00309	+

Table 5

Robustness of ELISA test under the influence of the type of plant tissue

Tissue	$OD_{405nm} \pm s$	Result
		(cut-off = 0.366)
Leaf	1.180 ± 0.02666	+
Petiole	1.545 ± 0.00809	+
Cane	1.607 ± 0.00587	+

Table 6

Robustness of ELISA test under the influence of the filter spectrophotometer

Sample	OD _{405nm}	Result	OD _{405/492nm}	Result
		(Cut-off =0.339)		(Cut-off =0.187)
PC (Kit)	1.466	+	1.268	+
	1.461	+	1.235	+
NC (kit)	0.117	-	0.063	-
	0.109	-	0.062	-
Sample 1	0.546	+	0.333	+
	0.683	+	0.445	+
Sample2	0.102	-	0.030	-
	0.102	-	0.010	-

Readings against blank (empty well). OD readings of known samples, against air (empty well) and without blank were compared and the results were identical (positive or negative) (Table 7).

Table 7

The influence of reading against air and without blank on ELISA results

Sample	OD _{405/492nm}	Result	OD _{405/492nm}	Result
		Cut-off=0.187	against blank (0.006)	(Cut-off =0.187)
PC (kit)	1.268	+	1.262	+
	1.235	+	1.229	+
NC (kit)	0.063	-	0.057	-
	0.062	-	0.056	-
Sample 1	0.333	+	0.327	+
-	0.445	+	0.439	+
Sample 2	0.030	-	0.024	-
-	0.010	-	0.004	-

The data of laboratory-performed validation and the results of proficiency tests (inter-laboratory comparisons), performed yearly, with similar laboratories in the world provided together indications of the robustness of the test. Also, the proficiency tests increase confidence in the capabilities of the laboratory. The laboratory ensures the traceability of results in virus diagnosis in grapevine.

Properly used, ELISA is a sensitive, accurate and rapid detection method. It is especially effective when large numbers of samples must be assayed and when results are needed rapidly.

CONCLUSIONS

The data of laboratory-performed validation for GLRaV1+3 detection provided the indication that the reagents are valid and can be used with confidence for the GLRaV-1+3 diagnostic in a single test.

The use of appropriate negative and positive controls is essential for ELISA results evaluation

Aliquots of frozen extracts of infected material stoked at -20°C can be later used successfully as positive control in ELISA test.

Virus-infected plants from the collection of grapevine viruses can be used as positive, their sanitary status being periodically verified and well known.

The results of the ELISA tests are not influenced by the reading of the extinction with single filter (405 nm) or dual filter (405/492 nm).

BIBLIOGRAPHY

Boscia D., Digiaro M., Fresno J., Greif C., Grenan S., Kassemeyer H.H., Prota V.A., De Sequueira O.A., 1997 - ELISA for the detection and identification of grapevine viruses. In: Walter B. (Ed), Sanitary selection of the grapevine. INRA Editions, Colmar (France), Les Colloques 86: 129-155

Buciumeanu E.C., Guță I.C., Semenescu F., 2009 – A survey of grapevine viruses in native cultivars in old plantations of Ștefănești-Argeș vineyard, România. Extended abstracts 16th Meeting of ICVG, Dijon, France, 31 Aug. - 4 Sept. 2009, (Le Progrès Agricole et Viticole – ISSN 0369-8173), 102-121

Clark M.F., Adams A.N., 1977 - Characteristics of the microplate method of the enzymelinked immunosorbent assay for the detection of plant viruses. J. Gen.Virol. 34: 475-483

Crowther J.R., 2000 – The ELISA Guidebook. Methods in molecular biology. Humana Press, Totowa, New Jersey.

Gugerli G.P., 2003 – Grapevine leafroll and related viruses. Proc. 14th ICVG Conference, Locorotondo, 12-17th September 2003, 25-31

Golino D.A., Weber E., Slim S., Rowhani A., 2008 - Leafroll disease is spreading rapidly in a Napa Valley vineyard. California agriculture 62: 156-160

Laimer M., Lemaire O., Herrbach E., Goldschmidt V., Minafra A., Bianco P., Wetzel T., 2009 - Resistance to viruses, phytoplasmas and their vectors in the grapevine in Europe: a review. J. Plant Pathology 91: 7-23

Martin R.R., Eastwell K.C., Lamprecht S., Tzanetakis I.E., 2005 - Survey for viruses of grapevine in Oregon and Washington. Plant Disease 89: 763–766

Rakhshandehroo F., Pou Rrahim R., Zamani Zadeh H., Rezaee S., Mohammadi M., 2005 - Incidence and distribution of viruses infecting Iranian vineyards. J. Phytopathol. 153: 480.

Zimmerman D., Bass P., Legin R., Walter B., 1990 - Characterization and serological detection of four closterovirus particles associated with leafroll disease on grapevine. J. Phytopathol. 130:205-218.

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

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

Vol. XVI (LII) - 2011

FANLEAF VIRUS INFECTION AND ITS RELATIONSHIP WITH PHYSIOLOGICAL PROCESS OF PHOTOSYNTHESIS IN GRAPEVINE ROOTSTOCK CV. ST. GEORGE

Ionela Cătălina Guță¹, Elena-Cocuța Buciumeanu¹

KEYWORDS: Vitis rupestris, GFLV, chlorophyllous pigments, carbohydrates, stomata characteristics

ABSTRACT

The effect of grapevine fanleaf infection on the physiological process of grapevine rootstock cv. St George was studied by comparing in the green-house conditions the healthy and the infected plants. The virus was uniformly distributed in the leaves along the shoots in the active growth period. The amount of soluble carbohydrates and assimilating pigments (chlorophyllous, carotenoids) was influenced by virus-infection but not significant differences as compared to the control have been registered. The stomata size and density were influenced by the presence of infection especially in the symptomatic leaves.

INTRODUCTION

The presence of viruses which infect the vine gives rise to abnormal plant growth and metabolic changes. These disturbances can be seen as considerable decreases in the volume and quality production. Viral infection changes some physiological process as photosynthesis, respiratory processes, enzymatic activities, inner bark transport, hormone balance, mineral nutrition (Walter 1988).

Fanleaf is the oldest known and one of the most important and widespread virus disease of the grapevine, with symptoms ranging from malformation of canes to chromeyellow discoloration, very often associated with vegetative vigour and crop reduction (Walter & Marteli 1996, Mannini 2003). Since the grapevine fanleaf virus (GFLV) shows its detrimental effect especially on growth parameter, its elimination is essential for rootstocks. The cutting wood yield from rootstock mother-plant reported highly reduced by GFLV (Credi & Babini 1996).

The behaviour of grapevine in vitro in the presence of virus infection showed certain differences as compared to the healthy material regarding the growth and the rooting of plantlets (Guță et al. 2009). The reduction of the yield in Chardonnay cv. experimentally infected with GFLV was related to the alterations of photosynthetic apparatus (Bálo et al. 1997).

The aim of this study was to investigate the influence of GFLV distribution in grapevine rootstock *V. rupestris* Scheele cv. St. George on the symptom expression of the disease and the physiological process of photosynthesis. Thus, the amount of the

¹ National Research and Development Institute for Biotechnology in Horticulture Ștefănești-Argeș, E-mail: gutaionelacatalina@yahoo.com

assimilating pigments (chlorophyll a, chlorophyll b, carotenoids) and the soluble carbohydrates in the leaves, and stomata characteristics in GFLV infected and control plants were determined. The influence of virus-infection on the stomata size in grapevine was less studied until now.

MATERIAL AND METHOD

In order to find some correlations between the GFLV presence and distribution on the physiological processes of photosynthesis in grapevine, plants belonging to *V. rupestris* Scheele cv. St. George showing fanleaf symptoms were investigated. GFLV-infected plants belonging to the grapevine virus collection were, also, tested free from leafroll associated virus serotypes 1+3 (GLRaV-1+3), fleck virus (GFkV) and virus A (GVA) by double antibody sandwich - enzyme-linked immunosorbent assay (DAS-ELISA) (Clark & Adams 1977) using commercial kits purchased from BIOREBA, Switzerland.

GFLV distribution in plant. GFLV-infected leaves were sampled over the growing season. Leaf samples (showing symptoms or no symptoms) were collected two times (before and after the flowering), from the basal, middle and upper part of three shoots/vine. The results concerning the virus detection and distribution in grapevine were evaluated using DO_{405nm} values (absorbance) obtained in ELISA tests. The minimum limit of detection is the cut-off value (being us three times the mean value of negative control); all values above this cut-off were regarded as positive. The length of the shoots was measured when the samples were collected.

Soluble carbohydrates and assimilating pigments (chlorophyll a, chlorophyll b, carotenoids) content. Leaf material (middle of the shoot) sampled from the GFLV-infected and control (healthy) plants were used for soluble carbohydrates and assimilating pigments (chlorophyll a, chlorophyll b, carotenoids) dosage. Three samples /plant (one sample/shoot) were collected in the morning and other three at the noon. The results are the average of these determinations.

The extraction of soluble carbohydrates from dry leaf material was realized with 80% alcohol. The soluble carbohydrates content in leaves has been done by anthrone method (Pánczél & Eifert 1960). The carbohydrate concentration was expressed in mg% dry weight (d.w.).

The extraction of assimilating pigments from fresh leaf material was realized with 85% acetone (Holm 1954). The assimilating pigments (chlorophyllous, carotenoids) concentration was expressed in mg/g fresh weight (f.w.)

Stomata characteristics (length, diameter, density). In order to study the stomata apparatus, leaf epidermal imprints were collected from the underside of GFLV-infected leaves with symptoms (nodes 4, 5) or symptomless (nodes 9, 10) from three shoots/one vine. Healthy leaves were collected from the node 4 of three shoots of a vine.

The samples were collected in the morning and at the noon. The imprints were taken using a clear nail varnish (Gokbayrak et al. 2008); three different regions of a leaf were used (basal, lateral and apical zone) and five fields/zone were seen, using objective of 40X and 10X ocular. The stomata measurements have been made using Quick PHOTO MICRO 2.2 software (OLYMPUS BX 41 microscope equipped with digital camera). The values are mean± s.d. based on 150–200 stomata measurements/ leaf.

Statistical assessment. Statistical significance of differences between virus - infected variants compared with the control (healthy) was analyzed by SPSS 10 for Windows, taking P<0.05 as significant according to one-way ANOVA.

RESULTS AND DISCUSSIONS

GFLV distribution in plant. In the active growth period, the fanleaf disease symptoms observed on the grapevine rootstock cv. St. George maintained in the greenhouse conditions, consisted of malformation of the leaves, open petiolar sinuses, acute denticulations and chlorotic mottle (Fig. 1). The foliar symptoms developed early in the spring and persisted on the leaves of the lower part of the shoot.



Fig. 1 Fanleaf disease symptoms on leaves, cv. St. George

The virus was reliably detected every time in the leaf samples, both in the blade and petiole. Before flowering, the ELISA readings varied slightly from one leaf to another along shoot. OD values were very close for the blade and petiole of the same leaf. There were no differences between shoots. However, after flowering, some differences between shoots and leaves of the same shoot were registered. An unexpected result was the concentration of GFLV in the basal leaves. The presence of the fanleaf disease symptoms can be correlated to the concentration of the virus in the basal leaves of the shoot. Also, ELISA values for blade and petiole of the same leaf registered certain differences, especially for the middle and upper leaves; lower OD values for the petiole comparatively to the leaf blade were obtained. Despite the fact that the shoot 3 was the longest one and the corresponding ELISA values were lower comparatively to shoot 1 and 2, no correlations between the length of the shoots and the GFLV concentration have been found (Table 1).

Table 1

(blade and petiole) along the shoots in the rootstock cv. St. George							
			DO 4	05 nm			
		Before flowering					
Shoot			(cut-off	= 0.501)			(cm)
	Basal		Middle		Upper		
	Blade Petiole Blade Petiole Blade Petiole						
1	1.019 1.027 1.126 1.125				40		
2	1.126	1.126 1.131 1.129 1.127				60	
3	1.135	1.129	-	-	1.138	1.022	47
			After fl	owering			
	(cut-off = 0.243)						
1	1.097 1.069 1.086 0.977 1.095 0.821						104
2	1.068	0.944	0.815	0.402	0.718	0.574	180
3	1.090	0.706	0.660	0.339	0.671	0.388	195

ELISA results regarding the distribution of GFLV in the leaves blade and petiole) along the shoots in the rootstock cv. St. Georg

In most cases, the virus concentration was higher in the upper leaves of grapevine than in the basal or middle leaves, but it wasn't possible to conclude that is better to use younger leaves (Walter & Etienne 1987).

Soluble carbohydrates and assimilating pigments (chlorophyllous, carotenoids) content. The soluble carbohydrate content in GFLV-infected leaves was reduced comparatively to the control. The presence of the virus led to the diminish of carbohydrate concentration with 23.2 % in the morning and with 7% at the noon as compared to the control, but non-significant differences have been registered (Fig. 2 a).



Fig. 2 The content of soluble carbohydrates (a) and assimilating pigments (chlorophyll a, chlorophyll b and carotenoids) (b) in GFLV- infected leaves belonging to rootstock cv. St. George, compared to the control (healthy). The values are mean ± s.d. based on 3 independent determinations.

Reduced carbon fixation is the most common effect observed in the leaves showing mosaic or yellowing. It begins to be detectable after few days of infection. GFLV strains that cause deformities can interfere with dioxide carbon fixation, causing a 20% reduction of carbohydrates assimilations in infected leaves (Abracheva & Slavcheva 1974).

Despite the significant difference between carotenoids content of virus- infected and non-infected leaves in the morning, the total amount of assimilating pigments (chlorophyll a, chlorophyll b and carotenoids) registered non-significant differences (2.747 and 3.236 mg/g f.m). Also, virus-infected and healthy leaves registered very close values of total pigments at noon (3.160 and 3.132 mg/g f.m., respectively) (Fig. 2 b).

Chromatic alteration intensity was directly related to the decrease of photosynthetic activity in grapevine infected with GFLV and GCMV (grapevine chrome mosaic) strains that lead to the tissue yellowing (Pozsár et al. 1969). Abracheva (1977) noted that the fanleaf disease produced the total chlorophyll content diminish and also, observed certain differences concerning the effects of various strain of the virus.

The infected plants characteristically showed faster electron transport, an elevated energetic efficiency of photosynthesis, and the suppression of CO_2 fixation owing to a presumable activation of the adenylate metabolism (Christov et al. 2001).

Stomata (length, diameter, density). The stomata length is significantly higher in GFLV-infected plant as compared to the control (healthy), both in the presence of the symptoms and in the symptomless leaves. The diameter vary significantly between infected and non-infected material, except the symptomatic leaves, at noon. In this case, the chlorotic mottle did not influenced the stomata opening. The stomata density was significantly lower for the GFLV-infected leaves compared to the healthy ones, except the symptomless leaves, at noon (Table 2, Fig. 3).

Table 2

Sanitary	Symptoms	Time	Stomata characteristics			
status		of day	Length±s.d.	Diameter ±s.d.	Density ±s.d.	
			(µm)	(µm)	(n^{o}/mm^{2})	
	Yes	Morning	33.44±1.9383 ^b	15.90±1.6549 ^d	89.98±19.3570 ^f	
GFLV-		Noon	33.93±2.4091 b'	18.90±3.6064 °	87.45±13.1951 ^f	
infected	No	Morning	30.44±2.8953 ^b	12.69±1.9028 ^d	149.58±29.7917 ^f	
		Noon	33.43±3.2919 ^{b'}	16.42±1.5589 d'	155.61±21.3930 e'	
Control	-	Morning	27.64±0.8407 ^a	22.11±0.7923 °	204.55±22.5666 e	
(healthy)		Noon	27.65±1.8826 a'	18.86±1.1903 °	170.51±60.6577 e'	

Stomata characteristics (length, diameter, density) in GFLV- infected grapevines belonging to rootstock cv. St. George, compared to the control (healthy); the lowercase letters represent significant differences compared to control at P<0,05

However, certain differences between symptomatic and symptomless leaves concerning the stomatal density have been registered. Thus, the stomata density was significantly higher in the presence of symptoms, the mean difference being 59.60-68.17.



Fig.3 Microscopic observations of stomata in grapevine leaves, cv. St. George (a - control: b - GFLV-infected with symptoms; c - GFLV-infected without symptoms)

The ability of some pathogens (bacteria, fungi) to modify the stomata behaviour of host plant have been reported has (Melloto et al. 2006, Allègre et al. 2007). Experiments are in progress to elucidate the causal mechanisms of the stomatal modifications (closure, abnormal opening, length, diameter, density), in grapevine under various stress factors.

In the field grown vines, with leaves showing symptoms of rolling and reddening, significant differences appeared in net photosynthesis in all cases examined, in comparison with healthy controls, and in transpiration rate and stomatal conductance in some cases. Symptomless leaves of GLRaV-3 infected vines showed a lower photosynthesis rate than healthy controls, but the difference was significant only in one case (Cabaleiro et al. 1997).

CONCLUSIONS

Grapevine fanleaf virus was reliably detected in the active growing season in the leaf samples along the shoot, both in the symptomatic and symptomless leaves.

The GFLV presence led to the diminish of carbohydrate and assimilating pigments content in leaves as compared to the control, but non-significant differences have been registered. The study of stomatal characteristics showed in most cases significant differences between virus-infected and healthy plant concerning the stomata size (higher length and lower diameter in the presence of the virus) and reduced density especially in the symptomatic leaves. New data regarding the stomatal apparatus can allow a better characterization of grapevine morpho-physiological modifications in the presence of virus infection.

BIBLIOGRAPHY

Abracheva P., Slavcheva T., 1974 – L'influence du virus du court-noué sur l'intensité de la photosynthèse chez la vigne. Hort. Vitic. Sci. (Sofia) 11: 125-129

Abracheva P., 1977 – The chlorophyll content of vine leaves as influenced by the cout-noué (fanleaf virus). Hort. Vitic. Sci. 14: 102-106

Allègre M., Daire X., Héloir M.-C., Trouvelot S., Mercier L., Adrian M., Pugin A., 2007 - Stomatal deregulation in *Plasmopara viticola* –infected grapevine leaves. New Phytologist 173: 832-840

Bálo B., Várady Gy., Papp E., Mustárdy L.A., Poliák D., 1997 – Structural and functional alteration in photosynthetic apparatus of virus-infected "Chardonnay"vines Abstracts of 5th Int. Symposium on Grapevine Physiology, Jerusalem, Israel, 25 – 30 May 1997, 56

Cabaleiro C., Piñeiro A., Segura A., 1997 - Photosynthesis in grapevines infected with leafroll virus (GLRaV-3). Extended abstracts 12th Meeting ICVG, Lisbon, Portugal, 29 September-2 October 1997, 153-154.

Christov I.K., Stefanov D., Goltsev V.N., Abrasheva P., 2001 - Effects of Grapevine Fanleaf and Stem Pitting Viruses on the Photosynthetic Activity of Grapevine Plants Grown in vitro. Russian Journal of Plant Physiology 48: 473–477

Clark M.F., Adams A.N., 1977 - Characteristics of the microplate method of the enzymelinked immunosorbent assay for the detection of plant viruses. J. Gen.Virol. 34: 475-483

Credi R., Babini A.R., 1996 – Effects of virus and virus-like infections on of grapevine rootstock. Adv. Hort. Sci. 10: 95-98

Gokbayrak Z., Dardeniz A., Bal M., 2008 – Stomatal density adaptation of grapevine to windy conditions. Trakia Journal of Sciences 6: 18-22

Guță I.C., Buciumeanu E.C., Visoiu E., 2009 – Comparative study of in vitro behaviour of grapevine (*V.vinifera* L., Fetească neagră cv.) under the influence of various virus infections. Extended abstracts 16th Meeting of ICVG, Dijon, France, 31 Aug. - 4 Sept. 2009, (Le Progrès Agricole et Viticole – ISSN 0369-8173), 247-248.

Holm G., 1954 - Chlorophyll mutation in barley. Acta Agric. Scand. 4: 457-471

Melotto M., Underwood W., Koczan J., Nomura K., He SY., 2006 - Plant stomata function in innate immunity against bacterial invasion. Cell 126: 969–980.

Pánczél M., Eifert J., 1960 - Die Bestimung des Zuckerund Stärkegehaltes der Weinrebe mittels Anthronreagens. Mitt. Klosterneuburg 10: 102–110.

Pozsár B.I., Horváth L., Lehoczky J., Sárospataki G., 1969 – Effects of grape chromemosaic and fanleaf –yellow mosaic virus infection on the photosynthetical carbon dioxide fixation in vine leaves. Vitis 8: 206-210

Walter B., Martelli G.P., 1996 – Sélection clonal de la vigne: sélection sanitaire et sélection pomologique. Influences des viroses et qualité. 1^{ère} partie: effects des viroses sur la culture de la vigne et ses produit. Sélection sanitaire, sélection pomologique. Bulletin de l'O.I.V. 69: 945-971

Walter B., Etienne L., 1987 - Detection of the Grapevine Fanleaf Viruses Away from the Period of Vegetation. J. Phytopathology 120: 355-364

Walter B., 1988 – Some examples of the physiological reaction of the vine in the presence of viruses. Bulletin de l'O.I.V. 687-688: 383-390

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA Seria: ✓ Biologie ✓ Horticultură ✓ Tehnologia prelucrării produselor agricole

🖊 Ingineria mediului

Vol. XVI (LII) - 2011

PRELIMINARY DATA REGARDING THE BEHAVIOR OF SOME PEACH VARIETIES, LESS KNOWN IN ROMANIA, IN SUPERINTENSIVE PLANTATIONS

Hoza D.¹, Duță Maria², Ligia Ion¹

KEYWORDS: peach tree, intensive culture, cultivar, growth, production

ABSTRACT

The comparative study of 6 peach varieties, less known in Romania, and Cardinal variety showed the different reactions of the trees in the same culture conditions, reactions given by the biological particularities. The growth of the trees was normal, but different, the variety Early rich proved to be the most vigorous, while the least vigorous variety was Reliance. The best ramification capacity was recorded for the varieties Early rich and October star and the lowest capacity for the varieties Cardinal and Late Luka. The fruit formation was influenced by the climatic conditions during spring, the average percentage of fruit formation being 16,21%, depending on the variety. The fruit production was between 4,6 and 7 t/ha in the third year of life, and reached values higher 13 t/ha for Cardinal, 12 t/ha for Early rich in the fourth year, smaller production being recorded for the variety October star, around 8 t/ha.

INTRODUCTION

The peach tree is one of the most important fruit growing species, both due to the area that it is cultivated in and due to the obtained productions. The fruit is consumed both fresh and processed into different finished goods. The peach varieties had in time a dynamics greater than other fruit growing species, on one side due to the small exploitation period of the orchards and on the other hand due to the continuously increasing interest to have varieties with good transportation and storage resistance, together with high quality characteristics. The large number of varieties from the world assortment and especially the creations of the last 20 years require thorough knowledge and prior testing in culture conditions before extending them in commercial plantations, in areas different than those in which they were created (Antonia Ivaşcu, Hoza D. 2005). The lack of knowledge of their behavior in certain pedo-climatic conditions can have negative consequences on the production, fruit quality and exploitation period of the orchard (Hoza D., Păun C., 1998). The intensification of the peach tree is also a matter of interest for most fruiters, different possibilities to increase the number trees per unit of area being searched for, in order to reduce the costs for labor (Sansavini S., 1993; Hoza D., Asanica A, 2004). In order to complete the assortment, and experiment with 6 peach varieties, less known than the Cardinal variety, was conducted.

¹ University of Agricultural Science and Veterinary Medicine Bucharest

² Ph candidate in Horticulture

MATERIAL AND METHOD

The experiment was conducted in the teaching field of the Fruit Growing Department from the Faculty of Horticulture from Bucharest, during 2010-2011, in a peach tree plantation, founded in the spring of 2008, with a planting distance of $5 \times 1,5$ m, the crown shape being Tatura Trellis. The purpose and objectives of this experiment were to analyze the manner in which the trees react to the conditions of planting at a small distance on the rows and managing the crowns Tatura Trellis shaped, both technological elements being less used in Romania.

The biological material was represented by 7 peach varieties: Cardinal, Inka, Reliance, Royal Estate, Early rich, October star and Late Luka, grafted on Mirobolan B29. Each of the varieties was represented by 5 trees, which consisted in the repetitions of the experiment.

The plantation was maintained according to the traditional technology for fruit plantation, the soil was maintained grassed on the rows and worked between rows and the water was ensured using a dripping irrigation system.

Measurements and determinations were made regarding:

- The ongoing of the phenology of the floral organs;
- Growth capacity of the trunk;
- Ramification capacity (mixed and anticipated branches);
- Percentage of fruits fecunded
- Production capacity.

RESULTS AND DISSCUTONS

The ongoing of the phonological phases of the reproduction organs was influenced by the climatic year, the year 2010 being earlier than 2011. The growth of the buds started in the last decade of March with the varieties Inka and Late Luka (24 March) and ended with the varieties Inka estate and October star (7-8 April). The flowering took place during 6-26 April, with small differences between varieties (table 1). The type of flower was rosy for the varieties Royal estate and Early rich and bell-shaped for the varieties Cardinal, Reliance, October star and Late Luke.

Table 1

Variety	Growth of the buds	Beginning of flowering	Top of flowering	End of flowering
Cardinal	25.03-6.04	7-13.04	12-17.04	19-23.04
Inka	24.03-7.04	6-14.04	12-18.04	18-24.04
Reliance	25.03-7.04	7-15.04	10-20.04	18-26.04
Royal estate	27.03-5.04	9-12.04	12-16.04	19-21.04
Early rich	24.03-4.04	6-11.04	10-19.04	18-24.04
October star	27.03-8.04	7-13.04	11-20.04	19-25.04
Late luka	24.03-4.04	8-12.04	12-19.04	18-24.04

The ongoing of the phenological phases during 2010-2011

The length of the flowering was rather close between varieties, with small fluctuations due to the climatic year (fig.1) and it lasted for 10-14 days.



Fig. 1 Length of flowering

The growth and ramification capacity of the trees was different depending on the variety, both regarding the increase in diameter of the trunk and the forming of annual branches (table 2). The varieties Early rich, Reliace and Royal estate proved to be more vigorous, with diameter of the trunk of 5 cm and less vigorous was the variety Inka, with 3,9 cm. the largest number of mixed branches was recorded for the Early rich variety, 92,6 branches/tree, while Inka had the lowest number,73 branches/tree. The capacity to form anticipates was higher for Early rich variety, with 7 anticipates on the main branch, and lower for the variety Cardinal, with only 3,5 anticipates/main branch. The sum of the total growths was between 3005 cm for Reliace and 4262 cm for Early rich.

Table 2

Variety	Diameter of trunk (cm)	Number of mixed branches/tree (branches)	Number of anticipates/mixed branch (anticipates)	Sum of total growths (cm)
Cardinal	4,10	79,33	3,50	3649,33
Inka	3,90	73,00	5,43	3358,00
Reliance	4,95	85,33	6,57	3005,33
Royal estate	4,95	86,33	5,67	3971,33
Early rich	5,22	92,67	7,00	4262,67
October star	4,28	86,67	6,67	3986,67
Late Luka	4,23	73,33	4,33	3373,33

Some biometric parameters of the trees (2011)

The fructification capacity of the trees depends on bud differentiation, on the degree of flowering and on the capacity to form fruit. The formation of fruit depends on the climatic conditions, which can be weakly influenced by the technology of culture. In the case of the analyzed varieties, the average percentage of fruit formation was between 12% for the varieties Inka and Late Luka and 21% for Royal estate (fig. 2), in the conditions of a very difficult spring.



Fig. 2 Average percentage of fruit formation (2010-2011)

The fruit production was satisfying because the trees were in the third and fourth year of life, and the crown had not yet reached the normal size according to the nutrition space. If in the third year of life, between 4,6 and 7 t/ha were produced, in the fourth year the trees produced more than 13 t/ha for Cardinal, 12 t/ha for Early rich, while at the other end the variety October star produced 8 t/ha (fig. 3). It is remarkable the fact that during the spring of 2011 there were some problems with *Taphrina*, immediately after the fruit formed, which determined a greater physiological fall.



Fig. 3 Fruit production t/ha

CONCLUSIONS

From this preliminary study, the following conclusions can be drawn:

- The length of the flowering was weakly influenced by the variety and greatly by the climatic conditions;
- The ramification capacity of the trees, expressed through the number of mixed branches and anticipates, was influenced by the particularities of the variety, the differences between them being obvious. The varieties Early rich and October star had a higher ramification capacity, while the varieties Cardinal and Late Luka a lower one;
- The growth of the trunk was higher for the varieties Early rich and October star and lower for the varieties Inka and Late Luka;
- In general, the variety Early rich proved to be more vigorous, while the variety Reliance show a low vigor;
- The capacity to form fruit was greatly influenced by the climatic year; in 2010 more fruit were formed for Cardinal, while in 2011 for Royal Estate;
- The production capacity, expressed through the production obtained in the two years, was higher for the varieties Cardinal and Early rich and lower for the varieties Late Luka and October star.

BIBLIOGRAPHY

- 1. Hoza Dorel ., Asanica A. Tehnologia de exploatare a plantațiilor de piersic. Editura Ad. Literam, Bucuresti, 2004, pag 12-20.
- Hoza D., Păun C. Toleranța la înghețul de revenire a unor specii drupacee. Lucr. şt. Seria B, Horticultura, vol.XLI, 1998, pag. 75-80.
- Ivaşcu Antonia, Hoza D. Cultura piersicului ghid practic Editura Medro, 2005, pag. 7-15.
- Sansavini S., High density peach and nectarine plantings in Europe. The Decidous Fruit Grower, April, 1993.

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

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

Vol. XVI (LII) - 2011

RESEARCH REGARDING THE BEHAVIOR OF LETTUCE IN CULTURE MULCHED WITH DIFFERENT MATERIALS

Hoza Gheorghita¹

KEYWORDS: mulch, lettuce, cultivation, agrotextile, plant material

ABSTRACT

The present paper consists of a study of the influence of the type of mulch on the lettuce field culture, during spring culture. As mulch, dry turf mowed one year before, fresh mowed turf, materials that bring additional nutrients besides the role that they have as mulch and that represent at times useless waste and black agrotextile were used. Six cultivars were used: Samba, Iwa, White boston, Lollo rosa, May king and Great lakes, each of them being cultivated in subdivided parcels, mulched with the above mentioned materials.

The obtained data demonstrated the mulching must be cosmulsory applied to a lettuce culture in order to obtain a large production and a lower risk of disease. From this point of view, the mulch with mowed turf was noted, which led to obtaining additional production.

The varieties Samba and Iwa recorded productions of $10,7 \text{ kg/m}^2$ and 10,1 kg/sm respectively, mulched with dry turf, followed by Great lakes with 9,3 kg/sm and May king with 8 kg/m², also mulched with dry turf. The fresh turf used to mulch led to a production of 7 - 8 kg/sm for Samba, Iwa, White boston and Great lakes and around 5 kg/sm for Lollo rosa and May king. The agrotextile led to weaker results, except for Samba variety. The smallest productions were obtained for the control parcel, which was not mulched.

The research would continue both for the lettuce and other cultures to highlight the benefits for the plants of this material that does not involve any cost.

INTRODUCTION

The lettuce is a vegetable species demanded and appreciated during the entire year, with benefits for the human body. Due to these elements, it is cultivated in phases, during a longer period within one year, taken into account the climatic conditions specific to our country. In order to achieve this fact, different methods and procedures must be used that lead to obtaining a good production and high quality lettuce.

One of the procedures used is mulching the culture with different materials that stimulate the growth of the plants by avoiding humidity fluctuations, maintaining the weeds at a level that does not affect the plants and protects from reaching the soil to avoid the risk of disease and depreciation of the edible part.

The mulching is made with different plant materials, such as different composts (Hoza Gheorghita, 2005) mowed grass, (Hoza Gheorghita, 2009) fresh or dry, straws, and with anorganic materials (Lamont, 1993), such as plastic mulching foil, black, green or white agrotextile foil (McCraw, D. Motes, J.E. 2007). The use of these mulching materials

¹ University of Agronomical Science and Veterinary Medicine Bucharest, <u>hozagh@yahoo.com</u>

does not limit the use of the irrigation instalation by drip, except for the mulching foil (Marr, 1993) which is waterproof. The organic materials enrich the physico-chemical features of the soil with benefits for the growth of lettuce plants.

MATERIAL AND METHOD

The research was conducted in filed, Bucharest area, in a spring culture founded with 32 day seedling, in pure culture, using the planting scheme of 25 cm/ 25 cm. The experiment was bifactorial, organized in subdivided parcels, as follows:

- *factor a*, with six varieties: a1 Samba, a2 Iwa, a3 White Boston, a4 Lollo rosa, a5 May king, a6 Great Lakes.
- *Factor b*, with three types of mulch: b1 black agrotextile, b2 dry turf, mowed one year before, b3 fresh mowed turf;

The seedling was produced in warm greenhouse, through direct, manual sowing, in palettes with alveolars of 3,5 cm, in substrate of peat with pH of 5,5-6, ensuring normal maintenance works.

The culture was founded in field, on March 22th and maintained according to the traditional technology. The mulch was applied before planting for the variants with agrotextile and the perforation of the mulch at the planting place, according to the planting scheme, and after the planting for the variants mulched with dry and fresh turf. The irrigation was made with hoses, because all the materials used are permeable, maintaining the soil wet. Two fertilizations were applied during the vegetation period, using Cosmlex 3, solution, with a concentration of 1 and 1,5 % respectively, 150 ml applied manually per plant.

Observations and measurements on the cultivated varieties considering the materials used for the mulch were made, such as: dynamics of the growth of the edible part, average weight at harvest and diameter of the edible part, total weight of plants, cosmuting the ratio between the edible part and total weight of plant, production per unit of area, separately for each variant.

RESULTS AND DISCUSSION

From the research conducted at the lettuce culture during the spring, it can be appreciated that mulching the culture leads to very good results, without great effort neither physical nor financial. Thus, by using different types of mulch, it could be observed an uniform growth of the plants for all verieties and a reduced ismact of diseases and enemies.

Analyzing the growth of the plants during three weeks, differences can be observed both between varieties and between types of mulch applied (table 1). The mulching variant with dry turf can be noted for all varieties studied, which determined an increase in the diameter of the rosette during the reference period, which demonstrates that this material is good for the lettuce culture.

Very good results were recorded also for the mulch with black agrotextile, due to the intake of solar radius, but still lower than for the mulch from dry turf, because the depth heating of the soil was weaker in the case of black agrotextile. The control recorded the lowest values, because the soil, not being mulched, greatly lost water, did not acumulate heat, which led to a slow growth of the plants.

Moreover, it can be observed that the variety Iwa had a very vigurous growth, having the largest rosettes that reached in te third week a diameter of 43 cm. The least

vigurous variety was Lollo rosa, with values of 26 cm in diamter, being a low vigor variety. The other varieties recorded intermediary values, being of medium to high vigor.

Regarding the average weight of the edible part, it was observed that the highest values were recorded for the mulched variants, as cosmared to the control (table 2). Differences between varieties were also recorded, the best results being obtained for the dry turf mulching, the edible part having 718 g for Samba, 671 g for Iwa, 617 g for Great lakes etc. Very good results were also obtained for fresh turf mulching as follows: 558 g for Iwa, 504 for Samba, 475 g for White Boston etc.

For not mulched plants, the weight of the edible part was lower, even by half for some varieties, as cosmared to the same varieties mulched with dry turf (Samba, Great lakes). The values recorded were 484 g la Iwa, 372 g for White Boston, 308 g for Great lakes and the lowest value for Lollo rosa, 231g.

The weight of the root had very low values cosmared to the edible part. Knowing the lettuce has a root system weakly developed, the values were from 11 g for Lollo rosa on agrotextile and Great lakes without mulch, to 29 g for Iwa on dry turf.

Cosmuting the lettuce production per unit of area, it was noted that there is a correlation between the average weight of the edible part and production and it is different depending on the variety and type of mulch used (table 3). The losses were small, around 10%.

Additional production was noted for the varieties Samba for Iwa with a value of 5,7 kg/sm and 4,7 kg/sm respectively, mulched with dry turf, followed by Iwa 4,3 kg/sm and May king 3,8 kg/sm, mulched also with dry turf. Also, the agrotextile and fresh turf used for mulching increased the production with 3,4 kg/sm and 2,5 kg/sm respectively for Samba, 1,9 kg/sm and 2,4 kg/sm la Great lakes. The smallest productions were recorded for the control.

Dynamics of lettuce plant growth (rosette diameter, cm)

Table 1

Variaty	Tuna of mulah	8	Date	
variety	Type of mulch	10.05	17.05	27.05
	Agrotextile	19,6	25,5	31
SAMBA	Dry turf	20,8	25,6	33,5
	Fresh turf	18,8	23,8	30,1
	Control	17,1	22,8	31
	Agrotextile	28	30,3	34,1
IWA	Dry turf	28,6	35,6	43,5
	Fresh turf	27,6	34,8	43,3
	Control	27,5	33,5	40,1
	Agrotextile	19,5	22,1	26,5
WHITE BOSTON	Dry turf	22,1	28,1	35
	Fresh turf	18	22,3	29,3
	Control	18,1	22,5	28,5
	Agrotextile	16,6	20,1	25
LOLLO ROSA	Dry turf	17,1	22,1	26,8
	Fresh turf	15,8	20,3	26,5
	Control	16	20,3	22,6
	Agrotextile	19,8	23	27,8
MAY KING	Dry turf	19,8	26,1	35
	Fresh turf	17,5	26,5	33,5
	Control	18	25,5	33,1
	Agrotextile	19,8	24,6	32,8

GREAT LAKES	Dry turf	20,6	28,6	39,6
	Fresh turf	18,6	27,6	36,3
	Control	17,6	21,3	31,3

Table 2

Average weight of lettuce plants mulched with different materials

Variata	True of mulab		Average weight, g			
variety	Type of mulch	Edible part	Root	Total		
	Agrotextile	562,6	15,8	578,4		
SAMBA	Dry turf	718,6	25,6	744,2		
	Fresh turf	504	17,4	521,4		
	Control	337,4	12,8	350,2		
	Agrotextile	469	23,4	492,4		
IWA	Dry turf	671,6	29,6	701,2		
	Fresh turf	558,8	24,8	586,8		
	Control	384,6	22,4	406,4		
	Agrotextile	381,6	20,8	402,4		
WHITE	Dry turf	482	25,8	507,8		
BOSTON	Fresh turf	475,8	14,4	490,2		
	Control	372,8	20	392,8		
	Agrotextile	309,6	11	320,6		
LOLLO ROSA	Dry turf	518,4	12,8	531,2		
	Fresh turf	350,8	13,2	364		
	Control	231,2	10,4	241,6		
	Agrotextile	298,6	19,4	318		
MAY KING	Dry turf	533	23,2	556,4		
	Fresh turf	354,4	22	376,4		
	Control	282,4	15	297,4		
	Agrotextile	435,4	12,2	447,6		
GREAT LAKES	Dry turf	618,4	11,8	630,2		
	Fresh turf	466,8	17,8	484,6		
	Control	308,6	11	319,6		

Table 3

Lettuce production, depending on the variety and type of mulch

			Production		
Variety	Type of mulch	K a/am	Difference cosmared to the control		
		Kg/SIII	Absolute, kg	Relative, %	
	Agrotextile	8,4	+ 3,4	168	
SAMBA	Dry turf	10,7	+ 5,7	214	
	Fresh turf	7,5	+ 2,5	150	
	Control	5	-	100	
	Agrotextile	7	+ 1,2	121	
IWA	Dry turf	10,1	+ 4,3	174	
	Fresh turf	8,3	+ 2,5	143	
	Control	5,8	-	100	
	Agrotextile	5,7	+ 0,2	103	
WHITE BOSTON	Dry turf	7,2	+ 1,7	131	
	Fresh turf	7,1	+ 1,6	129	
	Control	5,5	-	100	
	Agrotextile	4,6	+ 1,1	131	
LOLLO ROSA	Dry turf	7,8	+ 2,2	123	
-------------	-------------	-----	-------	-----	
	Fresh turf	5,3	+ 1,5	151	
	Control	3,5	-	100	
	Agrotextile	4,5	+0,3	107	
MAY KING	Dry turf	8	+ 3,8	190	
	Fresh turf	5,3	+ 1,1	126	
	Control	4,2		100	
	Agrotextile	6,5	+ 1,9	141	
GREAT LAKES	Dry turf	9,3	+ 4,7	202	
	Fresh turf	7	+ 2,4	152	
	Control	4,6	-	100	

CONCLUSIONS

On the basis of the results obtained regarding the influence of different types of mulch applied on the lettuce culture in field, the following conclusions can be drawn:

- the use of dry turf, mowed one year before, in a thick layer of 5-6 cm, applied after the culture was founded, has a special effect on the lettuce production also through the share of nutrients, which in the present paper was computed at 10 kg/sm for the varieties Samba and Iwa, 9,3 kg/sm for Great lakes, 8 kg/sm for May king;
- the use of fresh turf applied as the dry one had benefits on the lettuce production, leading to values of 7 -8 kg/sm for Samba, Iwa, White boston, Great lakes and 5,3 kg/sm for Lollo rosa and May king;
- the black agrotextile is a very good material to control the weeds, allows irrigation, but the production is smaller for some varieties compared to the two types of turf (White boston 5,7 kg/sm, Lollo rosa 4,6 kg/sm and May king 4,5 kg/sm);
- > the use of cultivars with high productive potential, disease tolerant;
- the application of maintenance works at the optimum moment and a high qualitative level.

REFERENCES

- Hoza Gheorghiţa, Florin Oancea, Oana Sicuia, Drăghici Elena Researches regarding the tomatoe culture in biocosmosit mulching system, Bulletin of agricultural sciences and veterinary medicine Cluj-Napoca, vol. 66, Issue 1/2009, pag. 672
- Hoza Gheorghița, Todică Al. Preliminary researches regarding the influence of some organic materials used for mulching the cucumber culture, Lucr.şt. UŞAMV Bucureşti, seria B Horticultură, 2005, vol. XLVIII, pag. 80-84.
- 3. Lamont, W. J., Jr. (1993). "Plastic mulches for the production of vegetable crops". *HortTechnology* **3** (1): 35–39.
- 4. McCraw, D. Motes, J.E. 2007. Use of Plastic Mulch and Row Covers in Vegetable Production. Oklahoma Cooperative Extension Fact Sheets. 1-5.
- 5. Wittwer, S. H. (1993). "World-wide use of plastics in horticultural production". *HortTechnology* **3** (1): 6–19.

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

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

Vol. XVI (LII) - 2011

ACROMEGALY – ETIOPATHOGENY, INCIDENCE, CLINICAL CHARACTERISTICS

Ionescu Elena¹, Glodeanu Adina¹, Gănescu Anca Elena²

KEYWORDS: *pituitary adenoma, STH hyposecretion, dysmorphism, acromegaly, visceromegaly.*

ABSTRACT

Pituitary adenomas are benign tumors; they arise from epithelial pituitary cells and they represent 10-15% of intracranial tumors. They can be found at 3% up to 20% of the population, on autopsy series.

Cephalalgia is a precocious symptom which keeps going over the disease. The aspect as a whole of the person who suffers from this disease in the phase of established malady is characteristic: a very flat-shaped body, massive and stubby thus justifying the comparison with a pachyderm.

Hands and legs are disproportionally bigger, like paddles, facies is disharmonic, facial features become coarse, with oblate forehead and massive prominent pregnant mandible. The joints disproportionately bigger, have limited, painful movement. The patient also presents visceral hypertrophy with numerous dysfunctions from various apparatus and systems.

INTRODUCTION

Pituitary adenomas are benign tumors from the epithelial pituitary cells and they represent 10-15% of intracranial tumors. They can be found at 3% up to 20% of the population, on autopsy series (Bistriceanu M.-Endocrinologie, 2000, Katznelson Laurance: The diagnosis and treatment of acromegaly. The endocrinologist. 2003).

These tumors can be hormonally active; they clinically manifest by acromegaly (excessive secretion of growth hormone), Cushing syndrome (ACTH and secondary of cortisol excess), amenorrhea-galactorrhea syndrome (prolactine excess) or it can be hormonally inactive (dysfunctional clinical tumors)(Dorshkind K, Horseman ND. Rev 2000 Jun, Dimaraki EV, Jaffe CA, DeMott Friberg R, et al. 2002).

Furthermore, pituitary adenomas can grow to sizes which can determine compression effects over the neighbouring structures, defending the pituitary insufficiency, vision disorders and, rarely, intracranial hypertension. From the historical point of view pituitary tumors are mostly benign.

The adenoma secreted by PRL or prolactine is the most frequent type of secretive pituituray tumor (about 39%), followed by GH secretive adenomas and ACTH secretive tumors. Non-functional tumors represent only 10 % of pituitary adenomas whereas TSH secreting tumors, gonadotrophines or alpha subunits are rare (Herrmann B.L, Bruch C,

¹ University of Medicine and Pharmacy Craiova

² University of Craiova Faculty Of Chemistry

Saller B, Bartel T, Ferdin S, Erbel R, Mann K: 2002). Regarding the age of apparition, the pituitary hypersomatotropism determines two distinctive clinical forms: gigantism, when it appears in childhood and acromegaly when it appears after the bones overgrowth. Acromegaly has a gradual slow progressive evolution (Freda PU, Reyes CM, Nuruzzaman AT, et al. 2003, Herrmann B.L, Bruch C, Saller B, Bartel T, Ferdin S, Erbel R, Mann K: 2002, Jaffrain-Rea ML, Moroni C, Baldelli R, et al 2003).

Cephalalgia is a precocious symptom which maintains over the disease. The aspect as a whole of the person who suffers from this disease in the phase of established malady is characteristic: a very flat-shaped body, stubby and massive thus justifying the comparison with a pachyderm.

Hands and legs are disproportionally bigger, like paddles, the facies is disharmonic, facial features become coarse with oblate forehead, massive prominent pregnant mandible. Although the muscular system is well developed, muscular force is diminished. The joints disproportionately bigger, have limited, painful movement. The patient also presents visceral hypertrophy with numerous dysfunctions from the various systems.

MATERIALS AND METHODS

This study was performed at Craiova Emergency County Hospital, having a retrospective component (after observation files) and a perspective one (by direct supervision), over a 6 years period (2004-2009)

Within the study there were included 80 patients with pituitary adenomas-27 prolactinomas, 19 GH secreting adenomas and 34 non-secreting tumors.

The patients were investigated by determining the STH, taking usual blood analyses and also evaluating the breathing function and making a cardiovascular, neurological, ophthalmological, psychological evaluation and CT or RMN examination of the GH secreting pituitary tumor.

RESULTS AND DISCUTION

Recent studies mention a 1/1 women/men proportion for the GH secreting adenomas, but in this study we registered 11 women and 8 men with GH secreting adenomas.

Regarding distribution on age groups specific studies showed that the ocurrence of investigared pathology is more frequent for the age group of 40 - 60 years. In our study we found 4 cases (5%) with ages between 40 - 49 years, 7 cases (8,75%) with ages between 50 - 59 years, and only 3 cases (3,75%) with ages between 30 - 39 years, no patient below 30 years and the rest of 5 cases with ages over 60 years.

As for the 19 patients diagnosed with acromegaly there has been performed GH dosing and as a result there were higher values than the upper limit (over 5ng/ml for men or over 10ng/ml for women). At the acromegalic patients The GH average was 20/96ng/ml, with a minimum of 6,8ng/ml and a maximum of 72,7ng/ml



Figure 1. Correlation between hormonal secretion and tumoral volume

From the graphic above (fig.1) we can conclude that there is a direct correlation between the dimension of the tumor measured RMN and somatotrope secretion (the bigger diameter of the tumor is, the bigger is the quantity of hormone), because the line of regression has a clear upward slope. This is underlined also statistically, the r correlation coefficient of Pearson having the value of 0.752, which overcomes the limit of significance of ± 0.456 of r for 19 subjects (17 freedom degrees). Within the acromegaly pacients group we have obtained the following pathological values (fig.2):

- Systolic HTA at 8 patients (57,9%) and diasistolic HTA at 1 patient (5,3%);

-AV over 80 beats /min at 1 patient (5,3%);

-Glycemia over 110 mg/dl at 2 patients (10,5%), with diabetes mellitus type II confirmed at 1 patient;

-Hypercholesterolemia at 9 patients (47,4%);

-Hypertriglyceridemia (triglycerides over 150 mg) at 5 patients (26,3%);

-11 patients (57,9%) had GH secretive macroadenoma GH and 8 patients (42,1%) had microadenoma (smaller than 10 mm diameter).





Regarding the patients from the present study, the percentage of those whose visual field was affected (8, 75% representing 7 patients) is comparable to that whose patients didn't have any CV deficits-8 patients and visual acuity decrease was registered at 46,25% of the acromegalic patients.

From the 19 patients diagnosed with acromegaly, only 1 patient didn't have an EKG **print**, 4 patients (5%) had cardiomegaly with associative ischemic cardiopathy, 5 patients (6,25%) had ischemic cardiopathy symptoms but 9 patients (11,25%) had an EKG track of normal repose.

At acromegalic patients, lung complications are a growing factor of mortality. In Wright and his collaborators' study there can be seen a three times growth of mortality from breathing causes. Functional breathing tests are abnormal not only at men but also at women. Total pulmonary capacity increases up to 81% at men and 56% at women, 36% present a narrowing of small pipes and 26% have their large bronchias narrowed. (155) Pipes' narrowing and apnea during sleeping, frequent at these patients, contributes to a high level of mortality at acromegalic patients (Oruckaptan HH, Senmevism O, Ozcan OE, et al: 2003, Popovic V, Leal A, Micic D et al. G 2000). In this study, 18 patients out of 19, took the breathing functional exploration test.

Patients were tested by using spirographic method, measuring the maximum exhaling volume per second (MEVS). After measuring the MEVS there resulted: 10 patients (52% of acromegalic people) didn't have a ventilation dysfunction of gentle obstructive type and 2 patients (11%) had a medium ventilation dysfunction (Katznelson Laurance, 2003). Depressive disorders and other kinds of disorders associated to acromegaly were: 10% of GH secretive pituitary tumor had a severe depression (closely related to present dysmorphism at these patients) 6,25% had an average depression, 5% a light depression and only 2,5% didn't present any symptoms of depression.

The risk of depression at the acromegalic patients is higher than the risk of this psychiatric manifestation at other pituitary affections. Other symptoms noticed at acromegalic patients were : psycho-emotional lability, physical and psychical asthenia, loss of initiative, inhibition, TENDENCY OF SOCIAL ISOLATION, mnestic and prosex

difficulties, insomnia/terrifying dreams, irritability, depressive ideation, panic attack, fatigue, anxiety, hallucinations (Bistriceanu, 2000).

CONCLUSIONS

- 1. As for the frequency, adenoma secreted by GH represents the second type of pituitary adenoma after prolactinoma being characterized by clinical dysmorphism and multivisceral affectation.
- 2. Within the studied group we had 11 women and 8 men with a frequent incidence of age group 40-60 years.
- 3. There was a direct correlation between the dimension of the tumor measured RMN and somatotrope secretion (the larger is the diameter of the tumor the bigger is the quantity of the hormone).
- 4. 85% of the patients had systolic HTA, 1 patient (5,3%) had HTA diastolic, diabetes mellitus type 2 was found at 1 patient and dyslipidemia was presented at 9 patients.

BIBLIOGRAFY

Bistriceanu M.-Endocrinologie clinică, Ed. de Sud, Craiova, 2000.

Dorshkind K, Horseman ND. The roles of prolactin, growth hormone, insulin-like growth factor-1, and thyroid hormones in lymphocyte development and function: insights from genetic models of hormone and hormone receptor deficiency. Endocr Rev 2000 Jun;21:292-312.

Dimaraki EV, Jaffe CA, DeMott Friberg R, et al. Acromegaly apparently normal Gh secretion: implication for diagnosis foolow up. J Clin Endocrinol Metab 2002:87;3537-3542.

Freda PU, Reyes CM, Nuruzzaman AT, et al. Basal and glucosuppressed GH levels less than 1 μ g/L in newly diagnosed acromegaly. Pituitary 2003;6:175-180.

Herrmann B.L, Bruch C, Saller B, Bartel T, Ferdin S, Erbel R, Mann K: Acromegaly evidence for a direct relation between disease activity and cardiac dysfunction in patients without ventricular hypertrophy. Clin Endocrinol 2002;56:595-602.

Jaffrain-Rea ML, Moroni Č, Baldelli R, et al: Relationship between blood pressure and glucose tolerance in acromegaly. Clinical Endocrinology (Oxf), 2003;54(2): 189-195. Ref. Type: Generic.

Katznelson Laurance: The diagnosis and treatment of acromegaly. The endocrinologist. 2003;13-428-434.

Oruckaptan HH, Senmevism O, Ozcan OE, et al: Pituitary adenomas: results of 684 surgically treated patients and review of the literature. Surg Neurol 2000, 53:211-219.

Popovic V, Leal A, Micic D et al. GH-releasing hormone and GH-releasing peptide-6 for diagnostic testing in GH-deficient adults. Lancet 2000;356:1137-1142

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

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

Vol. XVI (LII) - 2011

ALZHEIMER'S DISEASE-ETIOPATHOGENY AND CLINICAL ASPECTS

Ionescu Elena¹

KEYWORDS: *AD, neurodegenerative disorder; cognitive , neurogical, functional symptomes.*

ABSTRACT

AD is a progressive neurodegenerative disorder which, from the etiopathogenical point of view, implies not only numerous risk factors but also a neurobiological pattern which differentiate it from other forms of dementia.

Clinical manifestations in AD can be grouped in: 1) cognitive and neurological symptomes, 2) functional symptomes or deterioration of capacity of daily activities participation, 3) behavioural or psychiatric symptoms and 4) accentuation of deterioration by external factors intervention. It is assumed that in some cases the disease beginning can be established about 20 years before the first manifestations, and the precocious phase, which doesn't allow another clinical diagnosis, lasts 2-4 years. The difficulty of a precocious diagnosis is given by the insidious outset of symptoms, lack of relevance and their commonplace, entourage tolerance and the profile of subject activity.

INTRODUCTION

AD is a progressive neurodegenerative disorder which, from the etiopathogenical point of view, implies not only numerous risk factors but also a neurobiological pattern which differentiate it from other forms of dementia. Pathologic changes of AD have been primary noticed at the level of neocortex but they also appear in other sides of the brains (Katzman, R, 1986). Coarse cortical atrophy is accompanied by loss of neurons and synapses, together with astrogliosis.The hyppocampus is especially affected by the pathologic processes, which seem to explain the major memory problems of AD.

Loss of pyramidal cells is maximum in CA1, CA2 and the entorhinal cortex (Voght, BA, Finch, MD, Olson, CR, 2001). Up to now, the induction of progressive diminution of cerebral neurons, the occurence of senile plaques, granulovascular and neurofibrillar degeneracy, Hirano bodies and loss of neurotransmitters are partially known only (Francis, PR, 2003, Dănăilă, L, Gheorgh, MD, Ploaie, P, 1996).

Progressive degeneracy of basal nuclei, whose projections reach across the limbic system and associative cerebral cortex, leads to generalized touch of cognition and behaviour, sensitivity and sensoriality, turning the subject into a dependent on the people round him, who would be forced to witness at all the current life activities.

Major risk factors would be: female sex (proportion women/men=2/1), tyroid disorder antecedents, trisomy 21, mother's age at birth, craniocerebral traumas. For tardy

¹ University of Medicine and Pharmacy Craiova, e-mail address elena.ionesc@yahoo.com

begining, more important risk factors would be: alcohol abuse, professions that implies working with hands and family history regarding dementia.

It is sustained that 10% of cases with precociuos outset are based on genetic transmission autosomal dominant, after a punctiform mutation of the gene that encodes the protein predecessor of amyloid (APP) on C21. There have been inculpative another 2 genetic mulfunctions: mutations on the genes that encode presenilin 1 (PS21) on C14 and presenilin 2 (PS2) on C1. These three genetic malfunctions would lead to a growth of peptidic fragment beta A4 of APP, these forming the nucleus of amyloid plaque. Most of DA cases with precocious beginning and in fact all the ones with tardy beginning have a multifactorial polygenic transmission. The most controversial allele as risk factor for DA is the one for APOE4 that encodes the epsiolon4 variant of apolipoprotein E.

It is considered that there are sufficient experimental data that support the immunity hypothesis in Alzheimer etiopathogeny. The cerebral antibodies level at demented patients is significantly higher than the one present at healthy subjects with the same age. Lal-1985 (Lal, H, Forster, MJ, Nandy, K, 1985) sustains that in cognitive deterioration etiology are also involved the auto-immune ractions from CNS, and Glenner and Haga-1985 (Glenner, GG, Haga, G, 1985) show that amyloid fibres and senile plaques present at the patients with dementia are immunoglobulin compounds.

Another hypothesis involved in AD etiopathogeny is the neurobiochemical one. A constant feature of DA is represented by cellular losses from the colinergic structures: Meyert Basal Nucleus, longitudinal bandaletta nucleus and median septum. Apart from the colinergic structures there are also affected: locus coeruleus (with noradrenergic transmission distrurbance), raphes nuclei (affecting the serotoninergic transmission) and basal dopaminergic structures (striatum, nucleus caudatus, putamen). Microscopical base of macroscopical changes is represented by senile plaques and neurofibrillar tangles. Betaamyloid protein is stored in extracellular plaques (neuritic) which the more they grow the more compact they become and they are surrounded by neurons in degeneracy and glial cells. Tau protein, hyperphosphorylated, forms helical filaments in pairs inside the neurons named neurofibrillar tangles (NFT). On the biochemical level, these pathological modifications are associated with disturbance of neurotransmission systems, mainly the acetylcoline concentration and the imbalance between monoamines and the excitator amino acids. Furthermore, the number of nicotinic and muscarinic receptors (Flynn, P, 1995, Hsia, AY et al, 1999) decreses, as well as the level of choline acetyltransferase, responsible for acetylcholine bionsyntesis (Huang, C, Wahlung, LO, 2002, Marinescu, D, Udriștoiu, T, 2004). Clinical manifestations in AD can be grouped in: 1) cognitive and neurological symptomes, 2) functional symptomes or deterioration of capacity of daily activities participation, 3) behavioural or psychiatric symptoms and 4) deterioration emphasis by external factors intervention. It is assumed that in some cases the disease beginning can be established about 20 years before the first manifestations, and the precocious phase, which doesn't allow another clinical diagnosis, lasts 2-4 years. It is the period in which an isolated mnestic disorder and performances diminution, associated with behavioral disorders and mood perceivable by entourage, can anticipate a dementia. The difficulty of a precocious diagnosis is given by the insidious beginning of symptoms, lack of relevance and their commonplace, entourage tolerance and the profile of subject activity.

METHOD OF WORK

A retrospective study has been performed on a group of 265 patients diagnosed with Alzheimer disease, registered at Craiova Mental Health Laboratory between 2005-

2010. In order to make this study, data about the patients have been gathered –personal, clinical and paraclinical. There have been established age groups: under 50, 50-69, 70-79 and over 80, sex, place of origin (rural or urban), education level, family support, symptomatology at its beginning, heredo-collateral antecendents, precipitant factors, psychiatric factors, psychiatric antecedents (affective disorders, organic personality disorders, alcoholism), affections associated with cerebral function exploring by CT cerebral. The following scales have been used: MMSE (Mini Mintal State Examination) (table 1)which is the easiest to apply for cognition, used in order to evaluate the cognitive disfunction and Blessed scale (table 2) that consisted in an evaluation on 3 levels, where total incompetence represents 1 point, the partial one or variable incapacity- 0,5 points and the normal one-0, total rating varying from 0 to 28- extreme incapacity (Locascio, JJ, Groddon, JH, Corkin, S, 1995).

Table 1

	annation
Orientation	Score
1.Ask your patient ,,What season, date, month,	/5
year are we?"	
2.Ask "where are you?" –county, country, city,	/5
palce, hospital	
Memorize	Score
3.Ask your patient to memorize, then to	
pronounce 3 objects without any connection	
between them (speak slowly and clear). Ask	
your pacient to repeat the 3 objects	
(3 points if it is correct the first time, 2 points if it	/3
is correct the second time and	
1 point if the third time is correct). Ask the	
patients to memorize the 3 objects.	
Attention and concentration	Score
4. Ask your patient to take 7 out of 100, then 7	
out of the result and again to 5 operations	
Score1point for each correct answer or ask your	/5
patient to spell a word and score	
1 point for each correct letter	
Evocation	Score
5.Ask your patient să to name the 3 objects from	/3
test 3	
Language	Score
6.Show your patient 2 familiar objects (eg. pen,	
watch, etc) and ask him	/2
to name them	
7.Ask your patient to repeat a sentence after you	
(without "if" "and", or "but")	/1
8.Ask your pacient to obey a triple command:	
"Hold this paper with your left	
hand, fold it in half and put in on the floor"	/3
9.Ask your patient to read and obey a written	
command e.g. "Close your eyes"	/1

Mini Minal State Examination

10. Ask your patient to write a simple o sentence.	
The sentence must have a meaning	/1
and it must have a subject and predicate	
11.Ask your patient to reproduce a drawing:	/1
2 crossed pentagons	
Total score	
Below 24 indicates cognitive deficiency: posible	
Below 17 indicates cognitive deficiency:certain	

Table 2.

Blessed Demential Disease Scale

Changes in performing daily activities			
1. Incapacity to perform daily housework	1	1/2	0
2. Incapacity to manage small amount of	1	1/2	0
money			
3. Incapacity to remember a short list of	1	1/2	0
objects			
4. Incapacity to find the way inside the house	1	1/2	0
5. Incapacity to find familiar roads	1	1/2	0
6.Incapacity to interpret the surroundings (to			
recognize	1	1/2	0
the place: home, hospital, to make a			
distinction			
between pacients, doctors, nurses, relatives			
etc)			
7. Incapacity to remember recent events	1	1/2	0
(e.g recent walks, visits of relatives and			
friends)			
8. Tendency to remain in the past	1	1/2	0

Habit changes

9.Eating activity	
Clean with adequate utensils/objects	0
Dirty, only with spoon	2
Simple solid food (eg. biscuits)	2
Must be fed	3
10.Getting dressed activity	
Without help	0
Ocassionally confuses shirt buttons	1
Wrong way, usually forgets objects	2
Can't get dress	3
11. Total control of sphincter	0
Wet beds ocassionally	1
Wet beds frequently	2
Incontinent/incapable of holding	3

Personality, interests and management changes

No change	0
12.High rigidity	1
13. High egocentricity	1
14.Indifferent to other people's feelings	1
15.Behaviour roughning (vulgar language)	1
16.Deterioration of emotional control (high irritability)	1
17. Hilarity /louder laghter in inadequate situations	1
18.Diminished capacity to respond emotionally	1
19.Deliquency /sexual crime (newly appeared)	0

Restrained interests

20.Hobbies abandonned	1
21.Diminished initiative or growing apathy	1
22.Hyperactivity without a purpose	1

RESULTS

According to sex distribution in the studied group, the percentage of women was 62,3% and that of men 37%, and as for the group age distribution the following percentages were obtained: 49,5% for 70-79 years , 7, 5% below 60-these patients were included in another group of affections at the beginning of the disease, 21, 4% between 60-69 and 21, 6%- over 80. As for sex, women run ahead at the old age level, the most important difference being in the 8th decade, whereas in the adjacent decades the proportions were similar. Below 60 years, there has been noticed the predominance of masculine sex patients, probably related to the frequence of noisy psychotic symptoms interference at the apparent beginning of the affection, common to these, thus leading to precocious presentation at a specialized examination.

As far as place of origin is concerned, urban patients prevailed, which was also explained by the fact that in rural areas a specialized examination is required for behavioral disorder of the old people.

Within the studied group, the dominant education level was the elementary one (10 grades or less), representing 41,44%. We have noticed that superior training seems to have a protective role, as it also results from specialized studies, in our group 18,7% having a higher education and the rest of 19,86% representing secondary. From the medical history of patients with higher education it results that education, work and general environment stimulation played an important role in cognitive evolution. Occupational level was correlated with verbal content understanding, verbal fluency and numerical computation, ascertainments that were evident when applying scale MMSE. Occupational level was correlated with inductive reasoning, this bond weakening at retirement. This plays a diminution role of intelectual stimulation depending on the cognitive background had weaker results at memery tests. Therewith, those with reduced stimulative background had a rapid decline regarding cognitive function.

As for the onset way, the most frequent form was that through cognitive disorders mnestic related to almost half of the patients. From the observation files and family statements, the most frequent difficulties were related to recent everyday events, determing the patient to ask questions to the entourage all the time. Frequently, at the beginning it prooved to be difficult for the entourage to make the distinction between normal benign forgetfulness and the first symptoms of dementia. As the disease evolved (2 years on average) the severity of mnestic deficit became obvious, with masive deteriorating of shortlived memory but with keeping some information of long-lasting memory. Although the onset semeiology differed a lot at the 2 sexes, women having more frequent than men cognitive and marginal semeiology. The difference is not statistically significant, comparing test chi=6,51 and significance limen is 9,49. We must also emphasize in this case that women have a more concentrated distribution and men a more uniform one, regarding the onset semeiology. Anxiety has become more pronounced at some patients. Some of them didn't manage to obey a command just because they couldn't remember it. Anxiety was also more frequent at women. Other changes were personality and neurotic semeiology modiffications. Onset personality disorders were more frequent at men who gradually narrowed their preoccupations, so they became more egoistic and intolerant. Most of the patients were distinguished an unspecific dragged semeiology, with moderate physical asthenia, disorders of the sleep-wake pace, anxiety and loss of vital force.

Patients with psychotic manifestations, according to the clinical aspect of semeiology, presented the following clinical forms: affective disorders, schizophreniform disorders and disorganized type disorders.

In our longitudinal study, computer tomographies with contrast substance were made for a reduced number of patients, with quality family support. Tomography was made when the patient was taken under observation (distinguishing in all cases cerebral atrophy-a probable diagnose criterium, according NINCDS-ADRADA for AD) every 6 moths and yearly, afterwards, founding the atrophy progress by succesive, seried examinations.

Pathological modifications specific to AD have been observed at the neocortex level when the first tomographic examination was made, after about 2 years of disease evolution emerging in other areas of the brains too. After a 3 years evolving period, the coarse cortical atrophy at these patients accompanied the loss of neurons and synapses paralled with astrogliosis.

Hippocampus was particularly affected by pathological processes that seem to explain the major memory problems of Ad. Loss of pyramidal cells was maximum at the CA1 and CA2 levels and entorhinal cortex. These modifications of lesional type correlated clinically, with phases of medium or tardy evolutions of AD or with patients whose onset disease was reported late by the family.

After aplying MMSE scale, we have observed that no patient fit for the apparent onset of disease in the gentle degree of cognitive disfunction (MMSE higher than 21), score values being quite similar for both sexes, belonging to moderate cognitive deficit (16,23 for men and 15,07 for women- on average). Decrease of MMSE scores had an evolution quite similar to both sexes with a point every 3 months and more accentuated to female sex for the next 9 months.

Blessed scores started from an initial value quite reduced, emphasizing a satisfying level of family adaptation, without entourage dependency and subsequently the increasing scores had a linear, symmetrical aspect for both sexes.

AD evolution has important inferrences for the patient's family, caretakers and society at the same time. According to sex distribution, women seem to have a better evolution in accordance with the results obtained by using evaluation scales, women's percentage who hospitalized 2 or more times being 2%.

CONCLUSIONS

1. Patients over 60 ani seem to be the most affected population segment, with a slightly superiority of the female sex. Also, the urban environment and elementary education level would become risk factors for the disease occurance

2. The outset through non-cognitive symptoms took place at older ages and during the state period the semeyology was mainly cognitive.

3.There is a highly significant difference from the statistical point of view, in favour of men, regarding the number of hospitalizations.

4. Patients with psychiatric antecendents showed more frequent hospitalizations and a rapid regression, in most of the cases, showing up to the doctor in no more than a month since the symptoms appeared,

REFERENCES

Dănăilă, L, Gheorgh, MD, Ploaie, P, 1996 – Boala Alzheimer. Ed. Militară București, 23-46.

Flynn, P, 1995 – Effects of age and level of physical activity on plasma norepinephrine kinetics. Am J Physiol, 258, 256-262.

Francis, PR, 2003 – Glutamatergic system in Alzheimer, s disease. Int J Geriatr Psychiat, 18, 15s-21s.

Glenner, GG, Haga, G 1985 – Cortical-striatal-thalamic circuits and brain glucose methabolic activity in patientys with dementia. Hum patol, 16, 433-435.

Hsia, AY et al, 1999 – Plaque-independent disruption of neural circuits in Alzheimer, s disease mouse models. Prog Natl Acad Sci USA, 96, 3228-3233.

Huang, C, Wahlund, LO, 2002 – Cingulate cortex Hypoperfusion predict Alzheimer, s disease in mild cognitive impairment. Neurol, 2, 61-68.

Katzman, R, 1986 – Remote and autobiographical memory, temporal cortex memory and frontal atrophy in Korsakoff and Alzheimer patients. New Engl j Med, 314, 964-965.

Lal, H, Forster, MJ, Nandy, K, 1985 – Senile dementia of the Alzheimer type (Traper, J, Gispen, WH Eds.). Springer-Verlag, Berlin, 343-354.

Locascio, JJ, Groddon, JH, Corkin, S, 1995 – Cognitive test performances in detecting stanging and tracking Alzheimer, s disease. Arch Neurol, 52, 1087-1099.

Marinescu, D, Udriștoiu, T, 2004 – Actualități neurobiologice. Mecanisme colinergice. Considerații psihofarmacologice și terapeutice. Ed. Aius, Craiova, 52-63.

Voght, BA, Finch, MD, Olson, CR, 2001 – Functional homogeneity in cingulate cortex; the anterior executive and posterior evaluative region. Cereb Cortex, 2, 435, 443.

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA Seria: ✓ Biologie ✓ Horticultură ✓ Tehnologia prelucrării produselor agricole ✓ Ingineria mediului

Vol. XVI (LII) - 2011

RESEARCH REGARDING THE INFLUENCE OF DIFFERENTIATED PRUNING ON THE GROWTH AND FRUCTIFICATION OF SOME VARIETIES OF APPLE TREE WITH BIOLOGICAL RESISTANCE

Fl. Iosif, D. Hoza, Ligia Ion¹

KEYWORDS: apple, pruning, production, crow volume, area trunk section

ABSTRACT

The pruning of the apple is one of the most important technological interventions, which the fruit production and quality, the constant of fructification in time and the period of orchard exploitation depend on. The intensity of the pruning is determined, among other factors, by the level of the production from previous year, the length of annual growths, number of differentiated fruit buds, type of orchard, crown shape, age of plantation etc.

The comparative study of four pruning intensities: shortening the semiscaffold by $\frac{1}{2}$ of length with or without shortening the annual branches by $\frac{1}{2}$ of length and also the same shortenings but by $\frac{2}{3}$ of length led to different reactions for four resistant apple tree varieties: Pionier, Prima, Generos şi Florina. Generally, trunk growth was positively influenced by the variant with shortening the semiscaffold and annual branches by $\frac{1}{2}$ and the variant with shortening the semiscaffold by $\frac{2}{3}$ of length. The production was negatively influenced by the heavy pruning, while the crown volume was positively influenced by these interventions.

INTRODUCTION

Within the apple culture technology, pruning is the most important technological intervention that maintains the equilibrium between growth and fructification; it ensures constant and continuous fructification of the trees and extends the period of economic exploitation of the orchard. The manner in with the intervention is made on the trees and the intensity of the pruning depend on a series of factors, such as: variety, rootstock, planting density, crown shape, production of the previous year, the degree of fruit bud differentiation, level of annual growth etc., (Cepoiu N., și colab. 1990), factors that can be generally controlled if the characteristics of the varieties used are very well known. The present tendency in apple culture is to increase the number of trees per unit of area (Căpraru F., Grădinariu G., 2009), in order to increase the production, the quality of fruit and to ease the execution of manual work to increase the yield per unit of area. The avalanche of newly created varieties requires carefully testing them in concrete culture conditions before extending them at industrial level, because the characteristics of the culture area are specific for the relief and geographic area (Istrate M., Grădinariu G., Lidia Borza, 2000; Micu I., 1996). When more and more people put accent on reducing the impact of chemicals on the environment, the use of biologically resistant varieties, both for producing fruit for

¹ University of Agronomical Science and Veterinary Medicine Bucharest

consumption and especially for industrialization, can be an alternative, especially for the regular fruit producer, but also for the large producers (Sumedrea D., 2001).

MATERIAL AND METHOD

The experiment was conducted at the Institute of Research-Development in Fruit Growing Pitesti, Maracineni, during 2005-2008, in an apple tree plantation founded in 1995, with planting distance of,5/1 m and density of 2777 trees/ha.

Four biological resistant varieties were used: Pionier, Prima, Generos and Florina, grafted on M9. In order to observe how the trees react to pruning, four pruning variants were used, as follows:

- V1 shortening the semi scaffold by ½ of length;
- V2 shortening the semi scaffold by ½ of length + shortening the annual branches by ½ of length;
- V3 shortening the semi scaffold by 2/3 of length;
- V4 shortening the semi scaffold by 2/3 of length + shortening the annual branches by 2/3 of length.

The experiment was organized in subdivided parcels, in three repetitions with three trees each.

The technology applied was the traditional one, the soil being maintained grassed.

Measurements regarding the reaction to pruning were made, consisting in growth capacity of the trunk, crown volume, fructification capacity and productivity indexes were computed.

RESULTS AND DISCUSION

As a result of applying the four pruning variants, the trees reacted differently to pruning, both between varieties and especially per variety, between pruning variants. Thus, regarding the growth capacity of the trunk, expressed by the transversal section area (TSA), the different intensity of the pruning influenced differently the four varieties (table 1).

The highest average value per variety was recorded for the Florina variety, with dynamics from 25,08 cm² in 2005 to 48,04 cm² in 2008, followed by Prima with values of 23,12 cm² in 2005 and 40,39 cm² in 2008. The least vigorous variety was Pionier with limit values for the same period of 15,64 cm² and 20,97 cm² respectively.

Table I	
---------	--

Dif Compare							mared to	
Variate	Variant	2005	2006	2007	2008	Average	the average	
variety	v al lalli	2005	2000	2007	2008		the av	erage
							absolute	relative
	V1	13,64	14,81	16,47	18,65	15,89	-2,18	87,94
	V2	19,80	20,97	22,94	24,93	22,16	4,09	122,64
Pionier	V3	17,21	18,95	21,38	23,96	20,37	2,30	112,74
	V4	11,93	12,75	14,40	16,35	13,86	-4,21	76,69
	Average	15,64	16,87	18,80	20,97	18,07	0	
	V1	17,10	22,91	28,94	35,25	26,05	-5,70	82,05
Prima	V2	25,22	30,26	35,60	40,56	32,91	1,16	103,65
	V3	28,94	35,52	42,27	48,80	38,88	7,13	122,47
	V4	21,21	26,52	31,94	36,95	29,15	-2,59	91,83
	Average	23,12	28,80	34,68	40,39	31,75	0	

The influence of pruning on the transversal section area of the trunk

	V1	14,55	17,24	20,03	23,18	18,75	-1,91	90,76
	V2	14,85	17,79	20,94	24,24	19,46	-1,20	94,19
Generos	V3	17,06	18,33	21,18	23,88	20,11	-0,54	97,37
	V4	19,22	22,59	25,98	29,43	24,30	3,65	117,67
	Average	16,42	18,99	22,03	25,18	20,65	0,00	
	V1	33,38	41,16	49,41	58,56	45,63	9,33	125,70
	V2	23,97	30,66	37,56	45,21	34,35	-1,95	94,63
Florina	V3	20,90	26,45	32,30	39,05	29,67	-6,63	81,74
	V4	22,10	30,89	39,89	49,34	35,55	-0,75	97,94
	Average	25,08	32,29	39,79	48,04	36,30	0	

Per variety, the reactions were different depending on the intensity of pruning. The Pionier variety reacted stronger to the second variant with the shortening of the semi scaffold and annual branches by half of length and weaker to the third variant with shortening only he semi scaffold by half that stimulated the least the growth of the trunk.

Prima, a more vigorous variety, had strong growths when the semi scaffold was shortened by 1/3 and the annual branches by $\frac{1}{2}$ of length. The strong shortening of the semi scaffold and the annual branches did not strongly influence the growth.

The Generos variety, that fructifies generally on short branches, had the strongest reaction to the heavy pruning, the growth of the trunk was obviously better for the fourth variant as compared to the other three, which had closer values.

A different reaction was observed for the Florina variety, which had the highest growth for V1, 25% higher than the average of the variants, while for the other three variants the values were under the average.

Crown volume was rather highly influenced by the more heavy pruning due to longer growths that formed as a result of pruning. The general tendency of the average values was to increase the crown volume together with increasing the intensity of pruning, even though for some varieties there were no large differences between to close variants (table 2). During the years, small differences were observed between the values recorded per variant due to the limitation of height and lateral growths. Between varieties, higher values were again recorded for the variety Florina, 4,38 m³, closely followed by Prima with 4,35 m³, while Generos variety had a lower value, 4 m³, due to the reduced ramification capacity.

<u>'</u>]	ľa	bl	e	2

The influence of pruning on crown volume (mc/tree)								
Variety	Variant	riant 2005	2006	2007	2008	Average	Dif. Compared to	
(arreig	, arrant	2000	2000	1007	1000	i i veruge	absolute	relative
	V1	3,90	4,05	4,01	4,21	4,04	-0,16	93,20
	V2	4,10	4,15	4,17	4,18	4,15	-0,05	98,75
Pionier	V3	4,20	4,29	4,28	4,35	4,28	0,08	101,84
	V4	4,25	4,32	4,33	4,45	4,34	0,14	103,21
	Average	4,11	4,20	4,20	4,30	4,20	0	0
Prima	V1	4,21	4,32	4,28	4,30	4,28	-0,08	98,23
	V2	4,15	4,17	4,09	4,35	4,19	-0,16	96,23
	V3	4,43	4,29	4,61	4,45	4,45	0,09	102,08
	V4	4,50	4,53	4,60	4,39	4,51	0,15	103,46

	Average	4,32	4,32	4,40	4,37	4,35	0	0
	V1	3,80	3,95	3,85	3,90	3,88	-0,12	96,94
	V2	3,65	3,87	3,90	4,05	3,87	-0,13	96,75
Generos	V3	3,95	4,10	4,19	4,15	4,10	0,10	102,50
	V4	4,05	4,10	4,20	4,25	4,15	0,15	103,81
	Average	3,86	4,01	4,04	4,09	4,00	0	0
	V1	4,25	4,20	4,30	4,28	4,26	-0,13	97,15
	V2	4,20	4,25	4,35	4,30	4,28	-0,11	97,55
Florina	V3	4,44	4,50	4,55	4,50	4,50	0,12	102,62
	V4	4,40	4,50	4,60	4,50	4,50	0,12	102,68
	Average	4,32	4,36	4,45	4,40	4,38	0	0

The fruit production for these varieties showed that strong pruning is not beneficial; generally, the variants with large interventions had lower values of the production (table 3).

From the point of view of the total production during the analyzed period, the variety Prima recorded the best results, followed by Florina. The variety Florina had a tendency of alternation of the fructification in 2006, when the production was smaller. During the four years of research, the limit values of the production recorded were between 15,17 kg/tree for Prima V1, 15,11 kg/tree for Florina V2 and 5,03 kg/tree for Generos V4 (table 3). This shows that the production is influenced by many factors that must be known and controlled.

Between variants, a direct decrease of the production per variety can be observed, from V1 to V4, decrease of 32-33% for the varieties Pionier, Prima and Generos and of 44% for Florina.

Between the first two pruning variants, the difference is of 2-6% especially due to shortening the offshoots that did not fructify, while the shortening of the semi scaffold by 1/3 of length affects the area of fructification of the semiscaffold, where many stakes are located.

Dif. Compared to Variety Variant 2005 2006 2007 2008 Average the average absolute relative V1 8,29 12,36 11,64 12,32 11,15 1.40 114,30 V2 1,25 112,82 8,07 11,93 11,23 12,8 11,01 Pionier V3 6,25 9,23 9,75 10,21 8,86 -0.90 90,81 V4 6,07 8,19 9,21 8,56 8,01 -1,75 82,07 7,17 10,97 Average 10,43 10,46 9,76 0 0,00 V1 10,26 15,17 13,22 15,17 13,46 1,72 114,66 V2 11,31 14,89 13,58 115,74 14,46 13,67 1,85 Prima V3 10,12 10,06 9,97 11,01 10,29 -1,45 87,69 9,23 V4 9,63 9,47 10,12 9,61 -2,12 81,91 Average 10,33 12,29 11,52 12,80 11,74 0,00 0 11,88 11,33 119.44 Generos V1 11,6 12,61 11,86 1,93 V2 11,23 7,38 12,44 13,09 11,04 1,11 111,18 V3 9,68 7,63 8,45 8,58 -1,35 8,56 86,44

The influence of pruning on production (kg/tree)

Table 3

	V4	8,61	5,03	9,22	10,07	8,23	-1,69	82,94
	Average	10,35	7,91	10,68	10,76	9,93	0	0,00
	V1	12,47	6,29	14,54	13,22	11,63	1,18	111,29
	V2	14,62	5,93	15,11	13,78	12,36	1,91	118,28
Florina	V3	13,78	6,39	10,43	9,56	10,04	-0,41	96,08
	V4	8,61	5,47	8,78	8,22	7,77	-2,68	74,35
	Average	12,37	6,02	12,22	11,20	10,45	0	0,00

Computing the productivity index, it can be said that the heavy pruning is not favorable to a good fructification, even though it also ensures a good rejuvenation of the semiscaffold. The values of the productivity index were relative low, with some exceptions for the Pionier variety, which had a lower growth in thickness (table 4). In higher density orchards, the values of this index must be higher than 0.5 kg/cm^2 , in some situations being closer to 0.8 kg/cm^2 , while in the present situation the values were under 0.3 kg/cm^2 , which is not favorable from an economic point of view.

Regarding the average values per experiment, the best variety was Pionier with $0,54 \text{ kg/cm}^2$, followed by Generos with 0,49, while the least productive variety was Florina with only 0,30 kg/cm².

CONCLUSIONS

From the present paper, the following conclusions can be drawn:

- The pruning of the trees must be done with different intensity depending on the variety and ramification capacity;
- the generalization of the pruning to more varieties as level of intensity cannot lead to good results; the characteristics of the variety are expressed differently depending on the intensity of pruning;
- heavy pruning of the semiscaffold and annual branches (V4) generally determined high growths of the crown volume;
- the trunk growth was highly influenced by the pruning applied at the second and third variants;
- the fruit production was obviously favorized by the shortening of the semiscaffold by half, pruning applied at V1.

T	al	pl	e	4
---	----	----	---	---

The influence of pruning on production (kg/tree)								
Variety	Variant	2005	2006	2007	2008	Average		
	V1	0,61	0,83	0,71	0,66	0,70		
	V2	0,41	0,57	0,49	0,51	0,49		
Pionier	V3	0,36	0,49	0,46	0,43	0,43		
	V4	0,51	0,64	0,64	0,52	0,58		
	Average	0,46	0,62	0,56	0,52	0,54		
	V1	0,60	0,66	0,46	0,43	0,54		
	V2	0,45	0,48	0,38	0,37	0,42		
Prima	V3	0,35	0,28	0,24	0,23	0,27		
	V4	0,45	0,36	0,29	0,27	0,34		
	Average	0,45	0,43	0,33	0,32	0,38		
Generos	V1	0,82	0,67	0,63	0,49	0,65		

The influence of pruning on production (kg/tree)

	V2	0,76	0,41	0,59	0,54	0,58
	V3	0,57	0,42	0,40	0,36	0,44
	V4	0,45	0,22	0,35	0,34	0,34
	Average	0,63	0,42	0,48	0,43	0,49
	V1	0,37	0,15	0,29	0,23	0,26
	V2	0,61	0,19	0,40	0,30	0,38
Florina	V3	0,66	0,24	0,32	0,24	0,37
	V4	0,39	0,18	0,22	0,17	0,24
	Average	0,49	0,19	0,31	0,23	0,30

REFERENCES

- 1. Cepoiu N., și colab. 1990, Contribuții la conducerea și întreținerea coroanei fus subțire la măr, în plantații de mare densitate. Lucr. Șt. ISANB, seria B, vol. XXXIII, 45-54.
- Căpraru F., Grădinariu G., 2009 Cercetări privind productivitatea unor soiuri de măr, în secvențe tehnologice diferite în condițiile pedoclimatice de la Bistrița, Lucrări ştiințifice, anul LII-vol. 52, seria Horticultură, Ed. Ion Ionescu de la Brad, Iași, pg. 545-550.
- Istrate M., Grădinariu G., Lidia Borza, 2000 Studiul comportării unor soiuri de măr rezistente la boli în sistem intensiv de cultură, în condițiile zonei Iași. Lucrări științifice U.S.A.M.V. Iași, vol. 43, seria Horticultură, pg. 470 – 476.
- 4. Micu I., 1996 Rezultate privind comportarea unor soiuri de măr cu rezistență genetică la boli în condițiile pedoclimatice din centrul Podișului Transilvaniei, Lucrări științifice I.C.P.P. Pitești, vol. XVIII, pg. 37-46.
- 5. Sumedrea D., 2001 Cercetări privind intensivizarea culturii soiurilor de măr cu rezistență genetică la boli. Teză de doctorat, USAMV Bucuresti, pg.60 112.

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

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

Vol. XVI (LII) - 2011

MEDICINAL PLANTS FROM THE ROMANIAN FLORA IMPORTANT IN THE TREATMENT OF DIABETES MELLITUS

Mitrea Adina¹, Tiță Monica Gabriela², Mogoșanu G. D.³

KEYWORDS: Romanian flora, medicinal plants, diabetes mellitus, treatment

ABSTRACT

In this paper, the authors present data on 14 medicinal plants from the Romanian flora, with implications in the treatment of diabetes mellitus. In this respect, the most important natural products are Myrtilli fructus, Myrtilli folium, Galegae herba, Mori folium, Phaseoli sine seminibus fructus, and Bardanae radix.

INTRODUCTION

Diabetes mellitus, the most common pancreatic suffering is defined as a chronic disorder of metabolism that regulates the amount of glucose in the blood. It is caused by lack or insufficient secretion of insulin by β -Langerhans cells of endocrine pancreas (Berbecaru, 2011; Popa, 2008).

WHO reports that worldwide there are currently 60 million diabetics and the number diabetics increased by 100% every 10 years, which is alarming for humanity. Direct and indirect costs of diabetes and its complications, and the lower life expectancy and its quality have considerable economic consequences (Berbecaru, 2011; Bojor and Popescu, 2009; Popa, 2008). Hypoglycaemic effect of herbs may be due to stimulation of synthesis and secretion of insulin or glucose transporters and stimulation of increasing peripheral glucose use. Phytotherapy offers valuable opportunities for discovery of new natural compounds with beneficial effects on glucose homeostasis and for the possibility of developing new drugs based on plants (Berbecaru, 2011; Cicero *et al.*, 2004; Yeh *et al.*, 2003). Phytotherapy was reconsidered, so that, especially in recent years, an extensive research on identifying and studying herbs with hypoglycaemic activity have begun, and that is an important part of our paper.

MATERIALS AND METHODS

The paper presents 14 plant species from the Romanian flora important in the treatment of diabetes mellitus. The presentation of each species is accompanied by a short description, ecological and chorological information, data on the chemical composition of

¹ Department of Diabetes, Nutrition and Metabolic Disorders, Faculty of Medicine, University of Medicine and Pharmacy of Craiova

² PhD candidate, Faculty of Pharmacy, "Carol Davila" University of Medicine and Pharmacy, Bucharest.

³ Department of Pharmacognosy & Phytotherapy, Faculty of Pharmacy, University of Medicine and Pharmacy of Craiova, Corresponding author: E-mail address: monica_gabriela2007@yahoo.com

the vegetal products, their medicinal properties and forms of administration. The study has been initiated until 2003 as one of the main research projects of the Departments of Vegetal & Animal Biology, Pharmacognosy & Phytotherapy and Pharmacology from the Faculty of Pharmacy, University of Medicine and Pharmacy of Craiova. The plant specimens have been collected and identified according to "The Illustrated Flora of Romania. *Pteridophyta et Spermatophyta*" (Ciocârlan, 2000). Voucher specimens have been deposited in the herbariums of the above-mentioned departments.

RESULTS AND DISCUSSION

Morus nigra L. (Black Mulberry) and *M. alba* L. (White Mulberry), *Moraceae* family, are cultivated and spontaneous trees with high prevalence in our country. The medicinal product *Mori folium*, with hypoglycaemic activity, enters in the composition of antidiabetic teas (Berbecaru, 2011; Bojor and Popescu, 2009; Bruneton, 2009; Ciocârlan, 2000; Ciulei *et al.*, 1993; Istudor, 1998; Mencinicopschi *et al.*, 2009; Neacşu *et al.*, 2006; Tiță, 2008; Tiță and Năstase, 1997).

Urtica dioica L. (Common Nettle, Great Nettle), *Urticaceae* family, is a known very common plant. *Urticae folium* and *Urticae herba* contain protein, carbohydrates, lipids, free amino acids, chlorophyll, steroids, vitamins (C, B, K), provitamin A, mineral salts (Ca, Mg, Fe, Si, phosphates). The vegetal products have antiseptic, healing and deodorant properties, and enter in the formula of antidiabetic teas (Bojor and Popescu, 2009; Bruneton, 2009; Ciocârlan, 2000; Ciulei *et al.*, 1993; Istudor, 2001; Mencinicopschi *et al.*, 2009; Neacşu *et al.*, 2006; Tiță, 2008; Tiță and Năstase, 1997).

Juglans regia L. (Walnut), Juglandaceae family, is a towering tree, wild and much cultivated in Romania. Juglandis folium contains tannins, naphthoquinone derivatives, essential oil, vitamin C, flavone glycosides, and enters in the composition of some antidiabetic formulas (Bojor and Popescu, 2009; Bruneton, 2009; Ciocârlan, 2000; Ciulei et al., 1993; Istudor, 1998; Mencinicopschi et al., 2009; Neacşu et al., 2006; Tiță, 2008; Tiță and Năstase, 1997; Cosmulescu et al., 2010, 2011).

Betula pendula Roth sin. *B. verrucosa* Ehrh. (Birch), *Betulaceae* family, is a tree that can reach 20 m high. It is found in hilly areas, but can reach in mountainous areas too at 1600 m altitude. The medicinal product *Betulae folium* contains polyphenols, flavonoids, tannins, terpenes. It has diuretic, antimicrobial, and antirheumatic properties. At the cardio-renal patients reduce oedema, albuminuria, and increase diuresis. It takes part of the antidiabetic natural formulations (Bojor and Popescu, 2009; Bruneton, 2009; Ciocârlan, 2000; Ciulei *et al.*, 1993; Istudor, 1998; Mencinicopschi *et al.*, 2009; Neacşu *et al.*, 2006; Tiță, 2008; Tiță and Năstase, 1997).

Rosa canina L. (Rosehip), *Rosaceae* family, is a shrub of 3–5 m height living in steppe areas, meadows, forest edges. It is well known for our population. *Cynosbati fructus* contains 250–500 mg% vitamin C, and is one of the richest natural products in this vitamin, carotenoids (provitamin A), vitamins B1, B2, PP, K, P, arbutin, carbohydrates, pectin, organic acids, terpenoids, anthocyanins, etc. It has fortified, astringent, and anti-diarrhoeal properties, useful for the normal functioning of endocrine glands, liver, spleen, brain, heart. The product enters in the composition of some teas (fortified, liver, flavoured, kidney, diet), and in antidiabetic formulations due to the antioxidant compounds (Berbecaru, 2011; Bojor and Popescu, 2009; Bruneton, 2009; Ciocârlan, 2000; Ciulei *et al.*, 1993; Istudor, 2005; Mencinicopschi *et al.*, 2009; Neacşu *et al.*, 2006; Tiţă, 2008; Tiţă and Năstase, 1997).

Galega officinalis L. (Goat's Rue), Fabaceae (Leguminosae) family, is a perennial species, 50–120 cm tall, frequent in wet meadows, shore waters, forests. The product

Galegae herba contains galegine and related compounds, from the guanidine class, with hypoglycaemic and galactagogue activity. It is indicated in some formulas for the treatment of non-insulin-dependent diabetes (Berbecaru, 2011; Bojor and Popescu, 2009; Bruneton, 2009; Ciocârlan, 2000; Ciulei *et al.*, 1993; Istudor, 2005; Mencinicopschi *et al.*, 2009; Neacşu *et al.*, 2006; Tiţă, 2008; Tiţă and Năstase, 1997).

Phaseolus vulgaris L. (Bean), *Fabaceae (Leguminosae)* family, is an annual plant that is grown for seeds and young pods with high nutritional value. *Phaseoli sine seminibus fructus*, the dried pods after harvesting the seeds, has hypoglycaemic and diuretic properties. It contains amino acids, vitamin C, and is recommended as adjuvant in the treatment of pancreatitis and diabetes mellitus (Berbecaru, 2011; Bojor and Popescu, 2009; Bruneton, 2009; Ciocârlan, 2000; Ciulei *et al.*, 1993; Istudor, 2005; Mencinicopschi *et al.*, 2009; Neacşu *et al.*, 2006; Tiță, 2008; Tiță and Năstase, 1997).

Viola tricolor L. (Pansy), *Violaceae* family, is an annual or biennial grass of 10–40 cm tall. It has ovate leaves with pinnate fidate stipels. The flowers have long stalks and petals of different colours (blue, yellow, white). It grows in steppe areas, meadows, cultivated places, rocks, from the hills to mountain areas. *Violae tricoloris herba* (*Jaceae herba*), derived from flowering tops of the species, contains triterpene saponins, anthocyanins, flavonosids, essential oil, carotenoids, methyl salicylate, etc. It has diuretic, blood cleanser, expectorant, and antirheumatic action. In the last years, the medicinal product is used for his antidiabetic properties too (Berbecaru, 2011; Bojor and Popescu, 2009; Bruneton, 2009; Ciocârlan, 2000; Ciulei *et al.*, 1993; Istudor, 1998; Mencinicopschi *et al.*, 2009; Neacşu *et al.*, 2006; Tiță, 2008; Tiță and Năstase, 1997).

Vaccinium myrtillus (Blueberry), Ericaceae family, grows in mountain areas with bushes, forest glade, meadow. It is a shrub (undergrowth), 15-50 cm tall. The fruits (blueberries) are globular, dark-blue, and edible. The medicinal product Myrtilli folium contains tannin, flavones, proanthocyanins, triterpene acids, mineral salts. It has astringent and hypoglycaemic properties. Myrtilli fructus, the mature berry, dried after the harvesting, contains anthocyanosides, flavones, tannins, catechic tannin, sugars, organic acids, vitamins (C, B). It has vasoprotective, antioedematous, hypoglycaemic, and antibiotic properties. It stimulates the synthesis of rhodopsin and increased the visual acuity in twilight. It is used to protect the vascular system, in diabetes mellitus, diabetic retinopathy, vein insufficiency, haemorrhoids, diarrhoea, and spastic colitis, entering in the composition of some medicines (Difebion, Difabiol, Difrarel, Difrarel E, Mirtilene). The medicinal products derived from Blueberry have beneficial effects in mild or early forms of diabetes mellitus, when they could replace the insulin. The combination of these vegetal products with other herbal remedies with hypoglycaemic properties is more effective (Berbecaru, 2011; Bojor and Popescu, 2009; Bruneton, 2009; Ciocârlan, 2000; Ciulei et al., 1993; Istudor, 1998; Mencinicopschi et al., 2009; Neacşu et al., 2006; Tiță, 2008; Tiță and Năstase, 1997).

Hippophaë rhamnoides L. (Sea Buckthorn), *Elaeagnaceae* family, is a thorny shrub, rarely tree. It is common in steppe areas, along the waters, on sand and gravel, rocky coast. It has many ramifications, and is covered with thorns and bristles that give the white colour. *Hippophaë fructus* is considered the best natural product as source of multivitamins. It contains vitamins C (1500 mg%), E, B1, B2, PP, carotenoids (provitamin A), flavonoids (vitamin P), proanthocyanins, pectin, fatty oil, catechic tannin, triterpene acids. Due to some antioxidant compounds, the fruits of Sea Buckthorn enter in the some natural formulations in the treatment of diabetes mellitus (Bojor and Popescu, 2009; Bruneton, 2009; Ciocârlan, 2000; Ciulei *et al.*, 1993; Istudor, 2005; Mencinicopschi *et al.*, 2009; Neacşu *et al.*, 2006; Tiță, 2008; Tiță and Năstase, 1997).

Syringa vulgaris L. (Lilac), Oleaceae family, is a shrub or tree cultivated for

ornamental purposes, for his fragrant flowers, grouped in terminal panicles (Ciocârlan, 2000). Recent researches established that the flowers of purple lilac have hypoglycaemic and antioxidant properties (Berbecaru, 2011).

Arctium lappa L. (Burdock), Asteraceae (Compositae) family, is a biennial species common in steppe and ruderal places. In the second year, the stem is branched, pubescent, and can reach up to 2 m high. Bardanae radix contains large quantities of inulin. It has antimicrobial, choleretic, laxative, diuretic, diaphoretic, and bitter tonic activity. Recently, its anti-tumour action has been established. It is recommended for dermal, mouth or hepatobiliary diseases, urinary infections, and diabetes mellitus (Bojor and Popescu, 2009; Bruneton, 2009; Ciocârlan, 2000; Ciulei et al., 1993; Istudor, 1998; Mencinicopschi et al., 2009; Neacşu et al., 2006; Tiţă, 2008; Tiţă and Năstase, 1997).

Taraxacum officinale Weber ex Wiggers (Dandelion), *Asteraceae (Compositae)* family, is a common perennial plant. The leaves are lanceolate, and arranged in runcinate rosette. The product *Taraxaci radix*, respectively the underground organs of the plant, contains bitter sesquiterpenes, flavonoids, sterols, carotenoids, inulin, vitamins A1, B1, C, D, mineral salts, etc. It has bitter tonic, cholagogue, diuretic, diaphoretic, laxative, and peristaltic properties, and increase the pancreatic secretion. It is recommended in anorexia, cholecystitis, hypoacid gastritis, renal calculus. The medicinal product enters in the formula of some teas: dietary, depurative, liver, stomach, and antidiabetic (Bojor and Popescu, 2009; Bruneton, 2009; Ciocârlan, 2000; Ciulei *et al.*, 1993; Istudor, 1998; Mencinicopschi *et al.*, 2009; Neacşu *et al.*, 2006; Tiță, 2008; Tiță and Năstase, 1997).

Cichorium intybus L. (Chicory), *Asteraceae (Compositae)* family, is a perennial herb, 40–100 cm tall, frequent in steppe zones, ruderal places and crops. Solitary or grouped anthodiums, disposed terminal or axial, consist of blue ligulate, hermaphrodite flowers. The product *Cichorii herba et radix*, consisting of roots and aerial parts of the flowering plant, contains mainly bitter principles. It is used for stomachic, bitter tonic, cholagogue, diuretic, depurative, hypoglycaemic, and antibacterial properties, being recommended in anorexia, bloating, flatulence, slow digestion, diabetes, constipation (Bojor and Popescu, 2009; Bruneton, 2009; Ciocârlan, 2000; Ciulei *et al.*, 1993; Istudor, 2001; Mencinicopschi *et al.*, 2009; Neacşu *et al.*, 2006; Tiță, 2008; Tiță and Năstase, 1997).

CONCLUSIONS

The medicinal plants presented in this paper (Morus nigra, M. alba, Urtica dioica, Juglans regia, Betula pendula, Rosa canina, Galega officinalis, Phaseolus vulgaris, Viola tricolor, Vaccinium myrtillus, Hippophaë rhamnoides, Syringa vulgaris, Arctium lappa, Taraxacum officinale, Cichorium intybus) are a reliable local source of herbal medicines for the treatment of diabetes. In this respect, the most important natural products are Myrtilli fructus, Myrtilli folium, Galegae herba, Mori folium, Phaseoli sine seminibus fructus, and Bardanae radix.

REFERENCES

Berbecaru-Iovan Anca. 2011. Cercetări farmacognostice și farmacologice asupra unor specii vegetale cu virtuți hipoglicemiante. Edit. SITECH. Craiova, 166 p.

Bojor O., Popescu O. 2009. Fitoterapie tradițională și modernă. Ediția a V-a, revăzută și adăugită. Edit. Fiat Lux, București, 462 p.

Bruneton J. 2009. Pharmacognosie, Phytochimie, Plantes médicinales. 4^e édition. Lavoisier Tec & Doc. Paris, 1268 p.

Cicero A. F. G., Derosa G., Gaddi A. 2004. What do herbalists suggest to diabetic

patients in order to improve glycemic control? Evaluation of scientific evidence and potential risks. Acta Diabetologica, 41(3):91–98.

Ciocârlan V. 2000. Flora ilustrată a României. *Pteridophyta et Spermatophyta*. Ediția a 2-a. Edit. Ceres. București, 1139 p.

Ciulei I., Grigorescu Em., Stănescu Ursula. 1993. Plante medicinale, Fitochimie și Fitoterapie. Tratat de Farmacognozie. Edit. Medicală. București. Vol. I, 733 p. Vol. II, 741 p.

Cosmulescu S., Trandafir I., Achim G., Botu M., Baciu A., Gruia M. 2010. Phenolics of Green Husk in Mature Walnut Fruits. Not. Bot. Hort. Agrobot. Cluj, Vol. 38 (1): 53-56.

Cosmulescu S. N., Trandafir I., Achim Gh., Baciu A. 2011. Juglone Content in Leaf and Green Husk of Five Walnut (Juglans regia L.) Cultivars. Not. Bot. Hort. Agrobot. Cluj, Vol.(1):237-240

Istudor Viorica. 1998. Farmacognozie, Fitochimie, Fitoterapie. Oze, ozide și lipide. Edit. Medicală. București. Vol. I, 399 p.

Istudor Viorica. 2001. Farmacognozie, Fitochimie, Fitoterapie. *Aetherolea*, rezine, iridoide, principii amare, vitamine. Edit. Medicală. București. Vol. II, 385 p.

Istudor Viorica. 2005. Farmacognozie, Fitochimie, Fitoterapie. Principii active azotate (alcaloidice și nealcaloidice). Edit. Medicală. București. Vol. III, 406 p.

Mencinicopschi Gh., Bojor O., Ionescu-Călinești Larisa. 2009. Compendiu de terapie naturală. Nutriție, fitoterapie, cosmetică. Edit. Medicală. București, 814 p.

Neacşu P., Tiță Monica Gabriela, Mogoșanu G. D., Tiță I. 2006. Remedii naturale în tratamentul bolilor. Edit. SITECH. Craiova, 220 p.

Popa A. R. (red.). 2008. Complicațiile cronice ale diabetului zaharat. Edit. FarmaMedia. Târgu Mureş, 502 p.

Tiță I. 2008. Botanică farmaceutică. Ediția a III-a. Edit. SITECH. Craiova, 708 p.

Tiță I., Năstase A. 1997. Flora medicinală din Oltenia. Edit. Scrisul Românesc. Craiova, 157 p.

Yeh G. Y., Eisenberg D. M., Kaptchuk T. J., Phillips R. S. 2003. Systematic review of herbs and dietary supplements for glycemic control in diabetes. Diabetes Care, 26(4):1277–1294.

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

Seria: 🖌 Biologie

 ✓ Horticultură
 ✓ Tehnologia prelucrării produselor agricole
 ✓ Ingineria mediului

Vol. XVI (LII) - 2011

THE HARMFUL ENTOMOFAUNA OF THE PLUM AT THE RESEARCH AND DEVELOPMENT STATION FOR FRUIT VALCEA

I. Mitrea¹, Gh. Bancă

ABSTRACT

The harmful entomofauna of the plum orchards in Oltenia consists of 45 species, during entire vegetation period. The research that make the object of this paper has been materialized through establishing the structure of the harmful fauna of arthropods from the fruit-growing ecosystem Rm. Valcea. From the total of 45 species at the R. D. S. Valcea we have identified 21 species. Economically speaking, from the total collected entomofauna, the most important species, due to both registered densities and attacks are: Eurytoma shreineri Schr., Hoplocampa minuta Christ., Hyalopterus pruni Fabr.; Grapholitha funebrana Tr.

INTRODUCTION

If in the economy of the countries in the temperate zone, plum ranks 4th after apple, pear and peach in some countries, such as: Romania, Serbia, Bulgaria, plum is the dominant species. In Romania, the plum is the most popular and widespread fruit growing species. According to Statistical Yearbook of 2001 in terms of production achieved in 2000 in major plum growing counties, the region ranks first with 79,462 tons Arges, followed by Valcea with 47 308 tons, and then Dambovita with 38,743 tons, Caras-Severin with 27,776 tons and Salaj with 26,606. Within the cultivation technology, one of the most important link in order to obtain high and quality yield, is represented by the protection against the diseases and pests. In order to establish the biological reserve of the pests, we have to inventorying and follow the evolution of the pest populations (Brues C.T et al. 1954). Also it's very important to know the climatic conditions during the vegetative repose, which can modify the forecast establish in the autumn. Research on pests from plum orchards, point out that the plum it is attacked by a very wide range of pests and animals, depending on area, weather conditions, etc. can adversely affect fruit production.

Worldwide, the plum is attacked by more than 93 species of pests belonging to the following order: Acari Order 6 species; Heteroptera Order 4 species; Homoptera Order 16 species; Coleoptera Order 21 species; Hymenoptera Order 1 species; Lepidoptera Order 33 species; Diptera Order 1 species; Rodentia Order 2 species (Tucă O. 2006).

Depending on the area, pedological and climatic conditions, key pests may occur in varied densities, leading to an determination of different damaging tresholds in different years, so that a standard integrate management can not be applied (Smith, R. F. 1967).

MATERIAL AND METHODS

The research has been made in a plum orchard at the Research and Development Station for Fruit Valcea, and has focused on the identification of the harmful species of arthropods. During 2010 at the R. D. S. Valcea there has been collected entomological

¹ University of Craiova

material, and then analyzed in order to establish the harmful fauna of arthropods that affect the plum trees. Research and Development Station for Fruit Valcea is located on the right bank of the Olt River, north of the city of Ramnicu Valcea (Valcea county), in its immediate vicinity, along the E81 European road (national road DN7 Ramnicu Valcea - Sibiu).

In order to establish the harmful entomofauna of the plum orchard from R. D. S. Valcea, during 2010, there has been made collects of the entomological material, using different means and method: collecting using the entomological net, pheromonal traps, colored traps, visual control (Oldroyd H., 1958).

Considering the biological constants of pest and vegetation phenophases of plum, collecting biological material started from the third decade of March.

Pheromone traps and colored traps were installed in the second decade of April, and their reading and cleaning was done every 2 weeks.

Biological material was collected and analyzed to determine to species using the binocular magnifier and microscope, in the field and laboratory. The collects has been made in different phenophase of the plum.

The entomological material collected from R. D. S. Valcea ecosystem has

been determined using different guides for determine the species of insects (Chinery M., 1998., Panin L, 1951).

RESULTS AND DISCUSSIONS

Climatological speaking, in Valcea county, 2010 was a year characterized by average temperatures slightly higher compared with climatological normals, and in terms of rainfall there is an increasing amount of annual rainfall compared with multiannual amount. Air temperature regime was close to average annual values. In the last part of the year air temperature was close to normal. The average annual temperature fluctuated between 11.3°C (at Dragasani) and 11.5°C (Rm. Valcea). Absolute maximum temperatures were high but did not exceed the maximum absolute recorded in this region, ranging between 35.8°C (Rm. Valcea) and 36.4°C (Dragasani). Absolute minimum temperatures were recorded in January (January 25 to 26) at all meteorological stations considered, with values between -17.3° C in the mountains and -18.0°C in the hillside and plateau. In terms of rainfall, there is an annual quantity of precipitation increase compared with the multi annual quantity. At the weather stations in Valcea county wind speed did not exceed 11 m/s ranging between 9 m/s and 11 m/s (Table nr.1).

Weather	Temperature (⁰ C)			Rainfall Wind			
stations	Average	Maximum	Minimum	(mm)	Dominant	Predominant	Maximum
	-				direction	direction %	(m/s)
Rm.	11.3	35.8/15	- 18.0/26	948.4	Ν	37.8	9/dir. V
Valcea		VIII	Ι				
Dragasani	11.5	36.4/15	- 17.3/25	764.4	E	20.7	11/dir. V
		VIII	Ι				

Climatic main features of the Rm. Valcea region in 2010

The structure analyze of the phytopagous arthropods, from the R. D. S. Valcea ecosystem, impose a first remarque that not all the phytophagous arthropods encountered in the plum orchard, are harmful for this species. Some of them are only passing, a plum orchard represent an biotope which ensure if not food at least a temporary shelter.

The collected data has been processed and presented in the table 2. Thus, the harmful fauna, encountered in the plum orchard from the fruit-growing ecosystem R. D. S. Valcea, comprise a number of 21 species.

Tabl	le	2
1 401		_

Nr	Spacias	Family	Order
111.			
1	Bryobia rubrioculus Scheut.	Tetranychide	Acari
2	Quadraspidiotus perniciosus Comst.	Diaspididae	Homoptera
3	<i>Ceresa bubalus</i> F.	Membracidae	Homoptera
4	Parthenolecanium corni Bouche	Coccidae (Lecaniidae)	Homoptera
5	Hyalopterus pruni Geoffr.	Aphididae	Homoptera
6	Brachycaudus helichrysi Kalt.	Aphididae	Homoptera
7	Rhynchites bachus L.	Curculionidae	Coleoptera
8	Epicometis hirta Podo.	Scarabaeidae	Coleoptera
9	Rhynchites auratus Scop.	Curculionidae	Coleoptera
10	Melolontha melolontha L.	Scarabeidae	Coleoptera
11	Anomala solida Er.	Scarabeidae	Coleoptera
123	Eurytoma shreineri Schr.	Eurytoma shreineri	Hymenoptera
13	Hoplocampa minuta Christ.	Hoplocampa minuta	Hymenoptera
14	Neurotoma nemoralis L.	Pamphilidae	Hymenoptera
15	Vespa vulgaris L.	Vespidae	Hymenoptera
16	Vespa germanica L.	Vespidae	Hymenoptera
17	Grapholitha funebrana Tr.	Tortricidae	Lepidoptera
18	Yponomeuta padellus L.	Hyponomeutidae	Lepidoptera
19	Hyphantria cunea Drury.	Arctiidae	Lepidoptera
20	Aporia crataegi L.	Pieridae	Lepidoptera
21	Lymantria dispar L.	Lymantriidae	Lepidoptera





Fig. 1. The structure of the harmful fauna of arthropods in the fruit growing area R. D. S. Valcea in 2010

In the plum orchard from the R. D. S. Valcea, only 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.

From the total of 21 harmful species in the plum orchard from the R. D. S. Valcea based on the frequency and attack intensity, we have establish as the main pests:

- Plum moth (Grapholitha funebrana Tr.);
- Waspy Plum Seed (Eurytoma Schreineri Schr.)

CONCLUSIONS

Although the harmful entomofauna of the plum orchard in Oltenia comprise a number of 45 species, during our research we have identified a number of 21 harmful species.

Following the recorded data we can conclude that in the plum orchard from R.D.S. Valcea the harmful entomofauna it is framed in five orders, four comprising each five harmful species: Homoptera, Coleoptera, Hymenoptera, Lepidoptera and Acari order with one species.

The species that require a special attention, i.e. key species are:

- Plum moth (Grapholitha funebrana Tr.);
- Waspy Plum Seed (Eurytoma Schreineri Schr.)

REFERENCES

- Brues C.T, 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. Chinery M. (1998). Guida degli insetti d'Europa. Grupo editoriale Franco Muzzio editore, Padova.
- Oldroyd H., 1958 Collecting, Preserving and Studying Insects. London, Hutchinson.138.
- 4. Panin L, 1951 Determinatorul Coleopterelor dăunătoare și folositoare din R.P.R. Editura de Stat, București.
- 5. Săvescu A., 1961 Album de protecția plantelor. Voi. I și II. Centru de material didactic și propagandă agricolă, București.
- 6. Țucă O., 2006 Contribuții la studiul biologiei ecologiei și combaterii integrate a principalilor dăunători din plantațiile de prun pe rod. Teza de doctorat.
- 7. Smith, R. F. & R. van den Bosch. 1967. Integrated pest management. p. 295-340. In: W. W. Kilgore & R. L. Doutt (eds.), Pest Control. Academic Press, New york.

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA Seria: ✓ Biologie ✓ Horticultură ✓ Tehnologia prelucrării produselor agricole ✓ Ingineria mediului

Vol. XVI (LII) - 2011

THE DYNAMIC OF THE EVOLUTION OF THE FUNGUS PLASMOPARA VITICOLA (BERK ET CURT) BERI ET DE TONI AND THE BEHAVIOR OF VINE VARIETIES FROM THE TEACHING RESORT BANU MARACINE TO PATHOGEN'S ATTACK IN THE CLIMATIC CONDITIONS OF 2010

Mitrea Rodi^{1*}, Ciciu Tudosie Roxana Elena²

KEY WORDS: vine, downy mildew, behavior, varieties, attack

SUMMARY - ABSTRACT

Research on the behavior of 14 varieties of vine cultivated in the Teaching Resort Banu Maracine to attack of pathogen Plasmopara viticola showed that they manifested a great variability in the climatic conditions of the year 2010. In this year, the resistance spores germination was carried out in phases during the month of May, the incubation period of secondary infections shortened which led to the aggravation of 10 treatments at different dates in June, July and the first decade of August, as a consequence of a high infection pressure.

INTRODUCTIONS

Currently, diseases and pests of the vine represent the main cause of harvest and quality losses, especially in climatic conditions favorable to attacks, although the number of species of harmful organisms is relatively small, but the severity of attacks can be so intense that over time cause the entire plantation decline. (Tomoioaga L.;Oroian I.;Mihai C.,2006). Starting with 1878, when downy mildew caused by *Plasmopara viticola* was introduced in Europe, this disease continues to be most widespread, being found in all the vineyards on all varieties of *Vitis vinifera*. For this reason, from the first years of the report of downy mildew until now, *Vitis* species resistance to the attack of fungus *Plasmopara viticola* has concerned many vine growers and researchers. (Sotolár R., 2007, Boso S., Santiago J.L., and Martinez M.C, 2004).

The hybridization between *Vitis vinifera* and other species of *Vitis* not attacked of downy mildew, the so-called direct producer, resistant to disease, but lower quality than European varieties, which is why in most wine countries there are laws restricting the extension of direct producer hybrids (Blaich R,1990; Liu S.M;Sykes S. R.;Clingeleffer P. R.,2008). Also, as a result of numerous studies conducted worldwide conclude that the fungus *Plasmopara viticola*, there is no physiological specialization, the fungus has a pronounced genetic conservatism, this being of great importance in the work of improving and creating new varieties to act as resistant downy mildew.

Knowing the behavior of varieties of vines from fungus attack *Plasmopara viticola*, has a special importance practical, the appropriate use of resistant varieties and vineyard area representing a prophylactic measure for the success of plantations. In France,

¹ University of Craiova, Horticulture Faculty

² "Carol I" National College –Craiova, Cporresponding author: E-mail address: rodimitrea@yahoo.com

P. Galet, 1991 makes a synthesis of the research conducted up to that time on the vine varieties resistant to *Plasmopara viticola* fungus attack which are classified in: very sensitive varieties, sensitive varieties and less sensitive varieties. In Romania, data about the behavior of some varieties of vine at fungus attack presents: Oprea M.,1989;Marmureanu M.1990;Mitrea R.,2000;Necula C., Popa C., Gavrilescu E., Ştirbu Cl. 2004;Irimia N,Ulea E,Balau A. M.,2008;Pop N,Calugaru A,Farago M,Babes A,Hodor D,Bunea C,2009. Although the reaction of resistance haas a stable character that has its basis in the genetic of the variety, it can be modified or may vary with different internal and external factors, especially environmental factors (Zorman M, Lopes D, Martins J.O., Prendes C., Lorenzo C.D.,Cabrera R.,2008; Jürges G, Kassemeyer H.H., Dürrenberger M., Düggelin M., Nick P.2009), which makes the same variety to behave differently depending of the area of culture. In this paper, we present the behavior of new varieties of grapes grown in T.R.B.M.,the knowledge of their behavior can lead to reducing: the number of treatments for resistant varieties, the amount of pesticide applied per hectare, so of the implicit costs and environmental pollution.

MATERIALS AND METHODS

Behaviour of vine varieties to pathogen attack has been appreciated in the field. The biological material that formed the basis of the conducted research consisted of 14 varieties of vines newly grown in the Banu Maracine wine center (Table 1).

Table 1.

Crt.no.	Variety	Production direction
1	Azur	For table grapes
2	Augusta	
3	Victoria	
4	Auriu de Stefanesti	
5	Argessis	
6	Datier	
		For white wines
7	Cramposie selectionata	current consumption
8	Chardonnay	high quality
9	Ezerfurti	high quality
10	Ozana	high quality
		For red wines
11	Alicante Bouschet	current consumption
12	Cabernet Sauvignon	high quality
13	Negru de Dragasani	high quality
14	Novac	high quality

Biological material

The observations were made in 2010 during the vegetation of the vine according to the evolution of the climate conditions. The attack was expressed in value by frequency (F%), intensity (I%) and degree of attack (DA%). Depending on the value of the degree of attack (DA%) registered varieties of vine taken in the study were classified in accordance to OIV code for resistance to biotic factors. The degree of resistance at downy mildew and the character expression were appreciated according to the OIV code 452 (Table 2). The extending of the spots caused by downy mildew on the leaves from 6 hubs / variety was expressed for calculation.

Table 2.

Scale interpretation of the resistance arm of the vine leaves (according to OIV code 425)

Resistance to downy mildew leaves	Character expression	DA%
Very low	1	>75%
(total leaf attacked, early fall of leaves)	2	50-75%
Low	3	40-50%
(large spots on the leaves by hand, abundant mycelium)		
	4	25-40%
Middle	5	15-25%
(spots 1-2cm in diameter, irregularly shaped mycelium)		
	6	10-15%
Good	7	5-10%
(small spots of about 1 cm in diameter, low sporulatie)		
	8	1-5%
Very good	9	<1%
(necrotic spots very small sporulatie nonexistent)		

RESULTS AND DISCUSSION

The investigated vine varieties behaved differently at *Plasmopara viticola* fungus attack, varying degrees of attack from one variety to another were recorded, the dynamic of the evolution of the pathogen being closely related to the evolution of the climatic conditions. The climate data of the year 2010 from the critical period for vines at fungus attack are presented in Table 3. From the analysis of these data one can notice that the average monthly temperatures fall between the limits of development of *Plasmopara viticola* pathogen starting with the second half of April until the beginning of October. As a consequence, 2010 was a favorable year for the attack of downy mildew, registering with high levels of average monthly rainfall and air relative humidity (greater than 75%).

In these conditions, Craiova Forecast and Warning Station warned the application of a preventive treatment for May 7th to fight the pathogen. The germination of oospores took place in sequences, with primary infection in May. The incubation period was determined by the temperatures higher than 10-12 °C, which led to the observation of the first oil-colored spots on the 2^{nd} of June 2010.

The period rich in rainfall from June and the recorded temperatures values led to the decrease of the incubation period for secondary infection. Optimal conditions for producing infections in that year were recorded: June, 12th; June, 20th; June, 24th; June, 26th; June, 30th; July.30th; July, 15th; July, 24th, August, 1st; August, 10th. (Table 3). The attack produced by the fungus *Plasmopara viticola* in that year was,

The attack produced by the fungus *Plasmopara viticola* in that year was, depending on the variety, within the limit of the degrees of attack: low, medium and strong as it can be seen from the data of the tables 4, 5, 6 and 7. Referring to the behavior of vine varieties for table grapes (Table 4) in the climatic conditions of 2010, in the Teaching Resort Banu Maracine a good behavior to mildew was noted for Azur and Datier, newly-approved varieties (2002, respectively 2007), having a low attack (DA% between 25-40%), while Victoria and Augusta varieties had totally-attacked leaves because of high infection pressure.

Of the four varieties of vine for white wines (Table 5), the newly developed variety, Cramposia Selectionata, had a good behavior at the downy mildew attack (GA% between 1-5%).

Varieties for high quality white wines admitted for expansion in culture (Chardonnay, Ezerfurti) had a low behavior, on their leaves being present large spots of downy mildew with an abundant sporulation. The Ozana variety for quality white wines, a variety newly-introduced into cultivation, behaved as a medium resistance variety (GA% 15-25%).

Table 4

Tuble	-
Behaviour of vine varieties for table grapes at fungus attack Plasmopara viticola (Berk e	?t
Curt) Beri et De Toni in Teaching Resort Banu Maracine in 2010	

Crt.no.	Variety	F%	Ι%	DA%	Character expression						
1	Azur	26,5	25,47	6,75	7						
2	Augusta	91,5	74,53	68,20	2						
3	Victoria	88	59,51	52,37	2						
4	Auriu de Stefanesti	82,5	45,09	37,20	4						
5	Argessis	89,0	34,55	30,75	4						
6	Datier	17,5	9,4	1,16	8						

Table 5

Behaviour of vine varieties for white wines at fungus attack *Plasmopara viticola (Berk et Curt) Beri et De Toni* in Teaching Resort Banu Maracine in 2010

Crt.no.	Variety	F %	I %	DA %	Character expression
1	Cramposie	43,50	10,65	4,63	8
	Selectionata				
2	Chardonnay	94,50	72,32	68,35	2
3	Ezerfurti	92,0	53,31	49,05	3
4	Ozana	79,50	22,25	17,69	5

The varieties of vine for red wines were in the category of varieties with very low resistance to downy mildew (Cabernet Saugvignon and Alicante Bouschet) and in the category of varieties with good resistance (Novac and Negru de Dragasani).

Table 6

Behaviour of vine varieties for red wines at fungus attack *Plasmopara viticola (Berk et Curt) Beri et De Toni* in Teaching Resort Banu Maracine in 2010

Crt.no.	Variety	F %	I %	DA %	Character
					expression
1	Alicante Bouschet	72,50	79,37	57,55	2
2	Cabernet Souvignon	95,0	62,89	59,75	2
3	Negru de Dragasani	23,0	8,41	1,93	8
4	Novac	39,0	2,80	4,99	8

From the data of table 7, in which it is presented the overall behavior of the 14 varieties of grapes at the attack of the fungus Plasmopara viticola, it can be noted that the highest values of the degree of attack were recorded at Alicante Bouschet, Cabernet Sauvignon, Augusta and Chardonnay varieties, varieties at which the differences against the variations taken as control were statistically ensured as very significant positive. At the varieties Novac, Cramposia Selectionata, Negru de Dragasani and Datier there were recorded low levels of the degrees of attack, the differences being statistically ensured as highly significant negative as compared to the variants average taken as control.

Table 7

Crt.no.	Variety	DA%	% difference	Difference	Difference
	5		from control	from control	significance
1	Azur	6,75	20,53	-26,13	000
2	Augusta	68,20	207,42	35,32	XXX
3	Victoria	52,37	159,28	19,49	XX
4	Auriu de Stefanesti	37,20	113,14	4,32	-
5	Argessis	30,75	93,52	-2,13	-
6	Datier	1,16	3,53	-31,72	000
7	CramposieSelectionata	4,63	14,08	-28,25	000
8	Chardonnay	68,35	207,88	35,47	XXX
9	Ezerfurti	49,05	149,18	16,17	XX
10	Ozana	17,69	53,80	-15,19	00
11	Alicante Bouschet	57,55	175,03	24,67	XXX
12	Cabernet Sauvignon	59,75	181,72	26,87	XXX
13	Negru de Dragasani	1,93	5,87	-30,95	000
14	Novac	4,99	15,21	-27,89	000
15	Media alternatives	32,88	100	martor	

Behaviour of vine varieties at fungus attack *Plasmopara viticola (Berk et Curt) Beri et De Toni* in Teaching Resort Banu Maracine in 2010

> DL 5% = 7,66 DL 1% =13,44

DL0,1%=22,18

BIBLIOGRAPHY

Blaich R,1990. Influence of resveratrol on germination of conidia and mycelial growth of Botrytis cinerea and Plasmopara viticola

Denzer, H., G. Staudt, E. Schlosser, 1995, Host settlement of Plasmopara viticola on different susceptible hosts Vitis

Garlet P.1991-Precis de pathologie viticole, Ed Dehan, Montpellier, Franta

Irimia N.,Ulea E., Bălău A. M.,2008. Grapevine varieties behavior on main pathogens attack in 2008 from the ampelographical collection of U.S.A.M.V. Iasi. Symposium on Trends in European Agriculture Development, Volume 1. ISSN 2066-1843

Jürges G., Kassemeyer HH., Dürrenberger M., Düggelin M., Nick P., 2009.Institute of Botany,University of Karlsruhe, Germany. The mode of interaction between Vitis and Plasmopara viticola depends on the host species.

Liu S.M,Sykes S.R.,Clingeleffer P. R.2008. Variation between and within grapevine families in reaction to leaf inoculation with downy mildew sporangia under controlled conditions, CSIRO Plant Industry, Merbein,Australia

Mitrea R.,2000.Comportarea unor soiuri de vita de vie la atacul ciupercii Plasmopara viticola (Berk. Et Curt.) Berl. Et de Toni si combaterea ei in centrul viticol Banu Maracine.Editura academic Pres.

Necula C., Popa C., Stirbu C., 2004 - Research regarding the test for some fungicides in control of Plasmopara viticola (Berk. Et Curt.) Berl. Et de Toni in Stefănesti grape vine experiment station,. Analele Universității din Oradea – Fascicula agricultută– horticultură vol. X. Editura Universității din Oradea, aprilie, ISBN 963 9274 739

Necula C., Popa C., Stirbu C.,Gavrilescu E. 2004 - The influence of the attack produced by the mushroom plasmopara viticola (Berk. Et Curt.) Berl. Et de Toni on some physiological processes for some vareties of vineyard that were cultivated in the winegrowing center Ștefănești Argeș. Analele Universității din Craiova Vol. IX-2004 ISSN.1435-1275 pag.43

Pop N, Calugaru A., Farago M., Babes A, Hodor D., Bunea C.2009- Behavior of Grape Varieties Created at S.C.D.V.V. Blaj, Regarding Quantity and Quality during 2005-2008

Sotolár, R., 2004, Results of breeding for resistance grapevine (Vitis sp.) against Downy mildew (Plasmopara viticola Berk. et Court.) International Horticulture Scientific Conference in Nitra

Sotolár, R., 2007.Comparison of grape seedlings population against downy mildew by using different provocation methods

Tomoioaga L,Oroian I,Mihai C,2006-Managementul integrat de combatere a bolilor si daunatorilor vitei de vie-USAMV Cluj Napoca-Protectia plantelor,pag 29-36,Anul XVI,2006,nr 61-62.

Zorman Matej, Lopes David João Horta, Martins Jorge Oliveira, Prendes Carmelo, Lorenzo Carmen Dias, Cabrera Raimundo- Incidence of Downy Mildew Plasmopara viticola(Berk. et Curtis ex. de Bary) Berl. et de Toni in Terceira island, Azores Rev. de Ciências Agrárias, Dec 2008, vol.31, no.2, p.134-138. ISSN 0871-018X

Months		April		May		June				July		1	August		Se	eptember	•	
Decade	T °C	P l/m2	U %	T °C	P l/m2	U %	T °C	Pl/ m2	U %	T °C	P l/m2	U %	T °C	P l/m2	U %	T °C	P l/m2	U %
Ι	10.9	26.6	76	16.9	44.8	70	19.6	17.6	72	21.2	12.4	76	23.9	26.4	76	17.3	2.0	67
II	10.9	20.0	81	14.6	32.6	81	14.6	44.4	72	25.2	10.4	69	25.8	2.6	59	19.0	5.2	60
III	13.7	1.2	70	18.8	26.4	78	19.1	95.4	84	22.3	24.2	75	24.5	0.2	64	16.5	15.8	71
Media	11.8	∑= 47,8	76	16.8	Σ= 103.8	76	17.8	∑= 157.4	76	22.9	∑= 47.0	72	24.0	∑= 29.2	64	17.6	$\sum_{23}^{=}$	66

Climate elements from the vegetation period of the vine that influence the attack of fungus *Plasmopara viticola (Berk et Curt) Beri et De Toni* in Teaching Resort Banu Maracine in 2010

г

Table 3

252

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

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

Vol. XVI (LII) - 2011

THE BEHAVIOR OF SOME VARIETIES OF APPLE TREE TO THE ATTACK OF PATHOGENS VENTURIA INAEQUALIS (CKE.) WINT. AND PODOSPHERA LEUCOTRICHA (ELL. ET EVERH.) SALM.

Mitrea Rodi^{1*}, Tudosie Roxana Elena²

KEYWORDS: apple scab, attack, powdery mildew, varieties, apple tree, behavior

ABSTRACT

The research regarding the behavior of 19 varieties of apple trees grown in the Teaching Resort Banu Maracine Craiova to the attack of pathogens Venturia inaequalis and Podosphaera leucotricha pointed out that these showed a great variability during the two years in which they were studied. In order to analyze the behavior of the 19 varieties, the intensity and frequency were established and the degree of attack on the leaves was calculated in the period 2010-2011, the analysis being correlated with the intensity and frequency of rainfall, as well as with the temperature.

The 19 varieties behaved differently to the attack of the two pathogens, different degrees of attack being recorded.

INTRODUCTION

Currently, the diseases of the apple tree represent the main cause of harvest and quality losses, especially in the climatic conditions favorable to attacks. The brown staining of the leaves and fruit and the apple scab of branches, produced by Venturia inaequalis, are the most widespread and damaging disease of this fruit tree species (Gheorghe Lefter, Nicolae Minoiu, 1990).

In our country it has a general spreading, causing big production losses and quality impairment of fruit, especially in the years with rainy springs and summers, reaching to destroy 30-98% of fruit in the neglected gardens, the rest of the harvest being of poor quality.

Apple scab is considered the most damaging disease of the apple tree (Tomsa M, Tomsa E, 2003) and together with powdery mildew, produced by the fungus Podosphaera leucotricha can hinder production (Sestraş, 1997) when it is not strictly controlled by frequent applications of fungicides. Such a large amount of chemical treatments raises numerous ecological problems and it refers to the consumers' health, in addition to the economic cost (Cociu, 1990; Lespinasse, et Y.Al., 2002).

For this reason, since the early years of the report of the two diseases and up to the present, the resistance of the apple species to the attack of fungi Venturia inaequalis and Podosphaera leucotricha has preoccupied many researchers: Bondarenko, 1965;

¹ University of Craiova, Horticulture Faculty

² Colegiul National Elena Cuza, Craiova, *Corresponding author: E-mail address: rodimitrea@yahoo.com
Gollmick, 1950; Kock, 1927; Misic, 1966; Sarasola, 1963; Schander, 1958; Soskic, 1965; Volvac, 1965; Jegeret al., 1986, Kellerhals, 1989, Lateur, MC, Populer, C., 1994, Lesna, M., Berci, S.2001; Mikula, Petkovsek, M.; Usenik, V., embossing, F.2003, Kranz, J.2008, Stephen, F.2011.

In Romania, data about the behavior of some apple varieties to the attack of these fungi are presented by: Molnar, L.; Velici, A., Chirita, R., Borcean, A., 2005; Iordanescu, O.A., Micu, R.E. 2007; Timar, A. 2009; Sestras, A., Pamfil, D.,Dan, C., Bolboaca, S., Jäntschi, L., Sestras, R. 2011.

In this paper, we present the behavior of new varieties of apple grown in SDBM, the knowledge of their behavior can lead to the reduction of the number of treatments for resistant varieties, of the amount of pesticide applied per hectare, so of the costs and implicitly of the environmental pollution.

MATERIALS AND METHODS

The behaviour of varieties of apple trees to Venturia inaequalis and Podosphaera leucotricha attack has been estimated in the field.

The biological material that formed the basis of the conducted research consisted of 19 new varieties of apple trees grown in the Teaching Resort Banu Maracine Craiova (Table 1).

Table 1.

	Biological material				
Crt.no.	Studied apple tree varieties				
1	Florina				
2	Idared				
3	Starkrimston				
4	Goldenspur				
5	Ionagold				
6	Ionathan				
7	Elstar				
8	Sure Prise				
9	Generos				
10	Elton				
11	Royal				
12	Arlet				
13	Elista				
14	Early Red				
15	Fuji				
16	Prima				
17	Akane				
18	Arkcharm				
19	Granny Smith				

The observations were made during the years 2010,2011 in the period of apple vegetation according to the evolution of the climate conditions. The attack was expressed in value by frequency (F%), intensity (I%) and degree of attack (DA%).

Depending on the value of the recorded degree of attack (DA%), the studied apple tree varieties were classified into six groups of resistance according to the following scale: Without attack DA = 0%

Very weak attack DA = 0.1 - 1%

Weak attack DA = 1.1 - 5.0%

Average attack DA = 5.1-15%

Strong attack DA = 15.1-20% Very strong attack DA> 20.1%

very strong attack DA> 20.1%

RESULTS AND DISCUSSIONS

In the years 2010, 2011 in the Teaching Resort Banu Maracine Craiova, there were observed the evolution of the fungus Venturia inaequalis and Podosphaera leucotrichia and the behavior of apple tree varieties at their attack, depending on the climatic elements.

In the studied apple tree varieties there were registered varying degrees of attack, the dynamics of the evolution of the pathogens being closely related to the evolution of the climatic conditions.

From the analysis of climate data of the two years we can observe that monthly average temperatures fall between the limits of the development of the pathogens.

Due to these circumstances the evolution of the two fungi is primarily related to the regime of precipitation and air relative humidity.

In the two years during which the observations were made, the 19 varieties of apple tree showed both the attack of powdery mildew and apple scab.

The studied varieties behaved differently to the attack of the two pathogens as it can be seen in Tables 2, 3, 4, 5.

Table 2

Crt.	Studied apple tree varieties	Frequency on	Intensity on	DA %
no.		leaves	leaves	
		F%	Ι%	
1	Florina	0	0	0
2	Idared	45%	25,73%	11,57%
3	Starkrimston	28%	6.78%	1,89%
4	Goldenspur	80%	66,68%	53,35%
5	Ionagold	32,5%	12,24%	3,98%
6	Ionathan	25%	9.98%	2,49%
7	Elstar	34,5%	6%	2,07%
8	Sure Prise	0	0	0
9	Generos	0	0	0
10	Elton	57,5%	20,73%	11,92%
11	Royal	85%	16,38%	13,92%
12	Arlet	80%	44,65%	35,72%
13	Elista	15%	5,90%	0,88%

The behaviour of apple tree varieties to fungus attack *Venturia inaequalis (Cke.) Wint.* in Teaching Resort Banu Maracine in 2010

14	Early Red	20%	3,7%	0,74%
15	Fuji	44,5%	27,83%	12,38%
16	Prima	0	0	0
17	Akane	0	0	0
18	Arkcharm	0	0	0
19	Granny Smith	37,5%	10,89%	4,08%

From the data in Table 2 which present the behavior of the 19 varieties of apple tree to the attack of Venturia inaequalis fungus it can be seen that the highest values of the degree of attack were registered at Goldenspur and Arlet varieties.

The Florina, Sure Prize, Generos, Prima, Akane, Arkcharm varieties did not show any attack of apple scab on the leaves.

The Elista and Early Red varieties recorded a very weak attack, and the Fuji, Royal, Elton, Idared varieties recorded an average degree of attack.

Table 3

The behavior of apple tree varieties at fungus attack *Venturia inaequalis (Cke.) Wint.* in Teaching Resort Banu Maracine in 2011

Crt.	Studied apple tree varieties	Frequency on	Intensity on	DA %
no.		leaves	leaves	
		F%	Ι%	
1	Florina	0	0	0
2	Idared	0	0	0
3	Starkrimston	40%	15,68%	6,28%
4	Goldenspur	20%	12,29%	2,46%
5	Ionagold	15%	12,6%	1,89%
6	Ionathan	20%	21,6%	4,32%
7	Elstar	21%	8,26%	1,74%
8	Sure Prise	0	0	0
9	Generos	0	0	0
10	Elton	49%	21,57%	10,57%
11	Royal	67,5%	9,14%	6,17%
12	Arlet	55%	14,76%	8,12%
13	Elista	44,5%	11,65%	5,185%
14	Early Red	85%	28,98%	24,64%
15	Fuji	48,5%	16,95%	8,23%
16	Prima	0	0	0
17	Akane	0	0	0
18	Arkcharm	0	0	0
19	Granny Smith	22%	28,23%	6,21%

In 2011, after the attack of apple scab in the apple crop, there were not recorded varieties with very weak attack nor strong attack.

The Elstar, Ionathan, Ionagold and Goldenspur varieties had a weak degree of attack and the Starkrimston, Fuji, Royal, Elton, Idared, Arlet, Granny Smith, Elista varieties had an average degree of attack.

The Early Red variety showed the strongest degree of attack (24.64%).

It was not registered apple scab attack at the Florina, Idared, Sure Prize, Generos, Prima, Akane, Arkcharm varieties.

Table 4

Crt.	Studied apple tree varieties	Frequency on	Intensity on	DA %
No.		leaves	leaves	
		F%	I%	
1	Florina	0	0	0
2	Idared	50%	15%	7,5%
3	Starkrimston	0	0	0
4	Goldenspur	27,5%	43 %	11,82 %
5	Ionagold	20%	21%	4,2 %
6	Ionathan	62,5%	12,5%	7,81 %
7	Elstar	0	0	0
8	Sure Prise	28%	13,12%	3,67 %
9	Generos	15%	6,69	1 %
10	Elton	30%	20%	6%
11	Royal	0	0	0
12	Arlet	0	0	0
13	Elista	0	0	0
14	Early Red	0	0	0
15	Fuji	0	0	0
16	Prima	0	0	0
17	Akane	18,5%	10,15%	1,87%
18	Arkcharm	0	0	0
19	Granny Smith	0	0	0

The behaviour of apple tree varieties to fungus attack *Podosphaera leucotrichia (Ell. et Everh.) Salm* in Teaching Resort Banu Maracine in 2010

Regarding the behavior of apple tree varieties to the attack of the pathogen Podosphaera leucotrichia in the year 2010, the Florina, Starkrimston, Elstar, Royal, Arlet, Elista, Early Red, Fuji, Prima, Arkcharm, Granny Smith varieties did not record any attack of powdery mildew disease. None of the 19 varieties had a degree of strong or very strong attack.

Table 5

The behaviour of apple tree varieties to fungus attack *Podosphaera leucotrichia (Ell. et Everh.) Salm* in Teaching Resort Banu Maracine in 2011.

Crt.no.	Studied apple tree varieties	Frequency on	Intensity on	DA %
		leaves	leaves	
		F%	Ι%	
1	Florina	0	0	0
2	Idared	75%	30,86%	23,15%
3	Starkrimston	0	0	0
4	Goldenspur	37,5%	32 %	12%
5	Ionagold	27%	21,33%	5,76%

6	Ionathan	82,5%	22,57%	18,63%
7	Elstar	0	0	0
8	Sure Prise	38	8,12	3,08%
9	Generos	19	8,79	1,67%
10	Elton	49%	21,57%	10,57%
11	Royal	0	0	0
12	Arlet	0	0	0
13	Elista	0	0	0
14	Early Red	0	0	0
15	Fuji	0	0	0
16	Prima	0	0	0
17	Akane	23,5	13,85	3,25%
18	Arkcharm	0	0	0
19	Granny Smith	0	0	0

From the data of table 5 it can be concluded that in 2011 the Florina, Starkrimston, Elstar, Royal, Arlet, Elista, Early Red, Fuji, Prima, Arkcharm, Granny Smith varieties did not show any attack of mildew, the same as in the previous year. The variety with the strongest degree of attack was Idared (23.15%), and the varieties with the weakest degree of attack were Sure Prise, Generos and Akane.

At the end of two years in which research was conducted regarding the behavior of some apple tree varieties at the attack of the fungus *Venturia inaequalis* we can conclude that the frequency, intensity and degree of attack were lower in the year 2011 compared with the year 2010. Regarding the apple trees behavior at the attack of fungus *Podosphaera leucotrichia* the frequency, intensity and degree of attack were higher in the year 2011 than in the year 2010.

The Florina, Sure Prize, Generos, Prima, Akane, Archarm varieties did not show any attack of the two pathogens, behaving as resistant.

The growing of varieties, that can behave as resistant, limits the damage caused by pathogens, thus renouncing the chemical control methods in order to protect the ecosystems and our health.

BIBLIOGRAPHY

Cociu, 1990; Lespinasse, et Y.Al., 2002

Cociu, V., Oprea, St., 1989: Metode de cercetare în ameliorarea plantelor pomicole, Ed. Dacia, Cluj-Napoca.

E.Eliade – Biologia parazitilor vegetali

Gheorghe L., Nicolae M.-Combaterea bolilor si daunatorilor speciilor pomicole semintoase, 1990

Iordanescu O.A., Micu R.E. 2007 The behaviour of some local apple tree varieties to pests and diseases in conditions of Brad Hunedoare fruit culture Area

Kranz, J.2008 Simulation of Epidemics Caused by Venturia inaequalis (Cooke) Aderh.

Mikulic-Petkovsek, M.;Usenik,V.,Stampar, F.2003 The role of chlorogenic acid in the resistance of apples to apple scab (Venturia inaequalis (Cooke) G. Wind. Aderh.)

Molnar,L.;VeliciA.,ChiritaR.,BorceanA.,2005Comportarea unor soiuri de mar fata de ciuperca Podosphaera leucotricha (Ell. et Everh.) Salm.in conditiile climatice ale anului 2003,la SDE Timisoara

Lesnic ,M.; Bercic, S.2001 The effect of fungicide dosage reduction on development of powdery mildew (Podosphaera leucotricha (Ell. & Ev.) Salmon and aple scab (Venturia inaequalis (Cooke) Winter) on apples cv. 'Jonagold'

Plant Pathology, volume 45, Issue 5, pages 924–932, October 1996-The effects of constant and fluctuating temperatures on the length of the incubation period of apple powdery mildew (Podosphaera leucotricha)

Sestras A., Pamfil D., Dan C., Bolboaca S., Jäntschi L., Sestras R. 2011. Possibilities to improve apple scab (Venturia inaequalis (Cke.) Wint.) and powdery mildew [Podosphaera leucotricha (Ell. et Everh.) Salm.] resistance on apple by increasing genetic diversity using potentials of wild species

Sestras R- Response of several apple varieties to apple scab(Venturia inaequalis) attack in central Transylvania condition-2003

Sestras R- Response of several apple varieties to powdery mildew(Podosphaera leucotricha)) attack in central Transylvania condition

Journal of Central European 348 Agriculture (online), Volume 4 (2003) No 4

Stephen F.2011 Scab is a key disease of apples and selection of scab-immune varieties offer backyard growers an alternative *to spraying*.

Timar A.2009. The dynamics of apple scab attack- Venturia inaequalis in the orchards of apple from Sibiu country, in period 2006-2008

Timar A.2009. The dynamics of attacks of poedery mildew- Podosphaera leucotricha in the orchards of apple from Sibiu country, in period 2006-2008

Tomsa M,Tomsa E 2003- Protectia integrate a pomilor si arbustilor fructiferi la inceputul mileniului III,-pag 10

Woodward, R., C., Studies on Podosphaera leucotricha. The mode of perennation. Transactions of the British Mycological Society, Volume 12, Issues 2-3, 1927, Pages 173-204, IN7, IN8.

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

Seria:	🖌 Biologie
	🖌 Horticultură
	🖌 Tehnologia prelucrării
	produselor agricole
	🖌 Ingineria mediului

Vol. XVI (LII) - 2011

MACROMYCETES FROM CERNA OF OLTEŢ BASIN (COUNTY VALCEA) (I)

Mitrea Rodi¹, Dunarintu Mihaela²

KEY WORDS: macromycetes, Cerna of Oltet, Valcea.

ABSTRACT

This paper is a segment of a larger study on the territory micoflora dissertation study represents the co-author of this paper. Following research carried out on a 3-year periaodă identified a total of 52 species belonging to 17 families.

INTRODUCTION

Cerna of Olteț Basin is located in the SW part of Romania. Administratively belongs entirely Valcea county. Data on flora of this area can be found in numerous literature (Răduțoiu 2005, 2006, 2008) but mycological data are quite sporadic (Răduțoiu 2002 Mitrea & Dunărințu 2010).

In the first paper presented by the author listed 51 species of parasitic fungi (Mitrea & Dunărințu 2010). Studies about macromycetes of Oltenia are the few literature (Popescu et al. 2003).

Our research goal is to fill a gap in the first place on the map Mycological of Oltenia and are complementary to the knowledge of the area of mushrooms, being able to do so some ecological considerations on this group of organisms, which are key components in determining ecosystem natural.

MATERIAL AND METHOD

The first step in achieving this work consisted in consulting the literature. Based on bibliographic information have been made numerous field trips in all times of year, knowing that some macromycetes can be found all year round.

Field notes included information on color, smell, taste, stationary conditions, the substrate that develops, as sporifere bodies in all stages of development etc.

In species in which the determination was not possible to land passed to their collection for a subsequent determination in the laboratory using literature: (Cummins & Hiratsuka 2003, Kirk et al. 2001, Tănase & Şesan 2006, Pârvu 2007).

¹ University of Craiova, Horticulture Faculty

² Industrial High School C-tin Brâncoveanu – Baia de Arama. Mehedinti county

RESULTS AND DISCUSSION

				Table 1
	Systematic framing of	f species identified		
	Polyporales	Polyporaceae	6	8
	Cantharellales	Cantharellaceae	2	2
	Russulales	Russulaceae	2	8
		Stereaceae	1	2
	Boletales	Boletaceae	1	4
		Sclerodermataceae	1	1
Basidiomycetes	Agaricales	Agaricaceae	2	4
		Coprinaceae	1	1
		Fistulinaceae	1	1
		Lycoperdaceae	3	5
		Marasmiaceae	5	7
		Nidulariaceae	1	1
		Pluteaceae	1	4
		Sclerodermataceae	1	1
		Strophariaceae	2	2
	Tremellales	Tremellaceae	1	1

The species identified are classified into the following taxonomic system (Tab 1):

Polyporaceae

Daedalea quercina (L. et. Fr.) - present stubs Quercus polycarpa StroieȘti, 11.07.2009, Rugetu, 16.07.2010 (Fig. 1).



Fig. 1. Daedalea quercina on Quercus polycarpa

Fomes fomentarius (L.) J.J. Kickx - frequent on trunks of deciduous trees throughout the Cerna of Oltet Basin 1.05.2009.

Fomitopsis pinicola (Sow et Fr.) Karst. - present on Picea abies, Zăvidanu Peak, 8.09.2009.

Phellinus igniarius (L. et. Fr.) Quél. - present on Salix fragilis - StroeȘti 12.05.2009.

Phellinus robustus (Karst.) Bourd. et. Galz. - present on Abies alba and Picea abies on Buciumu Peak. 8.09.2009.

Polyporus squamosus (Huds.) Fr. - present on Juglans regia L., Ciumagi, 15.09.2009.

Trametes hirsuta (Wulf.) Pil., present on (*Carpinus betulus* L.), Rugetu, 16.07.2010 (Fig. 2).



Fig. 2. Trametes hirsuta on Carpinus betulus

Trametes versicolor (L. et. Fr.) Pil. – present on *Alnus glutinosa* found in advanced stage of decay. StroeŞti. 12.07.2009, Rugetu, 16.07.2010.

Cantharellaceae

Cantharellus cibarius Fr. - the beech forest soil, StroeȘti, Slătioara, Cerna, 12.07.2009.

Craterellus cornucopioides (L.) Pers. – present in forest of Fagus sylvatica, Vaideeni, Cerna localities, 8.09.2009.

Russulaceae

Lactarius deliciosus (L.) Gray – present in forest of *Picea abies*, Zăvidanu Peak, 8.09.2009.

Lactarius piperatus (L.) Pers. – present in forest of *Quercus dalechampii* StroeȘti and Slătioara 12.07-2009.

Lactarius velleveus (Schaeff) Fr. – ground in forest of *Quercus dalechampii*, CerniŞoara 8.09.2009.

Lactarius volemus (Fr.) Fr. – present in forest of *Carpinus betulus* with *Quercus robur* Rugetu locality, 16.07.2010 (Fig. 3).



Fig. 3. Lactarius volemus present in forest of Carpinus betulus

Russula delica Fr. – present in forest of *Fagus sylvatica* with *Abies alba* on StâniŞoara Peak, 8.09.2009, Rugetu, 16.07.2010.

Russula emetica (Schaeff) Fr. – present in forest of *Picea abies*, Buciumu Peak, instead much Sphagnum, 8.09.2009.

Russula lepida Fr. – present in forest of *Fagus sylvatica* with *Abies alba* on StăniŞoara Peak, 8.09.2009, Rugetu, 16.07.2010.

Russula virescens (Schaeff. et. Zanted.) Fr. – present in forest of *Fagus sylvatica* with *Abies alba* – Zăvidanu Peak, 8.09.2009.

Stereaceae

Stereum hirsutum (Wilid.) Pers. – present on the stump of deciduous trees (alder, beech, Quercus sp. etc.), almost the entire Cerna of Oltet Basin, 7.09.2009.

Stereum guasapatum (Fr.) Fr. (Syn.: Stereum spadiceum (Fr.) Fr.), on branches to Quercus robur and Carpinus betulus from Rugetu locality, 16.07.2010.

Boletaceae

Boletus edulis Bull. - present in forest of Picea abies on Zăvidanu Peak, 15.09.2009.

Boletus cavipes Opat – present in forest of Picea abies on Buciumu Peak, 8.09.2009.

Boletus pulverulentus Opat. – present in forest of *Quercus dalechampii* - Slătioara, 8.09.2009.

Boletus satanas lenz. - present in forest of Fagus sylvatica - StăniȘoara Peak, 15.09.2009.

Sclerodermataceae

Scleroderma verrucosum (Bull.) Pers. – present in forest of Carpinus betulus with Quercus robur from Rugetu locality, 16.07.2010.

Agaricaceae

Agaricus arvensis Schaeff. – the meadows of Agrostis capillaris with Festuca rubra, Dumbrăvița Hill, Cerna locality (Vaideeni), 14.07.2009.

Agaricus campestris L. et Fr. – the meadows of *Dichantium ischaemum* on Dealul viilor Hill, Ciumagi, 15.09.2009.

Agaricus sylvaticus Schaeff. ex Secr., present in forest of Carpinus betulus with Quercus robur from Rugetu locality, 16.07.2010.

Macrolepiota procera (Scop. et Fr.) Sing. – in the orchard of *Prunus domestica* L., on Dealul viilor Hill, Ciumagi locality, 15.09.2009.

Hydnangiaceae

Laccaria laccata (Scop.) Cooke - present in forest of *Carpinus betulus* with *Quercus robur* from Rugetu locality. 16.07.2010

Schizophyllaceae

Schizophyllum commune Fries. – on branches of *Carpinus betulus* L. from Rugetu locality, 16.07.2010.

Coprinaceae

Coprinus comatus (O. F. Müll.) Gray – ground at the edge of forest *Quercus cerris* and *Quercus frainetto* in all the investigated area, 14.07.2009.

Fistulinaceae

Fistulina hepatica (Schaeff.) With. – the stems of *Quercus polycarpa*, RoeȘti, "Valea Carului" forest, 15.09.2009.

Marasmiaceae

Clitocybe nebularis (Batsch. et Fr.) Kumm – present in forest of Quercus dalechampii, Slătioara, 15.09.2009.

Collybia fusipes (Bull. et Fr.) Quél – present in forest of Fagus sylvatica and Carpinus betulus, RoeȘti, 15.09.2009.

Collybia confluens (Pers. et Fr.) Kumm – present in forest of Fagus sylvatica; Cerna locality, 15.09.2009.

Flammulina velutipes (Curt. et Fr.) Sing. – present on the stump in the forest of *Fagus sylvatica*, RoeŞti, 18.09.2009.

Marasmius alliaceus (Jacq et Fr.) Fr. – the leaves *Fagus sylvatica* - Cerna locality (Vaideeni), 15.09.2009.

Marasmius rotula (Scop.) Fr. - the leaves Quercus robur, Rugetu, 16.07.2010.

Mycena galericulata (Scop. et. Fr.) S.F. Gray – present on the stem and branches of *Fagus sylvatica* found in advanced stage of decay, Cerna (Vaideeni), 12.07.2009.

Lycoperdaceae

Bovista nigrescens Pers. – the meadows of *Agrostis capillaris* with *Festuca rubra* on StâniŞoara Peak 8.09.2009.

Calvatia caelata (Bull.) Morg. – the meadows of *Agrostis capillaris* with *Festuca rubra*, Cerna, 15.09.2009.

Lycoperdon foetidum Bon. (Syn.: *L. perlatum* var. *nigrescens* Pers., *L. nigrescens* (Pers.) Lloyd) - ground in the forest of *Carpinus betulus* with *Quercus robur* from Rugetu locality, 16.07.2010.

Lycoperdon giganteum Koke – ground in mixed forests of *Carpinus betulus* with *Robinia pseudacacia*, RoeŞti, 15.09.2009.

Lycoperdon pyriforme Schaeff. – present in forest of *Fagus sylvatica*, Plaiul Cernei Hill, Cerna locality, 12.07.2009.

Nidulariaceae

Cyathus striatus (Huds.) Willd. – present on the ground in the forest of *Fagus sylvatica* with *Abies alba* on Zăvidanu Peak, 8.09.2009.

Pluteaceae (syn. Amanitaceae)

Amanita alba Gillet – (fig. 4) ground in the forest of Carpinus betulus with Quercus robur from Rugetu locality, 16.07.2010.



Fig. 4. Amanita alba ground in the forest of Carpinus betulus with Quercus robur

Amanita caesarea (Scop. et. Fr.) Pers. et. Schw. – on Quercus cerris and Quercus frainetto, Oteteliș locality on Răii Hill, 12.07.2009.

Amanita citrina (Schff.) S.F. Gray present on the ground in the forest of *Picea* abies on Zăvidanu Peak, 8.09.2009.

Amanita muscaria (L. et. Fr.) Hooker – present on the ground in the forest of *Picea abies* on Zăvidanu Peak, 8.09.2009.

Strophariaceae

Hypholoma fasciculare (Huds.) P. Kumm. – the strain of *Fagus sylvatica*. RoeȘti, Valea Carului forest. 15.09.2009.

Pholiota mutabilis (Schff. et. Fr.) Kumm. – present in wood in the forest of *Fagus sylvatica*, Plaiul Cernei Hill, Cerna locality, 12.07.2009.

Tremellaceae

Tremella mesenterica Retz. - the strain of Juglans regia L. LădeȘti, 7.09.2009.

CONCLUSIONS

In the present study are 52 species belonging to 17 families macromycetes. Families with most representatives are: Polyporaceae -8, Russulaceae – 8, Marasmiaceae – 7, Lycoperdaceae – 5, Pluteaceae Şi Agaricaceae – 4. The remaining families have 1-2 representatives.

Substrate on which the fungi in the studied soil or bark is different woods.

BIBLIOGRAPHY

- 1. Cummins G.B., Hiratsuka J., 2003. Illustrated genera of rust fungi, ed. a III-a APS Press, St. Paul Minnesota.
- 2. Kirk P.M., Cannon P.F., David J.C., Stalpers J. A., 2001. Dictionary of the Fungi, ed. a IX-a, CABI Publishing CAB International Wallinford UK.
- 3. Pârvu M., 2007. Ghid practic de micologie, Ed. Casa Cărții de Știință, Cluj-Napoca.
- Popescu G., Răduțoiu D., Violeta Boruz & Ioana Ciortan. 2003. Macromycetes from Oltenia (1). Analele Științifice ale Universității "Al. I. Cuza", Secțiunea II a. Biologie vegetală. Tomul XLIX. pp. 151-159.
- Răduţoiu D. 2002. Date parţiale cu privire la macromicetele şi lichenii din Bazinul Cernei de Olteţ (Vâlcea), Muzeul Olteniei Craiova, Oltenia, Studii şi comunicări, Ştiinţele Naturii vol. XVIII.
- Răduţoiu D. 2005. Additions to the flora of the Cerna of Olteţ Basin. Annals of the University of Craiova. Seria Biologie, Horticultură, Tehnologia prelucrării produselor agricole, Ingineria Mediului. Vol. X (XLVI). pp. 11-17. Annals of the University of Craiova.
- Răduțoiu D. 2006. Vegetation phases in the fallow grounds within the Cerna of Olteț Basin. Lucrări Științifice, Seria Horticultură. Anul XLVII, Vol. 1 (49). pp. 353-356.
- Răduțoiu D. 2008. Flora Şi vegetația Bazinului Cernei de Olteț. Edit. Sitech. Craiova. 407 pg.
- 9. Tănase Cătălin, Șesan Tatiana Eugenia 2006. Concepte actuale în taxonomia ciupercilor. Ed. Universității "Alexandru Ioan Cuza" Iași.

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

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

Vol. XVI (LII) - 2011

MEDICINAL PLANTS WITH SEDATIVE PROPERTIES IN THE FLORA OF OLTENIA REGION

Mogoșanu G. D.^{1,*}, Tiță Monica Gabriela², Mitrea Adina³, Tiță I.⁴

KEY WORDS: flora of Oltenia, medicinal plants, sedative properties

ABSTRACT

In this paper, the authors present some aspects of 13 medicinal plants from the flora of Oltenia Region (South-West of Romania), containing active principles with sedative properties. Thus, the most important medicinal products are Lupuli strobulum, Crataegi folium cum flore, Crataegi fructus, Tiliae flos, Leonuri herba, Melissae folium, and Valerianae rhizoma cum radicibus.

INTRODUCTION

Currently, the busy life rhythm in the development of our civilization caused social problems and high frequency of central nervous system diseases, respectively of neuropsychiatric disorders. The stress can cause nervous damages and associated disorders like gastrointestinal (ulcer, colitis), cardiovascular, renal or metabolic diseases. Therefore, the phytotherapy with sedative herbal remedies brings an essential or adjuvant contribution in the treatment of nervous system diseases (Bojor and Popescu, 2009; Lakhan and Vieira, 2010; Neeraj and Dinesh, 2008; Wing, 2001).

The Romanian flora has a remarkable diversity: 4000 species and 900 of them are known as medicinal plants (Ciocârlan V., 2000). In the Oltenia Region (South-West of Romania), due to the climatic and soil conditions are found over 2300 vegetal species, 600 of them being used in traditional medicine (Tiță, 2008; Tiță and Năstase, 1997). Thus, the aim of our study is the presentation of some medicinal plants having chemical compounds with sedative properties.

MATERIALS AND METHODS

The paper presents 13 plant species from the flora of Oltenia Region, currently used for their sedative properties. Each species is accompanied by a brief description,

 ¹ Department of Pharmacognosy & Phytotherapy, Faculty of Pharmacy, University of Medicine and Pharmacy of Craiova, 2–4 Petru Rareş Street, 200349 Craiova.
² PhD candidate, Faculty of Pharmacy, "Carol Davila" University of Medicine and Pharmacy, 6 Traian Vuia

² PhD candidate, Faculty of Pharmacy, "Carol Davila" University of Medicine and Pharmacy, 6 Traian Vuia Street, 020956 Bucharest.

³ Department of Diabetes, Nutrition and Metabolic Disorders, Faculty of Medicine, University of Medicine and Pharmacy of Craiova, 2–4 Petru Rareş Street, 200349 Craiova.

⁴ Department of Vegetal and Animal Biology, Faculty of Pharmacy, University of Medicine and Pharmacy of Craiova, 2–4 Petru Rares Street, 200349 Craiova.

^{*} Corresponding author: E-mail address: mogosanu2006@yahoo.com

ecological and chorological information, data on the chemical composition of the vegetal products, their medicinal properties and forms of administration. The study has been initiated until 2005 as one of the main research projects of the Departments of Vegetal & Animal Biology and Pharmacognosy & Phytotherapy from the Faculty of Pharmacy, University of Medicine and Pharmacy of Craiova. The plant specimens have been collected and identified according to "The Illustrated Flora of Romania. *Pteridophyta et Spermatophyta*" (Ciocârlan, 2000). Voucher specimens have been deposited in the herbariums of the above-mentioned departments.

RESULTS AND DISCUSSION

The use of medicinal plants in the South-West of Romania dates from centuries ago. Majority of farmers, shepherds, local healers, midwives knew many plants, and especially those utilized in decoctions, infusions and macerations for the treatment of frequent diseases. Our paper reports on the most important medicinal plants with sedative properties, and again confirms the usefulness of medicinal plants for modern therapy.

Humulus lupulus L. (Hop), *Cannabaceae (Cannabinaceae)* family, is a perennial, dioecious herb, with voluble stem of 3 to 10 m. Bracts and fruits are covered with multicellular glandular hairs. The plant lives in water meadows, bushes, water edges, being specific for temperate zones. The medicinal product Lupuli strobulum, derived from the female flowers, contains oleoresins with two main active principles: humulone and lupulone. It has mild sedative action, bitter tonic, anaphrodisiac, being used to treat insomnia and neurosis, with sexual background, and nervous gastropathies (Bojor and Popescu, 2009; Bruneton, 2009; Ciocârlan, 2000; Ciulei *et al.*, 1993; Istudor, 2001; Mencinicopschi *et al.*, 2009; Neacşu *et al.*, 2006; Tiţă, 2008; Tiţă and Năstase, 1997).

Crataegus monogyna L. (Hawthorn), *Rosaceae* family, is a shrub or tree that can reach a height of 10 m. It lives in the woods, thickets, lowland regions to the mountains. It has short branches, transformed into thorns. Leaves are diamond-lobed, pinnate-lobed or unequal-sectors, with 3–9 lobes or pinnate fidate. *C. laevigata* (Poiret) DC sin. *C. oxyacantha* auct. non L. (Bramble) grows especially in southern areas of Oltenia. Generally, it is similar to *C. monogyna* (Ciocârlan, 2000; Tiță, 2008; Tiță and Năstase, 1997).

Crataegi folium cum flore, the medicinal product derived from both species contains flavonosids, proanthocyanidins, catechic tannin, triterpene acids, amines, uric acid, coumarins, phenolic acids, vitamin B, etc. *Crataegi fructus*, the fruits harvested from both species contains vitamin C, anthocyanins, carotenoids, sorbitol, glucose, etc. The phytocomplex of the above-mentioned medicinal products has sedative action at the central nervous system (CNS) level, coronarodilator, antihypertensive, and cardiotonic properties. The pharmaceutical formulations (Extraveral, teas, powders, tinctures) are used in cardiac disorders in adults (tachycardia, palpitations), early heart failure, insomnia, neurovegetative dystonia, early atherosclerosis, and neurotonic states of adults and children (Bojor and Popescu, 2009; Bruneton, 2009; Ciulei *et al.*, 1993; Istudor, 1998; Mencinicopschi *et al.*, 2009; Neacşu *et al.*, 2006; Tiță and Năstase, 1997).

Prunus spinosa L. (Blackthorn), *Rosaceae* family, is a thorny shrub, which vegetate on the edge of forests and roadsides. The product *Pruni spinosi flos*, harvested in the early flowering, contains several flavones and tannins. It has diuretic, depurative, antihypertensive, and sedative properties (Bojor and Popescu, 2009; Bruneton, 2009; Ciocârlan, 2000; Ciulei *et al.*, 1993; Istudor, 1998; Mencinicopschi *et al.*, 2009; Neacşu *et al.*, 2006; Tiță, 2008; Tiță and Năstase, 1997).

Melilotus officinalis Lam. (Yellow Melilot), *Fabaceae (Leguminosae*) family, is a biennial herb, branched, which can reach a height of 1.5 m. It has trifoliate leaves, toothed on the edges, and yellow flowers arranged in elongated racemes. The plant often grows in meadows and steppe areas, shrubs, and ruderal places. *Meliloti herba* contains coumarin derivatives (metilotoside, melilotin, melilotic acid, melilotin-cumaric acid), pentacyclic triterpene saponosids, flavones, choline, polyglucides, allantoin, phenols. It had anti-edematous (diuretic), astringent, anti-inflammatory, antiseptic, anticoagulant, stimulant of the reticuloendothelial system, and hepatoprotective actions. Decreases capillary permeability and stimulates the proteolytic activity of macrophages. It is used in folk medicine to treat jaundice, varicose veins, thrombophlebitis, hemorrhoids, digestive disorders, anxiety and insomnia (Bojor and Popescu, 2009; Bruneton, 2009; Ciocârlan, 2000; Ciulei *et al.*, 1993; Istudor, 1998; Mencinicopschi *et al.*, 2009; Neacşu *et al.*, 2006; Tiţă, 2008; Tiţă and Năstase, 1997).

Tilia tomentosa Moench sin. *T. argentea* DC. (Silver Lime), *T. platyphyllos* Scop. (Leafy Lime), and *T. cordata* Miller (Sulfur Lime), *Tiliaceae* family, are trees of 20–30 m height, frequent in the forests of steppe zones, but also grown in parks and gardens. The medicinal product *Tiliae flos* contains mucilages, essential oil (farnesol), flavonoids, proanthocyanidines, saponins, sterols, vitamin E, carbohydrates, tannins. It has emollient, antitussive, diaphoretic, spasmolytic, and sedative properties, being recommended for chest diseases, as painkiller, sedative, diaphoretic, and for cardiac disorders (Bojor and Popescu, 2009; Bruneton, 2009; Ciocârlan, 2000; Ciulei *et al.*, 1993; Istudor, 1998; Mencinicopschi *et al.*, 2009; Neacşu *et al.*, 2006; Tiță, 2008; Tiță and Năstase, 1997).

Leonurus cardiaca L. (Motherwort), *Labiatae* family, is a perennial plant of 50– 150 cm tall, common in plains and hilly regions, in addition to fences, edge of forests and ruderal places. *Leonuri herba*, the aerial flowering parts, contains bitter compounds (diterpenes, iridoids), cardiac glycosides, saponosids, flavonosids, sterols, tannins, essential oil, vitamins (A, C, E), nitrogenous substances (stachydrin, leonurin), organic acids, mineral salts. It has sedative, antiseptic and uterotonic actions, being used in the treatment of cardiac autonomic disorders, hypertension, gynecologic thromboses (Bojor and Popescu, 2009; Bruneton, 2009; Ciocârlan, 2000; Ciulei *et al.*, 1993; Istudor, 2001; Mencinicopschi *et al.*, 2009; Neacşu *et al.*, 2006; Tiță, 2008; Tiță and Năstase, 1997).

Melissa officinalis L. (Lemon Balm, Grass Hive), *Labiatae* family, is a plant with incense smell, spontaneously or cultivated. It has erect branched stems. It blooms from June to August. *Melissae folium* contains essential oil, bitter principles, triterpenes, flavonosids, mucilages, resins, polyphenol-carboxylic acids. It has stomachic, sedative, cicatrising, antithyroid, antigonadotropic, carminative, cholagogue, choleretic, immunomodulatory, and antiviral properties. It is recommended in insomnia, migraine, neuralgia, gastric and cardiac neurosis, dyspepsia, indigestion, peptic ulcers (Bojor and Popescu, 2009; Bruneton, 2009; Ciocârlan, 2000; Ciulei *et al.*, 1993; Istudor, 2001; Mencinicopschi *et al.*, 2009; Neacşu *et al.*, 2006; Tiță, 2008; Tiță and Năstase, 1997).

Origanum vulgare L. (Oregano), *Labiatae* family, is a perennial species, of 30– 50 cm height, common in steppe areas, thickets, edges of woods, and meadows. *Origani herba* contains essential oil, flavones, anthocyanins, triterpenes. It has antiseptic stomachic, diuretic, and antispasmodic properties. Some pharmaceutical preparations based on the vegetal product (Galov G, Sedocalm) and teas (sedative, antibronchitis) are used to treat respiratory, digestive and nervous disorders (Bojor and Popescu, 2009; Bruneton, 2009; Ciocârlan, 2000; Ciulei *et al.*, 1993; Istudor, 2001; Mencinicopschi *et al.*, 2009; Neacşu *et al.*, 2006; Tiță, 2008; Tiță and Năstase, 1997).

Mentha × piperita L. (Mint, Peppermint), Labiatae family, is a natural hybrid

between *M. aquatica* and *M. spicata*. The cultivated forms of this species are f. *rubescens* and f. *palescens* (Ciocârlan, 2000; Tiță, 2008). *Menthae folium* and *Menthae herba* contain essential oil, organic acids, polyphenols, tannins, flavonosids, pentacyclic triterpenes, a bitter principle, carotenoids, enzymes, mineral salts (Na, K, Mg, Ca, Fe, Mn, Cu, Zn). It has stomachic, tonic, cholagogue, choleretic, anti-diarrhoeal, antispasmodic, antiemetic, antipruriginous, sedative, and antifungal properties. It is used in digestive disorders (stomach bloating, nausea, vomiting, flatulence, and spastic colitis), fermentation dysentery, dermal diseases, and for oral asepsis. The vegetal products enter in the composition of medicinal teas (for colic, gastritis, dietary, liver, diarrhoea) and industrial preparations (Ticiverol, Tarbedol, Hepatosil) (Bojor and Popescu, 2009; Bruneton, 2009; Ciulei *et al.*, 1993; Istudor, 2001; Mencinicopschi *et al.*, 2009; Neacşu *et al.*, 2006; Tiță, 2008; Tiță and Năstase, 1997).

M. suaveolens Ehrh. is a sporadic species, having many varieties. It contains essential oil with menthofuran as the main component. It has sedative-heart, antiarrhythmic, vasoconstrictor, decongestant, expectorant, stimulant-hormonal, and anti-inflammatory properties. It is used in stress, spasmophilia, asthma, asthmatic bronchitis, cardiac arrhythmias, impaired bile ducts (Bojor and Popescu, 2009; Bruneton, 2009; Ciocârlan, 2000; Ciulei *et al.*, 1993; Istudor, 2001; Mencinicopschi *et al.*, 2009; Neacşu *et al.*, 2006; Tiţă, 2008; Tiţă and Năstase, 1997).

Valeriana officinalis L. (Valerian), Valerianaceae family, is a perennial species of 50–150 cm tall. The plant grows in shady places, on the edge of the waters, scrubs, hills and mountains areas (Ciocârlan, 2000; Tiță, 2008). The medicinal product Valerianae rhizoma cum radicibus, harvested from cultures, contains essential oil, iridoids (valepotriates), alkaloids etc. It has sedative, tranquilizer, antispasmodic, hypotensive, and anticonvulsant properties. In the form of teas, tinctures, extracts, and industrial products (Extraveral) it is used in insomnia, neurosis, cardiac and menopause disorders, nervous tension. Valerianae aetheroleum, the essential oil obtained from roots and rhizomes of V. officinalis (European Valerian), V. officinalis var. latifolia (Japanese Valerian) and V. wallichii (Indian Valerian), has a sedative, neurotonic, phlebotonic, hypothermal, and tranquiliser action. It is used in nervous asthenia, fatigue, tachycardia, internal and external haemorrhoids, and varicose veins (Bojor and Popescu, 2009; Bruneton, 2009; Ciulei et al., 1993; Fernández-San-Martín et al., 2010; Istudor, 2001; Mencinicopschi et al., 2009; Neacşu et al., 2006; Tiță, 2008; Tiță and Năstase, 1997).

Inula helenium L. (Elecampane, Horse-Heal), *Asteraceae (Compositae)* family, is a perennial and robust plant, up to 1.5 m height. He lives in wet meadows and sometimes is cultivated. *Inulae radix* contains essential oil, sesquiterpene lactones, inulin, stigmasterol. It has antiseptic, antimycotic, vermifuge, antispasmodic, mucolytic, cholagogue, choleretic, diuretic, and tonic properties. It is used in catarrhal bronchitis, mucopurulent bronchitis, emphysema, chronic cough, intestinal parasites. The essential oil (*Inulae aetheroleum*) has the same actions and uses as *Inulae radix* (Bojor and Popescu, 2009; Bruneton, 2009; Ciocârlan, 2000; Ciulei *et al.*, 1993; Istudor, 2001; Mencinicopschi *et al.*, 2009; Neacşu *et al.*, 2006; Tiță, 2008; Tiță and Năstase, 1997).

Achillea millefolium L. (Yarrow), Asteraceae (Compositae) family, is a perennial species. The plant grows in a large area, from the plains to subalpine region. The medicinal product *Millefolii flos* contains volatile oil, bitter principles (proazulenes), tannins, flavones, vitamins (E, K), etc. It has sedative, anti-inflammatory, stomachic, bitter tonic, healing, antiseptic, homeostatic, and immunoregulatory actions. It is used in colitis, spastic conditions, epigastric bloating, flatulence, diverse bleeding, hemorrhoids, and burns. It is included in the formula of some pharmaceutical products (Tarbedol, Gerodontol) and teas

(Bojor and Popescu, 2009; Bruneton, 2009; Ciocârlan, 2000; Ciulei *et al.*, 1993; Istudor, 2001; Mencinicopschi *et al.*, 2009; Neacşu *et al.*, 2006; Tiţă, 2008; Tiţă and Năstase, 1997).

CONCLUSIONS

The medicinal plants from the flora of Oltenia Region presented in this paper (Humulus lupulus, Crataegus monogyna, C. laevigata, C. oxyacantha, Prunus spinosa, Melilotus officinalis, Tilia tomentosa, T. argenta, T. platyphyllos, T. cordata, Leonurus cardiaca, Melissa officinalis, Origanum vulgare, Mentha × piperita, M. suaveolens, Valeriana officinalis, Inula helenium, Achillea millefolium) are a reliable local source of herbal medicines with sedative effect for the treatment of central nervous system diseases and gastrointestinal, cardiovascular, renal or metabolic associated disorders. Thus, the most important medicinal products are Lupuli strobulum, Crataegi folium cum flore, Crataegi fructus, Tiliae flos, Leonuri herba, Melissae folium, and Valerianae rhizoma cum radicibus.

REFERENCES

Bojor O., Popescu O. 2009. Fitoterapie tradițională și modernă. Ediția a V-a, revăzută și adăugită. Edit. Fiat Lux, București, 462 p.

Bruneton J. 2009. Pharmacognosie, Phytochimie, Plantes médicinales. 4^e édition. Lavoisier Tec & Doc. Paris, 1268 p.

Ciocârlan V. 2000. Flora ilustrată a României. *Pteridophyta et Spermatophyta*. Ediția a 2-a. Edit. Ceres. București, 1139 p.

Ciulei I., Grigorescu Em., Stănescu Ursula. 1993. Plante medicinale, Fitochimie și Fitoterapie. Tratat de Farmacognozie. Edit. Medicală. București. Vol. I, 733 p. Vol. II, 741 p.

Fernández-San-Martín M. I., Masa-Font R., Palacios-Soler L., Sancho-Gómez P., Calbó-Caldentey C., Flores-Mateo G. 2010. Effectiveness of Valerian on insomnia: a metaanalysis of randomized placebo-controlled trials. Sleep Medicine, 11(6):505–511.

Istudor Viorica. 1998. Farmacognozie, Fitochimie, Fitoterapie. Oze, ozide și lipide. Edit. Medicală. București. Vol. I, 399 p.

Istudor Viorica. 2001. Farmacognozie, Fitochimie, Fitoterapie. *Aetherolea*, rezine, iridoide, principii amare, vitamine. Edit. Medicală. București. Vol. II, 385 p.

Istudor Viorica. 2005. Farmacognozie, Fitochimie, Fitoterapie. Principii active azotate (alcaloidice și nealcaloidice). Edit. Medicală. București. Vol. III, 406 p.

Lakhan S. E., Vieira K. F. 2010. Nutritional and herbal supplements for anxiety and anxiety-related disorders: systematic review. Nutrition Journal, 9:42.

Mencinicopschi Gh., Bojor O., Ionescu-Călinești Larisa. 2009. Compendiu de terapie naturală. Nutriție, fitoterapie, cosmetică. Edit. Medicală. București, 814 p.

Neacşu P., Tiță Monica Gabriela, Mogoșanu G. D., Tiță I. 2006. Remedii naturale în tratamentul bolilor. Edit. SITECH. Craiova, 220 p.

Neeraj G., Dinesh D. 2008. A review on antianxiety plants. Indian Journal of Natural Products and Resources (Natural Products Radiance), 7(5):476–483.

Tiță I. 2008. Botanică farmaceutică. Ediția a III-a. Edit. SITECH. Craiova, 708 p.

Tiță I., Năstase A. 1997. Flora medicinală din Oltenia. Edit. Scrisul Românesc. Craiova, 157 p.

Wing YK. 2001. Herbal treatment of insomnia. Hong Kong Medical Journal, 7(4):392–402.

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

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

Vol. XVI (LII) - 2011

THE BASEMENT MEMBRANE INTEGRITY IN PRECANCEROUS LESIONS OF THE ORAL MUCOSA

Olimid Daniel Alin¹, Olimid Diana²

KEY WORDS: premalignant lesion ,carcinoma, leukoplakia,

ABSTRACT

The purpose of this study is to determine changes caused by premalignant lesions in the depth of oral mucosal layer which are affecting the integrity of basal layer. We evaluated a total of 10 cases of premalignant lesions with trenante evolution. The results showed constantly an indemn basal membrane, but atypical mitosis were common and present in full thickness of epithelium until its superficial, and neoplastic stromal proliferation accompanied in all cases by the presence of an inflammatory infiltrate composed predominantly of lymphocytes and plasmocytes. Premalignant oral lesions consist of leukoplakia, eritroplazia and hairy leukoplakia . Most of the leukoplakia lesions do not show dysplasia and can be classified as hyperplasia. Severe dysplasia is associated in most cases with the process of malignancy.

INTRODUCTION

Leukoplakia is a white lesion that cannot be removed or classified as other clinical or pathological disease, is clinically diagnosed and does not imply other changes in histological terms. No doubt that a small percentage of leukoplakia are precancerous, and another part appears as an invasive carcinoma. It is impossible to appreciate which injuries are likely to become malignant, but some clinical and histological features are recognized as being associated with an increased risk factor. [13].

Leucoplakia incidence varies from less than 1% in some areas to over 10% in other areas, leukoplakia occurs predominantly at older men, but recent studies show an increase in young adults. It can occur anywhere in oral mucosa, but predominantly in the oral floor. Leukoplakia located in the ventral face of the tongue and oral floor have a higher risk of malignant transformation compared with other locations in the oral cavity. Leukoplakia lesions can vary from small circumscribed lesions to extensive over a large area of oral mucosa. The color of the lesion can vary from yellowish white to gray, and the surface may be homogenous or heterogeneous plaques [3, 11].

Eritroplazia appears as a bright red spot, soft, solitary or spots with confluare trends, which cannot be classified clinically or pathologically as part of another disease.

Eritroplazic lesions can be well defined homogeneous looking, well-defined, with irregular contour. Their surface depends on the two forms, hypertrophic (granulated) with irregular surface, granular, slightly raised, covered in places with hyperkeratosis areas or

¹ University of Craiova, Department of Biology

² University of Craiova, Department of Biology

atrophic form (agranulated), with smooth, slightly uneven by depapilare and without areas of hyperkeratosis.

Histopathologicaly, eritroplazia have aspects of a carcinoma in situ or invasive carcinoma. Passing in a form of leukoplakia is a clinical sign, indicating a significant aggravation, epithelial architecture is disturb because a high degree of dysplasia that affects all layers of lining. This architecture is similar to squamous cell carcinoma is differentiated from it by keeping the integrity of the basement membrane.

In mild dysplasia architectural changes are limited to lower third of the epithelium and are accompanied by cellular atypia, moderate dysplasia, architectural changes extend in the middle third of the epithelium, severe dysplasia extending architectural changes in more than two thirds of the epithelium, accompanied frequently of cellular atypia.

Squamous epithelium is reactive, regenerative and repair agents in response to trauma, inflammation, irradiation or ulceration, may exhibit cellular atypia or architectural changes. Nutritional deficiencies such as iron, folic acid or vitamin B 12 may simulate dysplasia. Severe displazia lesions are associated in most of the cases with malignancy. Association shows that a higher accumulation of mutagenic factors in the tissue may increase the chances of mutations, favorising in special malignancy. It is also true that the malignancy may arise in the epithelium nondisplazic, which shows that mutations may be present in the absence that cause dysplasia. Dysplasia was reported to be present in about 10-25% of cases of leukoplakia [2,12].

MATERIAL AND METHODS

The material investigated in this study was obtained by surgical excision and biopsy fragments. Surgical excision pieces were fixed in formalin after the recipe: 1 part commercial formalin, 4 parts water, neutralizing the pH being made with calcium carbonate. For histopathological study of selected cases we used the classical technique for inclusion in paraffin, followed by hematoxylin-eosin staining usual, and when was the case we used special stains (PAS and Giemsa). Cutting was done with paraffin microtome, obtaining serial sections of 3-5 microns thick which were displayed on glass slides smeared with albumin Mayer. Histological slides with sections were placed in special racks and placed for 24 hours in a thermostat at 37 ° C. Further histological preparations were stained by the usual techniques (hematoxylin-eosin: HE), and were examined under optical microscope.

RESULTS AND DISCUSSIONS

Carcinoma "in situ" or pre-invasive cancer is also known as advanced degenerative process, without clinical signs of malignancy but showing histological characteristics of malignancy, except basal membrane which remains intact. In other words malignant transformation was initiated, but invasion is not yet present [2].

Malignancy results in poor cellular differentiation (anaplastic), tahicromazie and change of cytoplasmic nuclear report for the nucleus. Atypical mitosis, are frequently. In optical microscopy phenomena appear limited to the basal membrane, and electron microscopy shows a basal melting of the lamina, located between the basal membrane visible in optical microscopy and basal cell layers.

Carcinoma "in situ" present in only 2 cases of lesions analyzed, belonged to male patients. Both cases diagnosed with carcinoma "in situ" were located on the lips, one driven by a leucoplakia lesions. We noticed changes in cell morphology and stratification limited

in scope, but that included full thickness of squamous epithelium. Epithelial stratification presented a strong upheaval, with complete loss of cell polarity, and pronounced morphological anomalies of the neoplastic cell.

Carcinoma cells have varied size and shape, but their cytoplasma was generally reduced, basophilic and content voluminous nuclei, hipercromatics, with irregular arrangement of chromatin (Fig. no. 1,2).



Fig. 1. Carcinom "in situ" lingual Col HE Ob. 40



Fig. 2. Carcinoma "in situ" lingual Col HE, Ob 100

Basal membrane did not show any changes, but atypical mitosis were common and present in full thickness of the epithelium, up to superficial levels (fig. no. 3).



Fig. 3. Carcinoma "in situ", Col PAS, Ob. 100

In the subjacent chorion lesion we found the presence of inflammatory infiltrate of lympho-plasmocitar type. In both cases, the epithelium adjacent to the area of carcinoma "in situ" showed mild and medium dysplasia changes.

Mucosal precancerous lesions associating with aspects of carcinoma "in situ" or invasive squamous carcinoma is frequently recorded in the literature [5, 6,8].

Similar studies consider that about 5% of precancerous lesions in the absence of treatment progressively evolving into a carcinoma "in situ" or invasive squamous cell carcinoma. Period of time during which these changes is estimated at about 10 years. Moreover, it was found that approximately 51% of lesions investigated for leukoplakia or eritroplazia, following histopathological examination are diagnosed as invasive squamous carcinomas [7,9,10].

Microcarcinoma term has special significance in invasive carcinomas. It means an early stage of development of malignant invasive neoplasia lesion corresponding to the depth at which it is not associated with the presence of metastases.

In this microcarcinoma with lingual localization appreciated depth is 5 mm. For this category of invasive squamous carcinomas, lymphatic or vascular invasion are excluded [4,12].

Neoplastic stromal proliferation was accompanied in all cases by the presence of an inflammatory infiltrate composed predominantly of lymphocytes and plasmocytes (fig. no. 4). We have not observed vascular or lymphatic invasion aspects for any of the analyzed cases.



Fig. 4. Microcarcinoma lower lip,

Col. HE Ob. 40

CONCLUSIONS

From all the cases reviewed, two cases of leukoplakia lesions were histopathologicaly carcinoma "in situ, preserving the integrity of the basement membrane, and in two cases of eritroplazia the histopathological appearance was microcarcinoma.

About 20% of leukoplakia lesions investigated for eritroplazia following histopathological examination are diagnosed as microcarcinom.

Severe dysplasia associated in most of cases the process of malignancy.

Most of squamous carcinomas of the oral mucosa and in particular of the tongue are developed on the pre-existing injuries.

Oral carcinoma in situ usually presents clinically as leukoplakia or erythroplakia.

Any premalignant lesions with long evolution, unresponsive to usual treatment should be properly investigated by biopsy followed by histopathology.

We have not observed vascular or lymphatic invasion aspects to any of the cases analyzed.

REFERENCES

- 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
- 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
- Bouquot J. E. (1991). Reviewing oral leukoplakia: clinical concepts for the 1990s. J Am Dent Assoc 122: 80-82

- Bouquot J. E., Gundlach K. K. H. (1986). Odd tongues: the prevalence of common tongue lesions in 23,616 white Americans over 35 years of age. Quintessence Internat 17: 719-730
- Burlibaşa C. (2005). Chirurgie orală și maxilo-facială, ediția a II-a, Editura Medicală: Buucreşti, pp. 815-965
- Cancer Research UK: UK Oral Cancer incidence statistics 2007. Londra: Cancer Research UK; 2007. <u>http://www.cancerresearchuk.org</u>
- 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
- 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
- 9. Lee J. J., Hong W. K., Hittelman W. N. (2000). Predicting cancer development in oral leukoplakia: ten years of translational research. Clin Cancer Res 6: 1702-1710
- 10. Saito T., Sugiura C., Hirai A. et al. (1999). High malignant transformation rate of widespread multiple oral leukoplakias. Oral Dis 5: 15-19
- 11. Sciubba J. J. (1995). Oral Leucoplakia, Crit Rev Oral Biol Med 6(2): 147-160
- Soames J. V., Southam J. C. (2005). Oral Pathology, Fourth Edition, Oxford University Press: Oxford, pp. 135-150
- 13. Van der Waal I., Schepman K. P., Van der Meij E. H., Smeele L. E. (1997). Oral leukoplakia: a clinicopathological review. Oral Oncol 33: 291-301

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

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

Vol. XVI (LII) - 2011

THE DISTRIBUTION OF THE PROGESTERONE RECEPTORS IN THE HYPERPLASTIC AND NEOPLASTIC HUMAN ENDOMENTRIUM

Olimid Diana¹, Olimid Daniel Alin²

KEY WORDS: progesterone receptors, endometrial hyperplasia, carcinoma

ABSTRACT

The purpose of this imunohistochemical study was to determinate the presence of the progesterone receptors in the hyperplastic and neoplastic endometrium and to correlate it with the histopathological degree of the lesions. We evaluated 27 cases of endometrial hyperplasia and 22 cases of endometrioid carcinoma. The results have shown that the progesterone receptors were present in all cases of endometrial hyperplasia and in 83,36% cases of endometrioid carcinomas. The values of progesterone receptors were higher in the endometrial hyperplasia in comparison to those from the endometrioid carcinomas. The values of hormonal receptors presented a decrease in the following order: well-differentiated carcinoma, poorly-differentiated and undifferentiated carcinoma.

INTRODUCTION

Marking of the endometrial epithelial, stromal and myometrial cells, using the specific antibodies of the progesterone receptors (PR), an important variation has been noticed in the menstrual cycle, with an intense positivity of the epithelial cells in the proliferative phase and in the post-ovulatory or early secretory phase. This immunoreactivity diminishes or disappears during the late secretory phase. In contrast, during it, the stromal cells are marked in an intensely positive manner. The progesterone receptors are not present in the muscular and endothelial cells of the vessels (Mulac-Jericevic and Connelly, 2004; Walker and Yacoub, 2003).

The progesteronic receptors have two isoforms, A and B, the latter being a truncated form of the former. They are coded by the same gene, but result following the initiation of different promoters, both of them being stimulated by estrogens. The 2 isoforms have different functions and tissue-specific repartition. PR-B is a transcription activator in the cells where PR-A is weakly represented while PR-A is an inhibitor of the action of PR-B, as well as of other nuclear receptors, such as the estrogenic ones. Their uneven repartition and their different functions could be responsible for the specific actions of progesterone within the various tissues (Saito et al, 2006; Xiaotao and O'Malley, 2003).

It has been pointed out the role of the 2 isoforms in the various tissues using animals (mice), which had the gene for PR-A and PR-B respectively, injected). Thus PR-A is necessary and sufficient for mediating the effects of the progesterone on the uterine level,

¹ University of Craiova, Department of Biology

² University of Craiova, Department of Biology

where it is responsible for the blocking of the endometrial proliferation and the inducing of the decidualisation of the stromal endometrial cells. On the other hand it inhibits the proliferative effects mediate by PR-B, in the endometrial cancer a normal report between the two isoforms, with the predominance of PR-B, being proven (Saito et al, 2006; Mylonas et al, 2007).

MATERIAL AND METHODS

The material used in the study was represented by 27 endometrial biopsy specimens with the diagnosis of endometrial hyperplasia and 22 specimens with the diagnosis of endometrioid carcinoma. The lesions were classified according to the World Health Organization (WHO) classification system: simple hyperplasia (20 cases), complex hyperplasia (5 cases), complex atypical hyperplasia (2 cases), well-differentiated carcinoma (12 cases), poorly-differentiated carcinoma (7 cases) and undifferentiated carcinoma (3 cases). We assessed the all cases with immunohistochemical staining for progesterone receptors (Walker and Yacoub, 2003).

All specimens were fixed in formalin, embedded in paraffin and cut in 3-4- μ m-thick sections. Endogenous peroxide activity was blocked with 3% H₂O₂ in distilled water for 10 minutes. A microwave oven was used for antigen retrieval at a frequency of 2450 MHz at level III (800 W) for 5 minutes and at level II (560 W) for 20 minutes.

The section were washed with distilled water and incubated with monoclonal mouse antiprogesterone protein (Dako, $1A_6$) at the temperature of 37^0 C and 1/10 dilution using the streptavidin-biotin-peroxidase method. Diaminobenzidine was used as chromogen and slides were counterstrained with Mayer hematoxylin for 15-30 seconds. For a negative control, normal saline was added in place of the primar antibody.

Progesterone receptors were regarded as positive when staining was more than 10%. All degrees of staining intensity were considered positive.

IP (positivity index) was defined as percentage of cells showing positive nuclear staining per total of 500 counted cells. We examined at least 500 cell nuclei in at least five fields under a grid at 400x magnification (10x ocular and 40x objective).

RESULTS AND DISCUSSIONS

The presence of the progesterone receptors has been proven by the positive black nuclear immunomarking. The negative nuclear immunomarking was represented by the light blue nuclear coloring with hematoxyline.

By using the monoclonal antibodies, receptors for the progesterone have been detected in the epithelial and stromal cells of the endometrium, in the cells of the myometrium, in the normal epithelial cells of the mammary glands and in mammary carcinomas (Mulac-Jericevic and Connelly, 2004).

The study of immunoexpression of PR indicated the fact that the progesterone receptors have been present in 46 of the 49 cases, representing 95.5 % of the cases immunohistochemically analyzed.

The immunoreaction has been positive at epithelial level for all histopathological forms of endometrial hyperplasia. The immunoexpression of progesterone receptors has been present in 19 of the 22 studied carcinomas (86.36 %). Based on the rating degree, we have observed that all the well–differentiated endometrioid carcinomas presented progesterone receptors. The expression of PR decreased along with the increase of the histological degree, in the poorly differentiated carcinoma group 6 of the 7 cases were positive (85.75 %) and only one positive case in the undifferentiated carcinoma group.

In literature it is mentioned that 100 % of the endometrial hyperplasias are positive for PR at stromal and epithelial level, but some studies mention the fact that receptors for progesterone are positive in a higher number in the case of hyperplastic endometrium without cytological atypias (Lisenko et al, 2004; Mitselou et al, 2003).

Also, it has been seen that approximately 90 % of the endometrial carcinomas present progesterone receptors, the forms with small histological degree being entirely positive (Mylonas et al, 2005). Based on Veral's study it has been observed that 62 % of the carcinomas with small histological degree and only 26 % of the ones with increased histological degree presented positive immunoexpression (Veral et al, 2002).

We have observed that IP–PR has had the highest values in complex hyperplasia without atypia, followed by complex atypical hyperplasia and simple hyperplasia without atypia. For simple hyperplasia without atypia, the average values of IP–PR have been of 43 % (fig. no. 1).

For the group of complex hyperplasia without atypia, the IP–PR values have been the highest ones, in relation to the histopathological forms of investigated hyperplasias, as well as all the studied lesional categories. Thus, for the 5 cases of complex hyperplasia without atypia, the average value of IP–PR was 78 %.



Fig. no. 1. Immunohistochemical staining of PR in simple hyperplasia, X 200

Both cases of complex atypical hyperplasia were positive for PR, the positivity index being 76 % compared to the complex form without atypia.

In the case of hyperplasias there are present a reduced number of progesterone receptors compared to the normal endometrium in proliferative phase (Lisenko et al, 2004).

The expression of progesterone receptors in endometrial carcinomas has been lower compared to endometrial complex atypical hyperplasia, the average values of IP for carcinomas being maximum, 52 %, compared to the average value of IP–PR in complex hyperplasia with atypias which was 76 %. The results were similar to those in literature. It is considered that in carcinomas, compared to endometrial hyperplasias, the progesterone is more heterogeneously distributed and is expressed at much more reduced levels (Mitselou et al, 2003; Mylonas et al, 2005). The expression of progesterone receptors decrease along with the increase of the histological degree. In the well–differentiated forms, the average IP–PR was 52 % (fig. no. 2), in contrast with the poorly differentiated ones in which IP–PR was 24 % (fig. no. 3) and the undifferentiated ones where the index value was 11 %.



Fig. no. 2. Immunohistochemical staining of PR in well-differentiated carcinoma, X 200



Fig. no. 3. Immunohistochemical staining of PR in poorly-differentiated carcinoma, X 200

Progesterone is a steroid hormone essential in the proliferation and differentiation control of cells from the female genital tract. The loss of isoform B of progesterone receptors has been recently correlated with the development of endometrial poorly differentiated tumors, sustaining the hypothesis that this isoform is important in maintaining the endometrial differentiation (Mylonas et al, 2007). The progesterone

induces the cyclin–dependent kinase inhibitors p21 and p27, that is why the percent of proliferative cells decreases significantly (Shih et al, 2003).

There has been proved a significant progesterone–dependent inhibition of the expression of cell adhesion molecules, including fibronectin, $\alpha 3$, $\beta 1$, $\beta 2$ integrins. The decrease of the molecular adhesion degree was significantly higher in the presence of isoform B, proving that progesterone takes action mainly through receptors B in order to inhibit cellular invasivity (Dai et al, 2002). The low expression of one or both isoforms of progesterone receptors is frequently produced in the endometrial carcinogenesis and is the main cause of the failure of progestative treatment in endometrial tumors (Wang et al, 2003; Utsunomiya et al, 2005). Studies have shown that progesterone inhibits significantly the expression of cellular adhesion factors that modulate the invasive potential. At the same time, the progesterone induces senescence to cells that no longer have the ability to enter in the cellular cycle and to divide themselves, thus sensitizing the cells at the scheduled cellular death (Dahmoun et al, 2004).

In most studies, the presence and quantity of steroid receptors has been correlated with histological differentiation, FIGO staging and survival. The different studies have reported variable results concerning the correlation of hormonal receptors' expression and the prognosis. Tumor recurrence has been correlated with the absence of estrogen and progesterone receptors and the response to progestative therapy has been more frequent in positive tumors for progesterone receptors. The progesterone receptors status correlated with other risk factors is considered a useful potential prognosis indicator. Data in literature indicate for type I carcinomas an immunoexpression of ER and PR significantly higher, of 70–73 % in contrast with type II carcinomas, where immunoreactivity is present only in 19–24 % proportion (Veral et al, 2002; Saito et al, 2006; Utsunomiya et al, 2005).

PR values in hyperplasias have comparatively been higher in relation to the ones in endometrial carcinomas, this explaining the fact for which the answer to hormonal therapy is kept in the cases of endometrial hyperplasias compared to endometrial carcinomas. (Wang et al, 2003).

CONCLUSIONS

The expression of progesterone receptors has been present in all analyzed hyperplastic lesions, which reflects into practice through the regression of these lesions under progestative hormonal treatment.

Hormonal receptors were expressed at more reduced level in neoplastic lesions compared to hyperplastic lesions, their immunoposivity correlating with the histological differentiation degree and decreasing in this order: well–differentiated endometrioid carcinomas, poorly differentiated carcinomas, undifferentiated carcinomas.

The expression of progesterone receptors has been present in all cases of endometrial hyperplasias and well–differentiated carcinomas and in reduced percentage in poorly and undifferentiated carcinomas.

The absence of hormonal receptors in the case of poorly and undifferentiated carcinomas reflects into practice through the lack of their response to the hormonal therapy and associates with increased tendency for tumor invasion and poor prognosis.

REFERENCES

Dahmoun M., Boman K., Cajander S., Backstrom T. Intratumoral effects of medroxi-progesterone on proliferation, apoptosis and sex steroid receptors in endometrioid endometrial adenocarcinoma. Gynecol Oncol ; 92: 116-126. 2004.

Dai D., Wolf M., Litman E.S., White M.J., Leslie K.K. Progesterone inhibits Human Endometrial Cancer Cell Grow and Invasiveness : Down-Regulation of Cellular Adhesion Molecules through Progesterone B receptors. Cancer Res ; 62(3): 881-886. 2002.

Lysenko O.N., Ashkhab M.K., Strizhova N.V., Babichenko I.I. Immunohistochemical study of the expression of receptors to steroid hormones in endometrial hyperplastic processes. Arkh Patol ; 66(2): 7-10. 2004.

Mitselou A., Ioachim E., Kitsou E. Immunohistochemical study of apoptosisrelated Bcl-2 protein and its correlation with proliferation indices (Ki67, PCNA), tumor suppressor genes (p53, pRb), the oncogene c-erbB-2, sex steroid hormone receptors and other clinicopathological features, in normal, hyperplastic and neoplastic endometrium. In Vivo ; 17(5): 469-477. 2003.

Mulac-Jericevic B., Connelly O.M. Reproductive tissue selective actions of progesterone receptors. Reproduction ; 128(2): 139-146. 2004.

Mylonas I., Jeschke U., Shabani N, Kuhn C., Kriegel S., Kupka M.S., Friese K. Normal and malignant human endometrium express immunohistochemically estrogen receptor alpha (ER-alpha), estrogen receptor beta (ER-beta) and progesterone receptor (PR). Anticancer Res ; 25(3A): 1679-1686. 2005.

Mylonas I., Jeschke U., Shabani N., Kuhn C., Kunze S., Dian D., Friedl C., Kupka M.S., Friese K. Steroid receptors ERalpha, ERbeta, PR-A and PR-B are differentially expressed in normal and atrophic human endometrium. Histol Histopathol ; 22(2): 169-176. 2007.

Saito S., Ito K., Nagase S., Suzuki T., Akahira J., Okamura K., Yaegashi N., Sasano H. Progesterone receptor isoforms as a prognostic marker in human endometrial carcinoma. Cancer Sci ; 97(12): 1308-1314. 2006.

Shih H.C., Shiozawa T., Kato K., et al. Immunohistochemical expression of cyclins, cyclin-dependent kinases, tumor-suppressor gene products, Ki-67, and sex-steroid receptors in endometrial carcinoma : positive staining for cyclin A as a poor pronostic indicator. Hum Pathol ; 34: 471-478. 2003.

Utsunomiya H., Suzuki T., Ito K., Moriya T., Konno R., Sato S., Yaegashi N., Okamura K., Sasano H. The correlation between the response to progestogen treatment and the expression of progesterone receptor B and 17beta-hydroxysteroid dehydrogenase type 2 in human endometrial carcinoma. Clin. End. (Oxf) ; 58(6): 696-703. 2003.

Veral S., Zekioglu O., Nart D. et al. P53, c-erb, Ki-67, estrogen and progesterone receptor expression and histological parameters in types I and II endometrial carcinomas. Annals of Saudi Medicine ; 22 (3) : 242-244. 2002.

Walker F., Yacoub M. Immunomarquages utiles et apports des techniques nouvelles en pathologie du corps uterin. In : Bulletin Academie Internationale de Pathologie. Division Française ; 38: 7-25. 2003.

Wang S., Pudney J., Song J., Mor G., Schwartz P.E., Zheng W. Mechanisms involved in the evolution of progestin resistance in human endometrial hyperplasia precursor of endometrial cancer. Gynecol Oncol; 88 (2): 108-117. 2003.

Xiaotao L., O'Malley B.W. Unfolding the action of progesterone receptors. J Biol Chem ; 278(41): 261-264. 2003.

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA Seria: ✓ Biologie ✓ Horticultură ✓ Tehnologia prelucrării produselor agricole ✓ Ingineria mediului

Vol. XVI (LII) - 2011

CLINICAL-STATISTICAL AND HISTOPATOLOGICAL CORELLATIONS IN ENDOMETRIAL PROLIFERATIVE LESIONS

Olimid Diana¹, Olimid Daniel Alin²

KEY WORDS: endometrium, hyperplasia, carcinoma, risk factors

ABSTRACT

This study was done during a period of 5 years and included 795 patients with a histopathological diagnosis of endometrial hyperplasia and endometrioid carcinoma. We made a clinical-statistical analysis regarding the incidence of lesions and we correlated it with the age of patients and their hormonal status. The histological form of simple hyperplasia without atypias was diagnosed in all age groups, the maximum incidence being in the 40–49 age group. We have not encountered any cases of atypical hyperplasia in patients with ages between 20 and 39 years. The maximum incidence for simple, as well as for the complex atypical hyperplasia was in the 50-59 age group. Endometrial neoplasias were diagnosed in patients approximately 10 years older compared to the ones diagnosed with endometrial hyperplasias. Regarding the hormonal status, 80.70 % of the patients with endometrial cancer were in the postmenopausal period.

INTRODUCTION

The endometrial hyperplasia and carcinoma represent lesions which recognize as common etiopathogenical mechanism the persistent and non-antagonized estrogenic stimulation. The endometrioid carcinoma represent over 80-90% of the endometrial cancers, neoplasies which rank the 5th as frequency worldwide in the feminine population, after the cervical cancer, ovary and breast. The endometrial cancer contains approximately 4% of all cancers occurred in women, approximately 150.000 new cases being diagnosed each year worldwide. The highest rates of incidence are registered in North America and Europe, meanwhile in developing countries the percentage is 4-5 times lower (American Cancer Society, 2007; Cancer Research UK, 2004). One of the highest worldwide incidence rate was found at the European population, where more than one in twenty cancers occurred in women is an endometrial cancer (Bray et al, 2005).

MATERIAL AND METHODS

We made this study during a period of 5 years, between 2005-2010, on two groups of patients: 624 women diagnosed with endometrial hyperplasia and 171 women diagnosed with endometrial cancer. The patients were investigated anamnestically regarding to their

¹ University of Craiova, Department of Biology

² University of Craiova, Department of Biology

age and hormonal status. We distributed the various histological types of endometrial hyperplasia and carcinoma on age groups.

We wanted to determinate the incidence of lesions on each group of age.

RESULTS AND DISCUSSIONS

Analyzing the distribution of endometrial hyperplasias taken into study according to age groups, we have observed that lesions have been diagnosed in patients with ages comprised in a large range, which varied between the IIIrd and VIIth decades of life (table no. 1).

Table no. 1

Age group	20-29	30-39	40-49	50-59	60-69
No. of cases	11	66	255	236	56
Percentage %	1,76%	10,58%	40,87%	37,82%	8,97%

The repartition of the cases according to the age group

The largest part of casuistry was diagnosed in patients with ages between 40 and 49 years, range in which we found 255 cases representing 40.87 % of the total cases. For the decade 50–59 years, the number of cases has been of 236, representing 37.82 % of the total casuistry. For the decades preceding the one with maximum incidence, the number of cases was much more reduced, respectively 66 cases for the IVth decade of life (10.58 %) and 11 cases for the IIIrd decade (1.76 %). In the VIIth decade of life, the number of cases was also reduced, respectively 56 cases, being 8.97 % of the total casuistry. The youngest patient diagnosed with endometrial hyperplasia was 21 years old and the oldest 69 years old.

In the professional literature it is appreciated that the endometrial hyperplasia is a lesion which mainly appears in women in the perimenopausal period, the maximum incidence being set in the Vth decade of age (Hall et al, 2002). Data in literature show that the youngest patient with endometrial hyperplasia was 16 years old (Lee and Scully, 1989).

Of the total cases diagnosed with endometrial hyperplasia, 544 cases corresponded to the form of simple hyperplasia, 53 cases to the form of complex hyperplasia without atypia and in 27 cases the diagnose was of atypical hyperplasia, simple in 8 cases and complex in 19 cases. The number of cases corresponding to each histological form were distributed into age groups (table no. 2).

For the form of simple hyperplasia the distribution of cases spread between the IIIrd and VIIth decades of life, with an incidence edge in the age group of 40–49 years old (42.64 %), followed by the age group of 50–59 years old (34.92 %). The lowest incidences were registered in the age group of 20–29 years old (2.02 %) and 60–69 years old (8.63 %).

In the case of complex hyperplasia without atypia we have not encountered any cases in the age group of 20–29 years old and the maximum incidence was in the VIth decade of life, with 27 cases (50.94 %). For the age group of 40–49 years old the number of cases was of 20 (37.73 %) and for the bordering decades, we have encountered two cases in the age group of 30–39 years old and 4 cases (7.54 %) in the age group of 60–69 years old.

We have not encountered any cases of atypical hyperplasia in patients with ages between 20 and 39 years old. The maximum incidence for simple as well as for complex hyperplasia was set in the age group of 50-59 years old, where we have encountered 5 cases (62.5 %), respectively 14 cases (73.68 %).

The general analysis of the age group distribution reflects a correspondence between the evolution stage of hyperplastic lesion and the patients' age, which translated the existence of time range necessary for the action of the estrogenic stimulation.

Table no. 2

Histological typ	Age group	20-29	30-39	40-49	50-59	60-69	
Simple	No. of cases	11	64	232	190	47	544
hyperplasia	Percentage %	2,02%	11,76%	42,64%	34,92%	8,63%	100%
Complex	No. of cases	-	2	20	27	4	53
hyperplasia	Percentage %	-	3,77%	37,73%	50,94%	7,54%	100%
Simple	No. of cases	-	-	1	5	2	8
atypical hyperplasia	Percentage %	-	-	12,50%	62,50%	25%	100%
Complex	No. of cases	-	-	2	14	3	19
atypical hyperplasia	Percentage %	-	-	10,53%	73,68%	15,79%	100%
All c	ases	11	66	255	236	56	624

The repartition of the histological type of endometrial hyperplasia according to the age group

The youngest patient diagnosed with atypical hyperplasia was 41 years old. In literature there are data about cases of atypical hyperplasia diagnosed in younger patients. Thus, in Kurman's study performed over a batch of 170 patients with endometrial hyperplasia, who didn't follow any treatment, there are described two cases: the one of a patient who, at the age of 21, was diagnosed with simple hyperplasia, at 28 with atypical hyperplasia and at 32 with stage II adenocarcinoma. The other case is that of an obese and infertile patient, diagnosed with complex hyperplasia at 22 years old, with atypical hyperplasia at 26 and who developed Ist degree adenocarcinoma at 30 years old (Kurman, 1985).

Another study performed over a batch of 460 premenopausal women didn't find any cases of atypical hyperplasia in women with age under 40 and in a batch of perimenopausal women investigated for abnormal uterine bleedings with ages between 40 and 55 years old, there were diagnosed only 5 cases of atypical hyperplasia in a group of 46 cases of hyperplasia, representing 0.7 % of the total morphological endometrial modifications (Weber et al, 1999; Lacey et al, 2005).

Even though atypical hyperplasia appears in women with age under 40, it can be treated and 20 % of these patients can become pregnant and can to carry a pregnancy to term (Kahn et al, 2001; Ushijima, 2007).

Distributing the patients with endometrial hyperplasia according to their hormonal status, we have observed that most cases (391-62.66%) were in their perimenopausal period.

Analyzing the distribution of the 171 endometrial carcinomas taken into study according to the age group, we have seen a distribution of cases between the Vth and VIIth decades of life, with an incidence edge in decades VI and VII (table no. 3).

Table no. 3

The repartition of the endometrioid carcinomas according to the age group

Age group	40-49	50-59	60-69	70-79
No. of cases	24	75	63	9
Percentage %	14,04%	43,86%	36,84%	5,26%

It can be noticed that neoplasias have been diagnosed in patients approximately 10 years older than the ones diagnosed with endometrial hyperplasias. Within the age range of 50-59 years old we have found a number of 75 cases, representing 43.86 % of the casuistry and in the age group of 60–69 years old we have found 63 cases, representing 36.84 %. 85.96 % of cases were diagnosed in patients with age over 50.

According to the studied bibliography, patients diagnosed with endometrial cancer are situated between decades II and VIII of life, with an average age of 59. Although it is a disease that appears especially in postmenopausal women, endometrial cancer can happen in women with age under 40 in proportion of 1.5 % up to 14 % of cases. The patients' age when consulting a physician is variable and although a small number of cases have reported in women under 30 years old, the youngest diagnosed patient was 15 years old (Duska et al, 2001; Güngor et al, 2003; Lee and Scully, 1989; Renaud et al, 2003; Simon et al, 2005; Yakata et al, 2006; Yamazava et al, 2007).

Distributing the patients diagnosed with endometrioid carcinoma according to the hormonal status, we have found that a number of 138 patients representing 30.70 % were in their menopausal period and 33 patients were in the menopausal transition period.

The data obtained are similar to those in the professional literature which attests that over 75 % of the cases appear in patient at menopause. According to American Cancer Society, endometrial cancer is a disease of post menopausal women with an average age when diagnosed of approximately 60 years old (American Cancer Society, 2005).

In a study made in Wisconsin between 1991 and 1994 over a batch of 740 women diagnosed with invasive endometrial cancer, the average age when diagnosed was 62.9 years old, with limits between 40 and 79 years and a percent of 83.38 % women were in their menopause period (Trentham-Dietz et al, 2006).

A study made within the National Cancer Institute (USA) research program found that most patients with endometrial cancer were in their menopause period and 68.82 % had ages over 60. The maximum incidence of 51.04 % registered in women with ages between 61 and 68 years. Patients with ages over 69 were present in the ratio of 17.78 %, those between 57 and 60 years in the ratio of 17.55 % and those under 57 years only in 13.62 % of cases (Lacey et al, 2007).

A study made in the case of women with abnormal uterine bleedings in perimenopausal or postmenopausal period showed that, from the total cases with complex endometrial hyperplasia and endometrial cancer, 70 % were diagnosed in women at menopause and the average age was 60 years; the age over 70 years was considered an important risk factor of endometrial cancer and the percent of patients over 70 was of 23 % in contrast with 13 % in the control batch (Weber et al, 1999).

A more ample study made in 13 European countries showed that there are different models of orientation of endometrial cancer incidence in regard to age groups. The general profile is given by the risk increase in women post menopausal women, with ages over 55 years and by the tendency of incidence rate to remain stable or decrease in premenopausal or perimenopausal women (with ages between 30 and 54 years), especially

in North and West European countries. The most important decline of incidence was observed in women with ages between 45 and 54 years (Bray et al, 2005; Cancer Statistics UK, 2008).

According to statistics in Great Britain, 93 % of cases of endometrial cancer are diagnosed in women with ages over 50 and very few women are diagnosed under the age of 35 years. The incidence edge of 71/100.000 women is in the 60–64 years age group and registers a decline after the age of 80. There are important variations in time of endometrial cancer incidence in relation to age. Thus, in women over 60 years old the incidence rates have increased starting with the middle of the 80s while for 40 year old women decreased with approximately 20 % (Cancer Statistics UK, 2008).

Age in the diagnosis moment is a factor that influences the mortality rate. Under the age of 50 there are registered very few deceases, but the mortality rate increases lineally and has an edge of 36/100.000 in the cases of women with age over 85 years. Survival is significantly smaller in the elder age group, women diagnosed between 1998 and 2001, with ages between 80 and 99 years in England have had a survival rate at 5 years of 52 % compared to women diagnosed between 50 and 59 years, whose survival rate was of 85 % (Cancer Research UK, 2004; Dos Santos and Swerllow, 1995).

CONCLUSIONS

The distribution of endometrial hyperplasia cases on age groups revealed its presence in all the age groups starting with the IIIrd decade of life and ending with the VIIth decade; the maximum incidence was between the Vth and VIth decades. The youngest patient was 21 years old and the oldest was 69.

The histological form of simple hyperplasia was diagnosed in all age groups, the maximum incidence being in the 40–49 age group (42.64%), followed by the 50–59 age group (34.92%); the smallest incidences were registered in the 20–29 age group (2.02%) and 60–69 years (8.63%). In the case of complex hyperplasia, we have not encountered any cases in the 20–29 age group and the maximum incidence was in the VIth decade of life.

We have not encountered any cases of atypical hyperplasia in patients with ages between 20 and 39 years. The maximum incidence for simple, as well as for complex atypical hyperplasia was in the 50–59 age group. The youngest patient diagnosed with atypical hyperplasia was 41 years old. Regarding the hormonal status, most cases of endometrial hyperplasia appeared in women in the perimenopausal period.

The general analysis of age group distribution reflected a parallel correspondence between the evolutional stage of hyperplastic lesion and patients' age when being diagnosed, which translated the existence of time range necessary for the action of estrogen stimulation.

Endometrioid carcinomas were diagnosed in women with ages between 40 and 79, the maximum incidence being in the 50–59 (43.86 %) and 60–69 (36.84 %) age groups. 85.96 % of the cases were diagnosed in patients with age over 50. Endometrial neoplasias were diagnosed in patients approximately 10 years older compared to the ones diagnosed with endometrial hyperplasias. Regarding the hormonal status, 80.70 % of the patients with endometrial cancer were in the postmenopausal period.

REFERENCES

American Cancer Society : Cancer Facts and Figures. Atlanta : American Cancer Society. http://www.cancer.org/. 2007.

American Cancer Society. Detailed Guide : Endometrial Cancer : What are the Risk Factors for Endometrial Cancer ? Atlanta : American Cancer Society. http://www.cancer.org/ . 2005.

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.

Cancer Research UK. Cancer Stats : Survival - England and Wales, http://info.cancerresearch.org. 2004.

Dos Santos S., Swerllow A.J. Recent trends in incidence of and mortality from breast, ovarian and endometrial cancer in England and Wales and their relation to changing fertility and oral contraceptive use. Br J Cancer ; 72 : 485-492. 1995.

Duska L.R., Garett A., Rueda B. R., Haas I., Chang Y., Fuller A. F. Endometrial cancer in women 40 years old or younger. Gynecol Oncol; 83: 388-393. 2001.

Güngör T., Demirtürk F., Özdal B. Five women befor 40 years of age with endometrial adenocarcinoma. Gynecol Obstet Reprod Med ; 9: 116-119. 2003.

Hall G.E., Hughes C.L., Cline J.M. Endometrial cancer : hormonal factors, the perimenopausal "window of risk", and isoflavones. J Clin Endocrinol Metab; 87:3-15. 2002.

Informations Resources Centre: UK. Uterus Cancer. Incidence Statistics. http://info.cancerresearchuk.org/Cancerstats/types/uterus/incidence/. 2008.

Kurman R.J., Kaminski P.F., Norris H.J. The behavior of endometrial hyperpasia. A long-term study of "untreated" hyperpasia in 170 patients. Cancer ; 56: 403-412. 1985.

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.

Lee K.R., Scully R.E. Complex endometrial hyperplasia and carcinoma in adolescents and young women 15 to 20 years of age: A report of 10 cases. Int J Gynecol Pathol; 8: 201-213. 1989.

Renaud M.C., Plante M., Roy M. Fertility preservation in endometrial carcinoma. Journal of Gynecologic Oncology; 8: 121-127. 2003.

Ronett B.M., Kurman R.J. Precursor Lesions of Endometrial Carcinoma. In : Kurman R.J., ed. Blaustein's Pathology of the Female Genital Tract. 5-th ed. New York : Springer-Verlag, pp. 467-493. 2002.

Simon B., Lee J., Partridge A.H., Runowicz. Preserving Fertility After Cancer. CA Cancer J Clin ; 55(4): 211-228. 2005.

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.

Ushijima K., Yahata H., Yoshikawa H., Konishi I., et al. Multicenter Phase II Study of Fertility-Sparing Treatment With Medroxyprogesterone Acetate for Endometrial Carcinoma and Atypical Hyperplasia in Young Women. J Clin Oncol ; 25(19): 2793-2803. 2007.

Weber A., Belinson J., Piedmonte M. Risk Factors for Endometrial Hyperplasia and Cancer Among Women With Abnormal Bleeding. Obstet Gynecol ; 93: 594-598. 1999.

Yakata T., Fujita K., Aoki Y., Tanaka K. Long-term conservative therapy for endometrial adenocarcinoma in young women. Hum Reprod ; 21(4): 1070-1075. 2006.

Yamazawa K., Hirai M., Fujito A., et al. Fertility-preserving treatment with progestin, and pathological criteria to predict responses, in young women with endometrial cancer. Hum Reprod ; 22(7): 1953-1958. 2007.

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

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

Vol. XVI (LII) - 2011

ASSESMENT OF A FERTILIZATION MANAGMENT PROGRAM EXPLOITATING THE SOIL SALINITY FOR GREENHOUSE CUCUBER CROPS

Nikolaos Gougoulias¹, Alexandros Papachatzis¹, Helen Kalorizou¹, Nikolaos Chouliaras¹

KEY WORDS: Electrical conductivity, salinity, fertilizer, greenhouse crop.

ABSTRACT

An assessment of a fertilization management practice for exploitation of soil salts was made in a successive greenhouse cucumber crop. An organic commercial fertilizer in the form of black peat moss slightly enriched with inorganic elements was embedded in soil before planting while a fertigation program was planned based on soil salinity level. This work confirmed that the plant need for nutrients might be covered largely by soil salts. The pre-planting application of the organic fertilizer in relation to fertigation program applied during cultivation period reduced soil electrical conductivity from 0.58 to 0.24 dS/m. However, significant increase in soil salinity (EC 0.48 dS/m) was observed after soil solarisation. Excessive salinity levels in soil should be taken into account when management of cultural practices in successive crops is applied.

INTRODUCTION

Soil salinity is one of the main factors reducing plants productivity. Electrical conductivity is an indicator of soil salts and could be used during cultivation period for soil salinity determination (Rhoades *et al.*, 1999). It is known that the high fertilizer rates applied in intensive greenhouse cultures increase electrical conductivity in soil solution. Soil samples from several greenhouses in Thessaly (Greece) had electrical conductivity (EC) in soil extracts (soil:H₂O ratio 1:5) higher than 0.4 dS/m. The salinity in these soils has been related with the increased concentration of soluble N and K. Thus, the preplanting application of the basic elements N and K in the following crop should be avoided (Chouliaras, 1996).

The aim of this work was to develop and assess a successful fertilization program for greenhouse cucumber crops where soil salinity and soil accumulated fertilizers exist as inhibitory parameters for successive cultivation periods.

MATERIALS AND METHODS

The study was conducted in a greenhouse (100 m^2) located at the Technological Education Institute (TEI) of Larissa, Greece. The greenhouse soil was loamy sand, slightly calcareous, with alkaline pH, low organic matter content and high Cation exchange

¹ Department of Plant Production, Technological Educational Institution of Larissa, Greece
capacity (table 1). The soil salinity in the greenhouse was estimated with EC measurement in soil samples taken from 15 cm depth before crop establishment. The electrical conductivity in soil extracts (water soil ratio1:5) was 0.58 dS/m indicating marginally increased soil salinity (Chouliaras, 1996).

According to salinity level and the applied fertilizers in the first cultivation period (Gougoulias *et al.*, 2010), the pre-planting application of N, K and P was omitted. An organic commercial fertilizer (25 tons/ha), in the form of black peat moss slightly enriched with inorganic elements was embedded in soil before plant transplantation.

	Table 1. Chemical soil properties
Soil properties	Values
рН	7.95
CaCO ₃ (%)	5.6
Organic matter (%)	1.47
Cation exchange capacity (cmol/kg)	26.5
Electrical conductivity in soil extract (1 soil : 5 H_2O , dS/m	n) 0.58

Two hundred and fifty cucumber plants (var. Gador) were transplanted at October 2008 in greenhouse. During cultivation period (October 2008-April 2009) parameters such as soil salinity, plant growth, blooming and fruit load were taken into account for fertigation program management. Seventy days after transplanting leaf samples analyzed for their mineral content determination. As the concentrations of N, P and K in plant tissues were found to be low, the fertigation program modified according to CTIFL guide (1989). Briefly, for the full growing period 215 Kg N, 238 Kg P (P₂O₅) and 223 Kg K (K₂O) per hectare were used for plant fertigation. The irrigation water in terms of the electrical conductivity had relatively good quality (EC= 500 μ S/cm).

The soil samples were analyzed following the Page *et al.* (1982) method. Soil organic carbon was measured by chemical oxidation with $1 \text{ mol } \Gamma^1 \text{ K}_2\text{Cr}_2\text{O}_7$ and titration of the remaining reagent with 0.5 mol Γ^1 FeSO₄. Soil organic matter was estimated by multiplying soil organic carbon by 1.724 as reported by Hesse (1972). Both ammonium and nitrate nitrogen were extracted with 9 mol Γ^1 CaCl₂ and estimated by distillation in the presence of MgO and Dewarda alloy, respectively. Available P (P-Olsen) was extracted with 0.5 mol Γ^1 NaHCO₃ and measured by spectroscopy. Exchangeable K was extracted with 1 mol Γ^1 CH₃COONH₄ and measured by Flame Photometry (Essex, UK).

The experimental design was completely randomized with four replications. Data analysis was made using the MINITAB statistical package (Ryan *et al.*, 2005). Analysis of variance was used to assess treatment effects. Mean separation was made using Tukey's test when significant differences between treatments were found.

RESULTS AND DISCUSSION

The fertigation program decreased soil salinity as indicated by EC reduction from 0.58 to 0.24 dS/m during the cultivation period (Fig 1). However, soil solarization after plant removal increased soil salinity. The electrical conductivity increased from 0.24 to 0.48 dS/m after soil solarisation due to soluble salts mobility to soil surface caused by intensive evaporation (table 1).

The residual nutrients in soil from the 1^{st} year crop and the fertilization program applied in the current crop increased plant yield. The total production of greenhouse cucumber was 9 ton/ ha. The availability of inorganic elements in the soil (15 cm depth) during growing period is shown in table 2. These data confirms the use of soil salts from the plants.



Figure 1. Electrical conductivity changes in soil extracts during cultivation period.

		Table 2	Inorganic elem	ents availability
	N (Kg/ha)	P ₂ O ₅ (Kg/ha)	K ₂ O (Kg/ha)	Electrical
	Inorganic	P-Olsen	Exchangeable	conductivity
Start of growing season	290	72	1020	0.58dS/m
Surface fertilizer	215	238	223	0.24 dS/m
application				
After soil solarization	270	90	866	0.48 dS/m

CONCLUSION

This study confirms the findings of Gougoulias *et al.* (2010). The high salinity level in greenhouse soil due to minerals accumulation constitutes a source of available plant nutrient elements and a reason for basic fertilizer omission. In this way, plant needs for nutrients might be covered largely by soil salts leading to limited fertilizer application and soil salinity reduction by the end of the growing season. In addition the high content of organic matter in soil reduces the negative effects of salinity (Chouliaras, 1996). However, after plant removal, when plant irrigation and fertigation interrupted, salts mobility to soil surface increase salinity. Thus, the salinity level in soil should be considered for the management of the cultural practices in successive crops.

REFERENCES

1. Chouliaras N. 1990. Organic matter and organic nitrogen in greenhouse soil. Newsletter of Soil Organization, Vol 10-11: 18-20.

- Chouliaras N., Mavromatis E., 1991. Nutritional conditions in greenhouses in Thessaly (Greece), Technical Communications of ISHS, International Society for Horticultural Science, Number 287, 221 p.
- 3. Chouliaras N., 1996. Greenhouses soil fertility in Thessaly. The Agricultural Association of Larissa, 16: 32-36.
- Gougoulias N., Papachatzis A., Kalorizou H., Chouliara A., Chouliaras N., 2010. Fertilization management of greenhouse crops based on soil salinity level. Symposium of "Sustainable Horticulture - Priorities and Perspectives", University of Craiova, Faculty of Horticulture, Annales of the University of Craiova, Vol. XV (XLXI) p. 275-278.
- 5. CTIFL, 1989. Memento, Fertilisation des Culture Legumieres. Centre Technique Interprofessionnel des Fruits et des Legumes, France, 398p.
- 6. Hesse P.R., 1972. A Textbook of Soil Chemical Analysis. John Murray, London.
- Page A.L., Miller R.H. and Keeney D.R., 1982. Methods of Soil Analysis Part 2: Chemical and Microbiological Properties. Agronomy, ASA and SSSA, Madison, Wisconsin, USA.
- Rhoades J.D., Chanduvi F. and Lesch S., 1999. Soil salinity assessment. Methods and interpretation of electrical conductivity measurements. FAO Irrigation and drainage paper 57.
- 9. Ryan B.F., Joiner B.L. and Ctyer J.D., 2005. MINITAB Handbook: 5th edition. Brooks/Cole-Thomson Learning Inc., Kentaky

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

Vol. XVI (LII) - 2011

EVALUATION OF SWEET CHERRY CULTIVARS INTRODUCED IN GREECE

Konstantinos Kazantzis¹, Ioannis Chatzicharissis¹, Alexandros Papachatzis², Thomas Sotiropoulos¹, Helen Kalorizou² and Nikolaos Koutinas³

KEY WORDS: Prunus avium, sweet cherry, fruit ripening period, Bakirtzeika, Bigarreau Burlat

ABSTRACT

Eight sweet cherry cultivars were evaluated for their plant growth characteristics, blossom and ripening period. All cultivars had moderate to vigorous growth. The cvs Bigarreau Burlat, Lapins and Adriana blossomed at the first days of April while cvs Ferrovia, Regina, Kordia, Bakirtzeika and Germersdorfer 5-10 days after Bigarreau Burlat. The ripening period ranged from early May to early June according to variety. Cultivar Bigarreau Burlat ripened earliest than the other cultivars, while cvs Germersdorfer and Bakirtzeika ripened 20 days after Bigarreau Burlat.All cultivars produced very large fruits, with good quality characteristics and high to moderate yield.

INTRODUCTION

Sweet cherry (*Prunus avium* L) is a vigoroustree of the family *Rosaceae*. It is cultivated throughout Greece, however the 70% of the cherry orchardsare established in the area of Central Macedonia. The local annual production for the year 2009 was 48,000 tones that ranked Greece in the 14 positionamong sweet cherry producing countries (FAO, 2011). A number of new cherry varieties with cold hardiness, good fruit quality characteristics, moderate or compact growth habit and early to late ripening period have been bred. However, the trees growth and productions is depended by climatic conditions like chilling hours (Mahmood *et al.* 2000), light intensity (Hisamatsu *et al.*, 2001), rain and temperature during blossom (Roversi and Ughini, 1996) etc. The last year's farmers in Greece have shown increased interest for new high quality marketable cherry cultivars. The replacement of old cherry cultivars with new productive and high quality cultivars has very slow progress as the evaluation of the new cultivars under local conditions is limited. The aim of this work was to provide information about trees growth, blossom and ripening period, andfruit quality characteristics under local climatic conditions of a number of new promising cherry cultivars.

MATERIALS AND METHODS

Eight sweet cherry cultivars (table 1) were established in the experimental orchardof the Pomology Institute located in Naoussa(Central Macedonia) in 2000. The Bigarreau Burlat, an old, productive and well adapted to local conditions cultivar was used as control.

¹Pomology Institute, N.AG.RE.F., R.R. Station 38, 59200, Naoussa, Greece.

²Department of Plant Production, Technological Education Institute of Larissa, 41110 Larissa, Greece.

³Department of Plant Production, Alexandreio Technological Education Institute of Thessaloniki, Greece.

The trial comprised two tree per cultivar grafted on wild cherry seedlingrootstock (*PrunusaviumL*). The planting distances were 6.5 x 6.5 m, while trees trained to vase-shaped canopy. Observations concerning plant growth characteristics, blossom and ripeningperiod were takenin accordanceto internationalstandards and compared with commercial new cherry cultivars promoted by plant nurseries in Greece.

Table 1

Sweet cherry cultivars					
Bigarreau Burlat	Kordia				
Adriana	Regina				
Lapins*	Germersdorfer				
Ferrovia	Bakirtzeika				

Sweet cherry cultivars evaluated in the Pomology Institute of Naoussa

*Self fertile cultivars

RESULTS AND DISCUSSION

Significant differences in the growth characteristics of the studied sweet cherry cultivars were not detected. All cultivars had moderate to vigorous growth with dense and very upright growth habit(cvs. Germersdorfer, Bakirtzeika and Lapins) or semi-erect crown (cvs. Adriana and Regina). The vigorous and upright growth habit of the cvs Germersdorfer and Bakirtzeika have also been reported by Chatzicharissis *et al.* (2011).

Concerning blossom period, the sweet cherry cultivars growing in Greece occurred from late March to middle April (Chatzicharissis and Kazantzis, 2007, 2010). In this study the cultivars Bigarreau Burlat, Lapins and Adriana blossomed relatively early (the first 10th days of April) while the cultivars Ferrovia, Regina, Kordia, Bakirtzeika and Germersdorfer very late (5-10 days after Bigarreau Burlat), (Fig 1). The ripening period ranged from early May to early June according to variety. Cultivar Bigarreau Burlat ripened earliest than the other cultivars. CultivarsGermersdorfer and Bakirtzeika ripened latest of all and 20 days after Bigarreau Burlat.

Fruit size is an important characteristic for commercial market value (Vittrup Christensen, 1995; Kappel *et al.*, 1996). In this study all cultivars produced very large fruits, with good quality characteristics and high (cultivars Bigarreau Burlat, Adriana, Lapins, Regina, Kordia and Bakirtzeika) to moderate yield (Ferrovia and Germersdorfer).

Apart from the cultivars evaluated there are a number of sweet cherries cultivars promoted by Greek plant nurseries. The time of ripening of these varieties according to literature ranging from early May to mid - late June (Fig. 1). The use of these cultivars could expand the harvesting period and consequently increasing the availability of fresh cherry fruits for longer period.

CONCLUSION

From the sweet cherry cultivars evaluatedFerovia, Kordia,Regina, Lapins and Bakirtzeika are the most promising cultivars. They produced large fruit with good quality characteristics that could easily absorbed by market. Concerning the new sweet cherry cultivars promoted by plant nurseries in Greece they have to be evaluated for their adaptability in local conditions before released to farmers.



- •: New cultivars promoted by Greek plant nurseries
- Ø: Self fertile cultivars promoted by Greek plant nurseries

Figure 1. Blossom period of the sweet cherry cultivars evaluated in the Pomology Institute of Naoussa and new cultivars promoted by Greek plant nurseries.

REFERENCES

Chatzicharissis I., Kazantzis K. Evaluation and description of 24 sweet cherry and 5 sour cherry cultivars. Proceedings of the Pomology Institute, Naoussa, Greece. 2007.

Chatzicharissis I., Kazantzis K. Evaluation and description of 8 sweet cherry and 1 sour cherry cultivars. Proceedings of the Pomology Institute, Naoussa, Greece. 2010

Chatzicharissis I., Kazantzis K., Sotiropoulos Th., Bakirtzeika: A Greek Sweet Cherry Cultivar. HortScience, 46(7): 1052–1053. 2011.

FAO (Food and Agricultural Organization),. http://faostat.fao.org. 2011

Hisamatsu T., Sugiyama Y., Kubota S., Koshioka M, Delaying anthesis by dark treatment in *Phalaenopsis*. Journal of the Japanese Society for Horticultural Science, *70*: 264–266. 2001.

Kappel, F., Fisher-Fleming, B. and Hoghe E., Fruit characteristics and sensory attributes of an ideal sweet cherry. HortScience, 31(3): 443–446. 1996.

Mahmood K., Carew J.G., Hadley P., Battey N.H., The effect of chilling and postchilling temperatures on growth and flowering of sweet cherry (*Prunus avium* L.). The Journal of Horticulural Science and Biotechnology, 75: 598–601. 2000.

Roversi A., Ughini V., Influence of weather conditions of the flowering period on sweet cherry fruit set. Acta Horticulturae, *410*: 427–433. 1996.

Vittrup Christensen, J., Evaluation of fruit characteristics of 20 sweet cherry cultivars. Fruit Varieties Journal, 49(2):113–117. 1995.

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

Vol. XVI (LII) - 2011

STUDY ON THE USE OF COMPOST FROM MUNICIPAL SEWAGE SLUDGE ON *HYDRANGEA SP.* GROWTH

Patrusca (Cepoi) Daniela Alina, Popa Daniela

KEY WORDS: municipal solid waste, Hydrangea sp., compost.

ABSTRACT

In recent decades, the problem of disposal of wastewater treatment plants has become a serious problem. Reuse of effluents and sludge treatment plants (formed in stage mechanical chemical and biological treatment) in agriculture is a tempting option because it improves physical and chemical properties of soil and increases the needs of conventional water resources that are in constant decline. Also, elements of sludge: organic substances, nitrogen and phosphorus are more beneficial for optimum plant growth than fertilizer minerals. This study confirms the possibility of using compost made from municipal sewage sludge (produced by aerobic fermentation process sludge) as a fertilizer used in cultivation of specialty horticultural soils. Also show different responses depending on the concentration of the plant substrate of the five variants, which is evaluated to determine any limitation on the use of compost.

INTRODUCTION

Composting or aerobic biological treatment of organic waste is an ancient method of reuse of organic matter. Composting provides a way this way not only to reduce the amount of waste to be removed, but make and conversion into a product that is useful for gardening, land, or house plants. Several studies (Tremier et al, 2005, Suthar et al, 2008, Lillenberg et al, 2010) have provided evidence that the existing range of organic waste, sewage sludge composting allows producing a quality product that can be used as a soil conditioner as organic matter content can vary from 50 % to 70% of the total solids (Banegas et al, 2007, Lillenberg et al, 2010). The nature and relationships of the materials or raw materials used in composting will influence the nutrient content of compost (Paulin et al, 2008). In addition, biological activity will increase due to compost application which plays the role of energy and nutrition source for microorganisms in the soil. In general, best results are achieved when compost is mixed with other materials such as perlite (in this case representing about 30% compost by volume). Due to its property of fertilizer, compost made from municipal sewage sludge that meet quality standards have similar effects to those of organic fertilizers, which are traditionally applied, and is an effective source of N, P and K to plants (Mahdavi et al, 2010). Council Directive 86/278/EEC of 12 June 1986 on environmental protection and in particular the soil, when sewage sludge is used in agriculture states that sewage sludge has valuable agronomic properties. When using sewage sludge must be taken into account nutritional needs of plants, without ignoring the quality of soil and groundwater. Sewage sludge can be used in agriculture, providing the State to regulate its use.

MATERIAL AND METHOD

In the first experiment (which took place between 07/08/2010 until 09/03/2010) it was used fermented sludge dried, from a municipal treatment plant mixed with vegetable waste. Organic matter is converted into a final stable product type humus (compost). The mineralization was 20 or 30% of volatile solids - are converted into CO₂ and H ₂O. In the second part of the experiment (which took place between 21.12.2010 - to date), compost was used as test substrate for rooting plant *Hydrangea sp. Hydrangea* is native to the Far East (Japan and China) in our country are often found in parks and gardens, in places slightly shaded. The experiment was located in the Botanical Garden greenhouse belonging to the University of Craiova Cuttings were obtained from shoots start of the main branches of the plant, plant cuttings to root was done in pots with a diameter of 6-8 cm in - a substrate consisting of: peat: compost: perlite in the following concentrations: V1 - peat: compost: perlite (1: 0: 1)

V2 - peat: compost: perlite (0: 5: 1.5)

V3 - peat: compost: perlite (2.5: 2.5: 1.5)

V4 - peat: compost: perlite (1: 4: 1.5)

V5 - peat: compost: perlite (3: 2: 1.5)

RESULTS AND DISCUSSIONS

Compost was characterized by a high phosphorus content (0.25%) and nitrogen (1.73%), essential for its fertilizer value. The physico-chemical analysis (Table no.1)confirmed that the parameters of the compost were in accordance with quality standards set out in the Regulation of the Ministry of Agriculture and Rural Development of 19 October 2004 on enforcement of regulations of the Act of fertilizers. The determined level of heavy metals (Cr, Zn, Cd, Cu, Pb) was appropriate in terms of environmental protection and complied with the standards required for the application of compost as fertilizer.

Substrate with compost gave the highest number of rooted plants, the lowest rooting rate were produced when it was used with peat substrat (Figure 1).

Initial temperature at which it started composting was 35° C climbing within approx. 2 weeks to complete the experiment reaching 45° C approx. As the temperature dropped composting process and went on a stable path, it was felt that much of the substance being determined as fermented organic compost quality.

Application of compost made from sewage sludge on agricultural soils is regulated by Directive 86/278/1986 environmental protection, and in particular the soil, when sewage sludge is used in agriculture and aims to encourage the use of sludge in agriculture and to regulate the use to in order to prevent harmful effects on the environment.

Table no 1

Nr.	Parameter	Value	STASS
crt.			
1.	pH	7,33	SR EN 13037:2002
2.	TOC	21,14%	SR ISO 10694-98
3.	N _T	1,73%	SR ISO
			11261:2000
4.	C/N	12,21%	
5.	P _T	0,25%	SR EN 7184/19-82
6.	Ca	0,07%	SR ISO 11047-99
7.	Na	0,22	
8.	Mg	0,65%	
9.	Cu	84,1 mg/kg d. m	
10	Zn	358,2 mg/kg d. m	
11.	Со	12,6 mg/kg d. m	
12.	Pb	128,1 mg/kg d. M	
14.	Ni	53,4 mg/kg d. m	
14.	Cr	19,4 mg/kg d. m	
15.	Cr total	324 mg/kg d. m	
16.	Cd	2,0 mg/kg d. m	

Chemical composition of compost derived from municipal sewage sludge used in the study



Fig.1. Rooting rate of seedlings of the experimental variants

Each version had 10 repetitions (sub-variants) = 10 vessels which received the same amount of water provided by watering daily (because the plant has excess moisture requirements) during the period of vegetation.

During the period of vegetative growth was observed an increase in height, plants with a height at planting of the 10 wafers experienced; the first three increases were recorded 3, 0 cm, these, those 4,5,6,7, 8, have returning customer vegetative approximately 5.0 cm and cuttings last two positions were approximately 1.5 cm size. Rooting has

occurred after about a month and a half (on the 07/02/2011 making - the roots of random measurements, the measurements were repeated on 29/03/2011 transfuse when plants were in containers with larger diameter (8 -10 cm).

Table no.2

	Version	Date	Version		Date
V_1	L = 2,7 cm l = 2,1 cm	07.02.2011	\mathbf{V}_1	L = 6,0 cm l = 4,0 cm	29.03.2011
V ₂	L = 3,4 cm 1 = 2,3 cm	07.02.2011	V_2	L = 5,2 cm 1 = 6,0 cm	29.03.2011
V ₃	L = 3.8 cm l = 2.4 cm	07.02.2011	V ₃	L = 9,0 cm 1 = 7,0 cm	29.03.2011
V ₄	L = 3.8 cm l = 2.4 cm	07.02.2011	V_4	L = 6,0 cm l = 7,0 cm	29.03.2011
V ₅	L = 6,1 cm l = 1,8 cm	07.02.2011	V ₅	L = 8,0 cm l = 6,0 cm	29.03.2011

Dimensions of the roots of the following experimental

From global analysis of results it could be considered the heterogeneity of variants, showing differences in plants growing at different concentrations of substrates and therefore different degrees of sensitivity; attachment rate were monitored and the height of each plant. Dynamic growth was followed by performing measurements during 21.12.2010 - 29.03.2011.

07.02.2011





29.03.2011



Fig. 2. Roots aspects of Hydrangea sp in two moments of growth

CONCLUSIONS

- Plants that have grown in compost-rich substrates were often somewhat chlorotic and dwarf, even a few weeks after planting, probably due to higher levels of salinity and nitrogen substrat.
- However, in the midst of growing, these plants were subsequently recovered and had higher growth in plants grown with less compost substrates.
- Thus, for all variants, the addition of compost leads to an increase in height in direct relation to the amount of compost given.

BIBLIOGRAPHY

1. Banegas, V., Moreno, J. L., Moreno, J. I., García, C., León, G., Hernández, T. Composting anaerobic and aerobic sewage sludges using two proportions of sawdust. Waste Manage., 27 (10), 1317-1327 2007

2. Lillenberg, M., Yurchenko, S., Kipper, K., Herodes, K., Pihl, V., Lõhmus, R., Ivask, M., Kuu, A., Kutti, S., Litvin, S.V., Nei, L. Presence of fluoroquinolones and sulfonamides in urban sewage sludge and their degradation as a result of composting Int. J. Environ. Sci. Tech., 7 (2), 307-312, Spring 2010 ISSN: 1735-1472 © IRSEN, CEERS, IAU, 2010

3. Mahdavi, M., Jafari, J., Environmental Risks due to Application of Sewage Sludge in Farmlands. Ozean Journal of Applied Sciences 3(2), 2010, 303 ISSN 1943-2429. 2010

4. Paulin, B., O'Malley, P., Compost production and use in horticulture. Bulletin 4746, ISSN 1833 7236, Department of Agriculture and Food .Government of Western Australia. © Western Australian Agriculture Authority, 2008.

5. Suthar, S., Singh, S., Vermicomposting of domestic waste by using two epigeic earthworms (Perionyx excavatus and Perionyx sansibaricus). Int. J. Environ. Sci. Tech., 5 (1), 99106 (8 pages). 2008.

6. Tremier, A., De Guardia, A., Massiani, C., Paul, E., Martel, J. L. A respirometric method for characterising the organic composition and biodegradation kinetics and the temperature influence on the biodegradation kinetics, for a mixture of sludge and bulking agent to be co-composted. Bioresour. Tech., 96 (2), 169-180 (12 pages) 2005.

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

Vol. XVI (LII) - 2011

EVALUATION OF BANU MARACINE CLIMATE VITICULTURAL CENTER FOR THE CULTIVATION OF VARIETIES WITH MATURITY DIFFERENT

Popa C., Stan S., Giugea N., Mărăcineanu L., Costea D.

Key words: viticultural area, climatology, wine varieties

ABSTRACT

This paper analyzes the current climate that characterizes the wine center Banu Mărăcine to highlight those elements that can ensure the succes of crop varieties with different maturity.

The meteorological data recorded over a long period, were interpreted, in terms of climatological indicators wine making calls to it and graphical methods for assessing the ecological potential of an area. In this way the center could be emphasized vocation for wine grape cultivation for table grapes or wine, and climatic constraints restricting the range of grapes for fresh consumption.

INTRODUCTION

Viticulture as important branch of national economy and tradition, is now considered a dynamic sector in full restructuring.

On the road of its social evolution, man has observed that varieties behave differently depending on environmental conditions provided by the viticultural biotope and gradually learned to form competitive varieties.

This led to the fame acquired by the vineyards from which the Romanian region of Oltenia in terms of quality excels.

In this region, with a remarkable variety of environmental conditions, valuable varieties find their place to obtain white and red wines of high quality, aromatic wine or to obtain grapes for fresh consumption.

Of course, this resource is not fully exploited. Vine growers are oriented mainly to varieties for wine making, to the detriment of the table grapes, whose culture has been gradually restricted and unfair to an area equivalent to that of a few decades ago. It would also be unfair not to mention here concerns to obtain new varieties for table grapes, an activity which still continues, with notable successes.

MATHERIAL AND METHOD

Observations and measurements made were oriented toward ecological studies (specific to viticultural climatology) and to determine the extent to which all potential climatic factors provides qualitative and quantitative expression of the studied varieties. Were performed in the center winegrowing center Banu Maracine, its ecological potential being evidenced by quantification of weather data using:

- Numerical methods of assessment in terms of climatic indicators such as thermal balance, sunstroke actual amount of rainfall, heliothermal index, bioclimatic index of the vine, oenoclimatic aptitude index, etc.;

- Graphical methods for assessing (ombrothermal diagrams, histophenograms).

Further interpretation of their values was made according to information presented in the literature: Stefan Teodorescu. et al. (1987), Olteanu I. (2000), Olteanu I. et al. (2002), Manea G. (2008), Maracineanu L. (2010).

RESULTS AND DISCUSSION

From the geographical point of view, the winegrowing center Banu Maracine is located at 44019' north latitude, at an altitude of 105 m.

He is part of the vineyard Hills of Craiova, along with two other wine centers (Brabova and Brădești).

In terms of climate, the average values for the years 1991-2010 are presented in Table no 1.

Table no: 1

Indicator								
Rainfall (1/m ²) Sunstroke		Air h	umidity (%)	Temperature (°C)				
		(hours)	, ()					
Annual	Vegetation	Vegetation	Annual	August,	Annual	July		
Annual	period	period	Annual	13 hour	average	average		
596	402	1589	76	51	11,4	23,2		

Climatic indicators registered at Banu Maracine (average 1991-2010)

If we refer to values that allow cultivation of the vine (400-700 mm / year of which 250 during the growing season), we find that this criterion is met in the wine area Banu Maracine, but the annual turnover of this factor is able to shape suitability of the viticultural years.

However, this indicator is not regarded as singular to indicate suitability of an area very precisely. It works together with the temperature and sunstroke and balance of the three is the one that condition the eco-climatic frame in which the grape-vine develop the growth and fructification processes.

On the other hand, unlike the other two factors mentioned, humidity is easily controlled, meaning that a deficit can be easily supplemented by irrigation.

Therefore, accentuated hydric deficits, recorded in some years do not mean necessarily as unfavourable for grape harvest.

They should be considered in the context of the one stated before, taking into account the distribution of rainfall during the growing season.

Regarding the atmospheric humidity is generally accepted that the range of 50-80% is necessary for vine leaves to ensure a properly photosynthetic, were seen in that this is a parameter more constant compared with rainfall amount.

In terms of atmospheric humidity in August at 13,00 hours, finds that this indicator does not conflict, in general, with a good plant metabolism.

In terms of temperature, average temperature in July can be used for establish the vocation of an viticultural area in terms of oenology.

Studies in this regard have shown that if it exceeds 21^{0} C, the area is suitable for obtaining quality wines with appellation of origin.

This is achieved greatly to Banu Maracine, as the annual and multi-annual average certify this.

Sunstroke, is an environmental factor more important as the grape-vine is a heliophyle plant so that this resource provides a favorable ecological viticulture, at the Banu Maracine.

As the unilateral evaluation of the ecological factors is not sufficient, we preceded to the calculation of synthetic indicators (Table no: 2).

This allows an overview of eco-climatic characteristics of a viticultural area as integrates the action of two or three ecological factors.

As a result, they shape a better suitability of the vineyard area because environmental factors do not act separately but in the complex, thus making their influence felt on the vine.

Table no: 2

Viticultural	climatic	indicators	registered	at Banu Marac	eine
	6	average 19	91-2010		

Indicatorul							
Heliothermal	Hydrothermal	Bioclimatic Index	Oenoclimatic				
index	index coefficient		aptitude				
2,7	1,18	8,44	4840				

Such higher values means the generosity of the heliothermal resources, which may correlate with the existence of favorable ecological framework late ripening varieties and accumulation of large amounts of sugars. However, high temperatures are not favourable to maintaining acidity. Hygrothermal coefficient confirms this hypothesis, in that it shows that the area has a moisture deficit in some years. Ternary indicators outlined in the highest degree the climate favorability of the winegrowing center Banu Maracine.

Average period ensure the conditions favorability from Banu Maracine for the vines culture, placing close to the optimum value.

Also, the index of oenoclimatic competency guides us to consider that from here we can obtain high quality red wines, with the premises that the heliothermal resource to ensure accumulation of significant amounts of anthocyanin pigments.

Higher values of 5100 were more rare, so table grape varieties ripening during maturation of all ages can not be guaranteed allaways.

Climagrame, based on the multi-media shows no period which could be characterized with hydric deficit. On the contrary, from January to December the area is experiencing hydric excess (figure no 1).





Figure no:2–Climagram Banu Mărăcine (1993)

This does not however exclude the existence of extremes from the climatological point of view, years where with very high temperatures and a pronounced hydric deficit (Figure no: 2) or years when the climatological features are not favorable because of the hydric excess and harvest depreciation (figure no : 3.).



Previous years were selected so as to illustrate better the possibility of extreme thermal-hydric manifestation at the Banu Maracine.

If in 1993 we witness the installation of a dry period lasting from the first half of April to late October in 1991 the situation was the opposite, meaning that hydric excess comprise all 12 months with an interruption during September.



At the completion of the image of an winemaking area, along with the ombrothermal diagram can contribute the histophenogram, achieved on the multiannual average on the basis of previous time periods.

It is another graphical method for highlighting the environmental potential of an area (Figure No: 4).

Through them we can make assessments on the season of vegetation within the weather station area that has been analyzed data, it can be observed differences between different areas depending on the geographical coordinates or elevation, etc.

Histofenograma achieved by interpreting multiannual data from Banu Maracine show that the average growing season is about. 255 days, during 9.III - 19.XI.

In the first part of this range, as temperatures rise, start the phenophases of vegetation and for some species, with reduced claims to temperature, can run the entire cycle of vegetation.

For grape-vine has importance the threshold of 10° C.

In light of this we can appreciate that at Banu Maracine the existing climate conditions ensures a long growing season, totaling approx. 200 days, during 7.IV - 24.X.

Maximum period of biological activity overlap between 7.VI - 31.VIII and totals about 85 days.

CONCLUSIONS

Current eco-climatic attributes that characterize the studied winegrowing center is favorable for the viticulture, assortment of varieties can be oriented producing high quality wines, current consumption or grapes for fresh consumption;

Synthesis of elements above show that late maturing varieties doesn't find at Banu Maracine, permanent conditions that ensure this, only 58% of a total of 12 indicators are favorable climatic cultivation of such varieties;

BIBLIOGRAFY

Manea G., "Elemente de biogeografie". Ed. Universitară, București; 2008

Mărăcineanu L.C., "Ecologia sistemelor antropice viticole (aplicații practice)". Ed. Arves, Craiova 2010.

Olteanu I., "Viticultură". Ed. Universitaria, Craiova; 2000 Olteanu I., D. Cichi, D, Costea, L.C. Mărăcineanu, "Viticultură specială". Ed. Universitaria, Craiova; 2002

Teodorescu Şt., A. Popa, Gh. Sandu, "Oenoclimatul României". Ed. Științifică și Enciclopedică, București; 1987

Seria: ✓ Biologie ✓ Horticultură ✓ Tehnologia prelucrării

> produselor agricole Ingineria mediului

Vol. XVI (LII) - 2011

STUDY ON THE BEGINNING OF DEVELOPMENT OF THE PUBLIC GARDENS OF CRAIOVA

Popescu Ion, Ana Felicia Iliescu¹

KEY WORDS: green spaces, historic, gardens

ABSTRACT

Organization of public gardens in Craiova was an activity that continued for over a half of century of private initiatives of great noble families. Another half of century (1853 - 1903) was characterized by the consolidation and care to those established in the first half on the nineteenth century. Also, they experienced "the decay of everything that is exposed to the unkempt" from the municipality, and damaging effects of the war years (1853-1856; 1877-1878).

INTRODUCTION

The early history of the public gardens of Craiova, similar to that of other important Romanian cities, is neither a favourite, nor a constant subject for historians or architect historians. Public gardens are, from this perspective an indicator of an urban geography, of a certain evolutionary stage of the cities or of a social-cultural influence indigenous external in its essence, the theme of our study is included in the history of the Romanian culture and civilization.

Intuitively, the moment public parks became consciously organized, firstly private and later public, coincides with the phenomenon of people gathering in certain areas witch changed the traditional way of living, propelling the human factor against nature. The moment that coincides with the beginning of public gardens, who continue growing in the present, is related to the capitalistic industrialization or perhaps to the demographic growth of certain cities and the development of the European urbanization, which manifested itself in the XIX th century.

At the same time, the city- as a place, but mostly as the horizon of the modern society – created a real as a counter measure to destroying the scenery, but also as the understanding of ambiance forms as a safe and serene way of living.

In a historical notion, following the chronology of the facts, we can restore, on mostly inedited historical materials, on undiscovered history of the beginnings of organized public gardens in the most important city from Oltenia, who now has a population of over 315.000 inhabitants.

Craiova, who was certificated at July1, 1475, on the estate of Craiovean boyars, but with a history that began before creating the feudal state Tara Romaneasca following the tradition of *Letopisetul Cantacuzino* became the center of an area later called Oltenia.

¹ USAMV Bucuresti

MATERIAL AND METHODS

The paper is based on the study of documents from the National Archives.

RESULTS AND DISCUTIONS

Prior to the XVIII th century, there is no written proof of parklands and public gardens. White felling stories about their trips, foreigners used to write about not only monasteries and boyars' lands but also about the beautiful gardens around those lauds. They were organized, in the beginning of the nineteenth century, the era of public parks began in Romania. Unlike private gardens, who were described by sumptuous arrangement, straight lines, symmetry, railings and terraces, decorated with statues which reminded of the ancient mythology, the nineteenth century brought picturesque park lands, which featured twisty irregular alleys, guarded by clear waters. In Tara Romaneasca, this kind of gardens appeared first in Bucharest. In Craiova, the first park was designed in 1844, to entertain people, when the City Hall representatives decided to create a garden in front of the Central School (NC "Carol I"). The Garden was shaped like a triangle and the only trees planted there were lindens. The garden also had beautiful flower plots and was attended by the German gardeners who also took care of the garden of the summer palace of Iancu Bibescu (Camillo Sitte, 1992, Gh. Dinculescu, 1931).

It is said the garden was never completely finished. After beginning the building of the park, following the design of the architect of the town, they were forced to stop working because Ioan Maiorescu, the headmaster of the Central School thought the students were disturbed by the workers.

In the first half of the nineteenth century are recorded Chintescului garden and Palaces of Bibescu boyars featuring a garden in the plans that accompany the decision of the Bibescu estate. Another garden Known in Craiova as " Campia Libertatii, The Freedom Plain, (taken in the revolutionary events of 1848), was just on open field near the suburb of the town, close to the Outside Fair. In its place is now the Chrysantemum Park and the blocks of fiats between schools no.21 and 22, the Postelnicu Fir church and Spain street.

Another place, the Brailoiu-Bengescu avenue was a land on which the army marched in 1831, re-established after the rules of the organic Regulations. Subsequently, the land was transformed into a parkland by the mayor Barbu Balcescu (G. Mil. Demetrescu, 1922).

Of the aforementioned "gardens", the first one that was declared a park, after modern architectural criterions belonged to the Bibescu family.

The arrangement of the garden began in the early nineteenth century. Around 1800, Dumitrache Bibescu became the owner of a part of the city's estate, and on December 1, 1815, Stefan Bibescu, Dumitrache's brother, mentioned he founded a garden in Craiova, for which he bought flowers and herbs from Turkey and Europe (Florea Firan, , 1975, 2003).

After wards, the garden was embellished and expanded, especially between 1844 and 1845, with the great care of chancellor Iancu Bibescu, brother of the ruler Gheorghe Bibescu.

Iancu Bibescu, a refined man for that time, gifted with the sense of beauty, made, while he was the prefect of the Dolj county (July 16, 1843-October 13, 1847) a series of works for "improving and beautifying Craiova": systematization and paving streets with stone boulders, the introductions of street lightning, setting up public gardens with trees and flower plots tended by German gardeners, who also took care of the "summer garden" (also known as the Bibescu garden). During his mandate, the garden was endowed with

pavilions, benches, greenhouses that used to grow lemons and other exotic plants. In the garden there were birds and animals and an iron kiosk, made in 1842 in Vienna, that played music. Contemporanes and their off springs believed the Bibescu garden was oldest, but also the biggest and the most beautiful public garden. (D. Valerian, 1931).

In 1846, an impressed visitor of the garden wrote: "An ornament that can be called among the first ones is the garden called the Bibescu garden, a building of freedom and of its skilled and art-loving spirit, that entered by a foreigner, especially on a holiday, when the garden is opened for everyone, will leave him amazed at the sight of an English-styled park with a kiosk and other very beautiful pavilions and at the sound of military music that brings to the passers-by the sweetest pleasure twice a week, caressing their hearing with the music of the most brilliant composers.

This record attests for the first time the quality as a public garden of the Bibescu garden from Craiova open only on holidays.

In 1953, the garden was bought by the City Hall of Craiova, headed by Costache Glogoveanu with the price of 12 000 royal coins. This was the moment when the garden became a public parkland.

The sale- purchase document was concluded on March 24, 1953 and authenticated at the court of Craiova no 79 of April 14,1953. the paper stipulated the city Hall was both the heir and the buyer the 259 acres wide. The walls, pavilions, flower shops and other buildings were also bought along with the furniture and the ornaments. All items were included in the inventory attached to the document.

According to the schedule of the ruler Barbu Stirbei, maintaining the garden in good condition was the mission of the City Hall allocating annual budgets and from the income earned by leasing property from the garden estate: flower shops, green houses, vineyards, ponds, the mill, orchards, etc.. For the lack of funds, the City Hall proposed the demolition of the greenhouses, firing the gardener Stefan Lani, selling the lemon trees, oleanders and other exotic plants and trees. Regarding the animals, they were considered useless because the visitors only wanted to wander through the summer garden.

The purpose of buying the garden was, according to the ruler, to build a parkland both for the citizens' recreation and for the reception of important people into a city as big as Craiova. In 1958, the "palace" was repaired and the garden was rearranged for the visit of the ambassadors of England and France. The garden hosted the first ruler of the United Principalities, Al I Cuza, during his visit in Craiova from June 26 to28, 1859, Elena Cuza and Mihail Kogalniceanu were also hasted there.

After 1853, the situation of Tara Romaneasca - the foreign occupation during the Crimean war, events that eventually brought the union of the principalities- made the garden, who was now regarded as the city garden, receive less care from the City Hall. Some facilities were damaged or were affected by atmospheric phenomena. In 1860 they executed a series of maintenance work and substantial repair to most building. This was followed by an annual tending and completion of the endowment with specific furniture and tools but the funds were insufficient.

The garden kept its charm and was a favourite place to wander to, but also to display the luxury of the of the elite of the city. Zoe Mandrea, daughter of the mayor of Craiova, Barbu Balcescu and the author of an interesting memoir recalled the garden: " remember the gratitude of climbing the carriage with our nanny and setting out for the Bibescu garden, the place where luxury met nobility".

During the War of Independence, in the garden have been established food and ammunition deposits and the army was welcomed here upon retuning from the land at the south of the Danube, at the end of the war. After 1878, the garden reached a state of advanced decay, becoming together with the Geanoglu and the Craiovita ponds, a real danger for the health of the citizens. Thus, the Bibescu garden is rarely mentioned in the archived documents, becoming of interest only when exhibitions and agricultural competitions were organized there or at discovery of archeological objects. However, given the fact the Bibescu garden was the only public park of Craiova, the City Hall representatives decided to keep it in a decent condition by performing small maintenance work, as well as ensuring a favourable atmosphere for the visitors.

In this respect, in 1855 the flower shop was repaired, the windows and the chopping holders were replaced and flower stands were built. In 1887, 84 poles and 100 gas lamps were installed to illuminate the garden twice a week during the summer, and since 1886 it was decided that the Army Corps would play military music on Thursdays and Sundays, near the Spiked Fountain (Fantana cu teapa).

1888 marked the beginning of some important changes. C Litarczeck, the head of the Technical Service of the city, thought additional funds were necessary as the Bibescu garden and the St. Demetrius church were "the only objects of value" of the city (Rică Marcus, 1958).

At the same time the complete renewal of the garden was considered, as well as creating their own nurseries. Thus, on August 19, 1888, the Municipality Technical Services requested the approval of additional funds to buy seeds, plants and trees and for slowly building a nursery. C. Litarczeck believed that by investing a small sum of money, the garden will look neat, restoring the previous state of the park.

Other buildings, outbuildings and annexes remained in an advanced degradation and to save them, they decided to install there different departments of the City Hall of Craiova. Also, in 1890 started the building of another dependency, with several rooms for the asylum of the disabled(it was actually a hospice).

To maintain a good appearance for visitors, sand and gravel was spread on alleys, the lightning was checked and ensured and specific gardening work was carried out every year: digging, raking, mowing etc. At the same purpose, in 1895, a "round" was built for military music, and starting 1896 electric lightning was introduced during summer.

The Bibescu garden was named, after 1877, "The Independence Park". Most of the documents on the garden remind of the advanced state of decay of the park. In the last years of the nineteenth century, amid a complex program of modernization, large utility projects and improvements have been conducted. Among these, we must include the rearrangement of the Bibescu garden, following the project of the famous French architect, Edouard Redont, as a great park for a city with a population of 45579 inhabitants in 1899, comparable with the best European parks at that time (Dinică Ciobotea and all. 1999).

Conclusions

Organization of public gardens in Craiova was an activity that continued for over a half of century of private initiatives of great noble families. Another half of century (1853 – 1903) was characterized by the consolidation and care to those established in the first half on the nineteenth century. Also, they experienced "the decay of everything that is exposed to the unkempt", from the municipality, and damaging effects of the war years (1853-1856; 1877-1878)..

After gaining full independence of the state (1877), the Romanian state's prosperity was evident and secure. By the turn of the twentieth century, general emulation was felt in all sectors of social life.

At this point, the community of Craiova proposed a comprehensive program of reconstruction of local urban bodies who included, among others, recreating all concepts of

Western public parks. The project had two outstanding personalities who have supported, designed and done it, the mayor Nicolae P. Romanescu and the French architect Edouart Redont.

REFERENCES

1. Arhivele Naționale Dolj

2. Camillo Sitte, Arta construirii orașelor. Urbanismul după principiile sale artistice. O încercare de rezolvare a problemelor moderne ale Arhitecturii și ale Plasticii monumentale, cu referiri speciale la cazul Vienei, Editura Tehnică, București, 1992

3. G. Mil. Demetrescu, Actul de cumpărare al Parcului Bibescu din anul 1853, în "Arhivele Olteniei", nr. 4, p 322, an I, 1922

4. Gh. Dinculescu, Grădini publice din Craiova, în Idem, nr. 53, p. 79-80, an X, 1931

5. D. Valerian, Notițe relative la Craiova de acum 100 de ani, în Idem, nr. 59-60, p. 104, an X, 1932,

6. Florea Firan, Parcul Poporului din Craiova, Craiova, f.a.; Parcul Romanescu Craiova. Centenar 1903-2003, Editura Alma, Craiova, 2003.

7. Dinică Ciobotea, Ion Zarzără, Vasile Pleniceanu ș.a., Craiova - Pagini de istorie și civilizație. Grădinile și Parcurile Craiovei, Editura de Sud, Craiova, 1999.

8. Florea Firan, Parcul Poporului din Craiova, Editura Scrisul Românesc, Craiova, 1975

9. Rică Marcus, Parcuri și grădini în România, Editura Tehnică, București, 1958

9. SJAN Dolj, fond Tribunalul Dolj, aut. 79/1853; G. Mil. Demetrescu, Actul de cumpărare al Parcului Bibescu din anul 1853, în "Arhivele Olteniei", nr. 4, p. 322, an I, 1922

10. Cum s-a format Parcul Bibescu, în "Anuarul ziarului Patria", Craiova, p. 170, 1906

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

Vol. XVI (LII) - 2011

INOCULATION PRACTICE OF MALOLACTIC BACTERIA IN RED WINES

Ionel Popescu-Mitroi¹, Marin Gheorghiță², Felicia Stoica²

KEY WORDS: malolactic fermentation, inoculation, starter cultures, commercial concoction

ABSTRACT

In this paper we experimentally evaluate the efficiency of the commercial concoction INOFLORE R (which contains the Leuconostoc oenos species), for introduction and development of the malolactic fermentation in Oporto, Burgund, Cadarca, Pinot noir and Merlot wines, obtained from Minis-Maderat vineyard, harvest 2006.

Wine composition (alcohol concentration, free and total SO_2 , total acidity, pH), temperature, the modality of preparation and use of the starter cultures, as well as the moment of inoculation, can influence the vitality and the malolactic activity of the lactic bacteria.

This study certifies that simultaneous alcoholic fermentation/malolactic fermentation haven't a negative impact on fermentation kinetics and neither the final parameters of the wine. In addition, the results suggest even a microbiological and technical advantage to apply the reactivation protocol must.

INTRODUCTION

The spontaneous malolactic fermentation is unpredictable and can start only after long periods of delay. This waste of time can represent a considerable cost for the producers. The delays amplify on the other hand, the development risks of contaminated microorganisms, that can generate an abnormal taste and smell. These risks are also high, by maintaining the wine in conditions to advantage the growth of contaminated lactic bacteria (high temperatures, little sulphitation, moderate pH).

In order to control the malolactic fermentation, selected lactic bacteria cultures were in train, of whom use, can assure a fast development of the process without difficulties (Henick-Kling, 1998).

Among the lactic bacteria, the most important species in malolactic fermentation is *Leuconostoc oenos*, who is available in many bacterial solutions (Popescu-Mitroi I., 2009).

Still, even at small scale (pilot station), the available bacterial solution cannot be successfully used, but only after a reactivation phase (Lafon-Lafourcade et al 1983, Krieger, 2002).

Introduction of lactic bacteria directly in wines, makes an important mortality and that is not efficient. The leaven "pied de cuve malo" is an indispensable phase, because the anhydrous bacteria continue their growth in wine and to guarantee sowing success. The

¹ "Aurel Vlaicu" University of Arad, Faculty of Food Engineering, Tourism and Environmental Protection

² University of Craiova, Faculty of Horticulture

more efficient the use of this leaven is, the sooner is developed after the alcoholic fermentation, obtaining an energy economy, in so far as the wines keep a temperature between 16-20°C (Valade and Laurent, 1995 apud. Gheorghita et al, 2006).

Oenological equipment manufacturers, offers starter cultures of lactic bacteria in a wide range: liquid cultures, lyophilised cultures and frozen cultures.

Table 1

Types of malolactic starter cultures of bacteria used by winemakers in the U.S.A. (Edinger
and Henick-Kling, 1994)

Company	Name of product	Bacteria	Form	Rehydration	Reactivation medium	Time of inoculation
Condimenta (Germania)	Bitec vino	L.oenos	lyophilised	hot water	must diluted with water	at the end of alcoholic fermentation
Owest International (USA)	Oeno	L.oenos	lyophilised	none	dilute must + nutrients	before and after alcoholic fermentation
Lallemand (USA)	X3	L.oenos	lyophilised	dilute must	dilute must + reactivation	during alcoholic fermentation
Lallemand (USA)	Inobacter	L.oenos	lyophilised	dilute wine + nutrients	wine	in wine-finished product
Lallemand (USA)	MCW	L.oenos	lyophilised	none	dilute must + nutrients	before and after alcoholic fermentation
Lallemand (USA)	OSU	L.oenos	lyophilised	none	dilute must + nutrients	before and after alcoholic fermentation
Wine Lab (USA)	ML 34, PSU-1	L.oenos	liquid	none	dilute must	during alcoholic fermentation
Vinquily	ML 34, MCW	L.oenos	liquid	none	must	in wine-finished product

MATERIAL AND METHODS

In this paper we experimentally evaluate the efficiency of the commercial concoction INOFLORE R (which contains the *Leuconostoc oenos* species), for introduction and development of the malolactic fermentation in Oporto, Burgund, Cadarca, Pinot noir and Merlot wines, obtained from Minis-Maderat vineyard, harvest 2006.

Albeit the concoction is MBR type (capable of direct sowing) 3 work ways were tested: direct inoculation (without reactivation), wine reactivation and must reactivation. In reactivation on wine, the inoculation of concoction INOFLORE R is made after the following scheme:



Figure 1. The simplified scheme of preparation of "pied de cuve malo" with reactivation on wine (Valade and Laurent, 1994)

The INOFLORE R concoction inoculation, in reactivation on must is made after the following scheme:



Figure 2. The simplified scheme of preparation of "a pied de cuve malo" with reactivation on must (Valade and Laurent, 1994)

RESULTS AND DISCUSSIONS

Before the malolactic initiation, the main physico-chemical properties of musts and wines malolactic fermented were determined. The must determination viewed: sugars concentration, total acidity, pH, malic and lactic acids concentrations, free and total SO₂. The wines determination viewed: alcohol concentration, sugars concentration, total and volatile acidity, pH, malic and lactic acids concentrations, free and total SO₂. The same physico-chemical properties were determined on wines after the malolactic fermentation.

Table 2

Types of must	Sugars g/l	Total acidity g/l	рН	Malic acid g/l	Lactic acid g/l	Free SO ₂ mg/l	Total SO ₂ mg/l
Oporto	207	3.33	3.40	1.9	trace	7	28
Burgund	207	5.48	3.15	3.1	trace	4	27
Pinot noir	205	4.45	3.28	2	trace	5	28
Merlot	208	5.48	3.15	2.5	trace	7	25
Cadarca	178	6.37	2.89	4.2	trace	5	28

Physico-chemical characteristics of musts before the INOFLORE R concoction inoculation (reactivation on must method)

Table 3

Physico-chemical characteristics of the wines before the INOFLORE R concoction inoculation

Types of	Alcohol	Total	Volatile	pН	Malic	Lactic	Free	Total
wines	% vol	acidity	acidity		acid	acid	SO_2	SO_2
		g/l	g/l		g/l	g/l	mg/l	mg/l
Oporto	12.1	3.21	0.28	3.4	1.5	0.34	7	28
Burgund	11.3	5.25	0.29	3.2	2.7	0.4	4	27
Pinot noir	11.5	4.40	0.29	3.3	1.5	0.28	7	25
Merlot	12.7	5.35	0.29	3.2	2	0.3	4	25
Cadarca	10.9	6.28	0.35	2.9	4.2	trace	5	28

The physico-chemical characteristics of the wines presented in table 3 (alcoholic concentration, total and volatile acidity, pH) do not satisfy the nutritional requisitions that must have an optimal culture environment for the growth and development of lactic bacteria. On the other hand, the musts, by their chemical composition, represent a propitious environment for the growth and development of the lactic bacteria. Still, the content in malic acid and total acidity is higher in musts, comparative to wines. Also, the content in lactic acid in musts is totally missing, while in wines, the contents in lactic acid vary between 0.2-0.4 g/l. This is accountable, by the fact that the malolactic fermentation starts at the end of the alcoholic fermentation before obtaining the wine.

Table 4

The physico-chemical characteristics of wines after the conducted malolactic fermentation (reactivation on must variant)

Types of	Alcohol	Total	Volatile	pН	Malic	Lactic	Free	Total
wines	% VOI	acidity	acidity		acid	acid	SO_2	SO_2
		g/l	g/l		g/l	g/l	mg/l	mg/l
Oporto	11.9	3.14	0.45	3.4	trace	1.3	7	28
Burgund	11.9	4.5	0.39	3.3	trace	1.8	4	27
Pinot noir	12.0	3.7	0.32	3.3	trace	1.4	7	25
Merlot	12.1	4.5	0.33	3.3	trace	1.8	7	25
Cadarca	10.3	4.6	0.47	3.1	trace	2.6	5	28

Types of wines	Alcohol % vol	Total acidity	Volatil acidity	pН	Malic acid	Lactic acid	Free SO ₂	Total SO ₂
		g/1	g/l		g/l	g/l	mg/l	mg/l
Oporto	12.2	3.15	0.51	3.5	trace	1.5	7	28
Burgund	12.3	4.6	0.43	3.3	trace	2	4	27
Pinot noir	12.5	3.9	0.4	3.3	trace	1.5	7	25
Merlot	12.5	4.6	0.4	3.3	trace	2	7	25
Cadarca	11.0	4.8	0.55	3.2	trace	3.5	5	28

The physico-chemical characteristics of wines after the conducted malolactic fermentation (reactivation on wine variant)

Table 5

Even in case of conducted malolactic fermentation, there are small differences between the values of the total acidity, dependent on the modality of work: direct inoculation, reactivation on wine and reactivation on must. The higher values of the volatile acidity are recorded in case of direct inoculation of the INFLORE R concoction, nigh values by those recorded in case of spontaneous malolactic fermentation (volatile acidity 0.4-0.55 g/l) The lowest values of the volatile acidity are recorded in case of must reactivation of the INFLORE R concoction (volatile acidity 0.32-0.47 g/l).

From tables 4 and 5 we see that the wines malolactic fermented by must reactivation method have the lower content in total acidity, volatile acidity and lactic acid by malolactic fermented wines compared with reactivation version on wine, which is reflected by a more quality and better biological stability.

In the version of must reactivation, the concentrations of lower alcohol wines can be explained by intense competition between lactic acid bacteria and yeasts during fermentation simultaneously (alcoholic and malolactic), the competition was ultimately won by lactic acid bacteria.

CONCLUSIONS

Comparative to wine sowing, the sowing technique of musts, present some advantages:

- simplification of the reactivation protocol, by decreasing the inoculate volume;
- an absolute adaptation of the lactic bacteria, seeing the lack of alcohol from the environment;
- standardization of the inoculation moment;
- low values of the volatile acidity and the assurance that undesirable compounds are not obtained (biogenic amines, diacetyl, acetoine).

Malolactic fermentation routing through the use of malolactic starter cultures of bacteria should be generalized to red winemaking, because it guarantees microbiological stability of the sulfite wines in the right way. This provides a sharper distinction between varieties of wine, increased significantly the quality of sensory profiles of red wine and considerably improved the quality of red wine and high quality red wines.

REFERENCES

1. Edinger D. W, Henick-Kling T. La malolattica nell' industria enologica USA, Vignevini, 4, pp. 48 – 51. 1994.

2. Gheorghiță M., Băducă Cîmpeanu C., Muntean C., Giugea N. Oenologie, vol 1 Craiova Editura Sitech, pp. 314-326. 2006.

3. Henick-Kling T., Acree T. E. Modificazioni dell' aroma del vino can la fermentazione malolattica ed uno di culture selezionate negli USA. Vignevini, (7-8), pp. 44-50.1998.

4. Krieger S. A. Starter cultures for the malolactic fermentation – time of inoculation, In Proceedings from the 13th International Enology Symposium, International Association of Enology, Management and Wine Marketing, Breisach, Germania, pp. 77-91.

5. Lafon-Lafoucarde S., Caree E., Lonvaud-Funel A., Ribereau-Gayon P. 1983. Induction de la fermentation malolactique des vins par inoculation d'une biomasse industrielle congelee de Leuconostoc oenos après reactivation. Conn. Vignevini, 17, pp. 55-71. 2001.

6. Popescu-Mitroi I. Bazele biotehnologice ale fermentației malolactice, Editura Universității "Aurel Vlaicu" Arad, pp. 128-148. 2009.

7. Valade M., Laurent M. La gestione della malolattica nella champagne Vignevini 4, pp. 52-57. 1994.

8. Valade M., Laurent M. La maitrise de la fermentation malolactique. Revue des Oenologues, 735, pp. 45-52. 1995.

Seria: 🖌 Biologie

✓ Horticultură
✓ Tehnologia prelucrării

produselor agricole

Ingineria mediului

Vol. XVI (LII) - 2011

RESEARCHES REGARDING THE PRODUCTION OF THE BASE PROBAGATING MATERIAL FOR THE VIRUS FREE MOTHER PLANTATIONS SETTING

Preda Silvia¹, Zagrai I.², Ion Ligia³, Poenaru Silvia¹

KEYWORDS: *rootstock, cultivar, prebase biological material*

ABSTRACT

In the spring of 2011, from the prebase plum roostocks Rival and Miroval preserved in an isolated greenhouse, were sampled scions and cuttings about 20 cm each were made. Scions from plum cultivar Andreea certifed as prebase biological material were grafted on the plum roostocks Rival and Miroval and thus, the base biological material was obtained. The base plum roostocks and the biological material Andreea/Miroval and Andreea/Rival were subjected to the serological assay DAS-ELISA in order to establish possible reinfections with the viruses PPV, PDV, PNRSV and ACLSV and the molecular method IC-RT-PCR for PPV. The infected material was marked and removed and the healthy one was transferred in individual containers and preserved in an isolated greenhouse.

INTRODUCTION

Worldwide, a major importance is given to the propagation of virus free biological material through national and international complex programmes of certification (Di Terlizzi et al., 1998; Myrta and Boscia, 1998).

Virus-free planting material even in comparison with plants only free of the main viruses is superior regarding compatibility rooting and suscessfully grafted trees in nurseries (Cembali, 2003; Lenz and Lankes, 2006).

Obtaining virus-free propagating material, preservation and the production of large scale "Certified" trees is an objective necessity due to the importance given to this sector in the EU and also to the gap between the performance area of our country in comparison to most EU countries.

The purpose of our research was to obtain plum base biological material, a key element to establishing new orchard of plum trees, free of viruses, which will allow the fruit valorification to higher prices with positive economic and social effects.

¹ Fruit Growing Research&Extension Station Vâlcea, University of Craiova, Calea lui Traian Street, no. 464, Râmnicu-Vâlcea, Romania

² Fruit Growing Research&Development Station Bistrița, Drumul Dumitrei Nou Street, no.3, Bistrița, Romania

³ Faculty of Horticulture, USAMV Bucharest, Mărăști Boulevard, no. 59, Bucharest, Romania

^{*}Corresponding author: E-mail address: predasilvia@yahoo.com

MATERIAL AND METHODS

The biological material was represented by the plum roostocks Rival and Miroval and cultivar Andreea certified as plum prebase according to the certificate of analysis no. 9/18/11/2010 issued by ITCSMS Rm. Vâlcea and preserved in an isolated greenhouse (Figure 1).

In the spring of 2011, from the prebase plum roostocks Rival and Miroval preserved in an isolated greenhouse, were sampled scions and cuttings about 20 cm each were made.

In a previously arranged plot, the cuttings were planted at 5-10cm apart leaving 1-2 buds above the ground (Figure 2).

Scions from plum cultivar Andreea certified as prebase biological material were grafted on the prebase plum roostocks Rival and Miroval in order to obtain the base biological material.



Fig.1 The plum prebase biological material preserved in an isolated greenhouse



Fig.2 Plum cuttings on the rootig platform

The base plum roostocks Miroval and Rival and the biological material Andreea/Miroval and Andreea/Rival were subjected to the serological and molecular tests for possible reinfections with the viruses PPV, PDV, PNRSV and ACLSV. The serolofical test performed was DAS-ELISA – Double Antibody Sandwitch-Enzyme Linked Immunosorbent Assay (Clark and Adams, 1977) using universal kits Bioreba (Switzerland) at Fruit Growing Research&Extension Station Vâlcea. The work protocol was done according to the kits instructions. The readings were made at 405 nm using the microplate reader Stat Fax(@3200 (Figure 3).

The molecular test applied for possible reinfections with PPV was IC-RT-PCR (Immunocapture-Reverse-Transciption-Polymerase Chain Reaction) at Fruit Growing Research&Development Station Bistrița. The work protocol was done using the pair of primers P1/P2 that amplifies a 243 bp fragment located at the C-terminus of rhe PPV capsidale protein (Wetzel et al., 1991, Wetzel et al., 1992). PPV immunocapture was trapped with PPV polyclonal antibodies adsorbed on an Eppendorf microtube. The thermal cycling scheme used was the following: RT- 30 min at 50°C, denaturation / RT inactivation - 2 min at 94°C followed by 35 cycles: template denaturation - 30 s at 94°C, primer annealing - 45 s at 61°C and DNA elongation- 60 s at 72°C. Following to the last cycle, amplified DNA was elongated for 10 min at 72°C. An aliquot of the amplified products (10 μ l) was fractionated onto 1,5% agarose gel electrophoresis in I x TBE buffer. Bands were visualized by ethidium-bromide staining under UV light.



Fig. 3 DAS-ELISA test for Plum pox virus detection: a – distribution of anticorp substrate on microplate (200µ/well); b – distribution of plants extracts, positive and negative controls on microplates (200µl/well); c – distribution of conjugate substrate on microplates (200µl/well); d1,d2- distribution of the reaction substrate on microplates(200µl/well).

RESULTS AND DISCUSSIONS

The percentage of rooting cuttings from plum rootstocks Rival and Miroval was approximatevely 50-60% (Figure 4). The plum base biological material (Andreea/Miroval, Andreea/Rival) was preserved in an isolated greenhouse (Figure 5).

The results of serological and molecular assays are presented in Table 1.

The results of the serological assay showed no infection with the viruses Prunus necrotic ring spot, Prune dwarf and Apple chlorotic leaf spot that in all sample analyzed.

From 200 samples of the plum roostocks Rival and Miroval, 4 samples of Rival and 6 samples of Miroval were infected with PPV. All samples (8) from the plum base biological material had a negative response to the infection with PPV.

Through the molecular method IC-RT-PCR, 5 samples of Rival and 8 samples of Miroval were determined to be infected with PPV. In agarose gel electrophoresis, L is the marker that indicates the molecular weight of PCR products. The positive and negative controls were samples infected, respectivly noninfected with the Plum pox virus (PPV) confirmed by serological and molecular tests to SCDP Bistrita. The presence of bands in agarose gels at size 243 bp indicates Plum pox virus infection in the samples analyzed (Figure 6).

The infected material was marked and removed and the healthy one was transferred in individual containers and preserved in an isolated greenhouse.

The authentic and healthy free of the viruses Plum pox, Prunus necrotic ring spot, Prune dwarf and Apple chlorotic leaf spot were certified and classified as plum base biological material according to the analysis report issued by ITCSMS Rm. Vâlcea



Fig.4 Plum base rootig cuttings A - rootstock Miroval, B - rootstock Rival



Fig. 5 Plum base biological material: A – Andreea/Miroval; B – Andreea/Rival

Table 1

Results of serological and molecular tests regarding possible reinfections with the viruses of plum base biological material

Plum	Number	Nı	Number of analyzed samples infected						
base biological	of analyzed samples	PP'	PDV	PNRSV	ACLSV				
material		DAS-ELISA	IC-RT-PCR						
Miroval	100	6	8	0	0	0			
Rival	100	4	5	0	0	0			
Andreea/Miroval	4	0	0	0	0	0			



Fig.6 Analysis of RT-PCR products migration in agarose gel for the Plum pox virus identification at the Rival samples (1-44)

REFERENCES

Cembalia, T., Folwella, R. J., Wandschneidera, P., Eastwellb, K. C., Howellb, W. E. 2003. Economic implications of a virus prevention program indeciduous tree fruits in the US. Crop Protection 22:1149–1156. 2003.

Clark, M., Adams, A.N.. Characteristic of the microplate method of enzyme linked immunosorbent assay (ELISA) for the detection of plant viruses. J. of. Gen. Virology 34:475-483. 1977.

Di Terlizzi, B., Çaglayan, K., Gavriel, I., Myrta, A., Srhiri, M., Zeramdini, H., Audergon, J.M., Djerbi, M., Khouri, W., Pallás, V., Varveri, C., Savino V. Efforts to harmonaise and promote a stone fruit certification scheme in the Mediterranean countries. Options Méditerranéennes, Serie B/no.19-Stone fruit viruses and certification in the Mediterranean: problems and prospects:134-148. 1998

Lenz, F.D., Lankes, Chr. Certification scheme for fruit trees in Germany. Latvian Journal of Agronomy, No. 9. LLU: 69-74. 2006.

Myrta, A., Boscia, D. Plum pox virus: a risk for the Mediterranean fruit trees industry. CIHEAM-Options Mediterraneennes:46-52. Macdonald B. 1986. Principeles of vegetation propagation, clonal selection and stock (mother) plants. In: Practical woody plant probagation for nursery owners. Timber Press Inc., Portland, Oregon, USA: 219-257. 1998.

Wetzel, T., Candresse, T., Ravelonandro, M., Dunez, J. A polymerase chain reaction assay adapted to plum pox potyvirus detection. J. Virol. Meth. 33:355-365. 1991

Wetzel, T., Candresse, T., Macquaire, G., Ravelonandro, M., Dunez, J. A highly sensitive immunocapture polymerase chain reaction method for plum pox potyvirus detection. J. Virol. Methods 39:27-37. 1992

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

Vol. XVI (LII) - 2011

TAXONOMICAL OBSERVATIONS ABOUT SOME SPECIES OF VERONICA WITH SOLITARY FLOWERS FROM ROMANIA

Răduțoiu Amira¹

KEY WORDS: Veronica, taxonomical observation, Romania.

Summary: The present paper presents a few taxonomical observations about the Veronica species with solitary flowers from Romania. We mention that the present article is a segment of some more ample botanical researches which present the author's doctoral thesis.

From the analysis of the material collected in the course of 8 years resulted information useful for an easier differentiation of the studied taxons.

To differentiate easier the taxons between them, where necessary, it was elaborated on the basis of the obtained data (both morphological and anatomical) a determination key too.

There were found 2 forms and a variety for a few taxons, all of them new for the science.

INTRODUCTION

The Veronica gender is considered one of the richest genders of Romania's spontaneous flora (and not only). In the Flora Europaea there are presented 62 species with numerous infraspecific taxons and in the Romanian Flora – vol. VII – 41 species and 3 hybrids.

Data regarding the Veronica species from Romania's flora was sporadic until the apparition of the paper "The conspectus of Romania's Flora" (D. Grecescu 1898).

Ciocârlan V. (2000) in "The illustrated flora of Romania Pteridophyta & Spermatophyta" points out the presence of 40 species and 15 subspecies (pag. 696-705).

One of these species is marked with an interrogation sign: *Veronica orientalis* Mill. The species had been mentioned at Bărăbanţ, near to Alba Iulia locality, but it hasn't been found posterior.

After, in the 3rd edition, the same author mentions 41 species, 13 subspecies and 2 varieties for the Veronica gender from Romania's flora (Ciocârlan 2009) (pag. 689-698).

Data about the chorology of the plants that we analyzed were also found in various synthesis papers that study the flora and vegetation of a certain territory (Resmeriță 1970, Dihoru & Doniță N. 1970, Boșcaiu 1971, Roman 1976, Oroian 1998, Mihăilescu 2001, Sarbu 2003, Costache 2005, Radutoiu 2006).

Albach Dirk et al. (2004) in the paper A new classification of the tribe Veroniceae – problems and a possible solution divides the Veronica gender into 13 subgenders starting from the phylogenetic analysis with the help of the DNA sequences: Beccabunga,

¹ Secondary School "Gh. Bibescu" nr. 36, Craiova

Corresponding author: amiraradutoiu@yahoo.com
Veronica, Pseudolysimachium, Synthyris, Cochlidiosperma, Pellidosperma, Stenocarpon, Triangulicapsula, Pocilla, Pentasepalae, Chamaedrys, Derwentia și Hebe.

Last hour data APG III (Angiosperm Phylogeny Group) (2009) situates them at Lamiales / Lamiide.

MATERIAL AND METHODS

The first stage in the elaboration of this paper consisted in consulting the specialized literature from the country and abroad. Ulterior there were effectuated numerous displacements in different locations from the country, where it was collected the vegetal material necessary for the posterior laboratory analysis.

The collected material included plants in all the development stages, in order to detect the eventual discriminating characters.

The determination of the material was made with the help of the specialized literature from the country and abroad (Beldie 1979, Ciocârlan 2009, Tutin et al. 1972).

RESULTS AND DISCUSSIONS

Veronica acinifolia L. In the Romanian botanical literature it is mentioned as *Veronica acinifolia* L. (Grecescu 1898, Prodan 1939: 891, Borza 1947, Beldie 1979: 104, Ciocârlan 2009: 691).

It can be confounded with *Veronica agrestis, Veronica arvensis, Veronica cymbalaria, Veronica opaca, Veronica persica, Veronica polita* sau *Veronica praecox*. It differs from *Veronica praecox* through ovate, almost whole leaves, bracts shorter than the pedicels and the capsule provided with a deep sinus and a 1, 5 mm style, more or less equal with the height of the sinus. At *Veronica praecox* the leaves are pronounced crenate-serrate, the bracts are more or less equal with the pedicels and the capsule has a small sinus and a 2 mm style, which evidently exceeds the sinus height.

It differs from *Veronica arvensis* through evidently pediceled flowers, with pedicels equal or longer than the bracts. In the case of *Veronica arvensis* the flowers are short pediceled, with pedicels shorter than the bracts.

If *Veronica acinifolia* has erect stem, at *Veronica opaca*, *V. persica* and *V. polita* the stem is creeping.

Veronica agrestis L.

In the specialized literature from the country and abroad this species is known as *Veronica agrestis* L.

At first sight, it can be confounded with *Veronica acinifolia*, *Veronica arvensis*, *Veronica cymbalaria*, *Veronica opaca*, *Veronica persica*, *Veronica polita*, *Veronica praecox*, but a more detailed analysis points out numerous differential characters.

If *Veronica acinifolia*, *V. arvensis*, *V. praecox* are annual plants with erect stem, *V. agrestis* has procumbent or ascendant stem.

From *Veronica persica* it differs through the length of the pedicels, the size of the corolla and the length of the style. At *V. persica* the pedicels are much longer than the bracteal leaves, the corolla measures 8-12 mm and the style passes 2 mm. *Veronica agrestis* has pedicels equal or shorter than the bracteal leaves, the corolla of 3-6 mm and the style not longer than 1,5 mm.

If the mentioned characters can be found at *Veronica opaca* and *Veronica polita* and they don't help at the differentiation of the species *Veronica agrestis* from the other

two, there are other characters, such as: the capsule hairs, the corolla's color and the proportion between the style's length and the capsule's style, which obviously separates it.

If in the case of *Veronica agrestis* the capsule has only glandular, long and rare hairs, whitish corolla with bluish veins and 1mm style which doesn't exceed the capsule's sinus, at *Veronica polita* and *Veronica opaca* the capsule has besides the glandular hairs also shorter, not glandular hairs, the corolla is blue and the style is equal or exceeds the fruit's sinus.

Veronica arvensis L.

In the specialized literature from Romania and abroad it is known as *Veronica* arvensis L.

It resembles to Veronica acinifolia, Veronica agrestis, Veronica opaca, Veronica persica, Veronica polita, V. peregrina or Veronica praecox.

At a more detailed analysis it can be observed that there are enough characters that differentiate it from these taxons, as it follows:

- *Veronica arvensis* has erect stem, similar with *Veronica acinifolia*'s or *Veronica praecox*'s, but it differs from the stem of *Veronica agrestis*, *Veronica opaca*, *Veronica persica* or *Veronica polita*, where it is procumbent or ascending.
- *Veronica arvensis* is a pubescent plant, glandular-hairy in the superior part (Fig. 1), with leaves of truncate or slightly cordate base, bracts crenated-serrated and ovate-lanceolate, more or less equal with the flowers, and *Veronica peregrina* is a glabrous plant, with narrow base, slightly crenated or whole leaves, and lanceolate bracts, which exceed 2-3 times the flowers.
- from *Veronica acinifolia* and *V. praecox* it differentiates through: very short pediceled flowers, with pedicels shorter than the bracteant leaves. At *V. acinifolia* and *V. praecox* these are equal or longer than the bracts.

Taxonomical news for this species:

var. *laxiflora* var. nova: big stems with long internodes and few flowers *Veronica filiformis* Sm.

From the taxonomic point of view this species is accepted at European level under this form, as also in the specialized determiners from the country.

In the Romanian Flora, volume VII, this taxon is not mentioned. Only among the synonyms of the *Veronica persica* Poiret species we can find *Veronica filiformis* Baumg. et auct transs., non Sm., but in this case it is another taxon.

Probably until that date the presence of this taxon the Romanian flora had been uncertain. After some years, Al. Beldie signaled out the presence of this taxon in Romania, (1979).

Flora Europaea mentions this taxon in the Northwest and centre of Europe, Romania not being mentioned at chorology.

It can be easily confounded with *Veronica persica* Poiret. The principal character of recognition is: *Veronica filiformis* is a perennial, chamaephyte species, while *Veronica persica* is annual. At these are added:

Veronica hederifolia L.

The basal leaves from all the analyzed mature exemplars have 5-7 lobes. Only the superior and the plantlets' leaves are trilobed. Consequently, this character is not constant and therefore it can't be used in the key of separation of the infrataxons of this species from Romania's flora.

The specimens with a very well developed vegetative apparatus (especially the foliar), have a big part of the flowers aborted. Apparently, the exaggerated development of the leaves has negative consequences for the flowers.

At the majority of the analyzed plants the fruit-pedicels are twice longer than the calyx, character which is presented in the determination keys of the subspecies *triloba Veronica triloba* – after *Bulgarian Flora* and new classifications regarding this gender – Albach D. 2004, 2005).

At this species the hypocotyl axis is very well developed: 2-10 cm, depending of the vigor of the exemplar.

The plants from the Southwest of Romania have much smaller leaves -4-6(7) mm wide.

The exemplars collected from polluted locations have the limb with bigger incisions comparing with the material collected from places where the pollution is absent or is weak.

Taxonomic news for this species:

f. *longicaulis* f. nova

The stem is 82-93 cm long. It was identified in ruderal places near to the Black Sea (Costinești – 10.VIII.2010).

f. *macrophylla* f. nova

The middle stem leaves have values between 3,5 and 3,8 cm.

Veronica polita Fries – At this species were also identified exemplars that do not have the margin of the leaf regularly crenate-serrated as it is told in the specialized literature. At the young leaves the base is not truncate as at the mature ones but it gradually prolongs into the petiole.

The exemplars that fructify abundantly have short internodes, close nodes and they are small plants.

The material that we collected from the Southwest of Romania it has been constantly observed, unlike the analyzed material from other regions. This refers to the margin of the leaves. At the plants from this part of the country it has been ascertained that the limb incisions are deep and the leaf has very reduced dimensions.

At the well developed exemplars it has been ascertained an abortion of the flowers, corroborated with the pedicels' elongation, fact that embarrasses their correct determination. This case has been frequently noticed in the polluted areas from the middle basin of the Jiu River, places known for the high level of contamination, radioactivity and for the presence of numerous heavy metals.

From the data collected from this side of the country, with special reference to the ash and sterile wastes, we can affirm that *Veronica polita* is a plant resistant at diverse stress factors, being found next to the place of ash discharge.

CONCLUSIONS

The detailed analysis of the morphological and anatomical characters of the species of Veronica with solitary flowers from Romania has emphasized not only characters but also infraspecific variability at some species (*Veronica arvensis* și *Veronica*

hederifolia). In this way there were discovered 3 infrataxons new for the science: *Veronica arvensis* L. var. *laxiflora* var. nova; *Veronica hederifolia* L. f. *macrophylla* f. nova and *Veronica hederifolia* L. f. *longicaulis* f. nova.

Also, at the exemplars of some species met on intensely polluted zones, there were observed modifications at the level of the foliar apparatus.

Acknowledgements: I want to express my gratitude to the Doctor Marin Andrei for the unconditional support offered as often as it has been necessary.

BIBLIOGRAPHY

- Albach, D.C., M. M. Martinez-Ortega, M. A. Fischer, M. W. Chase. Evolution of Veroniceae: A phylogenetic perspective. Annals of the Missouri Botanical Garden, 91: 275–302. 2004.
- 2. Albach, D.C., Martinez-Ortega, M.M., Fisher, M.A., Chase, M.W.. A new classification of the tribe *Veroniceae* problems and a possible solution. *Taxon*, 53: 429-452. 2004.
- 3. Albach, D.C., Jensen S.R., Ozgokce F. & Grayer R. J.. Veronica: Chemical characters for the support of phylogenetic relationships based on nuclear ribosomal and plastid DNA sequence data. *Bioch. Syst. and Ecol.* 33: 1087-1106. 2005.
- 4. Beldie Al.. *Flora României determinator ilustrat al plantelor vasculare*. 406 pag. Edit. Academiei Române. fig. 846-1439. București. 1979.
- 5. Boșcaiu N. *Flora și vegetația munților Țarcu, Godeanu și Cernei*. 494 pag. Edit. Acad. R.S.R., București. 1971.
- 6. Ciocârlan V. Flora ilustrată a României. Pteridophyta et Spermatophyta. 1041 pag. Edit. Ceres, București. 2009.
- Costache I.. Flora şi vegetația bazinului hidrografic inferior al râului Motru. Teza de doctorat. 290 pag. Bucureşti. 2005
- 8. Crișan Gianina, Tămaș M., Garbacki Nancy, Angenot L.. "*Criterii de diferențiere a unor specii de Veronica*" *Farmacia*: 49, 6, 67-73. 2001.
- 9. Dihoru G., Doniță N.. *Flora și vegetația podișului Babadag.* 438 pag. Edit. Acad. R.S.R., București. 1970.
- Ghişa E. Veronica. Pp. 505-565. In Tr. Săvulescu & al. (ed.). Flora României. Vol. VII. Bucureşti: Edit. Academiei Române. 1960.
- 11. Mihăilescu Simona. *Flora și vegetația masivului Piatra Craiului*. 399 pag. Edit. Vergiliu. București. 2001.
- Oroian Silvia. Flora şi vegetația Defileului Mureşului între Topolnița şi Deda. 426 pag. Casa de Edit. Mureş. Tg. Mureş. 1998.
- 13. Răduțoiu D., *Flora și vegetația Cernei de Olteț*. Teză de doctorat. 281 pag. București. 2006.
- 14. Resmeriță I.. *Flora, vegetația și potențialul productivpe Masivul Vlădeasa.* 317 pag. Edit. Acad. Române. 1990.
- 15. Roman N., *Flora și vegetația din sudul podișului Mehedinți*. 222 pag. Edit. Acad. Române, București. 1974.
- 16. Sârbu C.. *Podgoriile Cotnari, Iași și Huși. Studiu geobotanic.* 372 pag. Edit. "Ion Ionescu de la Brad" Iași. 2003.
- Tutin T. G., Heywood V. H., Burges N. A., Moore D.M., Valentine D. H., Walters S. M., Webb D. A. & al., *Flora Europaea*. Vol. III: 242-251. Cambridge University Press. Cambridge. 1972.

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

Seria: ✓ Biologie ✓ Horticultură ✓ Tehnologia prelucrării produselor agricole

✓ Ingineria mediului

Vol. XVI (LII) - 2011

MORPHO-ANATOMICAL CONSIDERATIONS ABOUT VERONICA ARVENSIS L. FROM THE ROMANIAN FLORA

Rădutoiu Amira¹

KEY WORDS: Veronica arvensis, structure, Romania.

ABSTRACT

Summary: For the recognition of the infraspecific variability of this species there were effectuated morphological studies and transversal sections on vegetative organs.

These complex studies revealed a new variety for this species (var. laxiflora), variety presented in other paper.

The present article forms part of a synthesis paper about the species of Veronica with solitary flowers, work that represents the doctoral thesis of the author.

From the anatomical point of view, the root has secondary structure at the level of the central cylinder, the stem primary structure at the level of the bark and secondary at the level of the central cylinder and the leaf has a simple structure, presenting between the two epidermises a homogenous mesophyll. This morphological and anatomical structure explains the ecological conditions of the plant's habitat.

INTRODUCTION

Data about the morphology of this species can be found in a few specialized books (Ghişa 1960, Beldie 1979, Ciocârlan 2009) and about the chorology in papers regarding the flora and vegetation of the territory (Pop 1968, Resmeriță 1970, Dihoru & Doniță 1970, Boșcaiu 1971, Dihoru 1979, Oroian 1998, Mihăilescu 2001, Răduțoiu & Răduțoiu 2009, Răduțoiu 2010).

The absence of anatomical studies for this species determined us to make sections into the organs that are important for the differentiation from the rest of the species of this gender. The anatomical studies come to complete this species' diagnose. Data about the structure of the Veronica species with solitary flowers from Romania were presented by the author in specialized journals from the country (Răduțoiu 2007, 2009).

MATERIAL AND METHODS

To complete the descriptions of the species and to emphasize the eventual structural differences between these we effectuated transversal sections with the help of an anatomical razor in the roots, stems and leaves of the studied plants. The segments that were sectioned appertained approximately to the same level on the analyzed plants.

¹ Secondary School "Gh. Bibescu" nr. 36, Craiova

For the study of the foliar epidermis and of the epidermal productions we used the peeling technique (tangential sections) (Andrei & Paraschivoiu 2003).

The microscopic sections were analyzed using a binocular, type Krüss (objectives 10, 20, 40) microscope, and afterwards photographed with a Nikon system.

The measurements were effectuated at an MC-3 microscope. There were done 100 measurements and numberings (epidermal cells, stomas). There were taken into account the maxim individual value (V_M) , the minimum individual value (V_m) and the medium value (\overline{X}) which represents the average of the 100 individual values.

RESULTS AND DISCUSSIONS

This species' cotyledons are spatulate and the leaves are simple, elliptical or ovate. The mature plant reaches a 5-25 cm height (Fig. 1) and presents a thin and ramified root in the soil.



Fig. 1. Veronica arvensis - general aspect (orig.)

The root has secondary structure at the level of the central cylinder. The average thickness is of $693 \ \mu m$.

The bark is little developed, being formed of 2-3 cells layers. The exterior layers were exfoliated (Fig. 2).



Fig. 2. Bark, phloem and wood at Veronica arvensis (Ob. 40 x Oc. 10 - orig.)

The phloem is 49,5 μ m thick and the wood has the diameter of 553,5 μ m.

The xylem vessels are disposed in radial rows and they have approximately the same dimensions in the entire root (Fig. 3). The primary wood does not differentiate from the secondary.



Fig. 3. The disposition of the xylem vessels in the root at *Veronica arvensis* (Ob. 40 x Oc. 10 – orig.)

The xylem vessels' diameter has the following values: $V_m = 6,75 \ \mu m$, $V_M = 15,75 \ \mu m$, $\overline{X} = 12,15 \ \mu m$. The medullar parenchyma is absent, being replaced by the xylem vessels, probably primary.

The stem can be simple or rarely little ramified, erect or ascendant, tousled hairy in the inferior part and fine glandulous hairy in the superior one.

It has secondary structure at the level of the central cylinder, primary in the bark and an average thickness of 1170 $\mu m.$



The epidermis is unistratified, the cells having the lateral walls cutinized (Fig. 4). It has the average thickness of 22,5 μ m and the cuticle is 1,125 μ m thick.



Some epidermal cells are transformed in elongated pluricellular hairs. The most developed hairs are formed of 7 cells.

The amiliferous sheath is unistrafied and formed of cells elongated in tangential sense.

The secondary phloem is little developed, of an 18 µm average thickness.

The secondary wood is formed of few xylem vessels and xylem fibers compactly disposed until the cambium level. (Fig. 84).

The diameter of the xylem vessels is variable: $V_m = 9 \ \mu m$, $V_M = 13.5 \ \mu m$); the

average is $X = 10,35 \,\mu\text{m}$. To be mentioned that the xylem vessels are orderly disposed in radial rows underneath the compact cordon of the xylem fibers.

The medullar parenchyma is well developed, formed of big, spheroidal or ovoid cells, with spaces between them. They occupy the middle zone of the stem.

The bark is parenchymal, formed of spheroidal, ovoid, spaced cells. It has an average thickness of 135 $\mu m.$

The inferior and middle leaves are shortly petiolated or sometimes sessile (Fig. 5), opposite, simple, ovate, glabrous or dispersed hairy, 5-15 mm long and 4-10 wide and the superior ones are alternate, almost sessile, unequally crenate, with obtuse tip and rounded or slightly cordate base. They decrease from the basis to the stem apex.



Fig. 5. Detail of middle leaves at Veronica arvensis (orig.)

It has a bifacial structure and a thickness of 193,5 µm.

The superior epidermis is unistratified, of an average thickness of 29,25 µm and a 1,125 µm cuticle. The cells of this epidermis have upright and thin walls; they are disorderly disposed, without spaces between, with lengths between $V_m = 42,75 \ \mu m$ and V_M = 63 μ m and variable widths, between V_m = 27 μ m and V_M = 49,5 μ m. The stomas at this epidermis' level are anomocitic and they have the same length:

27 µm. Their density is: $V_m = 0,0471$ stomas/mm² şi $V_M = 0,1413$ stomas/mm², $\overline{X} = 0.0471$ 0,07536 stomas/mm².

Among the cells of the superior epidermis there are two types of hairs: simple protectors and glandular. The protector hairs are pluricellular, elongated (Fig. 6), with

lengths between: $V_m = 270 \ \mu m$ and $V_M = 720 \ \mu m$, $\overline{X} = 468 \ \mu m$. The glandular ones present a unicellular little foot with 2 secretive cells (Fig. 7).

They have lengths of $V_m = 31,5 \ \mu\text{m}$, $V_M = 40,5 \ \mu\text{m}$, $\overline{X} = 24,52 \ \mu\text{m}$. The palisadic parenchyma is formed of two layers of elongated cells, without spaces between them, and the lacunous parenchyma has ovoid or spheroidal cells with spaces between them.





Fig. 7. Glandular hair from the Veronica arvensis leaf (Ob. 40 x Oc. 10 – orig.)

Fig. 6. **Protective pluricellular hair** from the superior face of the *Veronica arvensis* leaf (Ob. 40 x Oc. 10 – orig.)

The inferior epidermis is thinner comparing with the superior one, having an average thickness of 20,25 μ m and a 0,9 μ m thick cuticle. The stomas are disposed above the epidermis. There can also be observed the substomatic chambers.

The cells of the inferior epidermis have strongly sinuous and thin walls (Fig. 8). They are disposed disorderly, without spaces between them. The length of these cells is of $V_m = 56,25 \ \mu m$, $V_M = 85,5 \ \mu m$, with an average of $\overline{X} = 74,25 \ \mu m$ and the width of $V_m = 29,25 \ \mu m$, $V_M = 56,25 \ \mu m$, with the average $\overline{X} = 40,72 \ \mu m$.



Fig. 8. Inferior epidermis of the Veronica arvensis leaf (Ob. 40 x Oc. 10-orig.)

The stomas are anomocitic type, with a length of $V_m = 22,5 \ \mu m$, $V_M = 24,75 \ \mu m$, $\overline{X} = 26,55 \ \mu m$ and density $V_m = 0,2355 \ stomas/mm^2$, $V_M = 0,3297 \ stomas/mm^2$, $\overline{X} = 24,07 \ stomas/mm^2$. The glandular hairs from the inferior epidermis are similar with the ones from the superior epidermis as structure, but shorter ($V_m = 33,75 \ \mu m$, $V_M = 36 \ \mu m$). The

short protector hairs (270 μ m) are the most numerous; among these there are also another longer (774 μ m) and more rare.

CONCLUSIONS

The morphological data obtained complete the information already existing in the specialized literature. The anatomical studies emphasized a secondary structure at the central cylinder level in the root of this species (the external layers deteriorate at the contact with the soil particles); the stem has a primary structure at the bark level and secondary at the central cylinder level and the leaf has a homogenous mesophyll.

The stomas are of anomocitic type. It was elucidated the structure of the protector and glandular hairs, the hairiness being an important character for the differentiation of this species from the rest of this gender's species.

Acknowledgements: I want to express my gratitude to the Doctor Marin Andrei for the unconditional support offered as often as it has been necessary.

BIBLIOGRAPHY

- 1. Andrei M., Paraschivoiu Roxana Maria. *Microtehnică botanică*, Ed. Niculescu, București.. 2003.
- Beldie Al.. Flora României determinator ilustrat al plantelor vasculare. 406 pag. Edit. Academiei Române. fig. 846-1439. Bucureşti. 1979.
- Ciocârlan V.. Flora ilustrată a României. Pteridophyta et Spermatophyta. 1041 pag. Edit. Ceres, Bucureşti. 2009.
- 4. Ghişa E. *Veronica*. Pp. 505-565. In Tr. Săvulescu & al. (ed.). *Flora României*. Vol. VII. București: Edit. Academiei Române. 1960.
- Răduțoiu Amira. Morpho-anatomical consideration at Veronica hederifolia L. species. Annals of the University of Craiova. Seria Biologie, Horticultură, Tehnologia prelucrării produselor agricole, Ingineria Mediului. Vol. XII (XLVIII). pp. 299-302. 2007.
- 6. Răduțoiu Amira. Morpho-anatomical studies at the vegetative organs of Veronica peregrina L. species. *Annals of the University of Craiova. Seria Biologie, Horticultură, Tehnologia prelucrării produselor agricole, Ingineria Mediului.* Vol. XII (XLVIII). pp. 303-306. 2007.
- Răduţoiu Amira. Morphology and anatomy of the Veronica polita species from the Scrophulariaceae Family. Annals of the University of Craiova. Seria Biologie, Horticultură, Tehnologia prelucrării produselor agricole, Ingineria Mediului. Vol. XIV (XLX). pp. 541-546. 2009.
- 8. Răduțoiu Amira. Morpho-anatomical study from Veronica filiformis. *Lucrări Ştiințifice, Seria Horticultură*. Anul LII - Vol. 52. pp. 77-82. 2009.
- 9. Răduțoiu D., Amira Răduțoiu. Contributions to the knowledge of the vascular flora from the Saru forest Olt County. *Buletin of University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, Agriculture*, vol. 66 (1): 601-604. 2009.
- Răduțoiu D., Corneanu G. Corneanu Mihaela. Preliminary data about the flora of the wastes and ash dumps from Rovinari-Turceni area (Gorj county, Romania). *Muzeul Olteniei Craiova. Oltenia. Studii şi comunicări. Ştiințele Naturii.* Tom. 26, no. 1:58-60. ISSN 1454-6914. 2010.

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

Seria: ✓ Biologie ✓ Horticultură

✓ Tehnologia prelucrării

produselor agricole

🖌 Ingineria mediului

Vol. XVI (LII) - 2011

ANATOMICAL STUDY AT ORNITHOGALUM ORTOPHYLLUM SUBSP. PSAMOPHYLLUM FROM ROMANIAN FLORA

Răduțoiu Maria Ionela1

KEY WORDS: endemit, structure, Romania.

ABSTRACT

In this paper are presented structural data on the root and stem of Orinithogalum orthophyllum subsp. psmmophyllum.

Anatomical studies outline the presence of a primary structure at the level of the roots of this specie. The presence of contractile roots at this taxon is explained from the structural point of view by the existence of cells with sinuous walls.

The aerial stem has a primary structure, a well developed central cylinder and closed collateraly conductor fascicles are disposed on 3 concentric circles.

INTRODUCTION

Ornithogalum orthophyllum Ten. subsp. psammophyllum (Zahar.) Zahar. (Ornithogalum psammophilum Zahar., Ornithogalum kochii Parl. subsp. psammophilum (Zahar.) Zahar.) is a rare endemit that vegetates in the sandy places of Ialomița district: Săveni and Platonești.

It has been described for the first time by Zahariadi in Revue de Biol. VII (1962) 24-27 as *Ornithogalum psamophilum* Zahar.

It differs from the other taxa of this specie through the grouping by two of the edges from the level of the ovary and capsule, the presence of weak ditches and curved edges.

It is a taxon acknowledged by the Flora Europaea as Ornithogalum orthophyllum Ten. subsp. psammophilum (Zahar.) Zahar., Bot. Jour. Linn. Soc. 76: 356 (1978) (Ornithogalum psamophilum Zahar.). In Flora României vol. XI and the determinator of Flora României by Al. Beldie is regarded as an independent specie: Ornithogalum psamophilum Zahar.

V. Ciocârlan in Flora ilustrată a României – *Pteridophyta* et *Spermatophyta* makes the same enframement but the denomination is not techno-written as in the original treatment, but is adapted according to the taxonomic nomenclature code – subsp. psamophyllum.

¹ Secondary School "Radu Selejan" nr. 17 Sibiu, Romania Corresponding author: mirelaradutoiu@yahoo.com

Anatomical studies on psamophyle plants have also been made by other botanists (Simeanu 1975) and on representatives of the subfamily Scilloideae from which also takes part the taxon studied by the author of this writing (Răduţoiu 2007, 2009.). Up to the present there are not known anatomical studies on this taxon.

Because of the characteristical structure of the bulb, this taxons is related to *Ornithogalum orthophyllum* Ten. subsp. *kochii* (Parl.) Zahar., from which it flatly differs through the ovary and capsule which lack thickened ribs, as well as through the late blooming epoch.

MATERIAL AND METHODS

For the realisation of this study there have been made shiftings in the area of Săveni-Platonești (jud. Ialomița) for vegetal material collecting.

The collected plants have been preserved dry for a correct identification in a laboratory, based on specialized literature (Ciocârlan 2009, Tutin et al. 1980, Zahariadi 1966) and in a conserver based on absolute ethylic alcohol, glycerin and equally proportioned distilled water (Andrei & Paraschivoiu 2003).

For the completion of the species' description and to outline the possible structural differences between them, we have performed transversal sections with an anatomical razor through the vegetative organs.

The microscopic sections have been analysed using a Krüss binocular microscope (focuses of 10, 20, 40), then photographed with the help of a Nikon camera.

The measurements have been made at the MC-3 microscope. There have been taken into account the maximum individual value (V_M), minimum individual value (V_m) and the medium value (\overline{X}) which represents the arithmetical mean of the 100 individual values.

RESULTS AND DISCUSSIONS

The root has a primary structure and an average thickness of 292,5 μ m. On the exterior it has an unistratificated rhyzoderma, made of slender tangential cells (Fig. 1). It has an average thickness of 18 μ m.



Fig. 1. Root of *Ornithogalum orthophyllum* subsp. *psammophyllum* – general view (Ob. 10 x Oc. 10 – orig.)

The bark is well developed (Fig. 2); it has in it's composition and unistratificated exodermis with thin walls at the exterior, a so-called bark whose cells are spheroidal or ovoidal, with small spaces between them. Among these cells, especially in the external bark, under the exodermis, there are cells with sinuous walls (which probably have a contractile role).

The endodermis is unistratified, it presents slightly slender tangential cells and on the radial walls there can be easily noticed the Casparian strips (Fig. 3). The average thickness of the endoderma is of $9 \,\mu$ m.



Fig. 2. Root segment with rhyzoderma, bark and central cylinder of *Ornithogalum orthophyllum* subsp. *psammophyllum* (Ob. 40 x Oc. 10 - orig.)



The central cylinder has a diameter of 85,50 µm (Fig. 3).

Fig. 3. Detailed central cylinder of *Ornithogalum orthophyllum* subsp. *psammophyllum* (Ob. 40 x Oc. 10 – orig.)

The xylem conductory fascicles at the level of the cylinder are 4 and they are disposed in a cross, with the protoxylem leaned on the unistratificated pericycle and the metaxylem leaned on a big central metaxylematic vessel, common to the 4 fascicles (Fig. 3).

The average dimensions of the xylem vessels are within: $V_m = 4.5 \ \mu m$, $V_M = 13.5 \ \mu m$, having an average of $\overline{X} = 9.225 \ \mu m$.

The central xylem vessels have a size of 22,5 µm. It lacks pith.

The stem has a primary structure and an average thickness of 1755 μ m.

The epidermis is unistratified (Fig. 4), it has an average thickness of 28,125 μ m of which 1,125 μ m is the cuticle.

The bark is made of 4-5 layers of parenchymatous cells with spaces between them and with cloroplasts at the interior (stem clorenchyma)(Fig. 4).



Fig. 4. Epidermis and the bark from the stem of *Ornithogalum orthophyllum* subsp. *psammophyllum* (Ob. 40 x Oc. 10 – orig.)

The endodermis and pericycle are unobvious.

The central cylinder is well developed, at the level of the bark having a sclerenchyma ring made of 3-4 layers of cells. The rest of the central cylinder is occupied by fundamental parenchyma (Fig. 5).

The phloem-xylem conductory closed collateral fascicles are disposed on the concentric circles as it follows: an external circle made of smaller fascicles disposed in the sclerenchyma ring, a median ring whose fascicles are bigger, their phloem reaching the sclerenchyma ring and an internal circle made of 3 big fascicles (the biggest of those present in the stem) disposed in the central area of the stem.

To observe the difference of size between the conductory fascicles of the 3 concentric circles there have been made measurements. The obtained data are presented below.

The diameter of the xylem vessels:

- for the external circle: $V_m = 4,5 \ \mu m$, $V_M = 9 \ \mu m$, having an average of $\overline{X} = 5,85 \ \mu m$.

- the median circle: $V_m = 6,75 \ \mu m$, $V_M = 13,5 \ \mu m$, the average being the one of $\overline{X} = 10,58 \ \mu m$.

- the internal circle: $V_m = 11,25 \ \mu m$, $V_M = 22,5 \ \mu m$, havin an average diameter of $\overline{X} = 16,20 \ \mu m$.

The fundamental parenchyma is made of spheroidal and ovoidal cells, with spaces between them (Fig. 5).

The fundamental parenchyma's cells contain raphides. Around the conductory fascicles from the median and internal circle there cannot be found sclerenchymatous fasciculary pod. It lacks pith.



Fig. 5. Epidermis, bark and a part of the stem's central cylinder of *Ornithogalum* orthophyllum subsp. psammophyllum (Ob. 40 x Oc. 10 – orig.)

CONCLUIONS

From the structural point of view the root and the stem of *Ornithogalum* orthophyllum subsp. psammophyllum have a primary structure.

The root has an unistratified rhizodermis, a well developed bark with cells with sinuous walls having a role in deepening the bulb in soil and a central cylinder at which the

conductory fascicles are 4 and disposed in a cross. The center of the root is occupied by a big xylem vessel.

The stem has a well developed central cylinder. The endodermis and the pericycle are unobvious. The conductory fascicles of the stem are disposed on 3 concentric circles. The diameter of these fascicles grows from the exterior of the stem to the center of it.

BIBLIOGRAPHY

- 1. Andrei M., Paraschivoiu Roxana Maria. *Microtehnică botanică*, Ed. Niculescu, București. 2003.
- Răduţoiu Maria Ionela.. Morpho-anatomical consideration at Scilla bifolia subsp. bifolia. Lucrări ştiințifice. Agricultură, Montanologie, Cadastru. Annals of the University of Craiova. Vol. XXXVII/A. pp. 347-351. Craiova. 2007.
- Răduţoiu Maria Ionela.. Morpho-anatomical consideration at Scilla bifolia subsp. subtriphylla. Lucrări ştiințifice. Agricultură, Montanologie, Cadastru. Annals of the University of Craiova. Vol. XXXVII/A. pp. 351-354. Craiova. 2007.
- Răduţoiu Maria Ionela.. Anatomical studies of the vegetative organs of Scilla autumnalis. Annals of the University of Craiova. Seria Biologie, Horticultură, Tehnologia prelucrării produselor agricole, Ingineria Mediului. Vol. XIV (XLX). pp. 541-546. Craiova. 2009.
- 5. Simeanu V. *Studiul morfologic și anatomic al plantelor psamofile din Oltenia*. Teză de doctorat. București. 1975.
- Tutin T. G., Heywood V. H., Burges N. A., Moore D. M., Valentine D. H., Walters S. M., Webb D. A. & al. *Flora Europaea*. Vol. V. 35-48 pp. Cambridge University Press. Cambridge. 1980.
- 7. Zahariadi C. *Liliaceae* in Tr. Săvulescu & al. (ed.). *Flora României*. Vol. XI. București: Edit. Academiei Române. 1966.

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

Seria: ✓ Biologie ✓ Horticultură ✓ Tehnologia prelucrării produselor agricole

🖌 Ingineria mediului

Vol. XVI (LII) - 2011

MORPHO-ANATOMICAL STUDIES AT THE VEGETATIVE ORGANS OF MUSCARI COMMUTATUM GUSS. SPECIES FROM ROMANIA

Răduțoiu Maria Ionela¹

KEY WORDS: structure, morphology, Muscari commutatum, Romania.

ABSTRACT

Summary: The morpho anatomical research made on this specie come to fill in the existent data. Up to the present there are no known data over the anatomy of this specie. In the root's structure it can be noticed the alternation of 5 xylem conductory fascicles with 5 liberian fascicles.

In the stem's structure it can be noticed the predomination of the central cylinder in the detriment of the other areas. The leaf has an equifacial structure.

In almost all of the vegetative organs of this plant can be found acicular crystals of calcium oxalate.

INTRODUCTION

Muscari commutatum is a very rare specie for the flora of Romania. It belongs to the subfamily of Scilloideae from Liliaceae.

In Romanian Flora vol. XI, page 353 it is mentioned that the specie has been collected by A. Richter, but without being determined, and that it might be found at the herbarium of Cluj in numerous samples glued on 3 sheets of paper. After consulting the material from the herbarium of Cluj there is no paper for *Muscari commutatum* although in Flora României vol. XI it is said that there are 3 undetermined papers with lots of samples. The three papers are acually included at *Muscari neglectum*. It cannot be found written on the three papers who made this determination.

Beldie Al. 1979 vol. II - he classifies it at: *Muscari racemosum* (L.) Mill. subsp. *commutatum* (Guss.) Beldie – flower 5-7 mm long. The capsule's valves are 5-8 mm long.

Ciocârlan V. 2009 presents this taxon as we do too from the taxonomical position's point of view.

Similar data on other taxa of the Scilloideae subfamily are found in other papers too (Rădu oiu 2007, 2009).

MATERIAL AND METHODS

The work method in the realization of this study is the classic one. There have been shiftings on the field for the collecting of vegetal material, furthermore the material

¹ Secondary School "Radu Selejan" nr. 17 Sibiu, Romania Corresponding author: mirelaradutoiu@yahoo.com

has been conserved in a compound based on absolute ethylic alcohol, glycerin and equally proportioned distilled water after which there have been performed transversal sections on the vegetative organs of it.

For the study over the foliar epidermis and the epidermal productions we have used the peeling technique (tangetial sections)

The microscopic sections have been analysed using a Krüss binocular microscope (focuses of 10, 20, 40), then there have been taken photographies of them with a Nikon camera.

The measurements have been made with the MC-3 microscope. There have been made 100 measurements and countings for each (epidermal cells, stomata). There have been taken into consideration the maximum individual value (V_M), the minimum individual value (V_m) and the average value (\overline{X}) which represents the arithmetical mean of the 100 individual values.

RESULTS AND DISCUSSIONS

From the morphologic point of view this specie sembles with the other spontaneous species of Romania. The difference between it and the rest is especially at the level of the perigone. *Muscari commutatum* has a violet perigone with lighter blue teeth for fertile flowers and light blue for sterile flowers.

In transversal sections the root has a primary structure (Fig. 1) and an average thickness of $495 \ \mu\text{m}$. At the exterior it is found an unistratified rhizodermis, with an average thickness of $16,875 \ \mu\text{m}$.



Fig. 1. Root of Muscari commutatum - general view (Ob. 20 x Oc. 10 - orig.)

The bark is differentiated in the exodermis, cortical parenchyma and endodermis.

The exodermis is made of polygonal cells with thin walls. It has an average thickness of 24,75 $\mu m.$

The cortical parenchyma is pluristratified, having in its composition spheroidal or ovoidal cells, randomly disposed, with space between them. Some of the bark's cells have acicular mineral crystals which through sectioning jut out of the cells.

The endodermis is unistratified and has an average thickness of 11,25 μ m. It's cells are tangentially slender and have Casparian strips.

The central cylinder presents at the exterior an unistratified pericycle with cells smaller than the ones of the endodermis (Fig. 2).

In the fundamental parenchyma there can be found 5 xylem conductory fascicles alterning with 5 liberian conductory fascicles (Fig. 2). All the fascicles come in contact with a big xylem vessel centrally situated (Fig. 2), vessel which has a diameter of 29,25 μ m.

The liberian vessel's diameter is between the following values: $V_m = 2,25 \ \mu m$, $V_M = 9 \ \mu m$ with an average of $\overline{X} = 5,4 \ \mu m$. The xylem vessels have an varied diameter ($V_m = 4,5 \ \mu m$, $V_M = 13,5 \ \mu m$) with an average of $\overline{X} = 9,675 \ \mu m$.



Fig. 2. Central cylinder from the root of Muscari commutatum (Ob. 40 x Oc. 10 - orig.)

The medullary parenchyma lacks, it's place being occupied by a xylem conductory vessel.

The stem has a primary structure and an average thickness of 1980 μ m.

The epidermis is unistratified, it has tangetially slender cells, strongly cutinized tangetial walls (Fig. 3) and the cuticula layer having an average thickness 1,8 μ m. The epidermis' average thickness is of 33,75 μ m.

The bark is parenchymal, it has in it's composition spheroidal or ovoidal cells (Fig. 3), with spaces between them, at the interior chloroplasts and an random disposition. It has an average thickness of 225 μ m. Comparing to the central cylinder the bark is much more smaller.

The endodermis is under the form of amylipheric pod and is visible only in some areas.



Fig. 3. Segment of the epidermis and bark from the stem of *Muscari commutatum* (Ob. 40 x Oc. 10 – orig.)

The central cylinder is well developed, at the exterior it has a pluristratified pericycle at which the cells have sclerenchymatized walls (Fig. 4). It has the 72 μ m. It is an atactostele cylinder with randomly disposed conductory fascicles, in the central area they are bigger and as we get near the pericycle those diminish their size. The conductory fascicles are collaterally closed.



Fig. 4. Pericycle, conductory fascicles and part of the fundamental parenchyma from the stem of *Muscari commutatum* (Ob. 40 x Oc. 10 – orig.)

The phloem vessels have an average diameter of \overline{X} = 4,05 µm, the minimum value being of V_m = 2,25 µm and the maximum value of V_M = 6,75 µm.

In contrast to the phloem one, the xylem vessels are much more bigger. From the measurements there have resulted the following values : $V_m = 4,5 \ \mu m$, $V_M = 13,5 \ \mu m$, the average being of $\overline{X} = 8,55 \ \mu m$. The medullary parenchyma lacks, his place being taken by the fundamental parenchyma.

The leaf has an equifacial structure (Fig. 5) and an average thickness of 540 $\mu m.$ On the inferior surface it can be found 15 edges.



Fig. 5. Transversal section through the leaf of Muscari commutatum (Ob. 20 x Oc. 10-orig.)

The superior epidermis is composed of a sole layer of cells with slightly cutinized tangetial walls. The cells of the epidermis have convex external walls, a cuticule thick of $0.9 \ \mu m$ and an average thickness of $33.75 \ \mu m$.

The side walls are straight, and the cells are orderly disposed in longitudinal successions. The length of these epidermal cells has values between: $V_m = 171 \ \mu m$, $V_M =$ 540 µm, with an average of \overline{X} = 370,35 µm and the width of: V_m = 18 µm, V_M = 27 µm, with an average of $\overline{X} = 22,05 \ \mu m$.

Among the epidermal cells there can be found aperigenous stomata, orderly disposed in longitudinal successions. The length of the stomata reaches similar values: V_m = 33,75 μ m, V_M = 38,25 μ m (\overline{X} = 35,78 μ m) alike the density by mm² (V_m = 0,1413 stomata / mm², V_M = 0,2355 stomata / mm², the average being of \overline{X} = 0,19782 stomata / mm^2).

The palisadic parenchyma is made of a sole layer of radiary slightly slender cells without space between them.

The lacunous parenchyma is well developed, made of spheroidal, ovoidal, big cells with space between them. Some cells contain acicular crystals which after the cell's section can easily be emphasized.

The palisadic parenchyma above the inferior epidermis is composed of 2 layers of slender cells without spaces between them.

The inferior epidermis is made of a sole layer of cells with strongly cutinized external walls and the internal ones being lesser cutinized and tangential. The cells of this epidermis are radiary slender, have an average thickness of 38,85 µm and a cuticula much more thicker compared to the one at the level of the superior epidermis $(2,25 \,\mu\text{m})$.

After the detaching of the inferior epidermis from the leaf's mesophyle and it's microscopic analysation it has been noticed that it's cells are slender, have straight thin side walls and are orderly disposed in longitudinal successions. The trichomes missing.

The length and width of the inferior epidermis' cells reach different values:

- for the length: $V_m = 279 \ \mu m$, $V_M = 742.5 \ \mu m$, $\overline{X} = 456.3 \ \mu m$;

- for the width: $V_m = 13,5 \ \mu m$, $V_M = 22,5 \ \mu m$, $\overline{X} = 18 \ \mu m$. The stomata have the same composition, approximatively the same length ($V_m =$ 36 μ m, V_M = 40,5 μ m, \overline{X} = 39,15 μ m) and density (V_m = 0,0942 stomata / mm², V_M = 0,2355 stomata / mm², the average being of $\overline{X} = 0,15543$ stomata / mm²) as the ones at the superior epidermis.

The liberian and xylem vessels from the level of the conductory vessels from the leaf have approximatively the same size as the ones from the level of the conductory fascicles from the stem (for xylem vessels: $V_m = 4,5 \ \mu m$, $V_M = 20,25 \ \mu m$, $\overline{X} = 9,45 \ \mu m$ and for the liberian ones: $V_m = 2,25 \ \mu m$, $V_M = 6,75 \ \mu m$, $\overline{X} = 5,4 \ \mu m$).

CONCLUSIONS

The data presented in the paper come to fill up the diagnosis of this very rare specie of Romania's flora.

The anatomical studies contribute to the differentiation of this specie from other related to it. The root and the stem have a primari structure. Unlike other species from Scilloideae (Ornithogalum sp.) at which the number of conductory fascicles was 4, at *Muscari commutatum* these are 5 at the level of the root.

The leaf has an equifacial structure, on the inferior surface being noticeable 15 edges.

The xylem an liberian conductory vessels from the stem and leaves have approximatively the same size.

BIBLIOGRAPHY

- 1. Beldie Al. *Flora României determinator ilustrat al plantelor vasculare*. 406 pag. Edit. Academiei Române. București. 1979.
- 2. Ciocârlan V. Flora ilustrată a României. Pteridophyta et Spermatophyta. 1041 pag. Edit. Ceres, București. 2009.
- Răduţoiu Maria Ionela. Morpho-anatomical consideration at Scilla bifolia subsp. bifolia. Lucrări ştiinţifice. Agricultură, Montanologie, Cadastru. Annals of the University of Craiova. Vol. XXXVII/A. pp. 347-351. Craiova. 2007.
- Răduţoiu Maria Ionela. Morpho-anatomical consideration at Scilla bifolia subsp. subtriphylla. Lucrări ştiințifice. Agricultură, Montanologie, Cadastru. Annals of the University of Craiova. Vol. XXXVII/A. pp. 351-354. Craiova. 2007.
- Răduţoiu Maria Ionela. Anatomical studies of the vegetative organs of Scilla autumnalis. Annals of the University of Craiova. Seria Biologie, Horticultură, Tehnologia prelucrării produselor agricole, Ingineria Mediului. Vol. XIV (XLX). pp. 541-546. Craiova. 2009.
- 6. Zahariadi C. *Liliaceae* in Tr. Săvulescu & al. (ed.). *Flora României*. Vol. XI. București: Edit. Academiei Române. 1966.

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

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

Vol. XVI (LII) - 2011

GENETIC VARIABILITY ASSESMENT IN TWO GENTIANA CRUCIATA POPULATIONS BY THE MEANS OF SSR MARKERS

Paul Raica¹, Doru Pamfil¹, Constantin Botez¹

KEYWORDS: Gentiana cruciata, molecular markers, SSR.

ABSTRACT

The amount of genetic variation in the rare herb G. cruciata was determined in order to explore its relation to population size. We surveyed two populations of G. cruciata by SSR markers. Ten sequence specific primer pairs were used in order to asses the genetic variability within and between the studied populations. Our studies revealed different levels of genetic variability within populations correlated with the grazing policies.

INTRODUCTION

Conservation and utilization of genetic diversity in plants depends largely on the availability of information regarding the distribution of genetic diversity within species of interest. This information would allow making the best decision on what should be preserved for conservation, would improve operations management and would enable those concerned, to identify the biological material that has the characteristics of interest. Information may be obtained on the basis of morphological or physiological studies, biochemical markers (proteins or isoenzymes), or other molecular markers able to reveal genetic variability.

Development of DNA molecular marker techniques have facilitated the speed, simplicity and efficiency, of genetic variability study.

Gentianaceae family includes a number of medicinal plants that have been used since ancient times. This plant is used in many natural remedies recipes. Some species of the *Gentiana* genus are grown for their pharmaceutical importance, whilst others for ornamental value. These species are valuable not only for their practical and economic importance, but also for their value in their natural landscape.

Romania is considered to be an important centre of biodiversity on the map of Europe, counting many rare or endemic species despite this there are just a few studies regarding the genetic diversity in natral populations. However there are very few studies of genetic diversity in natural populations.

MATERIALS AND METHODS

Biological material was collected from two populations of the *G. cruciata* species, one of which is located in subalpine zone from Scărița – Belioara protected area (individuals noted

¹ University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca

CRS) and one in a hilly area on the pasture in the north of Sălicea village (individuals noted CRF) the two populations are situated 26 km apart.

In terms of areas occupied by these two populations we have met two different situations. The first case is the population located on the protected area of Scărița Belioara, where the population is occupying large areas within and beyond the protected area which is located on the west plateau of the reserve. However the density of individuals within the protected area is much higher than in surrounding areas. The second situation is met in the Sălicea population, where individuals grow clustered in small areas, consisting of a low number of individuals. This uneven distribution is probably due to grazing. Thus, the individuals are spread on this grassland area at very low frequency and with big distances between each other. However, in some small areas, unused for grazing, their number was significantly increased.

Sample material consisted in leaves, collected from ten individuals belonging to Scărița-Belioara population and ten individuals from Sălicea population.

For DNA extraction we used an extraction protocol published by Lodhi et al (1994) and modified by Rodica Pop et al (2003).

The sequences of the primers used for this study were published by Li et al. (2007). Amplification was carried out using a Eppendorf Mastercycler Gradient[®] PCR machine. Tehe program used for SSR markers was a Touchdown PCR technique. Amplification products were migrated using a 6%denaturating polyacrylamide gel, for 1.5 hours at 500 V, in $0.5 \times TBE$ buffer. Gel images analysis and band scoring was carried out by using Total Lab TL120 software.

Data analysis for codominant data (Write's F statistics, genetic distance calculation and principal coordinate analysis) was carried out using GenAlEx software package (Peakall 2006), genetic distances for data considering dominant and dendrograms were constructed using PHYLIP 3.69 software package (Felsenstein, 1989).

Due to the tetraploid nature of the *G. cruciata* species data obtained from amplifications with SSR primers were centralized in a binary matrix (the presence of each allele was scored with 1 -allele present- and 0 -allele absent). Binary matrix was then processed by statistical methods specific for dominant markers. Nei / Li (Dice) genetic distances were calculated using FreeTree 0.9.1.50 software (Hampl et al., 2001).

RESULTS AND DISCUSSIONS

Eight out of the ten primers pairs tested generated amplification products. Thus the Gcr138 and Gcr023 primers pairs did not generated amplification products. Due to the tetraploid nature of the species, with some primers pairs, up to four alleles per individual were obtained.

Gcr023 primer pair identified a number of five alleles with sizes ranging between 219 and 237 base pairs, up to two alleles per individual. Gcr059 primer pair revealed four alleles (113 to 182 bp). both smaller and longer than those previously reported (Li et al., 2007). But only one allele (113 bp) presented polymorphism. At the locus Gcr074, was found one allele (366 bp) (smaller than expected), present in ten out of the twenty individuals analyzed.

Primer pair Gcr128 revealed two types of amplification products. Thus a first amplification product category is represented by two alleles with sizes of 212 and 252 bp. These two alleles had similar dimensions to those reported by Li et al. (2007). A second category of products consists of four amplified fragments with sizes 140, 152, 158 and 175 bp, smaller than initially reported by Li et al. (2007). In the case of these fragments we identified between two to four alleles per individual. Allele of 140 bp size is present in all individuals while the allele of 152 bp is present in the majority of the individuals (except one) who also have 212 bp allele. 158 bp allele is present only in individuals witch presented also 252 bp allele. With the exception of one individual, allele size of 175 bp is found in individuals carrying the alleles of 158 bp and

252 bp respectively. The existence of two types of amplicons can be explained by the duplication of the loci, followed by their independent evolution (Avner et al., 2008).

Gcr169 locus presented two alleles (155 and 159 bp). 159 bp allele was present only eight individuals in the population from Scărița-Belioara and 155 bp allele was present in all individuals of the population of Sălicea. Gcr186 primer pair revealed a number of five alleles, (188 to 217 bp). 200 bp allele is a unique allele, being present only at one individual belonging to the Sălicea population. At this locus we found two alleles per individual and all the individuals examined were heterozygous. Gcr197 primer pair revealed six alleles, (196 to 217 bp). At this locus have been identified between two to four alleles per individual. A total of four alleles, (256 bp to 290 bp) were identified in the locus Gcr231 with two alleles per individual.

Out of the seven loci that presented at least two alleles per individual, five had two alleles per individual, a situation characteristic to tetrasomic inheritance model, found in autotetraploids (Marc et al., 2008). At Gcr197 locus were identified between two and four alleles per individual, a situation encountered in allotetraploid species following the disomic model (Marc et al., 2008). Locus Gcr128presents a more complex situation considering that the two categories of alleles identified are subject to different models. Such alleles 212 and 252, which have dimensions similar to those of other species (Li et al., 2007), are probably ancestral forms of alleles of this locus. We can say that these alleles are subject of tetrasomic model of inheritance. Following duplication of this locus in the genome sequence, copies have evolved independently, other new alleles occurring, but apparently following the disomic model.

Analysis based on SSR markers can lead to the conclusion that the *G. cruciata* species is an autotetraploid and the disomic model fond at the two loci is the result of divergent evolution of chromosomes forming quadrivalents, leading to partial homolog chromosomes that do not always form quadrivalent chromosomes, and thus lead to independent segregation of alleles.

Considering SSR alleles as dominant markers, the calculated average distance for the Scărița-Belioara population was 0.411, significantly lower (p = 0.024) than the average distance found across species (0.465). The average distance between individuals of the Sălicea population has a value of 0.439, differing slightly from the average distance of the species.

The calculated values for the observed heterozygosity (Ho), expected heterozygosity (He), fixation indices (F) and the likelihood and significance of χ^2 test for Hardy-Weinberg equilibrium are shown in Table 1.

Although both populations analyzed showed an excess of heterozygous majority of the analyzed loci, the genetic structure of populations are not significantly different from the structure expected for populations in genetic equilibrium. Thus only one locus (Gcr186) manifested a heterozygous excess, significantly different from that expected for populations in equilibrium.

The high genetic variability observed in the population located in Sălicea, population with a small number of individuals, can be explained on one hand by the large number of individuals who were analyzed in relation to the total number of individuals of the population, and on the other hand by the higher adaptability of the heterozygote. Thus, although populations differed greatly in the number of individuals ten individuals from each population were analyzed, leading to different proportions of analyzed individual. A similar situation is encountered by Leon et al. (1994) in a study of *Gentiana pneumonanthe* species, who observed a high genetic variability in small populations, where they analyzed a large proportion of individuals. Taking a large study sample compared to the total number of individuals from a population, can lead to an overestimation of genetic variability in small populations (Leon et al., 1994).

Another possible cause for the high genetic variability observed in the Sălicea population resides in the different adaptability of heterozygotes. Thus, it is assumed that in cross-fertilized species, heterozygous individuals, more vigorous due to the heterosis effect, and thus are more likely to survive under stress condition, compared with homozygous individuals (Leon et al., 1994). This selection leads to changes in allele frequency, and remove from Hardy-Weinberg genetic equilibrium in the direction of heterozygous excess.

Table 1

Analysis of genetic variability based on the proportion of heterozygote and genetic equilibrium analysis based on SSR allele frequencies in the *G. cruciata* species. (N - number of individuals, Na - number of alleles, Ne - effective number of alleles, Ho - observed proportion of heterozygote. He - expected proportion of heterozygote. F - fixation index)

neurozygow, rie - expected proportion of neurozygow, r - nxation index)										
Рор	Locus	Ν	Na	Ne	Ho	He	F	χ2	DF	р
CRS	Gcr023	10	5	3,509	0,700	0,715	0,021	11,389	10	0,328
	Gcr059	10	2	1,471	0,400	0,320	-0,250	0,625	1	0,429
	Gcr128	10	2	1,600	0,300	0,375	0,200	0,400	1	0,527
	Gcr169	8	1	1,000	0,000	0,000	-		-	
	Gcr186	9	3	2,219	1,000	0,549	-0,820	9,000	3	0,029
	Gcr231	9	1	1,000	0,000	0,000	-		-	
	Mean	9,333	2,33	1,800	0,400	0,327	0,212			
	SX	0,333	0,615	0,388	0,161	0,118	0,182			
CRF	Gcr023	10	5	4,651	0,500	0,785	0,363	17,000	10	0,074
	Gcr059	10	2	1,220	0,200	0,180	-0,111	0,123	1	0,725
	Gcr128	10	2	1,980	0,500	0,495	-0,010	0,001	1	0,975
	Gcr169	10	1	1,000	0,000	0,000	-		-	
	Gcr186	10	4	2,439	1,000	0,590	-0,695	30,000	6	0,000
	Gcr231	10	2	1,342	0,300	0,255	-0,176	0,311	1	0,577
	Mean	10,000	2,667	2,105	0,417	0,384	0,126			
	S _x	0,000	0,615	0,554	0,140	0,119	0,155			
Total	Mean	9,667	2,5	1,953	0,408	0,355	0,164			
	S _x	0,188	0,417	0,326	0,102	0,080	0,111			

Overestimation of genetic variability for the Sălicea population is supported by the evolution of the population demography, as fewer individuals were observed in the population as time passed from 2005 to 2011. All along during this period the number of individuals decreased and the population consists mostly of mature individuals. Lack of descent is probably due more intense grazing of these grasslands, leading to inability of the plant to produce seeds by destruction of plants before fruit maturation.

Table 2:

Analysis of molecular variance based on the genetic distance calculated by Nei distance coefficient using SSR markers results, in the G. cruciata species.

Source	df	SS	Estimated variance	(%)	$\Phi_{\rm ST}$	р
Among populations	1	19.900	1.719	39%	0.388	< 0.001
Between populations	18	48.800	2.711	61%		
Total	19	68.700	4.430	100%		

PCA analysis performed on calculated genetic distances reveals two distinct groups corresponding to the two populations (Figure 1). Analysis of molecular variance (Tables 2) and Fst coefficient (F_{ST} = 0.203), performed for the two types of data used (SSR considered as codominant and dominant markers), revealed a significant isolation of the two populations. However the number of migrants per generation, estimated based on SSR

allele frequency between the two populations is relatively high (Nm = 14.17), which may be due to the existence of some population interspersed between the analyzed populations.

Based on genetic distances calculated by Dice coefficient for SSR dominant markers, and based on Nei standard genetic distance coefficient for SSR codominant markers two dendrograms were generated (Figure 2). As can be seen in the dendrogram according to analysis of SSR codominant markers (Figures 2b), the two populations are clearly defined, individuals are grouped according to population of origin. If tetraploid SSR analysis, although there is a pretty obvious trend of grouping individuals according to population of origin, though some individuals are grouped together with individuals from another population (Figure 2a). This group is most likely due to migration actually evidentiated also by the analysis of alleles frequency.



CONCLUSIONS

Figure 1: a Graphical representation of principal coordinate analysis based on SSR markers in G. cruciata species. ; b Graphical representation of principal coordinate analysis based on SSR markers considered as dominant markers in G cruciata species.



Genetic variability found in the Scărița-Belioara population is lower than that found in

Figure 2: Dendrograms drawn by UPGMA method based SSR considered as codominant markers (a) and SSR considered dominant (b), in *G. cruciata* species.

the population located in Sălicea village pastures, but these results can be influenced by the overestimation of the variability found in Sălicea village pastures. These results can point to the conclusion that laboratory data have to be corroborated with the field data in order to find the correct conclusions. Although the two populations are isolated, the calculated number of migrants per generation is quite high, due to the existence of some interspersed populations between the analyzed populations. SSR markers based analysis can lead to the conclusion that the species is a autotetraploid species *G. cruciata* and the met tretrasomic model for the two loci is the result of divergent evolution of chromosomal fourfold, leading to partial chromosome counterparts, which do not form always tetravalent chromosomes, and thus lead to segregation of alleles independent.

Acknowledgements

This work has benefited from financial support through the 2010 POSDRU/89/1.5/S/52432 project, "Organizing The National Interest Postdoctoral School Of "Applied Biotechnologies" With Impact On Romanian Bioeconomy", project co-financed by the European Social Fund through the Sectoral Operational Programme Human Resources Development 2007-2013.

BIBLIOGRAPHY

1. AVNER CNAANI, ȘI THOMAS D. KOCHER, Sex-linked markers and microsatellite locus duplication in the cichlid species Oreochromis tanganicae, Biol. Lett. 4, 700–703. 2008

2. FELSENSTEIN, J., PHYLIP - Phylogeny Inference Package (Version 3.2). Cladistics 5: 164-166. 1989.

3. HAMPL, V., PAVLÍCEK A., FLEGR J., Construction and bootstrap analysis of DNA fingerprinting-based phylogenetic trees with the freeware program FreeTree: application to trichomonad parasites. Int J Syst Evol Microbiol, 51: 731–735. 2001.

4. LEON, E. L. RAIJMANN, NICO C. VAN LEEUWEN, RALPH KERSTEN, J. GERARD B. OOSTERMEIJER, HANS C. M. DEN NIJS, STEPH B. J. MENKEN, Genetic Outcrossing Rate in Relation toVariation and Population Size in Gentiana pneumonanthe L., Conservation Biology, 8(4): 1014-1026. 1994.

5. LI, Y., LI L. F., CHEN G. Q., GE X. J., Development of ten microsatellite loci for Gentiana crassicaulis *(Gentianaceae)*, Conservation8 Genetics,: 1499–1501. 2007.

6. LODHI, M., A., GUANG-NING Y., N. F.WEEDEN, B.I. REISCH, A simple and efficient method for DNA extraction from grapevine cultivars, Vitis species and Ampelopsis, Plant Molecular Biology Reporter, 12 (1): 6-13. 1994.

7. MARC STIFT, CAMILLO BERENOS, PETER KUPERUS ȘI PETER H. VAN TIENDEREN, Segregation Models for Disomic, Tetrasomic and Intermediate Inheritance in Tetraploids: A General Procedure Applied to Rorippa (Yellow Cress) Microsatellite Data, Genetics 179: 2113–2123. 2008.

8. PEAKALL, R. şi SMOUSE P. E., GENALEX 6: genetic analysis in Excel. Population genetic software for teaching and research, Molecular Ecology Notes, 6: 288-295. 2006.

9. POP, R., M. ARDELEAN, D. PAMFIL, IOANA MARINA GABOREANU, The efficiency of different DNA isolation and purification in ten cultivars of Vitis vinifera., Bul. USAMV Nr. 59, seria ZB, 259-261. 2003.

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

Seria:

Biologie

 ✓ Horticultură
 ✓ Tehnologia prelucrării produselor agricole

🖌 Ingineria mediului

Vol. XVI (LII) - 2011

ECOLOGICAL CAPACITY OF ADAPTATION OF THE TABLE GRAPES VARIETIES IN THE AREAS WITH SANDY SOILS FROM SOUTHERN OLTENIA

Ră oi I.1

Cuvinte cheie: sandy soils, vine, table grapes, adaptation.

ABSTRACT

The study was effectuated at Research and Development Station for Plants on sands Dăbuleni, in 2010 year, in new collection ampelographic. Were planted 16 varieties of grapes, 12 of which are new to the sandy soils in southern Oltenia and 4 have existed in ancient ampelographic collection. Of each variety were planted about 20 or 40 vines. He watched their ecological adaptation, expressing themselves by fixing the rate of planting and vigor vines at the end of vegetation. Varieties were emphasized Transilvania, Tamina, Moldova, Coarnă neagră selec ionată.

INTRODUCTION

Grape, must and wine have economic value, nutritional value and medicinal value. Due to these advantages the use of table grapes is increasing and as such should be extended areas under such culture (Baniță P., Vlădoianu Em., 1979; Dejeu L.C., and all., 2008; Celso V. Pommer, 2006; Edit Hajdu, 2007; Herrmann E., Andersen M.D., 2007; Jenifer M. Hashim, 2009), and improving of range (Martin T. And all., 1974; Liliana Rotaru, 2005; Peter D. Oldak, 2007; Dumitru I., and all., 2007; Cichi Daniela Doloris, Costea D.C., 2008; Popa Camelia and all., 2008; Popa Camelia and all., 2009). The economic value of table grape varieties is given mainly by the production of commodity (Oşlobeanu M., and all., 1980).

The analysis of climatic conditions on our territory showed that sandy soils are very favorable within the area table grape varieties (Martin T. and all., 1974; A. M. A. M. Bishtawi, Popa A., 2005; Cichi Daniela Doloris and all., 2008;). However during the life of the vines is shorter due mainly negative minimum temperatures in winter, which sensitizes the plant and increase the risk of bacterial cancer (*Agrobacterium tumefaciens*), (Baniță P., 1983).

MATERIAL AND METHOD

The studied varieties, planting in 2010 year, were the following: Silvania, Timpuriu de Cluj, Muscat de Hamburg Cl. 4 Pt., Tamina, Someşan, Splendid, Napoca,

e-mail: iulianratoi@yahoo.com

¹ Research- Development Station for Agricultural Plants on Sands- Dabuleni;

Victoria, Prima Cl. 1022, Coarnă neagră selecționată, Muscat de Hamburg Cl. 202, Transilvania, Afuz-Ali, Italia, Perla de Zala, Moldova.

The fertilization, at land preparation, maked with 60 t/ha manure, 300 kg/ha Complex 15 15 15. At planting were applied 5 Kg/pit manure semifermentated.

In vegetative period, in may month, was applied 100 kg/ha Complex 15 15 15.

To combat pests and diseases, we performed a total of 11 chemical treatments, 3 with Ridomil plus 48 - 0.3% + Sulfomat 0.5%, 3 with Shavit 0.2%, 3 with Champion 0.3% + Sulfomat 0.5% and 2 with Dithane 0.2% + Sulfomat 0.5%.

Were effectuated the following experimental observations and measurements:

- entry in vegetation;

- planting rate of catching;

- the number of eyes trained on the block during the year;

- annual increases total length;

- number of shoots with thickness exceeding 6 mm at the second internode.

RESULTS AND DISCUSSIONS

The climatical conditions from 2010 year were favorable for young plantations and vineyards (Table 1). Precipitation had a positive effect for established plantings in the spring, they received enough water, have created favorable conditions for growth of rooted shoots catching.

Table 1

Month	Air temperature (°C)			Rainf	fall (mm)	Relative humidity	
	minimum	average	maximum	2010 year	Average on 55 years	of air (%)	
Ι	-24,5	-3,4	10,1	12,6	25,8	92,7	
II	-15,8	-0,6	12,5	59,2	29,4	90,3	
III	-8,3	5,8	22,4	54,0	26,8	74,9	
IV	0,0	12,1	22,7	38,4	43,7	75,8	
V	5,8	16,8	30,1	<u>99,6</u>	46,7	73,0	
VI	6,9	20,8	35,4	<u>121,4</u>	63,2	76,0	
VII	12,7	23,2	35,0	<u>42,4</u>	55,5	73,5	
VIII	7,2	24,1	38,5	11,8	40,0	65,2	
IX	4,8	17,7	32,5	9,6	46,8	67,9	
X	-4,6	9,1	20,1	<u>9,6</u>	48,3	81,5	
XI	-3,5	9,4	26,9	54,4	31,7	86,4	
XII	-17,8	-1,4	16,9	100,6	53,7	91,0	
Total	-	-	-	613,8	511,6	-	

Main climatical data from 2010 year recorded at the meteorological station CCDCPN Dăbuleni

Negative minimum temperatures registered in winter did not affected the vineyards because vines were planted in spring 2010 (Table 1). Rainfall in May and June, registered on a great number of days (99.60 mm in 15 days in May and 121.40 mm in 16 days in June) had a favorable effect for plantations established in the Spring. This received enough water, have created favorable conditions for vines catching and for increases of shoots.

At the *Transilvania variety*, all planted vines have developed normally (Table 2). In others, losses ranged between 1 and 9 vines, and 2.5% in the varieties *Coarnă neagră selecționată* and *Muscat Hamburg Cl. 202*, and 25% for the variety *Some an*.

Daily average rate of growth of shoots was determined in the period May 5 to August 13 because after that time the most peaks sprout growth was affected by major diseases of vines, *Plasmopara Viticola* and *Uncinula Necator*. Overall average rate of growth of shoots daily recorded values below par. A single variety registered an daily average rate of growth of shoots greater than 1, namely 1.15 cm/shoot during the period under review, it was variety of *Moldova*, which is a hybrid between a nobleman variety and a variety HPD (Table 3). In other varieties the daily average rate of growth of shoots registered values ranging from 0.50 cm (variety *Prima Cl. 1022*) and 0.95 cm (*Timpuriu de Cluj and Transilvania*).

Table 2

Variety	Number of plantig vines	Remaining vines		Number of vines sickly or feeble	
		nr.	%	nr.	%
Silvania	40	33	82,5	7	17,5
Timpuriu de Cluj	20	18	90	2	10
Muscat de Hamburg Cl. 4 Pt.	40	36	90	4	10
Tamina	20	19	95	1	5
Someşan	20	15	75	5	25
Splendid	40	37	92,5	3	7,5
Napoca	20	17	85	3	15
Victoria	40	31	77,5	9	22,5
Prima Cl. 1022	40	31	77,5	9	22,5
Coarnă neagră selecționată	40	39	97,5	1	2,5
Muscat de Hamburg Cl. 202	40	39	97,5	1	2,5
Transilvania	40	40	100	-	-
Afuz-Ali	40	38	95	2	5
Italia	40	38	95	2	5
Perla de Zala	40	38	95	2	5
Moldova	40	37	92,5	3	7,5

Percentage of vines developed normally at the end of vegetation table grape varieties

The vigour of vines is shown by the length of the annual total number of nodes formed on vine (Table 4). The total length of recorded annual increases in value with a range between 173 cm/vine variety *Victoria*, and 507 cm/vine variety *Transilvania*. With good results in this regard were highlighted varieties *Moldova* (416 cm/vine) and *Tamina* (453 cm / vine). Poorer results were achieved and variety *Timpuriu de Cluj* (185 cm/vine) and *Somesan* (188 cm/vine).

Although internodes length is character variety, the number of nodes formed on a

vines approximately proportional to the length annual total. The largest number of nodes to form the variety *Transilvania* (120/vine) and the lowest, the variety *Victoria* (39/vine).

Table 3

Variety	05-14.07	15-24.07	25.07-	04-13.08	Average
			03.08		
Silvania	1,0	0,6	0,5	0,1	0,55
Timpuriu de Cluj	1,1	0,6	0,4	0,7	0,95
Muscat de Hamburg Cl. 4 Pt.	1,1	0,9	0,4	0,5	0,72
Tamina	0,5	0,7	0,5	1	0,67
Someşan	0,6	1,0	0,3	0,7	0,65
Splendid	0,9	1,0	0,3	0,3	0,62
Napoca	1,1	0,5	0,3	0,4	0,57
Victoria	0,8	0,7	0,4	0,2	0,52
Prima Cl. 1022	0,7	0,4	0,4	0,5	0,50
Coarnă neagră selecționată	0,7	0,5	0,4	0,7	0,52
Muscat de Hamburg Cl. 202	1,1	1,4	0,5	0,8	0,95
Transilvania	0,8	0,7	0,6	1,0	0,87
Afuz-Ali	0,7	0,4	0,5	0,7	0,52
Italia	0,9	0,6	0,5	1,0	0,75
Perla de Zala	1,3	0,8	0,5	0,7	0,82
Moldova	1,4	1,3	0.7	1,2	1,15

Average daily growth rate of sprouts per stump (cm/day/shoot) on table grape varieties

Table 4

Vine vigour in the first year after planting the varieties of table grapes

V ariety	Total length of annual	Number of nodes formed	
	increases in the vine (cm)		
Silvania	230	65	
Timpuriu de Cluj	185	58	
Muscat de Hamburg Cl. 4 Pt.	293	81	
Tamina	453	110	
Someşan	188	49	
Splendid	296	63	
Napoca	326	87	
Victoria	173	39	
Prima Cl. 1022	199	53	
Coarnă neagră selecționată	368	83	
Muscat de Hamburg Cl. 202	385	91	
Transilvania	507	120	
Afuz-Ali	282	75	
Italia	336	100	
Perla de Zala	261	58	
Moldova	416	83	

CONCLUSIONS

Rainfall in May and June, registered on a great number of days (99.60 mm in 15 days in May and 121.40 mm in 16 days in June) had a favorable effect for plantations established in the Spring.

At the variety *Transilvania*, all planted vines have developed normally. In others, losses ranged between 1 and 9 vines, and 2.5% in the varieties *Coarnă neagră selecționată* and *Muscat Hamburg Cl. 202*, and 25% for the variety *Some an*.

The daily average rate of growth of shoots registered values ranging from 0.50 cm (variety *Prima Cl. 1022*) and 1,15 cm (*Moldova*).

From point of view of vigor emphasized Transilvania variety with 120 nodes formed on vine and 507 cm the total length of annual increases.

REFERENCES

1. Bani ă P.,- Viticultura pe nisipuri. Editura CERES, Bucure ti pag. 15-45. 1983.

2. Baniță P., Vlădoianu Em. Studiul comportării unor soiuri cu struguri pentru masă pe nisipurile ameliorate din Oltenia. Analele SCCCPN Dăbuleni, vol. III, pag. 445-454. 1979.

3. Celso V. Pommer, Double cropping of table grapes in Brasil. Chronica Horticulturae, vol. 46, No. 2. 2006.

4. Cichi Daniela Doloris, Costea D.C., Soiuri de vi ă de vie cultivate i cultivabile în România. Editura Arves, Craiova, 300 p. 2008.

5. Cichi Daniela Doloris i colab., Monitoring and evaluation of environmental factors incidence on biodiversity variability in winw-growing. Book of abstracts. International Society for Horticultural Sciense (ISHS)- First Symposium on Horticulture in Europe-Viena, p 97. 2008.

6. Dejeu L.C., and all., Globalisation and Romanian Viticulture: Opportunities and restrictions. World Congress of Vine and Wine 6th general assembly of the O.I.V., 15-20 iunie, Verons, Italia. 2008.

7. Dumitru I., Cezarina Necula, Camelia Popa, tefania Iordache, Cristina Rizescu,– The bihavior of variety for table grapes – Muscat Iantarnii in vineyards conditions of tefăne ti Arge . Bulletin UASVM Horticulture, 66(1). 2009.

8. Edit Hajdu, Breeding of table grape varieties in Hungary and beyond our national borders. Agricole Research from Hungary. Vol. 4. 2007.

9. Herrmann E., Andersen M.D., Foraging brhaviour damage-causing birds in table grape vineyards in the Orange Valley, South Africa. South Africa Journal Enology and Viticulture, vol. 28, No. 2. 2007.

10. Jenifer M. Hashim, Study tour to California for Macedonian table grapes exporters report. California University. 2009.

11. Liliana Rotaru, The behaviour of some new varieties of table grapes in Romania, in the ecoclimatical conditions of the nord-est region. Agricultural University – Plovdiv, Bulgaria, Scientific Works, vol. L., Book 6, Jubilee Scientific Conference "State of the art and problem of agricultural sciense and education", 19-20 october. 2005.

12. Martin T. and all., Strugurii de masă. Editura CERES, București. 1974.

13. Mîndrilă Gheorghi a, Studiul caracterelor morfologice i al însu irilor biotehnologice, la unele soiuri de vi ă de vie, prin sisteme bazate pe ampelografie. Teză de doctorat, Universitatea din Craiova, Craiova. 2010.

14. Mohammad Ahmad Abdel Majid Bishtawi, Popa A., Comportarea unor soiuri de masă în condi iile ecopedoclimatice din centrele viticole Dăbuleni, Banu Maracine, Drăgă ani. Analele Universită ii din Craiova, vol X (XLVI). Editura Universitaria, Craiova, 39-44. 2005.

15. Oşlobeanu M., Magdalena Georgescu, Oprean M., Baniță P., Alexandrescu I.,

Jianu L., Viticultură generală și specială. Editura didactică și pedagogică, București, pag. 513-550. 1980.

16. Peter D. Oldak, Wine and table grapevarieties for New England. Jewell Towne Vineyards. South Hampton, New Hampshire NE Vegetable and Berry Conferance. 2007.

17. Popa Camelia, Cezarina Necula, Daniela Cichi, Giugea N., Studies on the behaviour of variety Golden tefăne ti in vineyards tefăne ti and Banu Mărăcine. Analele Universită ii din Craiova, – Seria Biologie, Horticulturaă, Tehnologia Prelucrării Produselor Agricole, Ingineria Mediului, vol. XIII (XLIX), pag. 45-48. 2009.

18. Popa Camelia, Daniela Cichi, Cezarina Necula, Argessis and Golden tefăne ti new varieties for table grapes with biological strength. Proceedings of the 32st World Congress of Vine and Wine, 7th General Assembly of the O.I.V., Verona, Italia. Edition Naklada, ISBN 978-9718-12-2. 2008.

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

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

Vol. XVI (LII) - 2011

INSTRUMENTAL TEXTURE ANALYSIS – AN OBJECTIVE MEASURING METHOD FOR QUALITY ASSURANCE IN FOOD INDUSTRY

Rosca Adrian^{1,*}, Rosca Daniela²

KEY WORDS: instrumental texture analysis, food texture evaluation, mechanical forces

ABSTRACT

Texture is an important index of food quality and refers to those qualities of a food that can be felt with the fingers, tongue, palate, or teeth. Foods have different textures and the evaluation of texture involves measuring the response of a food when it is subjected to mechanical forces such as cutting, shearing, chewing, compressing or stretching. Food texture depends on the rheological properties of the food, defined in deformation and flow terms of matter, as reaction of food when a force is applied to it.

The paper present international instrumental texture analysis proposed to remove the most elements of subjectivity from the food testing and recent experimental results obtained on vegetables, fruits and smoked Kaiser products.

INTRODUCTION

Texture defines the consistency and structure of foodstuffs, including all physical characteristics as the sensory feelings such as touching (the feeling in the mouth), appearance and acoustic behaviors. Textural properties proofing via the human senses takes place via the sensorial tasting foodstuffs and the textural properties are identified by terms relating to the senses or taste. The teeth, tongue and jaw exert a force on the food, and how easily it breaks or flows in the mouth determines whether it is perceived as hard, brittle or thick. The term mouthfeel is a general term used to describe the textural properties of a food as perceived in the mouth. Texture characteristics of foodstuffs can describe sensoric designations. For example: texture characteristic as hardness describe sensoric designations as soft, solid, hard; texture characteristic as composition, cohesion describe sensoric designations as crumbly, crisp, brittle (Kohyama et. al., 2009; Varela et. al., 2008; www.lloyd-instruments.co.uk , 2011; www.zwick roell.com, 2011). The main problem of texture analysis is that the shape and consistency of foodstuffs deviates very much, and the reproducible results require a careful preparation of specimens and the testing method. Product quality variances are much more apparent since they are determined by a texture analyzer which does not have the subjective rating which a sensorial team might have.

In cases of dispute, international norms recommend sensorial determined results to be not recognized. The most recommended texture testing methods to determine certain

¹ University of Craiova, Faculty of Horticulture

^{*} Corresponding author e-mail address: adrosca2003@yahoo.com

² University of Craiova, Faculty of Electromechanics, Industrial Informatics, Environmental Engineering in Industry
foodstuffs/ products' characteristics are presented in table 1 (Xianzhong et al, 2011;Xu et al, 2008; <u>www.lloyd-instruments.co.uk</u>, 2011; <u>www.zwickroell.com</u>, 2011).

Table 1

Foodstuff / product	Texture testing method	Characteristics
Fruit, vegetables, fruit and vegetable products		
fresh / uncooked	penetration test	degree of ripeness,
fruit or vegetable		skin strength
	compression or penetration test	firmness, hardness
	Warner-Bratzler shear test	firmness, bite characteristic
peas, beans, corn	compression test on single specimens	firmness
	extrusion test with OTMS cell	firmness, extrusion work
	shear test with Kramer shear cell	firmness, bite characteristic
potatoes salad,	extrusion test with OTMS cell	firmness, consistency,
mashed potatoes		extrusion work
Sausage, smoked ham, meat and fish products		
pasties, minced meat	extrusion test with OTMS cell	toughness, tenderness
uncooked meat,	shear test with Kramer shear cell	shear strength, toughness,
fish, seafood		tenderness, bite characteristic
smoked ham, frankfurters	Warner -Bratzler shear test	crunchiness, cutting strength,
		bite characteristic
smoked sausage, sausage	compression or penetration test	firmness, hardness

Texture testing methods

Compression test

In a compression test the specimen is smaller than the compression die, and under compression force the specimen should not extend over the die' edges. The static compression test is made on brittle specimens such as candies or coffee beans to determine the brittleness, freshness and firmness, or on fruits also to determine the stacking behaviour (figure 1). The cyclic compression test is carried out for elastic specimens such as bread, cake, cheese, fish and marshmallows. The compression and decompression recovery behavior shows firmness, stickiness, degree of ripeness and viscoelastic properties (<u>www.zwickroell.com</u>, 2011; <u>www.lloyd-instruments.co.uk</u>, 2011).



Figure 1. Compression test accessories Penetration test Figure 2. Penetration test accessories

The penetration test (puncture test or force penetration) is frequently used to test the degree of ripeness of fruits and vegetables as well as of the skin strength (figure 2).

The puncture needle is pushed into the specimen to a certain depth.

Depending on the skin and the consistency of the pulp, penetration dies with various shapes, sizes and materials, make possible distinctive experimental curves arise (<u>www.zwickroell.com</u>, 2011; <u>www.lloyd-instruments.co.uk</u>, 2011).

Ottawa Texture Measuring System test

Ottawa Texture Measuring System (OTMS) jig consists of a square test cell with solid walls and an open base which can be fitted with one of a variety of plates which are included in the kit. A square plunger is fitted to the machine crosshead and provides the compression (figure 3).

The test method involves weighing a suitable quantity of sample which is placed in the cell with either a slotted or a perforated plate fitted. In either case the result is determined by measuring the resulting force required to extrude the sample.

OTMS test determines the firmness of products by compression and extrusion that shows characteristics like ripeness, tenderness, crispness or extrusion work on a defined sample quantity. This method is suited for products which are easy to extrude such as canned vegetables, cream cheese and pastries. But also for extrudates and cereals it can be used.

Various extrusion plates and reduction inserts for the reduction of the volume enable an adaptation for different specimen materials. The measurement of pure compression forces is possible with the use of the sealing plate (<u>www.zwickroell.com</u>, 2011; <u>www.lloyd-instruments.co.uk</u>, 2011).



Figure 3. OTMS test accessories

Figure 4. Kramer shear accessories

Kramer Shear test

The Kramer shear cell simulates a single bite on foodstuffs and provides information about bite characteristic, crispness and firmness. It is used for meat and fish products, small sized fruit and vegetables as well as for cereals and snacks like potato chips.

The Kramer Type Shear cell comprises ten parallel steel blades which are driven down through guide slots into a rectangular container with corresponding slots in the base (figure 4).

The sample is sheared, compressed and extruded through the bottom openings.

The test is made on a defined sample quantity. The multiple blades provide a measure-ment on several positions at the same time thus local texture deviations are compensated for with this method (<u>www.zwickroell.com</u>, 2011; <u>www. lloyd-instruments.co.uk</u>, 2011).

Warner-Bratzler share test

In the Warner Bratzler test a blade cuts through a specimen.

The shear behavior gives information about the toughness and tenderness of meat and fish products, the crunchiness of sausages as well as the bite characteristic of cakes and pastries. The jig consists of a rigid frame supporting a shear bar.

Interchangeable shear blades fit into the frame. There are wide known two blades: the square cut blade that is mainly used for rectangular specimens, and the notched (triangular or "V" blade) for round specimens like sausages (figure 5).

The jig acts in direct compression for slicing / shearing tests on meat products and vegetables. Because of the good reproducibility of the results, this test is widely used in food texture analyze (www.zwickroell.com, 2011; www.lloyd-instruments.co.uk, 2011).



MATERIAL AND METHOD

In the Unconventional Technologies and Equipment for Agro-Food Industry Laboratory within Faculty of Horticulture in Craiova, general texture analysis research has concentrated on shear force measurements.

To perform interdisciplinary researches concerning general texture analysis an universal testing machine *Lloyd Instruments LRXPlus 5* was equipped with a variety of test jigs to make a wide range of texture measurements such as degree of ripeness, skin strength, shear strength, toughness, tenderness, firmness, hardness, chewiness and springiness.

In order to perform these texture measurements, the authors of this paper designed and made special jigs consisting of a rigid frame (made in transparent polycarbonate) supporting a shear bar that permits interchangeable Warner-Bratzler shear blades (square cut blade and triangular blade, made in stainless steel 316 L) and penetration / puncture needle (made in stainless steel 316 L) fit into the frame (Rosca & Rosca, 2009; Rosca & Rosca, 2010).

This fixture acts in direct compression for slicing / shearing specimens including meat products, fruits and vegetables. The mechanical resistance of the specimens to shearing as a function of time was recorded and displayed automatically using the NEXYGEN*Plus* control and measurement software in a force-deformation plot.

RESULTS AND DISCUSION

The paper presents the most recent experimental results on texture analysis research concerning fruits and smoked Kaiser. In figure 6 is presented the penetration test for an apple, and in figure 7 is presented the force-deformation plot for this penetration test (skin strength force up to 15,71N). In figure 8 is presented Warner-Bratzler (WB) shear test for an apple, and in figure 9 is presented the force-deformation plot for this WB test (firmness, bite characteristic force up to 76,91N).

In figure 10 is presented the smoked Kaiser product made by an innovative vacuum process; for this new produce was necessary to determine tenderness and cutting strength by using WB texture evaluation method.

In figure 11 is presented the force-deformation plot for this WB shear test; the figure shows that the maximum cutting force (48,36N) is lower then the maximum recommended value according consumers satisfy acceptance (50N according americans norms).





CONCLUSIONS

Texture analysis can be made in all product research and development activities: evaluation of the quality and processing characteristics of raw foodstuffs; product comparisons when new or alternative ingredients can be compared with existing ingredients for improvements; producers own products can be compared with competitor's products; characterization of structural changes during the production process and determination of the influence of process variations such as temperature, humidity and cooking or baking time.



Instrumental texture evaluation is an objective measuring method for quality control during production or of finished products to ensure a constant quality, and in the same time during transport and storage to asset the product freshness at point of sale and at consumer's home.

REFERENCES

Rosca, A.; Rosca, D. Experimental equipment to study the influence of vacuum processing on fruit preservation, Annales of the University of Craiova - Biology, Horticulture, Environment Engineering, Food Produce Processing Technology Series, 23-25 October, Craiova, Vol. XIV (XLX), ISSN: 1453-1275, pp. 583-586, Universitaria Publishing House, Craiova. 2009.

Rosca, A.; Rosca, D. Experimental equipment to study the influence of low vacuum processing on non-thermic preservation of orange fruit, Annales of the University of Craiova - Biology, Horticulture, Environment Engineering, Food Produce Processing Technology Series, 23-25 October, Craiova, Vol. XV (XLXI), ISSN: 1453-1275, pp. 494 - 500, Universitaria Publishing House, Craiova. 2010.

Kohyama, K.; Nagata, A.; Tamaki, Y.; Sakurai, N. Comparison of human-bite and instrument puncture tests of cucumber texture, Postharvest Biol. Technol. 52, 243–246.2009.

Varela, P.; Salvador, A.; Fiszman, S. On the assessment of fracture in brittle foods: The case of roasted almonds, Food Res. Intern. 41, 544–551.2008.

Xianzhong Xu; Shaofang Yuan An examination of the force generated from incisor penetration into foods with different textural properties part I: Experimental observation, Journal of Texture Studies, Special Issue, Volume 42, Issue 3, pp. 228–235. 2011.

Xu, X.; Wright, P.S.; Hector, M.P.; Heath, M.R.; Ferman, A. Force, rate and work used during incisor penetration on different texture foods, J. Texture Studies 39, 115–128. 2008.

*** www.lloyd-instruments.co.uk 2011.

*** www.zwickroell.com .2011

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

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

Vol. XVI (LII) - 2011

THERMOVISION - A RELIABLE METHOD TO PREVENT FIRE HAZARD IN FLOUR MILLING INDUSTRY

Roșca Daniela^{1,*}, Roșca Adrian²

KEY WORDS: thermovision, fire hazard, machines elements, flour milling industry

ABSTRACT

Thermovision has a wide range of applications including, but not limited to, the ability to detect defects as driving motor loads, sliding/rotating bearing temperature (poor shaft alignment), sliding /rotating bearing wear (lubrication failure or pitted damaged), imbalanced load of the machine elements during operation that can cause fire / explosion hazard in industrial process.

The great benefit of Thermovision over most other predictive maintenance technologies is easy infrared camera operation after adequate training and experience, and fast interprets of the results to prevent fire hazard.

This paper presents examples of the defects that can be identified by using Thermovision predictive maintenance to prevent fire hazard during flour milling process in a food industry small enterprise.

INTRODUCTION

Thermovision (infrared thermal imaging) predictive maintenance is a new one of the fastest and reliable method available to measure the condition of assets of the electrical and mechanical defects that can be in the early stages of failure or under stress due to normal or hazardous accidental operation. With wide and general applications throughout the industrial activities, *Thermovision* completes, but not replace the conventional predictive maintenance methods: *vibration analyses* - specific applications for bearings and rotating machines' elements; *acoustic level* - specific applications for mechanical elements and electrical parts; *tribology* - specific applications for machines' mechanical elements (<u>http://www.flir.com</u>, 2011, Willimas, 2009).

Thermovision has a wide application in various fields such as industrial maintenance, engineering (mechanical, civil, electric), aerospace, fire and explosion hazards prevention, medicine, pharmacy, veterinary, agriculture and food industry. The major advantages of Thermovision are non-contact, non-invasive, and rapid technique which could be used for online applications. With thermal cameras, it is possible to obtain temperature mapping of any particular region of interest with fast response times which is not possible with thermocouples or other temperature sensors which can only measure spot data (Vadivambal & Jayas, 2011).

¹International standards for the *Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids* (Eckhoff, 2003; Hatwig & Steen, 2004) contain comprehensive guidance on the control of dusts to prevent explosions, that recommend: minimize the escape of dust from process equipment or ventilation systems; use dust collection systems and filters; utilize surfaces that minimize dust accumulation and facilitate cleaning; inspect for dust residues in open and hidden areas, at regular intervals; clean dust residues at regular intervals; use cleaning methods that do not generate dust clouds (approved vacuum cleaners), if ignition sources are present; locate relief valves away from dust hazard areas; develop and implement a hazardous dust inspection, testing, and control program with established frequency and methods.

The vast majority of natural and synthetic organic materials, as well as some metals, can form combustible dust. International *Industrial Fire Hazards* standards (Hatwig & Steen, 2004) state that "any industrial process that reduces a combustible material and some normally noncombustible materials to a finely divided state present a potential for a serious fire or explosion." A combustible dust explosion hazard may exist in a variety of industries, including: food (dust cloud such as grain, flour, sugar, pollen, powdered milk), plastics, wood, rubber, furniture, textiles, pesticides, pharmaceuticals, dyes, coal, metals (e.g., aluminum, chromium, iron, magnesium, and zinc), and fossil fuel power generation (Eckhoff, 2003; Hatwig & Steen, 2004).

There are four necessary conditions for a dust explosion or deflagration: a combustible dust; the dust is suspended in the air at a high concentration; there is an oxidant (typically atmospheric oxygen); there is an ignition source. To support combustion, the dust must also consist of very small particles with a high surface area to volume ratio, thereby making the collective or combined surface area of all the particles very large in comparison to a dust of larger particles.

Combustible dust is defined by international standards for *Combustible Metals, Metal Powders, and Metal Dusts* as: "Any finely divided solid material that is 420 microns or smaller in diameter and presents a fire or explosion hazard when dispersed and ignited in air".

Below a certain value (LEL - the lower explosive limit), there is insufficient dust to support the combustion at the rate required for an explosion. A figure 20% lower than the LEL is considered safe. Similarly, if the fuel/air ratio increases above the upper explosive limit there is insufficient oxidant to permit combustion to continue at the necessary rate. Dusts have a very large surface area compared to their mass. Since burning can only occur at the surface of a solid or liquid, where it can react with oxygen, this causes dusts to be much more flammable than bulk materials. For example, a 1 kg sphere of a material with a density of $1g/cm^3$ would be about 27cm across and have a surface area of $0.3m^2$. However, if it was broken up into spherical dust particles 50µm in diameter (about the size of flour particles) it would have a surface area of 1600m². This greatly increased surface area allows the material to burn much faster, and the extremely small mass of each particle allows it to catch on fire with much less energy than the bulk material, as there is no heat loss to conduction within the material. When this mixture of fuel and air is ignited, especially in a confined space such as a warehouse, a silo or flour milling house, a significant increase in pressure is created, often more than sufficient to demolish the structure (Hatwig & Steen, 2004; Salas-Bringas et al, 2007).

¹ University of Craiova, Faculty of Electromechanics, Industrial Informatics, Environmental Engineering in Industry

^{*} Corresponding author e-mail address: drosca2003@yahoo.com

² University of Craiova, Faculty of Horticulture

In agriculture and food industry the dust can arise from activities such as transporting grain and indeed grain silos do regularly have explosions. Flour mills likewise have large amounts of flour dust as a result of milling. Some devastating and fatal explosions have occurred at flour mills (including an explosion) and a series of devastating grain dust explosions in grain elevators left many people dead and injured (Eckhoff, 2003).

MATERIAL AND METHOD

International general standards for the *Prevention of Fires and Dust Explosions in Agricultural and Food Processing Facilities*, and specific standards for *Grain Handling Facilities*, and for *Explosion Prevention Systems* recommend the temperature measure with thermocouples or other temperature sensors, and for online applications in the latest versions are recommend non-contact and rapid method as Thermovision (Eckhoff, 2003; Hatwig & Steen, 2004).

Infrared cameras are the ideal solution for assuring that temperature tolerances are maintained throughout all of the equipments operations, and in addition, can instantly reveal the operation condition of electrical components and machines' elements in the factory, warehouse, retail stores and refrigerator trailers (Rosca, 2010). In order to perform the interdisciplinary studies concerning the influence of low vacuum processing on non – thermic preservation of orange fruit high, in the Unconventional Technologies and Equipment for Agro-Food Industry Laboratory within Faculty of Horticulture in Craiova, a FLIR Infrared Thermovision Camera that can detect temperature differences as small as 0,1°C was used (Rosca & Rosca, 2010). In the last time, this camera was also used for temperature control in vegetable cropping, in fruits preservation in deposits, and in smoked Kaiser type product made by intensive vacuum process.

Flour milling is a mechanical manufacturing process which produces flour from wheat through comprehensive stages of grinding and separation. Gluten is the natural protein material which gives wheaten flour ability to make leavened bread and baked products, but during milling process must prevent water absorption in gluten. Therefore during the grinding, the operation temperature in all the milling process must not exceed 45°C. To prevent the overheating during the grinding process there are made rollers mill equipped with internal water cooling system.

The quality of the roller mill is of decisive importance to the efficiency of the mill and must create the optimal conditions in grain milling process for product quality. During grinding, as a result of breaking grains between the rollers mill, the milling process develops heat or over heat which generally adversely affect the process. Poor roller mills distance alignment (incorrect grinding gap setting) requires static and dynamic balance measurements using a specialist shaft alignment system.

The paper presents examples of the defects that can be identified by using T200 Flir Thermovision camera as predictive maintenance method to prevent fire or explosion hazard during flour milling process in a food industry small enterprise.

RESULTS AND DISCUTIONS

The small enterprise flour milling is put in centralized operation by a Diesel motor, and then by many belts transmissions. In figure 1 is presented the Diesel motor at 20 minute after starting the flour milling process. It is observed that the gases evacuation gallery was fast increased up to 272°C (in the spot). Due to high concentration of combustible dust suspended in the air, this temperature can determine fire hazard. To prevent fire hazard

thermal isolation multilayer mineral basaltic wool was fitted around the gases evacuation gallery, which caused the temperature decrease up to 80°C during operation.

In figure 2 is presented low quality maintenance example for a belt transmission (rubber and fiberglass insertion) that drive one of the roller mill. It can be observed the overheating of the belt up to $81,1^{\circ}$ C (maximum temperature in the thermal image) caused by poor alignment of the transmission wheels (in the figure, on the belt's width can be observed the temperature distribution from 61° C to $81,1^{\circ}$ C).



Figure 1. Diesel motor overheated up to 272°C

Figure 2. Belt transmission overheated up to 81,1°C

In figures 3 and 4 is presented a roller mill (with no internal water cooling system) with low quality maintenance that cause fast increasing of the temperature more then 45° C during operation. In these figures is observed the fast temperature increase of milling process up to 72,2°C (in the squared thermal image of Figure 3), and after just 1 minute, the temperature increase at maximum average up to 76°C (in the squared thermal image of Figure 4). These thermal images were compared with a thermal image of a similar flour process that reveals normal operation temperature at 30,7°C (maximum temperature in entire thermal image in figure 5).



Figure 3. Roller mill in overheat operation at 72,2°C temperature



Figure 4. Roller mill in overheat operation at 76°C temperature



Figure 5. Roller mill in normal operation temperature

According to international general standards for the Prevention of Fires and Dust Explosions in Agricultural and Food Processing Facilities, to prevent fire hazard in flour milling process, the operation temperature must not exceed 80°C.

Due to the Thermovision predictive maintenance, the milling process described in figures 3 and 4 was proposed to be stopped. During maintenance activity it was observed an important wear rate of both rollers mill caused by broken and high grade deformation of the rollers' riffle teeth. Therefore it was supposed high averages of accidental radial and tangential forces that caused broken and high grade deformation of the rollers' riffle teeth could produced high wear rate deformation of the sliding bearing.

A thermal imaging analyze revealed the intense overheat of the sliding bearing nearby the side with high grade deformation rollers' riffle teeth.

Due to this intense overheat of the sliding bearing, sequential Thermovision monitoring was performed; during this Thermovision monitoring a fast increase of the sliding bearing' temperature was observed: after 30 min from the starting of milling process the maximum temperature in thermal image was 139°C (figure 6), and then after just 30 min the maximum temperature increased up to 151°C (figure 7).

Due to these Thermovision monitoring results, the flour milling process was proposed to be stopped.

During the mechanical evaluation it was observed a very high ware rate of the sliding bearing, therefore this machine element was replaced with a new one. After 30 min from the flour milling process start, the Thermovision monitoring revealed a proper temperature at about 48,5°C (in figure 8, maximum temperature in entire thermal image).



Figure 6. Sliding bearing overheated at 139°C Figure 7. Sliding bearing overheated at 151°C



Figure 8. Sliding bearing in proper operation 48,5°C

CONCLUSIONS

Thermovision can be applied in all fields where temperature differences could be used to assist in evaluation, diagnosis, or analysis of a process or product.

Potential use of thermal imaging in food industry equipments could include Thermovision predictive maintenance in monitoring programmes that can prevent fire or explosion hazard in flour milling industry according with international general standards for the *Prevention of Fires and Dust Explosions in Agricultural and Food Processing Facilities*.

REFERENCES

Eckhoff, Rolf. K. Dust Explosions in the Process Industries, 3rd Edition, Gulf Professional Publishing. 2003.

Hatwig, M.; Steen, H. . Handbook of Explosion Prevention and Protection, Wiley-VCH. 2004.

Rosca, A. Mechanics. Materials Strength. Machines element, Universitaria Publishing House, ISBN 978-606-14-0055-3, Craiova. 2010.

Rosca, A.; Rosca, D. Experimental equipment to study the influence of low vacuum processing on non-thermic preservation of orange fruit, Annales of the University of Craiova - Biology, Horticulture, Environment Engineering, Food Produce Processing Technology Series, 23-25 October, Craiova, Vol. XV (XLXI), ISSN: 1453-1275, pp. 494 - 500, Universitaria Publishing House, Craiova. 2010.

Salas-Bringas, C.; Jeksrud, W. K.; Lekang, O. I.; Schüller, R. B. Noncontact temperature monitoring of a pelleting process using infrared thermography. Journal of Food Process Engineering, 30(1), 24–37. 2007.

Vadivambal, R.; Jayas, D. Applications of thermal imaging in agriculture and food industry – A review. Food Bioprocess Technology, Volume 4, Number 2, February 2011, pp. 186-199, ISSN 1935-5130, Springer Publisher. 2011.

Willimas, T. Thermal imaging cameras and their component parts. In T. Imaging (Ed.), Cameras: Characteristics and performance, pp. 7–34, Boca Raton, Taylor & Francis. 2009

*** http://www.flir.com/thermography/ .201.

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

Seria: ✓ Biologie ✓ Horticultură

Tehnologia prelucrării

produselor agricole ✓ Ingineria mediului

Ingineria meatatai

Vol. XVI (LII) - 2011

MORPHO-ANATOMICAL CHANGES TO LEAVES OF CORDYLINE TERMINALIS KUNT PRODUCED BY THE IMPERFECT FUNGUS PHYLLOSTICTA SP

Simeanu C. G¹., Răduțoiu D²., Simeanu Camelia-Ecaterina³

KEY WORDS: parasite, leaves, epidermis, mesophyll.

SUMMARY

In this paper are presented comparative results regarding the morphology and anatomy of the foliar limb of Cordyline terminalis Kunt unattacked and attacked by the imperfect fungus Phyllosticta sp. The limb of leaves attacked presents small circular spots which have in the center small black points, globular which represents picnidiae with picnispores. In transversal section the foliar limb unattacked by the parasite has an homogenous mesophyll. For the attacked leaves by the pathogen, the first affected are the chloroplasts, then the cells of the mesophyll which side walls are curling and finally these walls are turning flat. The cells of both epidermis are remaining intact.

INTRODUCTION

Cordyline terminalis Kunt is a specie originated from India and Australia. Being a plant of warm greenhouse, 40-90 cm tall, it is very decorative due to its leaves which are green or red.

The attack produced by the *Phyllosticta sp.* fungus on the leaves of *Cordyline terminalis* is called the brown staining of the leaves, and the application of the pest control measures is not easy, this fact goes to losing a lot of leaves.

MATERIAL AND METHOD

For the biological material we used full-size leaves of Cordyline terminalis unattacked and attacked by the parasite taken from the greenhouses belonging to The Botanical Garden "Al. Buia" of University of Craiova.

The cropped leaves have been analyzed macroscopically in fresh stage, and a part of them have been preserved in a mixture made in equal parts from etilic alcohol, glycerin, and distillated water in order to make the anatomical analysis. The transversal and tangent sections made through unattacked and attacked leaf by the parasite have been analysed with a Nikon microscope and then photographed.

¹ University of Craiova, Horticulture Faculty

² University of Craiova, Horticulture Faculty

³ National College "Carol I" Craiova

RESULTS AND DISCUSSIONS

The attack of the *Phyllosticta sp.* fungus on the limbs of the leaves of *Cordyline terminalis* determines the appearance of small circular yellow-brown spots with a diameter between 1-5 mm (fig. 1). In the center of these spots are observed small black points, in globular shape, which represents picnidiae with picnispores. The spots can be combined together, and the leaves are strongly attacked and then are drying themselves.

For illustrating the morpho-anatomical changes of the foliar limb sections have been done through the unattacked areas, but also through the attacked areas.



Fig. 1. Plant of Cordyline terminalis with unattacked and attacked leaves by Phyllosticta sp.

In transversal section the limbs of the unattacked leaves by the parasite presents a homogeneous mesophyll (fig. 2) and has the thickness of 13,5 μ m and has a thickness of 195,25 μ m.

The adaxial epidermis, without strata, consists of slightly alonged cells with a thickness of 13,5 μ m and in exterior have a cuticle of 2,03 μ m.

The homogeneous mesophyll consists of oval shape cells, rarely spherical, with spaces in between them, and in interior presents chloroplasts. Among the cells of the mesophyll appear sometimes spherical cells which lack chloroplasts. Leading wood-free fascicles of the nervures are collateral closed type and endowed with fascicle of sclerenchymatic sheaths. The average diameter of the liberian vessels from the nervures is $4,95 \mu m$ and of the wooden vessels of $10,58 \mu m$.

The abaxial epidermis consists from a stratum of cells slightly alonged in tangent section, has the thickness of 11,25 μ m and is endowed in exterior with a cuticle of 2,03 μ m. In transversal section through the follicular area which has the foliar limb attacked in initial stage the structure and dimensions are alike to the section from the leaves unattacked by the parasite (fig. 3). In this stage of attack are affected the chloroplasts which start to be

deformatted, clustered and turning brown (fig. 3). Also in this stage of attack, in the third stratum of the mesophyll cells from underneath adaxial epidermis, it can be observed the appearance of picnidiae with picnisporus (fig. 4).



Fig. 2. Transversal section through the limb of the leaf *Cordyline terminalis* unattacked by the pathogen



Fig. 3. Transversal section through the limb of the leaf *Cordyline terminalis* with initial attack of *Phyllosticta* sp.

In the advanced stage of attack of the parasite, the walls of the cells of the mesophyll start a process of curling and then of lyses. In the interior of the cells and also in

intercells spaces through lyses appear picnisporus, the cells of both foliar epidermis are remaining intact (fig. 5).



Fig. 4. Transversal section through the limb of the leaf *Cordyline terminalis* attacked of Phyllosticta sp. where a picnidiae is observed



Fig. 5. Transversal section through the limb of the leaf *Cordyline terminalis* attacked by the pathogen where the curling is observed and the beginning of lyses of the walls of the mesophyll cells

As the action of the patogeneous agent continues and intensifies the chloroplasts are destroyed, the cells of the mesophyll are turning flat and the foliar limb stays slim (figure 6) having a thickness of $103,5 \,\mu$ m.



Fig. 6. Transversal section of the limb of the leaf *Cordyline terminalis* strongly affected by *Phyllosticta* sp.

CONCLUSIONS

From the macroscopic and microscopic analysis of unattacked and attacked *Cordyline terminalis* leaves by the imperfect fungus *Phyllosticta* sp. we turn out to the following conclusions:

1. The attack of the parasite is manifested on the limb of the leaves under the form of small circular spots, yellow-brown in colour which have in the center small globular black points.

2. The attacked but also the unattacked leaves by the pathogen have a homogeneous mesophyll.

3. The beginning of the attack is manifested by the affection of chloroplasts, and as the time of the attack goes by, the walls of the cells start to curl.

4. In advanced stage the cells of the mesophyll are flattening and the limb pf the leaf is becoming thinner.

5. The cells of both epidermis are not affected by the patogen.

REFERENCES

Andrei M. Anatomia plantelor. Editura Did. Ped. București. 1978.

Andrei M., Paraschiv Maria-Roxana. Microtehnică botanică, Edit. Niculescu, București. 2003.

Bavaru A. & Bercu Rodica. Morfologia și anatomia plantelor. Edit. Ex Ponto, Constanța. 2002.

Bontea Vera. Ciuperci parazite și saprofite din România, vol. I și II. Edit. Acad. Române, București. 1985.

Eliade Eugenia. Biologia paraziților vegetali, Ediția a II-a. Tipografia Universității București. 1975

Simeanu C. G., Simeanu Camelia- Ecaterina. Morpho-anatomic studies on the fruit of *Prunus cerasifera* Eheh, attacked by *Taphrina pruni* (Fuck.) Tul. An. Univ. din Craiova, Ser. Bilogie, Horticultură, TPPA, Ing. Mediului Vol. XII (XLVIII): 27-32. 2007.

Simeanu C. G., Simeanu Camelia-Ecaterina. 2007. Morpho-anatomical modifications produced by Mycosphaerella fragarie (Tul.) Lindau on Fragaria ananassa leaves (Weston) Decane. et Naudin. An. Univ. din Craiova, Ser. Biologie, Horticultură, TPPA, Ing. Mediului Vol. XII (XLVIII): 33-38. 2007.

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

Seria: ✓ Biologie ✓ Horticultură ✓ Tehnologia prelucrării produselor agricole

🖊 Ingineria mediului

Vol. XVI (LII) 2011

HISTO-ANATOMY OF VEGETATIVE ORGANS AT KALANCHOE BLOSSFELDIANA POELLNITZ

Şipoş Monica¹, Bunta Daniel¹

KEY WORDS: Kalanchoe blossfeldiana Poellnitz, anatomy, root, stem, floriferous stem, leaf

ABSTRACT

In the present paper we have aimed at carrying out a comprehensive histo-anatomic analysis regarding the structure of the vegetative organs (root, stem and leaf), as well as of the flower axis, sustaining the cymous inflorescence, at Kalanchoe blossfeldiana Poellnitz. The structure of the root at Kalanchoe blossfeldiana is a typically secondary one, due to the functioning of the secondary meristem named cambium; the stem has a secondary structure the result of the activity of the cambium and felogen. The floriferous stem has a secondary structure at its level being present the cambium. At the level of the leaf petiole and of the foliar limb there are present only tissues with primary origin; the mezophyll of the leaf is homogenous, the leaf is glabrous, amfistomatic, the stomatic complexes are amarilidaceous cyclocitic type.

INTRODUCTION

Endemic species from Madagascar, *Kalanchoe blossfeldiana* (2n=34) has been discovered in 1924 by Perrier de la Bâthie, who has regarded it as being the *coccinea* variety of the species *Kalanchoe globulifera*. The first who has described it was Von Poellnitz (1934) and it was named *blossfeldiana* only in 1939, by Blossfeld of Potsdam, who has commercialized it in Germany (Van Voorst and Arends, 1982).

Anatomical and morphological aspects of the vegetative organs of some species of *Kalanchoe* (Hansen Pacheco et al., 2006, Hyakutakeand Grotta, 1972, Inamdar and Patel, 1970, Popham and Henry, 1955, Thiede and Eggli, 2007) and the trichomes structure of eight species from genus *Kalachoe* (Weryszko-Chmielewska and Chernetskyy, 2005) was studied.

At *Kalanchoe blossfeldiana*, the plants manifest the crassulacean photosynthetic metabolism (CAM) (Adam and Rustin, 1986, Fischer-Schliebs et al., 1997, Ota et al., 1988).

The ingrafting at *Kalanchoe blossfeldiana* was succeeded in three phases (Moore, 1982). The blossoming ,,in vitro" was made at *Kalanchoe blossfeldiana* (Dickens and Van Staden, 1988). The research made has demonstrated the fact that it is pretty difficult to

¹University of Oradea, Faculty of Sciences, Department of Biology, Universitatii st., No.1, 410087, Oradea, Romania

^{*}Corresponding author's address: M. \$IPO\$, University of Oradea, Faculty of Sciences, Department of Biology, Universitatii st., No.1, 410087, Oradea, Romania, E-mail: siposmonica@yahoo.com

obtain hybrids between the two sections - *Kalanchoe* and *Bryophyllum* - of the species *Kalanchoe* (Izumikawa et al., 2008).

There has been studied the influence of the growth regulators upon the forming of calus from ex-plants of leaves of *Kalanchoe blossfeldiana* (Varga et al., 1988). In order to optimize the regeneration ,,in vitro" of the stem of *Kalanchoe blossfeldiana*, research has been carried out using as ex-plants fragments of leaf and internods. There has been noticed that the regeneration of stems was better than the growth of the concentration of tidiazuron (Sanikhani et al., 2008)).

The latest research (Sanikhani et al., 2006, Thirukkumaran et al., 2009) vise the obtaining of transgenic plants at *Kalanchoe blossfeldiana*. There have been obtained transgenic plants less sensitive to ethylene, thus with a flower that lasts longer, through transfer of genes from *Arabidopsis thaliana* (Sanikhani et al., 2006).

In this paper we noted aspects of the vegetative organs structure at *Kalanchoe blossfeldiana* for the improvement of the knowledge in the field of genus *Kalanchoe* histoanatomy and in the same time this aspects can be use in other types of researches.

MATERIAL AND METHOD

The vegetal material used was picked up from the plants of *Kalanchoe blossfeldiana* vegetatively reproduced in the greenhouse of the University of Oradea. There have been used fragments of roots, stems, leaves and inflorescences. There has also been used vegetal material conserved in alcohol 70°. There have been carried out cross-sections through the vegetative organs previously mentioned and of peeling the epidermis (upper and lower). There have been made provisional microscopic prepared material, which was analysed with various sets of ocular-objective and photographed with a camera Canon A550 type, attached at the ocular of the microscope with an adapter. The photographs were procesed with a program ACD See Photo Manager.

RESULTS

The anatomy of the root

The contour of the cross-section through the root of *Kalanchoe blossfeldiana* is round. From the exterior of the root toward the interior of it there can be distinguished: the exodermis, which is a primary defense tissue, specific to the tough area of the root, it is practically a primary phellem since the cell walls of the cells are impregnated with suberine. The root hair are unicellular at *Kalanchoe blossfeldiana*.

Towards the interior one can observe the cortical parenchyma, as a next composing tissue – the main component of the cortex– in which there are deposited lots of amyloplasts, which got colored in dark blue with the ioded zinc chlorine. The last stratum of the cortex is known under the name of endodermis, and the first stratum of the central cylinder, placed immediately below this is called pericycle. In the central cylinder one can observe tissues denoting the secondary structure of the root from *Kalanchoe blossfeldiana* (fig.1). Thus there could be observed the presence of the secondary meristem called cambium (fig.2). This furnishes secondary phloem towards it exterior and secondary xylem towards the interior. The components of the secondary conducting tissues are the: the vessels, the parenchyma and the fibres. In figure 2 there can be observed the components of the secondary xilem: the tracheids, the wooden parenchyma and the wooden fibres (make up the so-called libriform).



40x

Fig.1. Cross-section through the root of *Kalanchoe blossfeldiana*; 1-exodermis; 2the cortical depositing parenchyma; 3-cambium; 4-the secondary phloem; 5- secondary xylem



100x

Fig.2. Structure detail concerning the secondary wood in the root of *Kalanchoe blossfeldiana*; 3-cambium; 4- secundary phloem; 5- secondary xylem; 6-libriform; 7- wooden parenchyma; 8-pith; 9- medular rays; 10-wooden vessels

Also we can observe the medular rays from the secondary xilem within the central cylinder (fig.2). Both in the medular rays and in the secondary wooden parenchyma there can be observed a lot of amyloplasts.

The initial primary tissues of the root have been flattened towards the interior by the secondary tissues generated by the cambium; there can only be observed a poorly represented pith.

As a result, the structure of the root at *Kalanchoe blossfeldiana* is a typically secondary one, with a very good possibility of emphasizing the secondary meristem named cambium, tissue which is practically responsible for the existence of this type of structure at the plant taken into study by us.

The anatomy of the stem

The contour of the cross-section through the stem of *Kalanchoe blossfeldiana* is round. The stem has a secondary structure due to the functioning of both secondary meristemes, the felogen in the cortex and the cambium in the central cylinder. The felogen is the secondary meristem generating the secondary phellem towards the exterior and the phelloderm towards the interior. The cells of the secondary meristemes generate through division cellular division elements which are placed extremely ordered, like coins in a roll of money.

At *Kalanchoe blossfeldiana* there can be observed, at the periphery of the stem, the existence of the felogen (fig.3) and of the secondary tisues which the meristematic cells of it generates by division: the phellem towards the exterior and a colenchymatized phelloderm towards the interior. In the phelloderm, like in the adiacent tissues there are present the chloroplasts. Under the phelloderm – in the constitution of the cortex – there is a parenchyma with amyloplasts, an ex- chlorenchyma (fig.3 and 4). In the stem of *Kalanchoe blossfeldiana*, in the cortical parenchyma, there have been a lot of chloroplasts. Further to the photosynthesis process in the chloroplasts there accumulates starch, which is colored in blue with ioded zinc chlorine (fig.4).

The last stratum of cells of the cortex is the endodermis and the first stratum of the central cylinder, placed right below the endodermis is called pericycle. In the central cylinder there is a tipically secondary structure due to the functioning of the cambium. This furnishes secondary phloem towards the exterior and secondary xylem towards the interior. In the constitution of the secondary wood there can be observed the predominating presence of the libriform of a few wooden vessels. In the middle of the central cylinder there can be noticed the presence of the primary wood, separated by primary medular rays, wood which is pushed towards the pith by the secondary tissues resulted by the activity of the cambium. At the level of the pith there can be observed the presence of a parenchyma with amyloplasts (fig.4).

Thus, at *Kalanchoe blossfeldiana*, the stem has a secondary structure, the result of the functioning of the cambium and the felogen. This plant, along time can have a bushy habitus.



Fig. 3. Cross-section through the stem of *Kalanchoe blossfeldiana*; coloration with Congo red; 1-phellem; 2-felogen: 3-colenchyma; 4-cortical parenchyma with amyloplasts.



40x

Fig. 4. Cross-section through the stem of *Kalanchoe blossfeldiana*; coloration coloration with ioded zinc chlorine with Congo red; 1-phellem; 3-colenchyma; 4- cortical parenchyma (clorenchyma); 5-endodermis (amilifer stratum); 6- secondary phloem; 7- cambium; 8- secondary xylem; 9- primary wood; 10- medular rays; 11-pith with amyloplasts.

The anatomy of the floriferous stem

The cymous inflorescence of the species of *Kalanchoe blossfeldiana* is supported by a floriferous stem whose internal structure is very similar to that of the main stem.

At its level, however, there cannot be observed the presence of the peripheral secondary meristem, called felogen. Thus, at the exterior, the floriferous stem is protected by a primary defense tissue, more exactly by the epidermis. Below the epidermis there are 1-2 strata of cells with the cellular walls supplimentarily thickened with cellulose (colenchyma). Next comes the cortical parenchyma, a clorenchyma. There can be very well observed the endodermis (the starch stratum)(fig. 5).

The central cylinder has an anatomic structure similar to that of the main stem; there can be observed: the cambium, the secundary phloem towards its exterior and the secondary xylem towards the interior of the secundary meristem above-mentioned, the primary wood separated by medular rays; at the centre of the floriferous stem there is a very well represented medular parenchyma (fig.5).

Thus, the floriferous stem at *Kalanchoe blossfeldiana* has a secundary structure, due to the functioning of the secondary meristem cambium from the central cylinder.



40x

Fig. 5. Cross-section through the floriferous stem of *Kalanchoe blossfeldiana*; coloration with Congo red; 1-epidermis; 3-colenchyma; 4- cortical parenchyma (clorenchyma); 5-endodermis (amilifer stratum); 6- secondary phloem; 7- cambium; 8- secondary xylem; 9- primary wood; 10- medular rays; 11-pith.

The anatomy of the leaf petiole

Figure 6 illustrates the structure of the leaf petiole at *Kalanchoe blossfeldiana*. The ab-axial face of the petiole is convex, whereas the ad-axial one is concave. The tissues entering in the componence of the leaf petiole are primary tissues.

From the exterior to the interior there can be observed: the epidermis, 1-2 strata of cells having supplimentary thickened cell walls with cellulose (a fine colenchyma), the fundamental parenchyma, in which there are spread colaterally opened conducting fascicles (fig.8). The fundamental parenchyma contains chloroplasts, with ioded zinc chlorine, the starch accumulated by photosintesis inside of these colors in blue (fig. 7, B). The conducting fascicles at the level of the leaf petiole are represented by a double big colaterally opened bundles, located centrally (fig. 7, A and B) and a lot of smaller fasicles, spread in the fundamental parenchyma (fig. 6).

The figure 7 present structure details regarding the double colaterally opened conducting fascicles which are present at the level of the leaf petiole.

Thus a fascicle is made up of primary bast and primary wood, both generated by the primary meristem known as procambium or intra-fascicular cambium, which is pluristratified. The fascicle is protected by a well represented colenchyma, placed above the primary phloem and by a mechanic tissue more poorly represented below the primary xylem (fig.7). In the making up of the primary xylem there are the wooden vessels and wooden parencyma, there are never present the wooden fibres.

Consequently, the petiole of the leaf of *Kalanchoe blossfeldiana* has a primary structure.



40x

Fig. 6. Cross-section through the leaf petiole at *Kalanchoe blossfeldiana*; coloration with Congo red; 1-epidermis; 2-colenchyma; 3- parenchyma; 4-colaterally opened central conducting bi-fascicle; 5- colaterally opened bundles; abx- ab-axial face ; adx- ad-axial face.



B 100x Fig.7. Structure detail regarding the double central conducting fascicle, colaterally opened from the leaf petiole of *Kalanchoe blossfeldiana*; A-coloration with Congo red; B-



coloration with ioded zinc chlorine; 3- parenchyma with amyloplasts; 6- primary xylem; 7- procambium; 8- primary phloem; 9-protecting fascicular colenchyma.

100x

Fig.8. Structure detail regarding the colaterally opened bundles from the fundamental parenchyma of the leaf petiole of *Kalanchoe blossfeldiana*; coloration with Congo red; 1-epidermis; 2-colenchyma; 3- parenchyma; 6- primary xylem; 7-procambium; 8- primary phloem; 9-protecting fascicular colenchyma.

The anatomy of the lamina at the level of the middrib

The structure of the lamina highly resembles that of the petiole (fig. 9). Between the upper epidermis and the lower one there is the leaf mezophyll. This is homogenous, full of chloroplasts, therein being observed colaterally opened fascicles, corresponding to the nervation. At the level of the middrib there can be observed that also in the leaf petiole, the double colaterally opened bundles (fig.9).



40x

Fig. 9. Cross-section through the lamina, at the level of the middrib, in the leaf of *Kalanchoe blossfeldiana*; coloration with Congo red; 1- upper epidermis; 2- lower epidermis; 3-the leaf mezophyll; 4-the double colaterally opened bundles; 5- colaterally opened conducting fascicle from the leaf mezophyll.

The upper and the lower epidermis of the lamina

The leaf at *Kalanchoe blossfeldiana* is amphistomatic, have no trichomes. There are present the stomatic complexes of amarilidaceous cyclocitic type (monocyclic or incompletely amphicyclic) in the upper and the lower epidermis. The upper epidermis is made up of poliedric cells (hexagonal, pentagonal) and less stomatic complexes (fig. 10, C) than in the lower epidermis. In the lower epidermis the epidermic cells have undulated walls (fig.10, A,B), and the stomatic complexes are numerous (fig. 10, A). The dimensions of the stomatic cells between 27 and 35 μ m, and the width between 7,5 and 10 μ m. The cells of the upper epidermis are bigger as dimensions (the length comprised between 132-225 μ m; the width between 62-100 μ m), comparatively with the cells of the lower epidermis (the length comprised between 125-205 μ m; the width between 55-90 μ m).







Fig.10. The lower epidermis (A,B) and the upper one (C) with their stomatae at the leaf of *Kalanchoe blossfeldiana* (bar - 100 μm).

DISCUSSIONS

The structure of the root at Kalanchoe blossfeldiana is one typically secondary due to the functioning of the secondary meristem called cambium. The root hair are unicellular at Kalanchoe blossfeldiana in comparison with multicellular ones at adventitious roots of Kalanchoe fedtschenkoi (Popham and Henry, 1955). At Kalanchoe blossfeldiana the stem has a secondary structure, result of the activity of the cambium and the felogen. In the central cylinder of the stem there is a tipically secondary structure, like at K. tubiflora (Hansen Pacheco et al., 2006), due to the functioning of the cambium. The floriferous stem at the species taken into study has a secondary structure, at its level being present the cambium. At the evel of the leaf petiole and of the lamina there are present only tissues having a primary origin; the mezophyll of the leaf is homogenous. The leaf at Kalanchoe blossfeldiana is amphistomatic, have no trichomes like other species of Kalanchoe genera (Weryszko-Chmielewska and Chernetskyy, 2005). There are present the stomatic complexes of amarilidaceous cyclocitic type (monocyclic or incompletely amphicyclic), both in the upper and the lower epidermis. Inamdar and Patel (1970) have described the structure and ontogeny of the stomatae at the vegetative and floral organs of three species of Kalanchoe. The mature anisocitical stomatae is monocyclical or completely or incolmpletely amphicyclical, more rarely paracytical, tranzitively between paracytic and anisocytic. The abnormal stomatae with a single cell annexed has developed directly from the meristemoid (Inamdar and Patel, 1970).

BIBLIOGRAPHY

Adam, V., Rustin, P. Enzymatic properties of phosfoenolpyruvate carboxylase of purified chloroplasts from CAM-performing *Kalanchoe blossfeldiana* Poelln. plants, Plant and Cell Physiology 27(5): 881-886. 1986.

Dickens, C.W.S., Van Staden, J. The In Vitro flowering of *Kalanchoe blossfeldiana* Poellniz, Journal of Experimental Botany, 39(4): 461-471. 1998.

Fischer-Schliebs, E., Mariaux, J.B., Lüttge, U. Stimulation of H+ transport activity of vacuolar H+ATPase by activation of H+Pase in *Kalanchoe blossfeldiana*, Biologia Plantarum, 39(2): 169-177. 1997.

Hansen Pacheco, F.T., Silva Stenico, M.E., Silva, D.M.. Anatomy of *Citrus* sp. and *Kalanchoe tubiflora* tumor tissues, Journal of Biological Sciences 6 (5): 899-904. 2006.

Hyakutake, S, Grotta Ade, S.. Morfological and anatomical study of *Kalanchoe braziliensis cambessedes*. *Crassulaceae*, Revista de farmacia e bioquimica de Universidade de Sao Paulo 10 (2): 217-237. 1972.

Inamdar, J.A., Patel, R.C. Structure and development of stomata in vegetative and floral organs of three species of *Kalanchoe*, Annals of Botany 34(4): 965-974. 1970.

Izumikawa, Y., Takei, S., Nakamura, I., Mii, M. Production and characterization of inter-sectional hybrids between *Kalanchoe spathulata* and *K. laxiflora* (= *Bryophyllum crenatum*), Euphytica 163(1):123-130. 2008.

Moore, R. Graft formation in *Kalanchoe blossfeldiana*, Journal of Experimental Botany, 33(3):533-540. 1982.

Ota, K., Tezuka, T., Yamamoto, Y. Changes in Crassulacean Acid Metabolism of *Kalanchoe blossfeldiana* by different nitrogen sources, Plant and Cell Physiology 29(4): 533-537. 1988.

Popham, R.A., Henry R.D. 1955. Multicellular root hairs on adventitious roots of *Kalanchoe fedtschenkoi*, The Ohio Journal Science 55 (5): 301-315.

Sanikhani, M., Frello, S., Serek, M. 2006. TDZ induces shoot regeneration in various *Kalanchoe blossfeldiana* Poelln. cultivars in the absence of auxin, Plant Cell Tissue and Organ Culture 85(1):75-82.

Sanikhani, M., Mibus, H., Stummann, B.M., Serek, M. *Kalanchoe blossfeldiana* plant expressing the *Arabidopsis* etr1-1 allele show reduced ethylene sensitivity, Plant Cell Reports 27 (4):729-737. 2008.

Thiede, J., Eggli, U. Crassulaceae, pp.83-118, In: K.Kubitzki (eds). 2007

The Families and Genera of Vascular Plants, Vol. IX, Springer Berlin Press.

Thirukkumaran, G., Khan, R.S., Chin, D.P., Nakamura, I., Mii, M. Isopentenyl transferase gene expression offers the positive selection of marker-free transgenic plant of *Kalanchoe blossfeldiana*, Plant Cell Tissue and Organ Culture 97(3):237-242. 2009.

Varga, A., Thoma, L.H., Bruinsma, J. Effects of auxin and cztokinins on epigenetic instability of callus-propagated *Kalanchoe blossfeldiana* Poelln., Plant Cell Tissue and Organ Culture, 15(3): 223-231. 1988.

Van Voorst, A., Arends, J.C. The origin and chromosome numbers of cultivars of *Kalanchoe blossfeldiana* Von Pollen.: Their history and evolution, Euphytica 31(3): 573-584. 1982.

Weryszko-Chmielewska, E., Chernetskyy, M. 2005. Structure of trichomes from the surface of leaves of some species of *Kalanchoe* Adans, Acta Biologica Cracoviensia, series Botanica 47 (2):15-22. 2005.

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

- Seria: ✓ Biologie ✓ Horticultură ✓ Tehnologia prelucrării
 - produselor agricole

🖌 Ingineria mediului

Vol. XVI (LII) - 2011

PROSPECTS OF DEVELOPMENT OF AGRICULTURE AND RURAL AREAS IN THE CONTEXT OF GLOBAL CLIMATE CHANGES. SUSTAINABLE DEVELOPMENT IN EUROPE - EUROPEAN STRATEGY FOR 2010-2013 IN SUSTAINABLE AGRICULTURE TAKING ACCOUNT OF CLIMATE CHANGE

Cristiana Sîrbu¹

KEY WORDS: sustainable development, rural development, climate changes, farmers

ABSTRACT

The paper aimed to accentuate the importance of the rural development and the impact of the climate changes on rural development and agriculture. Rural development is one of the most complex issues nowadays focused on achieving a balance between the preservation of rural conditions and the trend of modernization. In this paper we talk about methods and instruments released for the farmers by the European Union for the agriculture and rural development. Achieving the challenge for a sustainable rural and agriculture development can be achieved in terms of adapting to the major current global challenges: global climate changes, drastic restriction of biodiversity species of organisms, processes of degradation, erosion and soil pollution, diminishing water resources.

INTRODUCTION

The issue of rural development is one of the most complex nowadays, which means "acomplishing a ballance between the preservation of the economic, ecological and social – cultural rural areas, on one side, and the trend of "modernization" of the rural life, on the other side. Rural development is at the confluence between the trend of expansion of urban areas, aggressive development of industry at the expense of the rural areas and the requirement to maintain as far as possible, its current dimensions.

Sustainable agriculture refers to a long-term action which seeks to overcome problems and limitations faced by agriculture and society generally.

MATERIAL AND METHOD

More than 56% of the 27 EU Member States population live in rural areas, which cover 91% of European territory. This gives to the policy of rural development a vital importance. Livestock and forestry remain key factors for land usage and natural resource

¹ "The Ecological Initiative and Sustainable Development Group" Foundation

No. 13, 13 September Street, The Building of the Romanian Academy, Bucharest, Sector 5, Romania, Phone number: 0740 055 221, e-mail: fundatiagie@yahoo.com

University of Agronomic Sciences and Veterinary Surgeons, Faculty of Management, Economic Engineering in Agriculture and Rural Development

No. 59, Mărăști Boulevard, Bucharest, Sector 1, Romania, Phone number: 0740 055 221, e-mail: fundatiagie@yahoo.com

management in rural areas of the European Union, representing at the same time, a platform for economic diversification in rural communities.

Therefore, strengthening the rural development became a priority for the Union.

Rural development measures can be used in particular to encourage innovation in water management, production and usage of renewable energy sources, protect biodiversity and approaching the attenuation of the climate changes and the adaptation to them and to encourage favorable solution for all parties in competitiveness and environmental protection. To promote the full usage of innovation, a support should be available for innovative operations on new challenges. European Union rural development policy aimed to solve the problems that our rural areas are facing and exploiting their potential.

European Union agreed in early 2008 the local implementation of The National Rural Development Program (NRDP) and, starting then to today have been attracted funds of over 742 million euro. Only 198 million are money following the project submission for creating and modernization of the farms, renovation of villages, for encouraging tourism activities and the foundation of groups of producers, the rest being given to farmers working in disadvantaged areas as additional direct payments.

European funds are a relief to farmers in Romania, given that farmers are decapitalized and banks are reserved in supporting this sector. European Union aims to correct the unbalance in European agriculture, knowing that the future agriculture must be a modern agriculture based on agriculture policies that regard also the environmental protection. Romanian farmers dispose of 8,8 billion euro for the rural development until 2013 trough The Payment Agency for Rural Development and Fishery. The process of accessing the money ensues hardly, in the last three years only about 8,4% of this money actually reached the pockets of the farmers.

Rural development is one of EU priorities, such that over 6 billion euro will finance European agricultural actions trough The European Agricultural Fund for Rural Development following three directions:

1. Improving the competitiveness in agriculture and forestry;

2. Environmental and rural areas protection;

3. Quality of life and diversification of rural activities.

So far in Romania so far 121 was the most requested, over 4,500 farmers submitting applications for funding the scheme which has allocated an amount of 884 million euro. Most of the money were attracted for exploitations modernization, about 122 million euro are at farmers which mean 13,8% of the amount.

2010 will be a peak year for NRDP, because it can be attracted 3 - 4 million euro, if it will provide easier financing.

Thawing the credits is needed, trying to find actions to attract farmers, such as preferential interests, especially since this year the allocation is changing and will decrease with 10% the irredeemable contribution from the European Union.

European Union is concerned that many European regions are threatened by the desertification do to dramatic climate changes in the last 10 years.

Thus, European funds such as EAGGF - Guidance, European Regional Development Fund and European Social Fund (for recovering the less developed areas), supporting funding for:

a) Forestation, diversification, improving stands crops;

b) "Opening" sales markets for forest products.

If forestation (planting and maintenance) are ensured starting at 185 euro/ha up to 725 euro every year, depending on the exploitations type. To protect and maintain forests against fires are given between 40 and 120 euro/ha annually.

Also, keeping in sight the environmental protection, agro – environmental measures allow farmers to benefit by an aid between 100 and 1000 euro/ha, these measures are:

- a) Reducing the usage of the fertilizers and products for the plant's health;
- b) Conversion of the cropland into grass land;
- c) Reduction of the livestock per unit of fodder area;
- d) Natural environment protection;
- e) Increasing the local species threatened by extinction;
- f) Withdrawal on long-term (20 years) of agricultural land for the establishment of natural parks or water protection;
- g) Closing down cultivations to allow the entrance of the public for spending their free time and amusement;
- h) Training farmers for environmental protection;
- i) Improving environmental quality (1500 euro per person per exploitation for 5 years);
- j) Animal's welfare (500 euro per year per animal);
- k) Usage of the 100% recyclable packaging for food packing.

Common Agricultural Policy - CAP – founded in 1962, is the oldest and most integrated of European policies. But, after 30 years of "honest services", has been proved inadequate to modern agricultural production and trade requirements and it became the subject of some serious reforms.

RESULTS AND DISCUSSIONS

The new CAP reform introduces a new element: adoption and compliance with environmental protection and respect for the rural areas.

The experience created by "mad cow disease", made CAP seeks to ensure the European citizen consumers about the safety and quality of supplies and also about respecting the environment.

Thus, was created the European Food Safety Authority (EFSA), which came into operation in 2002 in Brussels, and has strengthened the legal principles adopted in November 2003. Regulation of GMOs (genetically modified organisms) - information about the presence of GMOs should be submitted in the food chain and kept for a period of 5 years. All these factors carefully designed in European policies, attempt to reduce pollution by 2020, the risk factors of carbon emissions by 80%.

The Parliament and the European Council created the framework for a cooperation regarding a sustainable development in rural areas, these decisions applying to the countries in European Union and the countries of Central and Eastern Europe. This framework is an actual plan called "Agenda 21".

Achieving rural development and sustainable development can be done by adapting to the greatest global challenges nowadays: global climate changes, drastic restriction of biodiversity species of organisms, processes of degradation, erosion and soil pollution, diminishing water resources.

Global climate changes manifested by increasing average temperature, and rainfall condition changes, have led to an increase of arid areas worldwide, in recent decades,.

After the last Commission report, published in December 2004, emissions of greenhouse gases in the EU in 2002 were 9% lower than in 1990.

EU wants to keep the work with this, so, in March 2005, European ministers of environment have proposed that the developed countries to consider reducing emissions

corridors from 15 - 30% by 2020 and 60 - 80% by 2050. The European Community has limited use of certain hazardous substances such as chloro - fluoro - carbons or CFCs used in aerosols and large refrigeration facilities. European Agreement concerning the reduction of ozone at ground level requires Member States to meet drastic targets in 2010. It should be avoided exceeding 120 miligrame/m³ for more than 25 days a year.

To reduce the negative impacts of climate changes is necessary to introduce issues related to climate and climate changes in water resources development agenda at national level. This statement was made at the opening ceremony of the 3rd international conference on climate and water (The Third International Conference Climate and Water), held in Helsinki, Finland, 3-6 September 2007.

Climate Change Conference in Copenhagen which took place in December this year has proved to be a disappointment. The Pact, hardly adopted, requires participating states to reduce emissions of greenhouse gases, "in order" to limit global warming to below $2 \circ C$ - the threshold beyond which climate changes would likely to get out of control. Thus, developed nations could significantly reduce emissions, in a measurable way. Developing countries are expected to limit their emissions and report the results recorded every two years, with "provisions for analysis and international consultations". The most important result of the conference is that developed countries have agreed to pay 30 billion dollars (21 billion euro) over the next three years and 100 billion dollars (70 billion euro) by 2020, for financing projects in poor states supporting efforts to promote clean energy and adaptation to drought, raising sea levels and other climate changes. EU committed to provide quick initial funding worth 7.2 billion euro (from a total of 21 billion). The amounts would come from different sources, public and private.

CONCLUSIONS

Climate changes may lead to a pronounced increase in poverty and undermine sustainable development, in particular in least developed countries. Efforts to reduce the effects of global climate change may enhance the overall development prospects in part by decreasing the risk of negative impacts of climate change.

On long term, the measures required for prevention and mitigation of climate change include reforestation programs, reducing pollution, restoring and upgrading anti-erosion works and expansion of planning and improvement of sandy soils, etc. However, population education and awareness on environmental protection are major requirements in developing adaptation strategies to climate change.

Sustainable development also requires a better understanding of the climate system, with the ability to predict future climate changes and their potential impact on climate variability, socio-economic and environmental activities.

REFERENCES

European Union's Guide, Jose Echkenazi

Lester R. Brown, Plan B 3.0.: Mobilizing to Save Civilization, Technical Editure, Bucharest, 2008

Ion Iliescu, For a sustainable developemnt, Semne Editure, Bucharest, 2007

Ion Iliescu, Opinion of The Forum on development. Sustainable Development Strategy in Romania. Horizon 2025, Bucharest, 2005
UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

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

Vol. XV (LII) - 2011

STRATEGY FOR THE DANUBE REGION - CONTRIBUTION TO IMPROVING THE CONDITIONS OF LIFE AND WORK OF ALL CITIZENS OF THE LOWER DANUBE REGION

Cristiana Sîrbu¹

KEY WORDS: Danube Commission, the European strategy, sustainable development, conditions of life

ABSTRACT

This paper aims to raise awareness about the European Commission Strategy for the Danube Region, strategy materialized in new opportunities and new potential, in particular as regards the strengthening of EU efforts to overcome economic crisis in a sustainable manner. This paper presents the main proposals and recommendations made by the European Economic and Social Committee for the Strategy in the Danube region, so that socio-economic development, competitiveness, environmental management and increased resource efficiency can be improved, and security and transport corridors, upgraded. European Parliament was established from the very beginning as a reliable partner that will always ensure the future "development strategy of the Danube region. The strategy should make it a region that truly belongs to the 21st century, secure and confident in their forces and one of the most attractive in Europe.

INTRODUCTION

Danube Delta (3446 km²), located largely in Dobrogea, Romania, and partly in Ukraine, is the largest and best preserved of European deltas.

Delta entered into the UNESCO world heritage in 1991 and is classified as a national biosphere reserve as a national park in Romania and in international taxonomy of IUCN (International Union for Conservation of Nature and Natural Resources).

Delta vegetation is represented mainly by specific vegetation that exists mostly in wetlands (reed, bulrush, sedge, mixed with dwarf willow) and covers 78% of the total. Riverside coppices occupies 6% of the delta, are forests of willow, ash, alder, poplar, which grow on river levees, that are regularly flooded, and the stitches covered by water are occupied by floating aquatic vegetation (2% of the delta). There are also forests in Letea and Caraorman Fields that consist of gray oak, ash, poplar, elm, climbing plants.

It contains more than 320 species of birds as well as 45 freshwater fish species in its numerous lakes and backwaters. This is where millions of birds from different corners of

¹ The Ecological Initiative and Sustainable Development Group" Foundation

No. 13, 13 September Street, The Building of the Romanian Academy, Bucharest, Sector 5, Romania, Phone number: 0740 055 221, e-mail: cris_sirbu@yahoo.com, fundatiagie@yahoo.com

University of Agronomic Sciences and Veterinary Surgeons, Faculty of Management, Economic Engineering in Agriculture and Rural Development

No. 59, Mărăști Boulevard, Bucharest, Sector 1, Romania, Phone number: 0740 055 221, e-mail: cris_sirbu@yahoo.com, fundatiagie@yahoo.com

the Earth (Europe, Asia, Africa, and Mediterranean) come to roost. Major species of fish in the Danube Delta are pike and catfish. Delta population has a way of life unchanged for centuries. Discrete human implantation has allowed amazing survival of the Delta ecosystem. Large extent of waters explains the low number of habitants.

Fishing is a constant of human activity in the region. Exploitation of reeds and rushes is another branch of human activity. The crop is practiced some areas and others contain common land for farming. Navigation and transport on the Danube Channel are other concerns of residents. Danube Delta is a region of great beauty and touristic attraction and has a real scientific interest. Danube Delta Biosphere Reservation is located on the 5th place among the Earth's wetlands and no. 2 in Europe, but regarding the ecological importance is the third in the world.

MATERIAL AND METHOD

Danube region has changed dramatically. Recently, there have been waves of EU enlargement in 2004 and 2007. River Basin that crosses most countries in the world is now largely an area of the European Union. There are new opportunities and new potential, in particular as regards strengthening of EU efforts to overcome economic crisis in a sustainable manner. Socio-economic development, competitiveness, environmental management and increased resource efficiency can be improved, and security and transport corridors, upgraded. Danube can open the EU to immediate neighbors, the Black Sea region, the South Caucasus and Central Asia. An EU strategy for the Danube region may contribute to the EU objectives, strengthening the EU's major policy initiatives, particularly Europe 2020 Strategy.

Danube's region development strategy is a long chain of consultation and debate that would highlight the action plan of over 800 contributions received from the 14 countries: Germany, Austria, Slovenia, Czech Republic, Slovakia, Hungary, Romania, Bulgaria, Croatia, Serbia, Bosnia, Herzegovina, Montenegro, Moldova, and Ukraine, countries both inside and outside European Community.

Thus, the countries of the Danube region expressed their commitment to creating a new macro-region that is considering a joint plan of action that is based on four pillars and focus on 11 priority areas. European Parliament was established from the very beginning as a reliable partner that will always ensure the future "development strategy of the Danube region.

RESULTS

On 16 of September 2010 was held in Brussels the Plenary Session of the European Economic and Social Committee (EESC) where was adopted "The European Strategy for the Danube Region" (reporting Miklos Barabas - Group III - Hungary and Mihai Manoliu - Group I - Romania, President of CNPR and Secretary General ACPR).

The notification of EESC wants to seize the opportunity given to the European civil society by the European Commission to set concrete practical proposals that would constitute a contribution to the Strategy's Action Plan for the Danube Region, currently developing. The Committee expects that future strategy should be a real contribution to improving life and working conditions of all citizens in the Danube region, which it considers a mirror of Europe.

The main proposals and the recommendations made by the Committee for European Union Strategy for the Danube Region were:

1. At the political level, the strategy planned for the Danube Region:

must have an open, inclusive and sensitive to social, economic and environmental, to take into account the recommendations of civil society organizations and rely on their experience;

> given the complex and interdependent problems reached, can be effective only if it consistently follows the principle of integrated approach, rather than sectorial point of views, and if highlights the need to achieve the objectives of key stakeholders;

> must stimulate and take account of the civil security cooperation in areas such as emergency services which work together to cope with natural disasters, the mobility of workers, businesses, etc. or to prepare emergency plans to deal with environmental accidents;

> must contribute to the fullest possible use of opportunities offered by the Treaty of Lisbon like the consistent application of the principle of participatory democracy;

must be an appropriate tool for:

to contribute effectively, as a macro regional development policies, towards deepening the European integration, particularly in Europe 2020 Strategy (for smart growth, sustainable and inclusive);

to get the six countries in the region that are not members closer to the European Union, supporting them in their integration efforts;

should reflect the European Union policy at a macro level and, thus, active and creative contribution and role of organized civil society;

> must contribute to the harmonization of activities already existing in the region, operating at different levels and in different fields, for their efficiency and to avoid duplication;

> its governance structure should be clear, simple and transparent and allow bottom-up approach in terms of organized civil society;

> must be implemented as a process that involves, during the course, flexibility and regular review and, where possible, additional financial resources;

have to follow some realistic goals and establish priorities for effective implementation;

 \succ must have visible and tangible results for society and citizens to create better living conditions and better jobs for citizens, including youth;

> must reflect the importance of social and civil dialogue;

must recognize the importance of connections in the Danube region;

> must take into account the experiences resulting from implementation of the EU Strategy for Baltic Sea region.

2. Practical recommendations on civil society, the planned strategy action plan for the Danube Region:

should create a network of civil society organizations in the region (Civil Society Forum in the Danube region) to facilitate, among other things, actions and projects; network members would meet every year in another country in the region;

should contain events (meetings, festivals, visits, exhibitions, fairs, etc..) in way to strengthen the people's sense of belonging to the Danube region, building a regional consciousness and maintaining cultural diversity, with special emphasis on youth; to achieve this objective it could help also a regional and cultural publication;

should be held annually in different locations, a "Week of the Danube", which might be an appropriate forum for discussing topical issues relating to strategy for the Danube Region and to present results;

 \succ to ensure continued support from citizens and organized civil society in both the EU and neighboring countries which are not EU members, is required a communication strategy for effective and permanent Danube region;

> in developing programs under the Strategy for the Danube Region should pay attention to disadvantaged and marginalized groups, particularly Romani people;

should strengthen cooperation and systematic relations between actors in the region, as well as social and civil dialogue; in this context, economic and social councils at national level can play an important role;

Entrepreneurial Forum set up in the Danube region (Danube Business Forum), which would include social and economic actors, could be an important tool for achieving cooperation and economic, social and territorial cohesion in the region; employers organizations in the region should access and should be encouraged to participate in funding programs aimed at organizing this forum;

should contribute to strengthening human relations by further reducing the obstacles to free movement, even eliminating them, and by applying the principles of decent work and fair remuneration;

➤ to implement the Strategy for the Danube region, would be valued achievements and information society services;

 \succ should establish an international research group, which will have as its task to examine and analyze the scientific aspects of the strategy for the Danube region, its activities should be supported through a scholarship program;

should consider how they can correlate the different years and subjects of their programs with the European Union Strategy for the Danube region;

should support initiatives aimed at teaching languages used in the region;
 European Economic and Social Committee should establish an observer

or a study group to work continuously and strategy to deal with the Danube region; implementation and monitoring the Strategy for the Danube region

previsions and its action plan should be made by a management committee composed of representatives of civil society to submit its findings in annual reports;

> in conjunction with the adoption of the Strategy for the Danube region, the European Commission should support some pilot projects suitable for testing and start acquiring experience;

Strategy funding towards the Danube region and the provisions of the plan of action should come from various sources: with European funds (primarily structural funds) may be taken into account countries' own funds in the region, private sources and international financial institutions. Taking into account their contribution, the Committee recommends establishing a separate fund;

European Economic and Social Committee considers that the Strategy for the Danube region - whose adoption is scheduled for the first half of 2011, during the Hungarian presidency of the EU - can be a crucial tool for creating a dynamic, competitive and prosperous region of the Danube.

On 8th of December 2010 The European Commission has approved and published the EU Strategy for the Danube region, reflected in a Communication and Action Plan. The documents discussed and agreed at Community level and which form the core of regional cooperation on the Danube, is making concentrated efforts of riveran states, which together with the European Commission, analyzed and evaluated the real needs of the Danube region and proposed an agreed document at political and technical level.

The strategy proposes an Action Plan, which requires a strong commitment from the states and stakeholders. The Commission will produce a regular progress report.

Therefore, actions and projects will be upgraded or replaced as they are completed, making this plan a flexible one. It points out the importance of localized and integrated approach. Good connections between urban and rural infrastructure and equitable access to services and comparable living conditions, promote territorial cohesion, which is now an explicit objective of the European Union.

The consultation has identified a number of proposals on different lines of action. Commission, in partnership with Member States, regions and other stakeholders has selected those that:

demonstrate immediate and visible benefits for the habitants;

 \triangleright have an impact on the macro-region (or significant portions thereof).

Projects should, therefore, promote sustainable development and to include more regions and countries;

are coherent and mutually reinforcing, creating suitable solutions for all \geq parties involved

are realistic (technically feasible and credible financing).

The main problems are grouped into four pillars. Each of them contains the priority areas, specific areas of action. They are:

- interconnection in the Danube region
- ÷ to improve mobility and multimodality
- √ inland

≻

 \geq

√ road links, rail and air

* to encouraging more sustainable energy

- ÷ to promote culture and tourism, direct contacts between people
- ≻ environmental protection in the Danube region
- * restoration and maintenance of water quality
- ÷ managing environmental risks
- ÷ biodiversity conservation, landscape and air and soil quality
- ≻ increasing prosperity in the Danube region

÷ knowledge-based society through research, education and information technology

support the competitiveness of enterprises, including the development groups

- * investment in people and skills
- \triangleright consolidation of the Danube region

* improving institutional capacity and cooperation

••• cooperation to promote security and to resolve problems posed by organized crime and serious crime.

DISCUSIONS

The work I conducted as an executive president of the "Ecological Initiative and sustainable Development Group" Foundation, I tried to put the entire population as much in touch with current reality, the act of awareness act representing a first step towards sustainable development.

Our efforts were noticed even by Mr. Philip Weller, Executive Secretary, International Commission for the Protection of the Danube River (ICPDR) who wanted to congratulate the "Ecological Initiative and sustainable Development Group" Foundation . considering our proposals very useful in the context of the European Strategy for the Danube. International Commission for the Protection of the Danube River (ICPDR) is active in preparing the proposed strategy for the Danube and its implementation through a participatory approach from the heads of delegations of the ICPDR and the Priority Area Coordinators recently nominated for the European strategy for the Danube. ICPDR people are militating for prosperity and sustainable development in the Danube basin in this region. This message from the ICPDR has encouraged us and gave us hope of cooperation to meet the challenges we face in this region. In current times, development is a clear component of the Strategy for the Danube region. Danube region has changed dramatically. Recently, the EU has enlarged. River Basin that crosses most countries in the world is now largely an area of the European Union, so there is a need to connect people, ideas and needs in this region. A first start of making this strategy public was the organization of the Forum "Danube – restoration or damming? Optimal solutions", in which Mr. Mihai Manoliu as coreporter of the EESC opinion of civil society's position towards the future strategy, presented to the public the public version of the new EESC opinion on the strategy and action plan for Danube region.

SHORT NOTES

Consistency with EU legislation and policies are at the base of The Europe 2020 Strategy. The aim of this Strategy is that all citizens of Danube region should enjoy better prospects of higher education, labor employment and prosperity in areas where they live. The strategy should help the region to become a secure one and one of the most attractive in Europe and make the citizens confident in their forces.

Europe 2020 Strategy is essentially the EU's commitment towards creating jobs, sustainable and inclusive growth, that this strategy will reinforce. It has five main objectives. They are: promoting employment, improving conditions for innovation, research and development, addressing climate change and energy goals, improving education, and promoting social inclusion in particular by reducing poverty and the problems posed by aging. Strategy with its vision for the Danube region in 2020, wants to achieve these objectives. It supports sustainable growth by reducing energy consumption, increase use of renewable energy, modernizing the transport sector by optimizing and improving its environmental impact and promoting ecological tourism. It helps to remove obstacles to internal market and improve the business environment.

Consistency with EU legislation and policies are at the base of this strategy. It approaches the implementation gap and practical and organizational difficulties that lead to lack of results. It supports better implementation of EU legal obligations, in particular the single market and the environment. The purpose and the EU's strategy for biodiversity after 2010, with its projection for 2050 and 2020 target, are also consolidates a gateway to Europe and the Asian neighbors, the region is essential in supporting other EU external policies, in line with European Neighborhood Policy and regional initiatives (example: the Eastern Partnership).

By 2020, all citizens of this region should enjoy better prospects of higher education, labor employment and prosperity in areas where they live.

The strategy should make it a region that truly belongs to the 21st century, secure and confident in their forces and one of the most attractive in Europe.

REFERENCES

European's Commission Communication on the Danube Strategy, 2010 Action Plan of the Strategy for the Danube region, 2010

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

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

Vol. XVI (LII) - 2011

DYNAMICS OF SOME BIOTOPE FACTORS THAT CHARACTERIZETHE VITICULTURAL CENTER BANU MARACINE

Stan S.¹, Giugea N²., Mărăcineanu L²., Costea D²., Popa C³.

KEY WORDS: viticultural area, climatology

ABSTRACT

This paper analyzes the dynamics of biotope factors that characterize the wine center Banu Maracine. For this meteorological data recorded over a long period were interpreted, in terms of climatological indicators wine making calls to it and graphical methods for assessing the ecological potential of an.

INTRODUCTION

Features of climate in Romania amount some features generated by our geographical position. This translates into small differences between the duration of the day compared to the one of the nights, small differences regarding the average annual temperature between the vineyards of the north and the south.

On the other hand, Romania is also placed at an area of intersection of air masses, providing nuance climate, which contribute to the full feature and concentric arrangement of the relief. Therefore, the study undertaken aimed to highlight the as possible, the defining features of current climate that characterize the viticultural biotope from the studied winemaking center.

MATERIAL AND METHOD

This study was done by interpreting weather records provided by the Regional Weather Center Craiova, the weather station is located in the area of the winegrowing center Banu Maracine.

It was considered a period of 20 years, using as comparison the decade from 1972 to 1981. Highlighting the current climate framework was based on interpretation of weather data recorded through the viticultural climate indicators or specific indicators to meteorology, numerical methods of assessment, but also by making climagrame as a graphical method for characterizing winegrowing areas. In this sense, the literature found consistently provided a theoretical suport for characterization of the recorded values.

We can mention the works of the following authors: Oşlobeanu M. et al. (1980), St. Teodorescu. et al. (1987), Olteanu I. (2000), Olteanu I. et al. (2002), Maracineanu L. (2010).

¹ Universitatea din Craiova, Grădina Botanică

² Universitatea din Craiova, Facultatea de Horticultură

³ Agenția Națională a Îmbunătățirilor Funciare, București

RESULTS AND DISCUSSION

Climate data that were the basis for climatic interpretation are presented in the following tables. Thus, Table no 1 shows the evolution of indicators registered in the Banu Maracine center, from 1972 to 1981. They will continue to be used as a therm of comparison to highlight the current climate of the Banu Maracine center, presented in Tables no 2, 3 and 4. Given the annual average temperature, we find that it rose from 10.3° C during 1972-1981, to 11.4° C, between 1991 and 2010, the difference is 1.1° C, which means much in the current climatic context.

The amplitude of the reference period amounted to 1.5° C, while the mean differences has been between 0.28 and 0.78 were °C (3-8%) in negative sense and between 0.22 and 0.72° C (2-7%), in positive sense.

Speaking in therms of relative values we can say that in 60% of values were above average. Regarding the period 1991 - 2010 the situation in this case we see that the amplitude temperature values and the percentage rises to 2.4° C below average years with values equal to those with above average values, ie 50%. Recorded values are higher with 1-10% or lower 1-11%.

From statistically point of view things are normal, as the sum of differences should be zero but note that talking climatological average deviation record higher values in the contemporary period, compared with the reference decade, which corresponds, as seen with greater amplitude of the average temperature.

Compared to the average 1972 - 1981, present value, of 11.4° C, represent an additional 10.7%. An indicator that can provide additional information is the average temperature of the hottest month, considered to be July, although there are cases when the average temperature in August is higher than in July. We find that an increase from 21.4° to 23.2° C, ie 1.8°. Translated into relative value is 8.4%.

The gap amounted to 2.8° C, during the reference period and 4.9° C in the current period. Here are some elements that make us say that at present, from the thermal point of view we assist to obvious changes. They are to be completed by thermal balance calculation. From this perspective, the values previously reported are 3289° C, in terms of active thermal balance and 1588° C, in terms of useful thermal balance.

The current period is characterized by an average of 3394° C, in terms of active thermal balance and 1662° C, in terms of useful thermal balance.

The differences are evident for the interval 1991 - 2010 and beyond previous average 105° C, respectively, 74° C.

This translates into a surplus of 3.2% or 4.7% if we consider the useful thermal balance. Compared to the period 1972 - 1981, when 30% of years recorded a higher average value, for the active thermal balance, and 40% for the useful thermal balance, between 1991 and 2010, 61% of viticultural years have recorded above average values, given active thermal balance and 66% if we refer to the useful thermal balance.

Regarding rainfall, the previous average of 380 l/m2 is now exceeded by 22.5 l/m2, reaching 402.5 l/m2, ie almost 6%.

Therefore it follows that the due to the increasing of the thermal resource concomitent has amplified the hydric resource, recorded during the growing season.

Compared with the reference decade, when 30% of years recorded a value of above average rainfall during the growing season, now increased up to 35%.

Table nr: 1

Year	Temp. average annual (°C)	Temp. average July (°C)	Active thermal balance (°C)	Useful thermal balance (°C)	Sunstroke (hours)	Rainfall (l/m ²)	Heliothermal index	Bioclimatic index	Oenoclimatic aptitude index
1972	10,5	22,4	3232	1528	1640	408	2,5	7,1	4714
1973	10,0	21,1	3263	1463	1659	374	2,4	7,9	4798
1974	10,5	22,8	3263	1493	1664	312	2,5	9,5	4865
1975	10,9	21,3	3356	1526	1596	488	2,4	6,0	4714
1976	9,5	20,0	3114	1284	1399	378	1,8	6,3	4385
1977	10,5	21,6	3129	1947	1624	305	3,2	9,1	4698
1978	9,6	20,8	3130	1270	1645	420	2,1	6,7	4605
1979	11,0	21,2	3113	1943	1402	379	2,7	6,3	4386
1980	9,5	21,1	3676	1776	1436	375	2,6	7,7	4987
1981	10,8	21,3	3618	1648	1533	361	2,5	8,4	5040
Media	10,3	21,4	3289	1588	1560	380	2,5	7,5	4719

Climatic indicators recorded at the winegrowing center Banu Mărăcine

Table nr: 2

	Temp.	Temp.	Active thermal	Useful thermal	Sunstroke	Rainfall	Heliothermal	Bioclimatic	Oenoclimatic
Year	average	average July	balance (°C)	balance (°C)	(hours)	$(1/m^2)$	index	index	aptitude index
	annual (°C)	(°C)							
1991	10,1	22,2	3081	1401	1541	497,3	2,2	4,75	4326
1992	11,5	22,3	3400	1650	1551	209,2	2,6	13,09	4980
1993	10,8	23,1	3389	1689	1722	151,1	2,9	19,42	5197
1994	12,4	23,0	3567	1817	1613	321,2	2,9	8,27	5050
1995	10,8	23,6	3243	1543	1565	335,1	2,4	7,90	4707
1996	10,2	22,6	3283	1603	1494	281,8	2,4	9,09	4732
1997	10,3	21,6	3042	1433	1567	388,0	2,2	5,26	4364
1998	11,1	23,4	3459	1639	1588	375,6	2,6	7,03	4870
1999	11,7	23,6	3436	1696	1573	449,1	2,7	5,67	4738
2000	12,5	23,9	3659	1879	1858	223,3	3,5	16,61	5543
2001	11,7	23,4	3351	1631	1630	470,5	2,7	6,32	4758
2002	12,0	24,1	3398	1696	1588	420,5	2,7	6,07	4751
2003	11,3	22,6	3498	1819	1573	348,5	2,9	7,48	4920
2004	11,7	23,1	3207	1473	1858	420,5	2,7	6,71	4829
2005	10,5	21,8	-	-	1738	348,5	-	-	-
2006	10,9	22,8	-	-	1464	408,3	-	-	-
2007	12,4	26,5	3626	1836	1628	371,0	3,0	6,33	4994
2008	11,9	22,8	3443	1684	1354	263,4	2,3	7,71	4716
2009	12,1	23,7	3548	1768	1451	396,6	2,6	7,09	4943
2010	11,3	22,9	3463	1663	1416	434,0	2,4	7,17	4695
Media	11,4	23,2	3394	1662	1589	402,5	2,7	8,44	4840

Climatic indicators recorded at the winegrowing center Banu Mărăcine

Integrating the values of temperature humidity, climagrama of the period 1991 - 2010 indicate increased humidity deficit in two years: 1992 and 2000 (figure no 1).

Be noted that this refers to the calendar year.

Previous period, illustrated in Figure no: 2 do not indicate years with hydric deficient although for a more accurate monthly data would be useful.

Even so it is sufficient to elaborate thermo-hydric picture of the winegrowing center in the period 1972-1981.





Figure no: 1 – Climagrame of the period 1991 - 2010

Figure no: 2 – Climagrame of the period 1972 - 1982

This does not mean that the drought is completely absent, it can be highlighted more clearly if the implementation is done separately for each year in the range of 20, of the climagrame or if the data are consistent with some climatological summary indicators.

Regarding real sunstroke, the average of 1972 - 1981 indicates 1560 hours while the average 1991 to 2010 shows a higher value of 1589 hours, ie 1.9% more.

Percentage of years with above-average values is of 60% in the decade of reference, while over 20 years, 40% are above average values.

A possible explanation would be the more pronounced cloudiness, as a condition for the increase of rainfall.

On the other hand reference interval totaling 10 years, compared with a period of 20 years of trial, which is a possible cause of inaccuracy.

Therefore, we believe it is useful to consider the climatological study to consider some elements that characterize cloudiness recorded.

In terms of binary and ternary climatic indicators, the situation is commented below.

Thus, the heliothermal index recorded an increase from 2.5 to 2.7, the bioclimatic index of the vine from 7.5 to 8.5 and the index of oenoclimatic competency from 4719-4840.

These are the advocates of the hypothesis that climatic profile of Banu Maracine winegrowing center suffered major changes in therms of major climatic factors.

CONCLUSIONS

The winegrowing center Banu Maracine has favorability for vines, with the possibility of cultivation of varieties for white, red and aromatic wines those that not combustion acids, including obtaining quality wines DOC;

The climate shows a trend, so that at present the main ecological parameters (temperature, light and humidity) have higher values than those previously registered;

The interaction of temperature, light and humidity should be highlighted more precisely by making annual climagrame and expanding its area interpretation by calculating a larger number of indicators of climate, necessary to establish the range of wine varieties grown in the winegrowing center Banu Maracine or adaptation of the cultivation technologies.

BIBLIOGRAFY

Giugea N., I. Olteanu, "Banu Mărăcine, Tradiție și vocație viticolă". Ed. Universitaria Craiova; 2001.

Teodorescu Șt., A. Popa, Gh. Sandu, "Oenoclimatul României". Ed. Științifică și Enciclopedică, București; 1987.

Olteanu I., "Viticultură". Ed. Universitaria, Craiova; 2000

Olteanu I., D. Cichi, D, Costea, L.C. Mărăcineanu, "Viticultură specială". Ed. Universitaria, Craiova; 2002.

Oșlobeanu M., M. Oprean, I. Alexandrescu, M. Georgescu, P. Baniță, L. Jianu, , "Viticultură generală și specială", Ed Didactică și Pedagogică, București; 1980.

Manea G., "Elemente de biogeografie". Ed. Universitară, București; 2008

Mărăcineanu L.C., "Ecologia sistemelor antropice viticole (aplicații practice)". Ed. Arves, Craiova. 2010

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

Seria:
Biologie

✓ Horticultură
✓ Tehnologia prelucrării

produselor agricole ✓ Ingineria mediului

Vol. XVI (LII) - 2011

RESEARCHES REGARDING THE BEHAVIOR OF APPLE VARIETIES, ACCORDING TO THE CROWN FORM, IN HIGHLY - INTENSIVE PLANTATIONS, IN SUB-CARPATHIAN ARE OF OLTENIA

Tărăsescu Florina¹

KEY WORDS: apple, cultivar, forms of crown

ABSTRACT

In the conditions existing in the hill area of Oltenia, the highly intensive culture of apple represents a necessity both for its modernization and to meet the needs of society. Crown formation was made during the first 3 years after planting, after which they were

maintained by cuttings for crown keeping and fruiting (during the winter period).

Fruit production represents the most important element characterizing an apple plantation. For both species, the most productive forms of crown proved to be: Solen, Tatura Trellis and Ax Vertical.

INTRODUCTION

Apple culture is the most known and widespread in temperate climates, due to the importance of fruits in human nutrition, to higher incomes obtained from the cultivating fruits. Cultivation of apple in highly intensive systems enables us to obtain, from the first years after planting, large production of high quality fruits. Researches conducted in the country and abroad (Negrilă, 1965; Mike și colab., 1976; Isac și colab., 1975; Ştefan, 1983; Krebs Ch., 1990; Lespinasse M., Delort F., 1994) demonstrated the importance of establishing the form of crown which should allow keeping a reduced height of trees, the forming of a lightened crown, flattened such that to ensure large production of fruits. In this paper we proposed to establish the behavior of apple varieties - Idared and Florina – according to the form of crown, in highly intensive plantations from Sub-Carpathians Area of Oltenia.

MATERIAL AND METHODS

The research was located at SCDP Vâlcea (Valcea Station of Research and Development in Pomiculture), in a plantation set up during the spring of 2002, with trees in field II, grafted on root M9. Planting was carried out at a distance of 3.5/1.5 m (1905 plants/ha). The experiment is polyfactorial, type 2x8 (species, forms of crown), with four repetitions, each experimental plot containing six trees.

Factor A – Soli: Idared, Florina.

¹ Fruit Growing Research&Extension Station Vâlcea, University of Craiova, Râmnicu-Vâlcea, Romania

Factor B – Form of crown: Fus Fougeres, Ax Vertical, Solen, Vâlcea 1, Cruce Dublă 1, Cruce Dublă 2, Tatura Trellis, Tessa.

For the plants studied observations and measurements were made with reference to: determination of stem section surface (SST), in cm^2 ; the crown diameter by measuring the crown projection in two perpendicular directions (m); the tree height (m); the crown volume (m^3); the time of flowering, the fruit ripening time; the fruit production.

RESULTS AND DISCUSSIONS

Crown formation was made during the first 3 years after planting, after which they were maintained by cuttings for crown keeping and fruiting (during the winter period). After 9 years of growth, the two varieties developed SST, crown diameter, crown height, branches semi-skeleton, the amount of annual increases shown in figures 1-8, according to variety and form of crown.

ŀ	AX VERTICAL	
CHARACTERISTICS	SOIL	SOIL
	FLORINA	IDARED
		The
-age of plants	-9 years	-9 years
-SST	$-53,64 \text{ cm}^2$	-40.9 cm^2
-crown diameter,	- 1,8/1,6 m	-2/1.6 m
-height	-2,9-3,1 m	-2.9-3.1 m
-distance from soil to crown	-0.40 m	- 0.40 m
-axis is shortened at	-2,8-3,30 m	- 2.8-3.30 m
-no. of branches semi-skeleton	- 8	-8
- no. of branches semi-skeleton on		-
skeleton branches	- 10	- 10
-sum of annual increases	- 9,90 m	9.50 m
F	US FOUGERES	
CHARACTERISTICS	SOIL	SOIL
	FLORINA	IDARED
-age of plants -	-9 years	– 9 years
-SST	-69.81 cm^2	-67.00 cm^2
-crown diameter	-2.8/1.9 m	2 60/1 90m
-height	-2.8-3.3 m	-2.8-3.3 m
- distance from soil to crown	- 0 40 m	- 0 40 m
- no. of branches semi-skeleton	- 9	-12
-no. of branches semi-skeleton on	,	
skeleton branches	-13	-10
-sum of annual increases	- 10 00 m	- 7 60 m
	SOLEN	,,
CHARACTERISTICS	SOIL	SOIL
	FLORINA	IDARED
-age of plants	-9 years	-9 years
-SST	-5430 cm^2	$-4568\mathrm{cm}^2$
-crown diameter	1 90/1 70m	1 70/1 50m
-distance from soil to crown	-,- 0, 1,, 0111	-,

- no. of branches semi-skeleton	- 0.40-0.50 m	-0.40-0.50 m	1754
no of branches somi skalaton on	11	0	172 m
-no. of branches senii-skeleton on	-11	- 2	A Part
skeleton branches			1 Aller
-sum of annual increases	- 13	-12	(man and
	- 9.60 m	- 8 80 m	(manual)
	- 9,00 m	- 0,00 m	T
	VALCEA 1		
	VALCEA		
		0.017	ant.
CHARACTERISTICS	SOIL	SOIL	22 48
	FLORINA	IDARED	14 Les
			3 Here
aga of planta	0	0	* * Tie
-age of plants	- 9 years	- 9 years	
-SST	$-40,40 \text{ cm}^2$	-31,90 cm ²	
-crown diameter	2 40/1 80m	-1.80/1.60m	
-height	2,40/1,0011	2.5.2.0	
	- 2,50-3,00 m	-2,5-3,0 m	
-distance from soil to crown	- 0,40 m	- 0,40 m	
- no. of branches semi-skeleton	- 9	-9	
-no, of branches semi-skeleton on			
skeleton branches	10	10	
skeleton oranenes	-12	-12	
-sum of annual increases	7,90 m	8,70 m	
	CRUCE DUBLA 1		
CHARACTERISTICS	SOIL	SOIL	
en nu te rendo rieb	FLORINA		NR .
	FLOKINA	IDAKED	Vert
-age of plants	– 9 years	– 9 years	3-75 555
-SST	-58 83 cm ²	-41 50 cm ²	43 KK
-crown diameter	$2 \frac{40}{1.80}$	2.50/1.00m	
haight	-2,40/1,80111	-2,30/1,9011	
-neight	-2,50-3,00 m	- 2,5-3,0 m	
-distance from soil to crown	- 0,70 m	- 0,70 m	
- no. of branches skeleton	-4	-4	
- no of branches semi-skeleton	8	Q	
no of branches somi skalaton on	- 8	- 0	
skeleton branches	- 8	-9	
-sum of annual increases	- 8,30 m	-11,40	
	CRUCE DUBLA 2	,	
CUADACTEDISTICS	SOIL	SOII	
CHARACTERISTICS	SULL	SOIL	war.
	FLORINA	IDARED	aster.
-age of plants			Me.
-SST	-9 years	-9 years	TAPE
arown diamotor	68 22 om	27.00 2	
-clowil diameter	-08,25 CIII	$-37,80 \text{ cm}^2$	
-height	-2,20/2,00m	-2,00/1,80m	
-distance from soil to crown	-2,50-3,00 m	-2 5-3 0 m	
- no of branches skeleton	-0 70 m	0.70 m	
no of branches sami skalatan	1	- 0,70 m	
- no. of oranches semi-skeleton	-4	-4	
-no. of branches semi-skeleton on	-6	- 9	
skeleton branches	-10	-11	
-sum of annual increases	-9.30 m	-10.20 m	
	TATUDA TOPLETO	-10,20 111	
	IATUKA TRELLIS		

CHARACTERISTICS S	SOIL	SOIL	12 322
F	FLORINA	IDARED	1 the state
-age of plants			A MARK
-SST -	– 9 years	-9 years	ALL ALL
-crown diameter	$70,68 \text{ cm}^2$	$-40,40 \text{ cm}^2$	XXY
-height -	-1,80/2,50m	-2,30/1,50m	WY I
-distance from soil to crown -2	2,60-3,00 m	- 2,6-3,0 m	1
- no. of branches semi-skeleton -(0,40 -0,50m	- 0,40-0,50 m	
-no. of branches semi-skeleton on -	8	- 8	
skeleton branches	9	- 8	
-sum of annual increases	7.20 m	- 7,70 m	
	TESSA	,	
CHARACTERISTICS S	SOIL	SOIL	JF. SU.
F	FLORINA	IDARED	1.Aver
-age of plants -	– 9 years	-9 years	AC SE
-SST -0	64.98 cm^2	$-44,40 \text{ cm}^2$	45 11
-crown diameter -2	2,00/1,70m	-2,60/2,30m	5
-height -2	2,50-3,00 m	- 2,5-3,0 m	1
-distance from soil to crown	0,50 -0,60m	- 0,5-0,60 m	
- no. of branches semi-skeleton -	5	-7	
-no. of branches semi-skeleton on			
skeleton branches -	14	-13	
-sum of annual increases -9	9,80 m	- 7,00 m	

	-			(200	12010)					
Species	Form of crown			Pro	duction (t/ha)			Σ	Media
		2004	2005	2006	2007	2008	2009	2010		t/ha
	Fus Fougeres	16,80	20,00	22,90	25,70	28,20	30,94	36,39	180,93	25,80
	Ax vertical	15,80	18,50	23,80	26,00	29,00	32,88	39,76	185,74	26,50
	Solen	13,30	23,60	26,10	28,60	30,90	34,77	39,81	197,08	28,10
	Vâlcea 1	19,30	19,10	19,90	23,40	27,10	32,04	34,77	175,61	25,00
Florina	Cruce dublă 1	15,60	17,10	20,40	22,90	26,70	30,29	32,88	165,87	23,70
	Cruce dublă 2	15,80	17,30	18,10	24,40	27,20	30,67	36,67	170,14	24,30
	Tatura Trellis	13,60	24,40	25,20	28,60	30,50	34,77	38,90	195,97	28,00
	Tessa	16,00	18,10	19,30	22,70	27,10	30,67	36,12	169,99	24,30
	Media	15,80	19,80	22,00	25,30	28,30	32,10	36,90	180,20	25,70
	Fus Fougeres	7,40	14,90	21,00	23,70	30,80	33,95	38,71	170,46	24,30
	Ax vertical	9,60	15,40	23,60	24,80	32,30	35,24	37,72	178,66	25,50
	Solen	11,80	22,90	26,70	28,60	30,70	35,93	39,24	195,87	28,00
Idared	Vâlcea 1	9,20	16,40	20,40	24,00	28,30	31,79	36,00	166,09	23,70
	Cruce dublă 1	7,70	14,90	18,10	21,00	24,80	29,34	32,58	148,42	21,20
	Cruce dublă 2	10,60	16,60	23,80	23,60	27,10	31,13	36,10	168,93	24,10
	Tatura Trellis	7,70	18,70	22,70	26,10	30,7	34,58	38,86	179,34	25,60
	Tessa	10,50	13,90	18,50	21,70	26,70	30,67	35,05	157,02	22,40
	Media	9,3	16,7	21,9	24,2	28,9	32,8	36,8	170,6	24,40

Production of fruits for apple varieties according to the form of crown (2004-2010)

Fruit production represents the most important element characterizing an apple plantation. Apple production has been recorded for an interval of 7 years (2004-2010), i.e. from year III up to year IX since planting. During this period, Florina species recorded an average production of 25.7 t/ha, and Idared 24.3 t/ha, under non-irrigation conditions.

Apple production oscillated according to the 8 types of crown. For Florina species, during the 7 years of fruiting, Solen form resulted in a cumulated production of 197.08 t/ha and an average production of 28.1 t/ha. The smallest production was obtained for the species Cruce Dublă 1 (cumulated to 165.87 t/ha, and average production of 23.7 t/ha).

The largest productions were obtained for the forms: Solen (28.1 t/ha), Tatura Trellis (28.0 t/ha) and Ax Vertical (26.5 t/ha). For species Idared, the largest productions was recorded for the form of crown Solen (28.0 t/ha) with a cumulated production of 195.87 t/ha, followed by forms Tatura Trellis (25.60 t/ha), Ax vertical (25.50 t/ha) and Fus Fougeres (24.30t/ha). For both species, the most productive forms of crown proved to be: Solen, Tatura Trellis and Ax Vertical.

CONCLUSIONS

-In the conditions existing in the hill area of Oltenia, the highly intensive culture of apple represents a necessity both for its modernization and to meet the needs of society.

-The forming of types of crown may be carried out in the first 3 years after planting, when plants in the form of rod are used as seeding material;

-The growth vigor of the two varieties is higher at Florina than at Idared, and the differences between directed trees in various forms of crown are relatively small within the same variety.

-The form of crowns Tatura Trellis, Tessa and Solen form more difficult than others, taking into account the arrangement of branches semi-skeleton and even of the axis under different forms.

-Entry into fruiting for all forms of crown occurred in the third year after planting. -The largest average production of fruits was obtained for the forms Solen (28.0-

28.1 t/ha), Tatura Trellis (28.0-25.6 t/ha), Ax vertical (26.5-25.5 t) ha, for both varieties.

REFERENCES

Botu I., Botu M., Pomicultura modernă și durabilă. Ed. Conphis, Rm Vâlcea. 2003 Carlson R.F., New systems of apple tree culture. Hotr. Science.5, vol. 8. 1973

Childers N.F., Modern fruit science. Rutgers University, New Jersey. 1976.

Dumitrache I., Influența unor forme de coroană asupra creșterii și rodirii mărului în livezile superintensive. Lucrări științifice ICPP Pitești, vol. X: 31-37. 1983.

Feneşan N., Gh. Guran, Influența formelor de coroana asupra creșterii si rodirii mărului în sistem superintensiv, în bazinul pomicol Caransebeş. Lucrări științifice ICPP Pitești, vol. XII : 121-126. 1987.

Lespinase M., Delort F., Le sollen-vergers pieton. Rev. Fruits et Legumes no. 119, France. 1994.

Nissen A., Systemes de conduite des arbres et main d'oeuvre, Le fruit belge, nr 319, Bruxe. 1968.

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

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

Vol. XVI (LII) - 2011

FEATURES OF CERTAIN SOIL TYPES PRESENT AT BANU MĂRĂCINE AND THEIR VOCATION FOR VITICULTURE

Tâștea George¹, Popa Aurel¹

KEY WORD: soil types, morphological features, physical properties, vocation, quality.

ABSTRACT

Our researches during 2007-2009 on the soil types present at Banu Mărăcine spotlighted the fact that, here, the main soils are brought together in a surprising mosaic favourable to the qualitative viticulture. In the present paper we spotlight the features of the soil types: luvic weak reddish preluvosoil and pseudogleic reddish preluvosoil.

INTRODUCTION

Systematic researches developed in time have revealed the influence of the climatic factor on the soil types (G. Murgoci, 1910; T. Saidel, 1928; N.C. Cernescu, 1934; Teodorescu Ştefan, Popa Aurel, Sandu Gheorghe, 1987; Popa Aurel 2008; Popa Aurel, Nicu Cornel). We can appreciate that in a climatic area, the soil influences the quality and for that, we can obtain very qualitative wines only on certain soils, for example on the ones formed of shell limestone in Cotnari – Iaşi. In Cotnari, the area occupied by this soil type is relatively restrained, so we can obtain the famous Cotnari wines only in this region.

Between soil and wine quality, there is also a tight connection. It has been known for a long time that the wines obtained from the plantations on limestone soils are especially fine, and on skeletal or ferruginous soils, the red wines are sparklingly red and they have a remarkable generosity. Also, it is known that, on the fertile soils, we obtain bigger productions than on the poor ones, especially the water supply is provided and the sun offers a good warming. Unfortunately, the certain and complex influence of the soil is still hard to express from oenological viewpoint, under an analytical aspect.

Taking into consideration that in Banu Mărăcine there have always been obtained red and flavoured wines of a higher quality, of course this is due to the properties of the soil types. In the present paper, we reveal the features of two soil types that are important in the area, namely the luvic weak reddish preluvosoil and the pseudogleic reddish preluvosoil.

MATERIAL AND METHOD

In order to establish the physical and chemical properties of the two soil types, we accomplished soil profiles in the viticultural area of Banu Mărăcinefor establishing: the succession and the size of horizons, the morphological properties, the physical and chemical ones. For establishing the main soil types, we respected the methodology and the

¹ PhD candidate University of Craiova, tastea_george@yahoo.com

analysing methods recommended by the National Society of Soil Science. The chemical analyses were accomplished in the specialty laboratory of Dolj county.

RESULTS

1. THE LUVIC WEAK REDDISH PRELUVOSOIL

This oil type is generally formed and spread on the plane fields of the viticultural region. Due to the precipitation water accumulation and stagnation for a longer lapse of time, the processes of alteration, basification and eluviation are more emphasized. This is why the colloidal silica is released and it is laid at the surface of the structural aggregates of the surface horizon (Ap), and it gives it a grey colour and at the level of the AB and Bt horizons, the iluvion clay.

A. Morphological Description

The processed A horizon (Ap): 0-19 cm; brown-gray colour ($10YR 4,5, 5\2$) in dry status; loam-clay-sandy texture, the weakly formed granular structure; porous; loosened to compact environment; thick fibre roots; rare cervotocine and coprolites; wet; clear passage.

The ocric A horizon (Ao); 19-38 cm; dark gray colour (10yr5\2); loam-clay-sandy texture; big medium angular polyedric structure; delicately porous; very compact; rare roots; cervotocine and coprolites; wet to moist, granules of quartz of 1-2 mm in diameter; gradual passage.

The ocric B horizon 2(Bt.2): below 118 cm; brown-yellow colour (5yR5\4); claysandy texture; rough structure; delicately porous; compact; frequent granules of quartz; wet; it makes no effervescence.

B. Physical Properties

From the analysis of the granulometric data (tab.1) it results that the luvic weak brown-reddish preluvosoil in the area of Banu Mărăcine, contains a high quantity of coarse sand that decreases easily on the profile from 27,7% to 15%. The fine sand is relatively constant, being contained between 30,5% in the Ap horizon and it decreases to 18,8% in the Bt2 horizon. We find an obvious eluviation on the profile of the clay that laid down in the Bt2 horizon, but also in Bt1, where the percentage is 39,7%. This is how we may explain the presence of the clay films on the surface of the structural aggregates. Except for the surface horizon (Ap) processed by agricultural tools, the rest of the profile is pressed. In this context, the apparent density increases from 1,36g to 1,55g\cm. The soil presents a porosity of 49% in the first front, and after that it diminishes to 42% in Bt1.

C. Hydro-physical Properties

After the analysis of the hydro-physical indexes, we find (tab.2) that they have medium values, correlating well with the granulometric composition and the content of organic material of the soil. Thus, the hygroscopicity coefficient has a more reduced weight in the Ap horizon (5,84%) where the clay also registers the lowest percentage and increases to 30,65% in Bt1 horizon.

The soil capacity of useful water is medium and it is kept approximately at constant values on the entire profile, oscillating between 15% and 16%.

D. Chemical Properties

The luvic weak brown-reddish soil is supplied with humus in a medium to weak manner (tab.3). In the Ap horizon, the humus percentage is 2,76%, and after that it decreases on the profile to 0, 42%. We should notice that the humus is kept in a proportion of more than 1% on quite great deepness, namely to approximately 50 cm.

The nitrogen has a higher value in the surface horizon (0, 171%) and after that its rate decreases to 0,041%. We may say that, from this viewpoint, the soil is supplied with this element in a medium manner in the first 20 cm and it is very weakly supplied in its

deepness. We should notice the very big content of phosphor and mobile potassium in the first horizon (Ap) 80 respectively 320 ppm, a fact that can be explained by the regulate fertilization with fertilizers, minerals across the years. However, over the first 40 cm the soil is weakly supplied with chemical elements useful to plants. The soil reaction is weakly acid, and the pH value increases easily on the profile, from 6,0 to 6,7.

The hydrolytic acidity correlates well with the weakly acid reaction, namely it has small values, under 4me/100g sol. The sum of the changeable bases and the total capacity of cationic exchange have medium to small values and the saturation degree in bases in moderately mezobasic. Depending on the morphological features and the physical-chemical properties, this soil types has a medium to small natural fertility.

2. PSEUDOGLEIC REDDISH PRELUVOSOIL

It was formed on the northern adumbrated versants, this is why they contain more humidity in a longer lapse of time. This humidity determines more or less intense processes of reduction (pseudogleic processes) in the first half of the soil profile. Also, the alteration and basification processes are present. This is why the soil contains more clay, it is a little pressed, it has a low permeability and the pH value is under 6. The soil profile was found to be such as Ap-ABW-BtW-Bt.

A. Morphological Description

The processed A horizon (Ap): 0-18 cm; brown-gray colour (10zR5/2) with rare gray spots (10zR5/1); loam-clay texture; structure of big granular aggregates or small well formed polyedric ones; delicately porous; compact; thick fibre roots; frequent cervotocine and coprolites; obvious punctiform concretions in iron and manganese; rare pseudogleic gray-violet spots; moist; clear passage.

The pseudologized AB horizon ABW): 18-28 cm; brown colour (7,5yR4/2) with frequent gray-violet spots (10zR5/1); clay-loam texture; big angular polyedric structure; delicately porous; very compact; rare fibre roots; cervotocine and coprolites; concretions in iron and manganese of 2-3mm in diameter; obvious clay films at the surface of the structural aggregates; moist; gradual passage. The pseudogleic arigic B horizon (Btw); 28-85 cm; dark brown-reddish colour (5yR3/3) with thick gray-violet spots (10yR5/1); clay-loam texture; massive prismatic structure; delicately porous; very compact; rare cervotocine and coprolites; thick concretions in iron and manganese (bobovine) with a big diameter; obvious clay films; moist; gradual passage.

The argic B horizon (Bt): under 85 cm; brown-reddish colour /5yR4/4); clay-loam texture; massive-cloggy structure; delicately porous; compacted; diffuse clay films at the surface of the structural aggregates; rare bobovine; moist.

B. Physical Properties

The pseudogleic reddish preluvosoil, being placed on the northern versants, adumbrated, in the granulometric fraction, the clay predominates. Thus, the clay percentage has a weight of 38,5% from the surface, being much higher than the previous soil type and increases to 46,6% in the pseudogleic clay-iluvial B horizon (tab.4). The highest dust content is the surface horizon (21,1%) and then it decreases to 14,4% in Bt horizon. The most obvious decrease, compared to the previous soil, is for the coarse sand, that is of 14,6% in the Ap horizon, diminishing to 9,2% in the Btw horizon.

This granulometric composition, where clay predominates, engraves to the soil a fine loam-clay or clay-loam texture on the entire thickness of the profile. The soil is very traced and the apparent density has very high values even from the surface $(1,45g\cm)$. The high value of the apparent density makes the soil porosity to be low, being of 40% in the deep horizon.

C. Hydro-physical Properties

Having a high content of clay fractions, the soil also presents the highest values of the hydro-physical indexes. In this sense, the maximum coefficient of hygroscopicity increases from 8,16% in the Ap horizon to 11,1% in the Btw horizon, a horizon where the biggest clay quantity is accumulated (tab.5). The droop coefficient is correlated to the hygroscopicity one. Still due to the high clay content, the humidity equivalent increases on the profile from 29,82% to 35,66%. This soil presents a bigger ability to keep the water and the humidity reserve it may offer to the plants is of 19%.

D. Chemical Properties

The humus reserve of the soil is small, being of 1,56% in the Ap horizon, and then it decreases strongly to only 0,24% in the Bt horizon in the deepness. Also, the content of total nitrogen is higher in the surface horizon (0,114%), and then it is reduced to more than half in the other horizons (tab.6). The phosphor and the mobile potassium have high values only in the first two horizons, a fact that may be explained by applying certain big doses of chemical fertilizers based on these elements. The soil reaction is at the limit between moderately acid and weakly acid and the pH value increases on the profile from 5,8 to 6,7.

This soil is richer in mineral colloids and the value of the hydrolytic acidity is of 4,69mc/100g soil. These values engrave to the soil a total ability of cationic exchange of more than 21mc/100g soil. The saturation degree in bases is raised, over 80%, framing the soil in the group of the mezzo-oligotrophic ones. Even if the soil that is rich in colloidal complex has a low natural fertility, because, being placed on the northern versants, the erosion processes are emphasized and the humidification ones are more reduced, due to an insufficient microbiological activity.

CONCLUSIONS

- 1. From the studies and analyses made on the two soil types, we spotlighted the fact that they had a vocation for the grapevine culture in order to obtain red and flavoured wines of a higher quality;
- 2. In placing the viticultural plantations, especially of the varieties, we should consider that the plateaus are for the red and flavoured varieties and the northern expositions are for the white varieties that are more productive;
- 3. The two soil types, by their features and properties, we justify the good quality of red and flavoured wines, of course in a consensus with the climatic offer.

REFERENCES

Cornescu N.C., Facteurs du climat et zones de sol en Roumanie. Romanian Geologic Institute. St. Teh., S.C., no.2, Bucharest; 1934

Murgaci G., Die Bodenzones Rumaniens. An. Romanian Geologic Institute, vol. IV, Bucharest; 1910

Popa, Aurel, The Secrete of the Good Wine. Alma Press, Craiova; 2008

Popa Aurel, Dicu Cornel, Romanian Winegrowers and Wines; 2010

Saidel T., Eude chimique des principaux types de sols de Roumanie, XIV-e Congr.Intern. d'Agric., 4-e sect.; 1928

Teodorescu Ștefan, Popa Aurel, Sandu Gheorghe, Romania's Oenoclimate, Scientific and Encyclopaedic Press, Bucharest. 1987

Ph	ysical Prope	rties			Ĩ	51			
Hariman	Deepness		Granulometric	fraction	Textural	Apparent	Specific	Total	
Holizon	(cm)	Coarse sand	Fine sand 0.2-	Dust 0.02-	Clay <	class	(Da g/cmc)	(Dg/cmc)	(Pt%)
		2-0.2 (mm)	0.02 (mm)	0.002 (mm)	0.002 (mm)		(Da.g/enic)	(Dg/enic)	(1 1/0)
Ар	0-19	21,7	30,5	21,8	26,0	LAN	1,36	2,65	49
Ao	19-38	19,5	30,8	20,3	29,4	LAN	1,51	2,65	44
AB	38-55	16,8	29,7	20,9	33,6	LAN	1,52	2,67	43
Bt1	55-118	14,9	25,8	19,6	39,7	AN	1,55	2,68	42
Bt2	Sub 118	15,6	27,0	18,8	37,6	AN	1,54	2,68	43

Features of the luvic weak reddish preluvosoil soil type

Hydro-physical Properties

Horizon	Deepness (cm)	Hygroscopicity coefficient (CH%)	Droop coefficient (CO%)	Humidity equivalent (EU%)	Useful water capacity (CU%)
Ар	0-19	5,84	8,76	24,17	15,41
Ao	19-38	7,14	10,71	25,71	15,00
AB	38-55	8,56	12,84	29,12	16,28
Bt1	55-118	10,11	15,16	30,65	15,49
Bt2	Sub 118	8,31	12,46	28,49	16,03
					Table 3

Chemical Properties

Horizon	Deepness (cm)	Humus (%)	Total Nitrogen	Mobile Phosphor (P. ppm)	Mobile pH potassium (H ₂ O) (AH)	Sum of the changeable bases (SB)	Total capacity of cationic exchange (T)	Saturation degree in bases		
			(11170)	(r.ppiii)	(K.ppin)			Me/100g sol		(v 70)
Ар	0-19	2,76	0,171	80	320	6,05	4,75	14,60	19,42	75
Ao	19-38	1,46	0,093	16	85	6,20	3,62	15,80	19,42	81
AB	38-55	1,20	0,093	10	66	6,30	3,15	17,20	20,35	85
Bt1	55-118	0,84	0,067	4,5	85	6,40	3,10	17,80	20,90	85
Bt2	Sub 118	0,42	0,041	3,8	59	6,70	2,80	19,10	21,90	87

Table 2

Table 4

Phys	sical Properti	ies		1 0	Ĩ	51			
Horizon	Desmann		Granulometri	c fraction		Tautum1	Apparent	Specific density (D g/cmc)	Total porosity (Pt%)
	(cm)	Coarse sand 2-0.2 (mm)	Fine sand 0.2- 0.02 (mm)	Dust 0.02- 0.002 (mm)	Clay < 0.002 (mm)	class	density (Da.g/cmc)		
Ар	0-16	14,6	25,8	21,1	38,5	LA	1,45	2,65	46
ABw	18-28	13,7	24,2	20,5	41,6	AL	1,55	2,67	42
Btw	28-85	9,2	26,9	17,3	46,6	AL	1,58	2,68	41
Bt	Sub 85	15,7	25,8	14,4	44,1	Al	1,61	2,70	40

Features of the pseudogleic reddish preluvosoil soil type

Table 5

Hydro-physical Properties

Horizon	Deepness	Hygroscopicity Coefficient	Droop coefficient	Humidity equivalent	Useful water capacity
	(cm)	(CH%)	(CO%)	(EU%)	(CU%)
Ар	0-18	8,16	12,24	29,82	17,58
ABw	18-28	9,05	13,30	32,91	
Btw	28-85	11,10	16,32	35,66	
Bt	Sub 85	10,61	15,60	34,26	18,66

Table 6

Chemical Properties

Horizon	Deepness (cm)	Humus (%)	Total nitrogen (Nt%)	Mobile Phosphor (P.ppm)	Mobile Potassium (K.ppm)	pH (H ₂ O)	Hydrolytic acidity (AH)	Sum of changeable bases (SB)	Total capacity of cationic exchange (T)	Saturation degree in bases (V%)
								Me/100g sol		
Ар	0-18	1,56	0,114	88	350	5,9	4,26	18,60	22,86	81
ABw	18-28	0,70	0,060	68	130	5,8	4,95	17,80	22,75	78
Btw	28-85	0,51	0,041	17	88	6,6	2,81	20,14	22,95	88
Bt	Sub 85	0,24	0,025	11	61	6,7	1,40	20,04	21,44	93

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

Seria: ✓ Biologie ✓ Horticultură ✓ Tehnologia prelucrării produselor agricole

🖌 Ingineria mediului

Vol. XVI (LII) - 2011

STUDIES REGARDING THE FEATURES OF THE MEDIUM ERODED REDDISH PRELUVOSOIL SOIL TYPE AND THEIR INFLUENCE ON QUALITATIVE VITICULTURE

Tâștea George¹, Popa Aurel¹,

KEY WORDS: *fertility, erosion, humus, leaching, horizons, texture, structure, porosity, hydrolytic acidity, nutrition.*

ABSTRACT

From the researches and the analyses made by us in 2007-2009 on the medium eroded reddish preluvosoil soil type, at Banu Mărăcine, we find that this soil type has a vocation for qualitative viticulture, especially for the red and flavoured wines. The moderated proportion of humus, the substantial warming, The release of excessive humidity are features of this soil type, favourable to the grapevine. When settling the wine-growing plantations, because of the high soil compactness, it is necessary to provide its deep mobilization, to 60-70cm.

INTRODUCTION

Mostly, the soil features that influence the wine quality are, in their turn, tightly connected or conditioned by the climate. A big importance belongs to the chemical properties, but especially the physical ones, the ones of the soil and of the subsoil, that regulate the system of water, air, temperature, permeability and the power to keep water. In the wine-growing cool regions, the soils with grit provide a good leakage of the water excess and they warm up too easily, allowing, by keeping the warmth, a better maturation of the grapes.

Also, the torrential rains interfering after maturation are less favourable if the soil is permeable and it allows a quick water filtration in deepness. Well drained soils are a first major qualitative factor, especially in the wine-growing cool regions. The entire wealth results from two factors: the soil nature (sand, grit, etc.) and the slope (the bigger it is, the easier the water leakage is). It contributes to the quick heating of the soil during the day. The drainage is very important not only in cool regions, but also in the others (of course, in warm areas); in autumn and during maturation, by preventing the installation of the grey rot and favouring the noble one, protecting the plantations with varieties for red wines or flavoured wines, of rot.

From the numerous researches (Dejeu Liviu, 1986, 1985, 2010; Fregoni M., 2005; Popa Aurel, 2007; Condei Gh., 1977; Morlat R., 2001; Teodorescu and collab., 1987) it results clearly enough the importance of the soil participation to defining the composition

¹ University of Craiova

and the quality of the grapes and wine, a soil reaching the level of an obvious vocation for accomplishing certain valuable features of quality. Also we notice the fact that, in the same area with a favourable climate, the wine stops being excellent and becomes common, even if the variety is the same if the soil was planted differently from the tradition one, and this is an inconvenient.

As these studies must be made for every wine-growing region, we wanted, for the lapse of time 2007-2009 to research the soil types at Banu Mărăcine and the way they decide the quality of the grapes and wine.

In the current paper, we present the obtained results regarding the features of the medium eroded reddish preluvosoil soil type that, in the vineyard, owns an important weight.

MATERIAL AND METHOD

In order to establish the physical and chemical properties of the two soil types, we accomplished soil profiles in the viticultural area of Banu Mărăcine for establishing: the succession and the size of the horizons, the morphological properties, the physical and chemical ones.

For establishing the main soil types, we respected the methodology and the analysing methods recommended by the National Society of Soil Science. The chemical analyses were accomplished in the specialty laboratory of Dolj county.

RESULTS

The medium eroded reddish preluvosoil soil type is met on the southern versants, with the slope from 10 to 15%. Depending on the field tilt, the erosion is more or less intense, partially or totally removing the accumulation horizon of the organic matter (Ao). By a stronger heating, the accumulation of a small water quantity, the processes of the alteration, eluviations and debasification are weaker. This is why the profile is less deep.

For characterising this soil type, it was described a profile such as Ap-AB-Bt1-Bt2-C, placed in the middle of the southern versant.

A. Morphological Description

The processed A horizon (Ap): 0-16 cm; brown-yellow colour (10yR6/4); loamclay-sandy texture, big granular structure or weakly formed polyedric structure; cervotocine and coprolites; granules of quartz sand; wet; gradual passage.

The AB horizon (Ao); 16-34 cm; brown colour (7,5y5/4); loam-clay-sandy texture; big angular polyedric structure or small prismatic, cloggy one; delicately porous; compact; rare roots; cervotocine and coprolites; frequently, granules of quartz coarse sand; diffuse films of iluvial clay; wet; gradual passage.

The B argic 1 horizon 1 (Bt1): 34-80 cm; brown reddish yellow colour (5yR5/3); clay-sandy texture; bobonos prismatic structure; delicately porous; very compact; obvious clay films at the surface of the structural aggregates; gradual passage.

The B argic 2 horizon (Bt2): 80-120 cm; yellow reddish colour (5yR5/6); loamclay-sandy texture; delicately porous; compact; diffuse clay particles at the surface of the structural aggregates; rare granules of quartz; gradual passage. *The C horizon:* under 120 cm; yellow colour (10yR5/6); loam-sandy texture; unstructured; delicately porous; compact; frequent white spots; moderate effervescence.

B. Physical Properties

From the granulometric viewpoint, we find that this soil type is richer in coarse fractions and poorer in fine fractions (tab. 7). For example, coarse sand has a weight of 30,2% in the Ap horizon and decreases gradually to 23,9% in the Bt2 horizon. The option of the fine sand is smaller, registering 28,7% in the first horizon and 26,1% in the Bt2 horizon.

The dust registers the most reduced value, under 18%, and it is relatively constant during the entire thickness of the profile.

The strongest variation is noticed at the clay that increases on the profile from 23,2% in the Ap horizon to 34,4% in the Bt1 horizon, an evolution spotlighting the colloids migration on the soil profile and motivates the presence of the colloidal films.

From the surface, we spotlight the high value of the apparent density that increases on the profile from 1,39g/cm in Bt1 to 1,54 in Bt2, indicating a strong pressure of the soil.

The porosity is under 50%, even in the horizon processed by agricultural tools that determine a strong pressure.

C. Hydro-physical Properties

The knowledge of the hydro-physical indexes help to appreciate the water quantity the soil may keep and how much of it can be offered to the plants.

The more reduced the values of the hydro-physical indexes are, the smaller is the water reserve of the soil. At the analysed profile, for this soil type, the hydroscopicity coefficient is 5,3% in the Ap horizon, and the maximum value of 9,15% was determined in Bt1, where the accumulated clay percentage is higher, namely 34,4% (tab.8).

The droop coefficient oscillates between 8,04% and 13,72%, and the humidity equivalent has a weight of 23,84% and respectively 28,92%.

The useful water capacity is about 15% on the entire profile, fact that proves that the soil may keep a medium water reserve that may be used by the plants.

The value of the hydro-physical indexes, in general, depends on the colloidal complex and on the loosening degree of the soil. This soil type with a poorer content of humus and clay and having a high pressing degree has a lower value of the hydro-physical indexes.

D. Chemical Properties

From the analysis of the chemical properties of the medium eroded reddish preluvosoil, it results that it is weakly supplied with humus (tab.8). This low content of only 1,28%, is explained by the presence of the erosion phenomenon by means of which the surface horizon is partially washed.

The soil presents a low value of the hydrolytic acidity, of the exchange capacity for bases and of the total capacity of cationic exchange, due to the low content of colloidal complex. The hydrolytic acidity decreases on the profile from 2,71mc/100g soil in the Ap horizon to 0,9mc/100g soil in the Bt1 horizon; and the sum of the changeable bases increases from 12mc/100g soil in the Ap horizon to 17,2mc/100g soil in the Bt2 horizon.

Referring to the saturation degree in bases, the soil is megabasic in the superior half of the profile and eubasic in the second part of the profile.

From the analysis of these properties, we may appreciate that the medium eroded reddish preluvosoil has a lower natural fertility in relation to the luvic reddish preluvosoil because it contains less humus and nutritive elements and it is poorer in the colloidal complex.

CONCLUSIONS

- 1. In the wine-growing area at Banu Mărăcine most of the wine-growing plantations are placed on the southern exposition where the predominant soil type is the medium eroded reddish preluvosoil;
- 2. By its features and properties, this soil type, together with the climatic offer provides the obtaining of more qualitative red and flavoured wines;
- 3. The moderate proportion of humus, the additional warming, the easy evacuation of the humidity excess are some of the features of this soil types that make it to have a vocation for the qualitative viticulture;
- 4. It is necessary, due to the compactness of this soil, when settling the winegrowing plantations, to provide a deep mobilization of the soil, to 60-70 cm.

REFERENCES

Condei Gh., Popa Aurel, Testing the Soil Fertility in Drăgășani and Miniș Vineyard, by Agro-Chemical Analysis and Vegetal Diagnosis, Annals of I.C.V.V. Valea Călugărească, vol. VIII; 1977

Dejeu Liviu, Researches regarding the Influence of the Soil Humidity on the Grapes Quality for Cabernet Sauvignon Variety. Scientific Papers IANB, series B, vol. XXIX, 105-111; 1986.

Dejeu Liviu, Puiu Ștefan, Researches regarding the Influence of Certain Ecopedological Conditions on the Raising and Fruitiness of the Vineyard. Scientific Papers IANB, series B, vol. XXVIII, 77-82; 1985

Dejeu Liviu, Viticulture, Ceres Press, Bucharest 2010;

2001

Fregoni M., Viticultura di qualita, Editure Phytoline – Affi – Italia; 2005

Morlat, R., Terroirs viticoles: Etude et valorisation. Ed. Oenoplurimedia, chaintre;

Popa Aurel, Wine-growing Regions in Oltenia – Romania having a Vocation for Obtaining Qualitative Wines with Names of a Controlled Origin (N.C.O.), Annals of USAMV Cluj-Napoca, Horticulture series; 2007

Teodorescu Șt., Popa A., Sandu Gh., Romania's Oenoclimate, Scientific and Encyclopaedic Press, Bucharest. 1987

Features of the medium eroded reddish preluvosoil soil type

Physical Properties

	Deepness (cm)	Granulometric fraction							
Horizon		Coarse sand 2-0.2 (mm)	Fine sand 0.2-0.02 (mm)	Dust 0.02- 0.002 (mm)	Clay < 0.002 (mm)	Textural class	Apparent density (Da.g/cmc)	Specific density (Dg/cmc)	Total porosity (Pt%)
Ар	0-16	30,2	28,7	17,9	23,2	LAN	1,39	2,67	48
AB	16-34	28,0	28,3	17,1	26,6	LAN	1,52	2,68	43
Bt1	34-80	24,1	25,9	15,6	34,4	AN	1,55	2,69	42
Bt2	Sub 80	23,9	26,1	16,8	33,2	LAN	1,54	2,70	43
С	-	-	-	-	-	-	-	-	-

Table 8

Table 7

Hydro-Physical Properties

Horizon	Deepness (cm)	Hydroscopicity Coefficient (CH%)	Droop coefficient (CO%)	Humidity equivalent (EU%)	Useful water capacity (CU%)	
Ар	0-16	5,36	8,04	23,84	15,80	
AB	16-34	7,65	11,47	26,65	15,18	
Bt1	34-80	9,15	13,72	28,92	15,20	
Bt2	Sub 80	8,27	12,40	27,04	15,64	
С	-	-	-	-	-	

Chemical Properties

Horizon	Deepness (cm)	Humus (%)	Total nitrogen (Nt%)	Mobile phosphor (P.ppm)	Mobile potassium (K.ppm)	pH (H ₂ O)	Hydrolytic acidity (AH)	Sum of the changeable bases (SB)	Total capacity of cationic exchange (T)	Saturation degree in bases (V%)
								Me/100g sol		
Ар	0-16	1,28	0,120	63	245	6,20	2,71	12,0	14,71	81
AB	16-34	0,72	0,083	45	85	6,30	2,50	14,6	17,10	85
Bt1	34-80	0,51	0,057	17	61	6,60	1,10	16,6	17,80	93
Bt2	Sub 80	0,34	0,031	8,6	54	6,70	0,90	17,2	18,10	95
С	-	-	-	-	-	-	-	-	-	-

Table 9

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

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

Vol. XVI (LII) - 2011

HISTO-ANATOMICAL STUDY ON THE MEDICINAL VEGETATIVE ORGANS OF ORIGANUM VULGARE L. SPECIES

Tiță Monica Gabriela^{1,*}, Lupuleasa D.², Mogoșanu G. D.³

KEY WORDS: Origanum vulgare L., stem, leaf, histo-anatomical study

ABSTRACT

In this paper, the authors present the results of the histo-anatomical study on the stem and leaf of Origanum vulgare L. species, from which the medicinal products Origani herba and Origani aetheroleum are obtained.

INTRODUCTION

Origanum vulgare L., oregano, from *Lamiaceae (Labiatae)* family, is a perennial herbaceous species, of 30–50 cm tall, growing in steppes, shrubs, forest edges, crops. The stem is erect, branched in the upper part, reddish, pubescent, the leaves are ovate, opposite, and the flowers have pink-purple corolla, arranged in corymb inflorescences (Ciocârlan, 2000; Săvulescu, 1961; Tiță, 2005).

The product *Origani herba*, harvested from the aerial part of the species, contains: essential oil, tannin, flavones, anthocyanins, pentacyclic triterpene acids, sugars, vitamins, organic acids, mineral salts. It has antiseptic, stomachic, diuretic, and spasmolytic actions, being used in the treatment of respiratory and digestive infections, of spastic enterocolites and nervousness, in the form of industrial products (Galov G, Sedocalm) or teas (sedative, antibronchitis) (Bruneton, 2009; Ciulei *et al.*, 1993; Gârd *et al.*, 2009; Istudor, 2001).

Origani aetheroleum, the essential oil of *O. vulgare* species, rich in carvacrol and thymol, has a wider application in therapy: asthenia, arterial hypotension, ear-nose-throat and respiratory infections (rhino- and oropharyngitis), digestive infections (enterocolitis), and genitourinary infections (cystitis, nephritis), malaria, adenitis, neuritis (Bruneton, 2009; Ciulei *et al.*, 1993; Galeş *et al.*, 2008; Gârd *et al.*, 2009; Istudor, 2001; Kintzios, 2002).

Histo-anatomical researches on *O. vulgare* species are few (Bosabalidis and Kokkini, 1997; Galeş *et al.*, 2008; Kofidis *et al.*, 2003; Toma and Rugină, 1998). This fact and the therapeutic value of the plant have led us to perform the study.

¹ PhD candidate, Faculty of Pharmacy, "Carol Davila" University of Medicine and Pharmacy, 6 Traian Vuia Street, 020956 Bucharest.

² Department of Pharmaceutical Technology, Faculty of Pharmacy, "Carol Davila" University of Medicine and Pharmacy, 6 Traian Vuia Street, 020956 Bucharest.

³ Department of Pharmacognosy & Phytotherapy, Faculty of Pharmacy, University of Medicine and Pharmacy of Craiova, 2–4 Petru Rares Street, 200349 Craiova.

^{*} Corresponding author: E-mail address: monica_gabriela2007@yahoo.com

MATERIALS AND METHODS

The vegetal material was represented by the stems and leaves of *O. vulgare* species, collected in August 2009, from plants in blossom, in Tismana City, Gorj County. In terms of histo-anatomical study, the material passed through the following steps:

(a) Fixation and preservation in 70% ethylic alcohol.

(b) Manually sectioning, using hand microtome and botanical razor, with elder pith as support.

(c) Removal of cell content, with sodium hypochlorite for 20-35 minutes (depending on material), after which the cross-sections were washed with distilled and acetic water.

(d) Staining of cross-sections with iodine green and alum carmine red: conventional staining for the histo-anatomical studies of plants. Sections were first stained with iodine green (one minute), washed with 90% ethylic alcohol, and then stained with alum carmine red (20 minutes) and consecutively washed with distilled water (Andrei and Paraschivoiu, 2003).

(e) Making of permanent preparations: stained cross-sections were mounted into glycerol-gelatin drops, added between the blade and slide.

(f) Valorization of the preparations: drawings at MC1 photon microscope (Romania) with projection mirror (Projektionszeichenspiegel) and color photographs at NOVEX photon microscope (Holland), with Canon A540 digital camera were made.

RESULTS AND DISCUSSION

The stem structure (Figure 1, a–h)

In the upper third, the shape of cross-section is rectangular-quadratic (Figure 1a), with two large and shallow opposed ditches. The epidermis contains isodiametric cells, with thickened internal and external walls. External wall is covered with a thin cuticle fine striated (Figure 1b). At the level of epidermis are found numerous long tector hairs, pluricellular uniseriated and rare pluricellular secretory hairs, with unicellular pedicle and bi- or tetracellular gland. Here and there, stomata protrude prominently above the epidermis. The bark is differentiated in an external zone of thick angular collenchyma cords (Figure 1b) in the four very prominent ribs, which continues between them under the form of a 1-2 layers, and in an internal zone continued by a meatus-type cortical parenchyma. The inner layer of the bark consists of a primary-type endodermis with Caspary thickenings (Figure 1c) in the radial walls of cells.

The central cylinder is thick and contains four very large libero-ligneous conducting fascicles in front of the four ribs and four very small fascicles between them. The four large fascicles have secondary structure (Figure 1, c and d). The phloem includes sieve-tubes, annex cells, and fewer parenchyma cells. The xylem is differently structured: the primary xylem contains vessels placed in radial rows separated by cellulosic parenchyma cells; the secondary xylem, much thicker, has vessels dispersed in radial rows too, but separated by libriform fibres. The medullary rays are strongly sclerified and intensely lignified. The pith is thick, parenchymatous-lignified, meatus-type.

In the middle third (Figure 1, e-h), the shape of cross-section is typically quadratic (Figure 1e) with the four ribs clearly attenuated. The tector and secretory hairs are rarest, the latter have often-unicellular gland. The tector hairs have often a pluricellular pedestal, composed of epidermal cells and cortical external cells. The collenchyma remains visible in the four ribs. The endodermis remains for Casparian type at this level too (Figure 1f). The conducting tissues already formed two rings – one external of phloem and another internal

of xylem – thicker in front of the four ribs. Compared to the above-analyzed stem level, the phloem is continuously and the xylem vessels are scattered throughout the thickness of the ring, more numerous and larger in front of the ribs.



Figure 1 (a–d). Aspects of cross-sections through the upper third stem of *O. vulgare*. Scale bar = $100 \mu m$ (originals).





Figure 1 (e–h). Aspects of cross-sections through the middle third stem of *O. vulgare*. Scale bar = $100 \mu m$ (originals).

The leaf structure

The petiole structure (Figure 2, a–d)

In cross section, the petiole has a semilunar-semielliptical shape (Figure 2a), with a wide and superficial ditch at the level of adaxial side. The epidermis has isodiametric cells with thickened internal and external walls. The external wall is covered with a finely striated thick cuticle. The fundamental parenchyma is thin at both sides and very thick at both latero-adaxial crests; in all cases, the collenchyma is from angular type (Figure 2, a and b). The internal fundamental parenchyma has bigger cells, but colenchymatised too, from meatus-type, with less thickened walls. The conducting tissues formed two liberoligneous fascicles (Figure 2, c and d) from collateral type, arranged in an arch and separated by cells of ligneous cellulosic parenchyma. At the external side of phloem, a thin zone of collenchymatic tissue is observed.



Figure 2 (a–d). Aspects of cross-sections through the petiole of *O. vulgare*. Scale bar = $100 \mu m$ (originals).

The leaf's limb structure (Figure 3, a–k)

The epidermis, seen from front, is formed by cells with polygonal-irregular shape, with slightly curled sidewalls (Figure 3, a–f). Here and there, are found numerous very long tector hairs, pluricellular, uniseriated, with thick lignified walls, and secretory hairs with octocellular gland (Figure 3, b–e and k). The diacytic-type stomata are located in both epidermises, but are more numerous per unit area in the lower side (Figure 3, d–f), so the leaf's limb is amphistomatic. The secretory hairs are very numerous on the edge of the leaf's limb; some of them are curved or with the top inclined to the epidermis. The secretory hairs are more numerous on the lower epidermis.



Figure 3 (a–f). Aspects of the epidermises of the leaf's limb of *O. vulgare*. Scale bar = $100 \mu m$ (originals).

In cross section (Figure 3, g-k), the median rib is very evident to the underside of the leaf's limb, having a structure similar to that of petiole. The difference is only in conductive tissues that form a single arch-shaped fascicle. Between the lateral ribs (those of first order are easy evident also on the underside), the mesophyll is differentiated in palisade tissue, a unicellular layer on the upper side and lacunose tissue, a pluricellular layer on the underside. Both epidermises are composed of isodiametric cells with thickened external wall in front of the median rib, and slightly tangentially elongated between the lateral ribs, where the external wall is thinner. Except the median rib, in all other ribs are small conducting bundles.



Scale bar = $100 \,\mu m$ (originals).

Comparing the results of our study with results of other researchers, we find that there are not significant structural differences; small differences are due to the phenophase stage of plants harvested for analysis and to the environmental conditions in which plants were grown.
CONCLUSIONS

At maturity, the stem of *O. vulgare* species has a secondary-type structure into the central cylinder, respectively at the level of four libero-ligneous conducting fascicles. Four cords of angular collenchyma, specific to *Lamiaceae* family, are found in the bark.

The leaf's limb is amfistomatic, and the stomates are of diacytic type. The limb structure is of bifacial heterofacial type.

At the level of stem epidermis, pluricellular secretory hairs with bi- or tetracellular gland are found. On the leaf epidermises, especially of underside, secretory hairs with octocellular gland are found.

REFERENCES

Andrei M., Paraschivoiu Roxana Maria. Microtehnică botanică. Edit. Niculescu. București, p. 107–109, 118, 150. 2003.

Bosabalidis A. M., Kokkini S. Infraspecific variation of leaf anatomy in *Origanum* vulgare grown wild in Greece. Bot J Linn Soc, 123(4):353–362. 1997.

Bruneton J. Pharmacognosie, Phytochimie, Plantes médicinales. 4^e édition. Lavoisier Tec & Doc. Paris, p. 639–640. 2009.

Ciocârlan V. Flora ilustrată a României. *Pteridophyta et Spermatophyta*. Ediția a 2-a. Edit. Ceres. București, p. 670. 2000.

Ciulei I., Grigorescu Em., Stănescu Ursula. Plante medicinale, Fitochimie și Fitoterapie. Tratat de Farmacognozie. Edit. Medicală. București. Vol. II, p. 161–163. 1993.

Galeș Ramona, Toma C., Preotu Ana, Gille Elvira. Structural peculiarities of the vegetative apparatus of spontaneous and cultivated *Origanum vulgare* L. plants. Analele Științifice ale Universității din Craiova, XIII(XLIX):273–278. 2008.

Gârd Cerasela Elena, Duțu Ligia Elena, Popescu Maria Lidia, Pavel Mariana, Iordache Alina Titina, Tudor Ioana. Bazele teoretice și practice ale analizei farmacognostice. Edit. Curtea Veche. București. Vol. II, p. 45–47. 2009.

Istudor Viorica. Farmacognozie, Fitochimie, Fitoterapie. Aetherolea, rezine, iridoide, principii amare, vitamine. Edit. Medicală. București. Vol. II, p. 90–92. 2001.

Kintzios S. E. Oregano: the genera *Origanum* and *Lippia*. Taylor & Francis. London–New York, 67–104, 177–201. 2002.

Kofidis G., Bosabalidis A. M., Moustakas M. Contemporary seasonal and altitudinal variations of leaf structural features in oregano (*Origanum vulgare* L.). Ann Bot, 92(5):635–645 2003..

Săvulescu T. (ed.). Flora Republicii Populare Române. Edit. Academiei Române. București. Vol. VIII, p. 298–300. 1961.

Tiță I. Botanică farmaceutică, Ed. Didactică și Pedagogică. București. p. 802. 2005.

Toma C., Rugină Rodica. Anatomia plantelor medicinale. Atlas. Edit. Academiei Române. București, p. 163–166. 1998.

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

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

Vol. XVI (LII) - 2011

HISTO-ANATOMICAL RESEARCHES ON THE STEM AND LEAF'S LIMB OF XANTHIUM SPINOSUM L. SPECIES

Tiță Monica Gabriela^{1,*}, Lupuleasa D.², Mogoșanu G. D.³

KEY WORDS: Xanthium spinosum L., stem, leaf, histo-anatomical researches

ABSTRACT

In this paper, the authors present the results of the histo-anatomical researches on the stem and leaf of Xanthium spinosum L. species, from which the medicinal product Xanthii spinosi herba is obtained.

INTRODUCTION

Xanthium spinosum L., spiny cocklebur, prickly burweed, from *Asteraceae* (*Compositae*) family, is an annual weed, of 30–50 cm tall, growing in ruderal areas, fields, pastures, from plain to mountain. The stem is branched, erect. The leaves are alternate, petiolate, and three-lobed, with the centre lobe much longer than the other two, shiny dark green and hairy on the upper surface and downy beneath. About 2–3 cm long yellow spines are found in leaf axils and at stem nodes. The flowers are monoecious unisexuate. The male flowers are found at the top of the stems. The female flowers are arranged, two each in the leaf axils, surrounded by involucral hypsophylla as bent tip thorns. The fruit is represented by two achenes closed in bilocular involucre, with numerous hooked spines having one or two straight terminal spines (Ciocârlan, 2000; Săvulescu, 1964; Tiță, 2005).

The medicinal product *Xanthii spinosi herba* contains: flavones, saponosides, tannin, essential oil, sesquiterpene lactones, phytosterols, carotenoids, polyphenolic acids (caffeic acid, chlorogenic acid), sugars, vitamins, organic acids, mineral salts (Ciulei *et al.*, 1993; Gârd *et al.*, 2005; Istudor, 2001; Kiss and Racz, 1988). It has an anti-inflammatory, decongestant and diuretic action (Tămaş and Toader, 1989). In the form of pharmaceutical preparations (Proprin, Votis, Prostatin) it is used in the treatment of prostate adenoma (Ciulei *et al.*, 1993; Gârd *et al.*, 2005; Istudor, 2001; Petcu *et al.*, 1980).

In Romania, there is a histo-anatomical study on the *X. italicum* species (Tiță *et al.*, 2004). This fact and the therapeutic value of the plant have led us to perform the study.

¹ PhD candidate, Faculty of Pharmacy, "Carol Davila" University of Medicine and Pharmacy, 6 Traian Vuia Street, 020956 Bucharest.

² Department of Pharmaceutical Technology, Faculty of Pharmacy, "Carol Davila" University of Medicine and Pharmacy, 6 Traian Vuia Street, 020956 Bucharest.

³ Department of Pharmacognosy & Phytotherapy, Faculty of Pharmacy, University of Medicine and Pharmacy of Craiova, 2–4 Petru Rares Street, 200349 Craiova.

^{*} Corresponding author: E-mail address: monica_gabriela2007@yahoo.com

MATERIALS AND METHODS

The vegetal material was represented by the stems and leaves of *X. spinosum* species, collected in August 2009, from plants in blossom, in Seaca de Câmp village, Dolj County. In terms of histo-anatomical study, the material passed through the following steps:

(a) Fixation and preservation in 70% ethylic alcohol.

(b) Manually sectioning, using hand microtome and botanical razor, with elder pith as support.

(c) Removal of cell content, with sodium hypochlorite for 20-35 minutes (depending on material), after which the cross sections were washed with distilled and acetic water.

(d) Staining of the cross-sections with iodine green and alum carmine red: conventional staining for the histo-anatomical studies of plants. The cross-sections were first stained with iodine green (one minute), washed with 90% ethylic alcohol, and then stained with alum carmine red (20 minutes) and consecutively washed with distilled water (Andrei and Paraschivoiu, 2003).

(e) Making of permanent preparations: stained cross-sections were mounted into glycerol–gelatin drops, added between the blade and slide.

(f) Valorization of the preparations: drawings at MC1 photon microscope (Romania) with projection mirror (Projektionszeichenspiegel) and color photographs at NOVEX photon microscope (Holland), with Canon A540 digital camera were made.

RESULTS AND DISCUSSION

The stem structure (Figure 1, a–l)

In the upper region, the shape is almost pentagonal with attenuated ribs (Figure 1a). The epidermis had slightly tangential-elongated cells with internal and external walls much more thickened than others did. Numerous tector hairs are pluricellular uniseriated, long, with sharp tip. Always thicker in the ribs, the bark is collenchymatised for the most part (Figure 1b). Collenchyma is from angular-type. Parenchymatous-cellulosic from meatus-type, the inner bark does not end with a special type endodermis.

The central cylinder is thick and includes several (14–16) libero-ligneous fascicles (Figure 1, c and d, f–h) of collateral-open type, with different sizes, separated by parenchymatous-cellulosic medullary rays of various widths. At this level, the conducting tissues are from primary origin; most of them have phloem and xylem separated by a very thick meristematic zone (5–6 layers). The phloem includes sieve-tubes and annex cells (the external being collenchymatised). The xylem (currently still building) has dispersed vessels in radial rows separated by cells of slightly collenchymatised cellulosic parenchyma. The pith is thin, parenchymatous-cellulosic, meatus-type; the cells are higher than those of cortical layer and with very thin walls. Both the inner bark and into the pith, small secretory channels with very tight sewer can be observed (Figure 1e).

In mid-basal region (Figure 1, i–l), the shape remains the same and the conducting tissues are still of primary-type. As a variation, we note the following: the stem is much thicker, the ribs more attenuated; the secretory hairs are rarest; the conducting fascicles are large and visibly stuck in the pith; the tracheogenesis process is still ongoing, the last metaxylem vessels having thin cellulosic walls; the precambial meristematic tissue is very thick. Between the large and intermediate fascicles, extremely small fascicles are visible, often without xylem vessels; although there is not visible a typical endodermis, an amiliferous endodermoid is observed both in the phoem periphery and between the

fascicles. At the level of epidermis are found pluricellular secretory hairs with unicellular pedicle and strongly curved cuticle at the periphery of the gland. Here and there, in the thickness of the collenchymatic-type bark can be observed groups of parenchymatous-assimilatory cells with very thin walls, representing a typical collenchyma.





Figure 1 (a–h). Aspects of cross-sections through the upper region of the stem of X. spinosum. Scale bar = 100 µm (originals).



Figure 1 (i–l). Aspects of cross-sections through the mid-basal region of the stem of X. spinosum. Scale bar = 100 μ m (originals).

The leaf structure *The petiole structure* The petiole has the same histo-anatomical structure as the stem. *The leaf's limb structure* (Figure 2, a–h) Seen from front, the epidermis is formed by irregular polygonal shape cells, with slightly curled sidewalls. Both epidermises have numerous anomocytic stomates and pluricellular uniseriated tector hairs with a very sharp tip (Figure 2, a–c). Here and there, are found pluricellular biseriated secretory hairs. In the lower side, the shorter tector hairs are more numerous per unit area, around the nervures and on the edge of leaves' lacinia.

In the cross section, the median nervure is prominent to the underside of the leaf's limb (Figure 2, d and e). In the fundamental parenchyma are three big and two small liberoligneous conducting fascicles, all of collateral type. Throughout the mesophyll, small areas of chlorenchyma are found (Figure 2f).

Between the lateral nervures, the mesophyll is almost entirely of palisade-type (Figure 2, g and h), with higher cells under the upper epidermis, therefore the leaf's limb has a bifacial-isofacial structure.

Into the mesophyll thickness are found numerous small libero-ligneous conducting fascicles surrounded by a parenchymatous sheath of very large cells. Both epidermises, especially the upper side, have cells with thickened internal and external walls. The secretory hairs can see much better (Figure 2, g and h).







Figure 2 (a–h). Aspects of the surface of the leaf's limb of X. spinosum. Scale bar = $100 \mu m$ (originals).









Figure 2 (d–h). Aspects of cross-sections through the leaf's limb of X. spinosum. Scale bar = $100 \mu m$ (originals).

CONCLUSIONS

The stem of *X. spinosum* had a primary-type structure, the bark being strongly collenchymatised. In the central cylinder are found 14–16 libero-ligneous conducting fascicles from collateral-opened type. Secretory channels are found into the bark and pith.

The leaf's limb has a bifacial-isofacial structure. On the both epidermises, the stomates are of anomocytic type. The tector hairs are pluricellular uniseriated, and the secretory hairs pluricellular biseriated. In the fundamental parenchyma, the principal nervures have three libero-ligneous conducting fascicles from collateral type.

REFERENCES

Andrei M., Paraschivoiu Roxana Maria. Microtehnică botanică. Edit. Niculescu. București, p. 107–109, 118, 150. 2003.

Ciocârlan V. Flora ilustrată a României. *Pteridophyta et Spermatophyta*. Ediția a 2-a. Edit. Ceres. București, p. 785 2000.

Ciulei I., Grigorescu Em., Stănescu Ursula. Plante medicinale, Fitochimie și Fitoterapie. Tratat de Farmacognozie. Edit. Medicală. București. Vol. II, p. 215–216. 1993.

Gârd Cerasela Elena, Duțu Ligia Elena, Popescu Maria Lidia, Pavel Mariana.. Farmacognozie. Baze practice. Edit. Universitară "Carol Davila". București. Vol. I, p. 93. 2005.

Istudor Viorica. Farmacognozie, Fitochimie, Fitoterapie. Aetherolea, rezine,

iridoide, principii amare, vitamine. Edit. Medicală. București. Vol. II, p. 180-182. 2001.

Kiss I., Racz G. Conținutul în glicozide ale sitosterolului în frunzele de *Xanthium spinosum* și *Xanthium italicum*. Farmacia, 36(1):55–58. 1988.

Petcu P., Andronescu Ecaterina, Petrișor Gh. Tratamentul adenomului de prostată și al sechelelor după adenomectomie cu planta *Xanthium spinosum* L. Farmacia, 28(4):217–220. 1980.

Săvulescu T. (ed.). Flora Republicii Populare Române. Edit. Academiei Române. București. Vol. IX, p. 308–311. 1964.

Tămaș M., Toader S. Acțiunea diuretică a unor extracte vegetale. Clujul Medical, 62(1):75–79. 1989.

Tiță I. Botanică farmaceutică, Ed. Didactică și Pedagogică. București, p. 834. 2005.

Tiță I., Bejenaru Cornelia, Bejenaru L., Mogoșanu G. D. Histo-anatomical researches at the species *Xanthium italicum (Asteraceae)*. Acta Horti Botanici Bucurestiensis, 31:37–41. 2004.

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

Seria: ✓ Biologie ✓ Horticultură ✓ Tehnologia prelucrării produselor agricole

🖌 Ingineria mediului

Vol. XVI (LII) - 2011

USE OF SPECIFIC ECOLOGICAL FAVORABILITY CONDITIONS FROM SOME MICROZONE FOR EXPLOATATION OF PLUM AND CHERRY CULTURE

Tudor Ion¹

KEYWORDS: ecological conditions, plum, sweet chery, cultivars, microzone

ABSTRACT

Plum and cherry culture is specific to the sub-Carpathian Oltenia North. This area is fit to "The 1st fruit growing region of country " and has some of the most favorable conditions for the fruit growing plants.Northern Oltenia area, there are several optimal microzone plum and sweet cherry culture but have different climate elements that influence plant growth and fructify. Culture of plum and sweet cherry cultivars in Rm Valcea and Boisoara microzone are differentiates by bearing and maturation for all cultivars. The cultivars of plum and sweet cherry fruit are mature with 5-7 days later in Boisoara then Rm. Valcea, prolong in this case the fresh fruit consumption.

INTRODUCTION

Plum and cherry culture is specific to the sub-Carpathian Oltenia North. This area is fit to "The 1st fruit growing region of country " and has some of the most favorable conditions for the fruit growing plants.

Numerous studies have emphasized the behavior of cultivars of plum, sweet cherry, apple, walnut, etc.. but they were related to the between Rm Valcea and Tg. Jiu areas with altitudes 230-326 m (Botu, 1978, 1999; Botu at al. 1997, Cociu and Roman 1994, etc.),since this region occupies a large geographic territory (north county Valcea, Gorj and Mehedinti). Environmental conditions vary greatly because of the altitude and positioning especially in some localities in the high hills to the plains from the south.

Considering these aspects, we intend to identify some microzone plum and sweet cherry in that culture to offer some advantages for growth, productivity and economic efficiency.

MATERIAL AND METHODS

This study was made in two microzone of Valcea county (Boisoara and Rm Valcea), during 2005-2010.

¹ University of Craiova, Faculty of horticulture, A.I. Cuza Street, no. 11, Craiova, Romania

The cultivars used are:

- The plum: Centenar, Tuleu gras, Stanley;

- The sweet cherry: Ramon Oliva and Germersdorf.

Culture conditions are characterized by the following elements:

Boisoara located in the intramontane zone, between Fagaras Mountains and Cozia Mount an altitude of 600-750 m with an average of annual temperature over 7°C and precipitation over 800-1082 mm.

Rm Valcea situated at an altitude of 230 m with average annual temperature of 10.2 °C - 11.2°C and the average amount of precipitation 715 mm.

In both microzone soil types are very different but contain large amounts of clay (>40%).

Observations were made on each of 10 plants of cultivars, and included items related to growth, fructification and relationship with climatic conditions (especially temperature).

RESULTS AND DISCUSSIONS

In the process of growth and fructification is found obvious differences, both cultivars of plum and sweet cherry on the both microzone.

At the age of 20 years the have plum cultivars carry out a sectional trunk area between 141 cm2 (Tuleu gras) and 178 cm2 (Centenar), in the Boisoara condition and at Rm Valcea between 152 cm2 (Tuleu gras) and 192 cm² (Centenar).

For the sweet cheries the sectional trunk area oscillated between 302 Ciresului cm2 (Ramon Oliva) and 362 cm² (Germersdorf) at Boisoara and 314 cm2 (Ramon Oliva) and 380 cm² (Germersdorf) at Rm Valcea (Table 1).

Table 1

The trunk section area and the crown volume of plum and sweet cherry cultivars grown in different microzone from North of Oltenia

Species	Cultivar	The trunk section area (cm^2)			
-		The trunk section area (cm ²) Ramnicu Valcea Boisoara 192 178 152 141 186 172 314 302 380 362 Crown volume (m ²) 62.8 62.8 58.4 49.8 48.4 69.2 65.1 117.7 97.5 157.5 121.3			
	Centenar	192	178		
Plum	Tuleu gras	152	141		
	Stanley	186	172		
Sweet	Ramon Oliva	314	302		
cherry	Germersdorf	380	362		
		Crown volume (n	m ²)		
	Centenar	62.8	58.4		
Plum	Tuleu gras	49.8	48.4		
	Stanley	69.2	65.1		
Sweet	Ramon Oliva	117.7	97.5		
cherry	Germersdorf	157.5	121.3		

(2005 - 2010)

Obvious differences are observed in terms of crown volume, the plum tree between 48.4 m³ (Tuleu gras) and 65.1 m³ (Stanley), at Boisoara and 49.8 m³ (Tuleu gras) and 69.2 m³ (Stanley) at Rm Valcea and at the sweet cherry tree from 97.5 m³ (Ramon Oliva) and 121.3 m³ (Germersdorf) at Boisoara and 117.7 m³ (Ramon Oliva) and 157.5 m³ (Germersdorf) at Rm. Valcea.

In terms of bearing period it is found that at the plum was started between 16.04 (Centenar) to 6.05 (Stanley) at Boisoara and 7.04 (Centenar) and 28.04 to other cultivars, according to conditions of Rm Valcea.

The bearing of sweet cherry started to Boisoara between 11.04. (Ramon Oliva) and 27.04 (Germersdorf) and in Rm Valcea between 7.04 (Ramon Oliva) and 23.04 (Germersdorf).

Differences in bearing in the same cultivars are 7 to 9 days between the Boisoara microzone and Rm Valcea, at the plum and at sweet cherry 4 days.

Depending on the microzone used the productions were between 15.1 t / ha (Tuleu gras) and 18.9 t / ha (Stanley) to Boisoara and in Rm were between 14.7 t / ha (Tuleu gras) and 20.1 t / ha (Stanley) (Table 2).

Table 2 Average production of plum and sweet cherry cultivars grown in different microzone from North of Oltenia

(2005 - 2010)

Species	Cultivor	Average p t/l	production ha
	Cultival	Ramnicu Valcea	Boisoara 17.8 15.1 18.9 10.7
	Centenar	18.6	17.8
Plum	Tuleu gras	14.7	15.1
	Stanley	20.1	18.9
Sweet	Ramon Oliva	19.2	10.7
cherry	Germersdorf	18.3	16.5

Sweet cherry production has oscillated between 10.7 t / ha (Ramon Oliva) and 16.5 t / ha (Germersdorf) at Boisoara and 18.3 t / ha (Germersdorf) to 19.2 t / ha (Ramon Oliva) at Rm Valcea.

Particularly interesting is the period of maturation the cultivars of plums tree and sweet cherry tree since that is recorded big differences between them.

Lower temperatures during the growing period of fruit maturation favor earlier varieties grown in microzone Rm Valcea from those of Boisoara.

The cultivars of plum maturation occurs between 23.07 (Centenary) and 9.09 (Stanley) at Rm Valcea while the Boisoara maturation occurs between 28.07. (Centenary) and 15.09 (Stanley).

Differences in maturation between the two microzone are,on the plum, of 5 to 6 days (Table 3).

The maturity period of plum and sweet cherry cultivars grown in different microzone from North of Oltenia

Tabelul 3

Species	Culting	The maturity period of fruits				
	Cultivar	The maturity period of fruitsRamnicu ValceaBoisoara23.07-4.0828.07-10.0818.08-29.0825.08-1.0930.08-9.093.09-15.0910.06-17.0616.06-28.06				
Dlum	Centenar	23.07-4.08	28.07-10.08			
I IuIII	Tuleu gras	18.08-29.08	25.08-1.09			
	Stanley	30.08-9.09	3.09-15.09			
Sweet	Ramon Oliva	10.06-17.06	16.06-28.06			
cherry	Germersdorf	22.06-5.07	28.06-12.07			

(2005 - 2010)

In terms of cultivars of sweet cherry fruit maturation occurs at 10.06. (Ramon Oliva) to 5.07. (Germersdorf) in Rm.Valcea and at Boisoara between 6.06 (Ramon Oliva) and 12.07 (Germersdorf). May delayed maturation of microzone Boisoara is 5-6 days in the same cultivar from Ramnicu Valcea.

The two microzone studied express the culture potential for plum and sweet cherry cultivars very strongly in terms of time period between bearing and fruit ripening. By growing the same cultivar in both microzone, the process of bearing and fruit ripening are offsets by 5-7 days, thus ensuring a prolonged consumption of fruit for the same cultivar.

This represents a significant advantage for a modern fruit growing.

CONCLUSIONS

- Northern Oltenia area, there are several optimal microzone plum and sweet cherry culture but have different climate elements that influence plant growth and fruition;

- Culture of plum and sweet cherry cultivars in Rm Valcea and Boisoara microzone are differentiates by bearing and maturation for all cultivars:

- Cultivars of plum and sweet cherry fruit are mature with 5-7 days later in Boisoara then Rm. Valcea, prolong in this case the fresh fruit consumption.

REFERENCES

Botu, I.,- Studiul agrobiologic al unor tipuri autohtone de prun din zona subcarpatică a Olteniei și comportarea lor ca portaltoi pentru prun și cais în pepinieră. Teza de doctorat. Universitatea din Craiova. 1978.

Botu I., Turcu E., Botu M., Preda S.,- Ameliorarea soiurilor de prun la SCDP Valcea - sinteza. 1997.

Botu M.,- Studiu privind evaluarea unor soiuri de prun in nordul Olteniei. Teza de doctorat. Universitatea din Craiova. 1999.

Cociu V., Roman R.,- Realizari si perspective in ameliorarea prunului din Romania, Zilele prunului , Ed. VIII , Tg. Jiu. 1994.

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

- Seria: ✓ Biologie ✓ Horticultură ✓ Tehnologia prelucrării
 - produselor agricole

Ingineria mediului

Vol. XVI (LII) - 2011

STUDIES CONCERNING THE INFLUENCE OF SOME FACTORS UPON LACTIC BACTERIA

Tutulescu Felicia¹, Aurel Popa¹

KEY WORDS: lactic bacteria, factors, malolactic fermentation

ABSTRACT

The malolactic fermentation is a complex biological phenomenon. Its influences exerted upon wines are especially significant. In some cases, these influences have a positive effect upon the wines' composition and gustative, in cases they create a negative effect.

In the cases when its effects would be convenient useful malolactic fermentiion should be provoked by all available means. When the consequences of its development would not be suitable, all available means should be used to provent it.

INTRODUCTION

Lactic bacteria are important into oenology both for the alterations they might cause and for their positive effect in the development of malolactic fermentation. This type of fermentation is generally preferred for two main reasons (Popa A., and all. 2004; Alexandre H. and all., 2008) :

- the bacteria transformation of malic acid (a bi-acid) into lactic acid (a mono-acid) leads to a de-acidifyng which confers supleness to the wine, also intensifying the colour of red wines.
- the disapperance of malic acid ensures to the wine its biological stability in regard to lactic bacteria. There are situations when malolactic fermentation is not prefered to be produced in order to preserve for the white wines a higher level of acidity and in order to safeguard the alcoholic fermentation.

During the last 50 years and especially during the last two decades, systematical studies and researches were performed concerning the lactic bacteria, particulary aiming to identify the determining items which microorganisms. Scientific interest was also show to the lactic bacteria's natural and technological circuits, but to the selection as well (Jose Antonio Saurez Lope, and all. 2004).

The environment's parameters the physical and the chemical ones as well do exert significant influences upon the process of cells' multiplying and upon the lactic bacteria's matabolism (Popa A., and all.1990; Popa A., 2008; Cotea D.V. and all., 2009). This is why we estimated necessary to consider the study of some among the physical, chemical and

¹ University of Craiova, Horticulture Faculty

e-mail: felixdragomir@yahoo.com

biological items which influence upon the metabilic processes of lactic bacteria during the lactic and alcoholic fermentations.

MATERIALS AND METHODS

Were performed from 2006 to 2010, into the viticultural area of Banu Maracine, well-know for its quality red wines.

We performed our experiments upon Merlot musts and wines, and we have employed in order to metabolits the malic acid, strains of lactic bacteria that we have identified and selected upon the grapes, into the must and into the wine, but as the spontaneous bacterial flora.

The indices, we have studied are: the yeasts, the sulphur anhidride, the temperature, the concentration of hydrogen ions (pH).

We made use of the methods adopted by the O.I.V. in order to establish the alcoholic concentration the value of the pH, the amount of free SO_2 .

In order to establish the number of living germs, we employed the method of the colonies' forming units. In order to establish the number of yeast' strains that were present into the fresh must and into the fermenting must, we have made use of the counting chamber.

RESULTS AND DISCUTIONS

In order to see what should be the influence held by temperature upon the vital and metabolic process of lactic bacteria during the development of malolactic fermentation, at the end of the alcoholic fermentation we have inseminated the strain *Oenococcus oeni*, C.S.II.10, previously identified by us and selected from wine. We developed the malolactic fermentation at four temperature thresholds: 12° C, 15° C, 20° C and 25° C. A bacterial population of $3x10^{3}$ was provided at the insemination's moment.

Table 1 presents the obtained results.

Table 1

Influence of the fermentation environment's temperature upon the *Oenococcus oeni* bacterial populations CS II strain (CFU/ml)

(The population of lactic bacteria ensured through insemination was $3 \ge 10^2$, the fermentation environment was a Merlot wine from Banu Maracine, 2008, 13 vol% alcohol, pH = 3,2)

Determined element		Wine's tempe	erature (°C)	
	12°C	15°C	20°C	25°C
Population of lactic bacteria at ate start of the	$4 \ge 10^4$	4 x 10 ⁷	5×10^4	5×10^8
	5 107	6 106	0 102	0 108
Maximum of population for lactic bacteria	5 x 10'	$6 \times 10^{\circ}$	8 x 10 ²	$8 \times 10^{\circ}$
(CFU)				
Time flown (hours) from insemination at the	96	77	64	62
start of the MLF				
Time flown (hours) from seeding for the	480	370	288	197
maximum of population				
Formation of lactic acid after (day) since the	5	4	3	2
beginning of growth				

Formation of lactic acid after (day) after	4	3	2	2
reaching to the maximum of population				
Population of lactic bacteria at the moment of	3×10^3	3×10^3	3×10^3	3×10^3
insemination (CFU/ml)				

We have seen that, at the beginning of the malolactic fermentation, when the wine has started to thicken, the bacterial population expts in various ratios suiting the temperature level provided. We found the smallest population at the temperature of 12°C. The greatest population is to be found at the temperature of 25°C.

At the end of malolactic fermentation, the popullation of lactic bacteria usually reaches to its maximum. It generally folows the same sense as beyond, but we have to notice a much higher ratio of multiplying. For 12° C, we do count 5×10^{7} cells, while at 25° C we reach to 8×10^{8} . it is known that, for rising temperatures, lactic bacteria do become more exigent about their nutrition. This is why we think that smaller temperatures ($12-15^{\circ}$ C) should be prefered. The temperature level also determines various time periods to be recorded from the moment of insemination till the beginning of malolactic fermentation. At 12° C, we have the longest duration (96 hours). At 25° C, the fermentation starts after 62 hours. The temperature chosen to be maintained during malolactic fermentation also influes upon the time lapse flown since insemination till the reaching of the upmost number of cells. At 5 days after insemination, we are able to see the formation of lactic acid, at 12° C. The same fact occurs at 2 days after insemination, for 25° C. Thus we are able to conclude that the best convenient temperatures for the achievement of malolactic fermentation are the ones of 12° C and 15° C. They are easier to attend within wine-making locations and they are also comforting in regard to the other components of the wine.

The time duration taken for metabolizing the malic acid is rather brief and is relatively similar to the case of the higher temperatures.

The environment's pH exerts upon lactic bacteria a significant and multilateral influence. The wine's real acidity exerts a selective influence and achieves a trial among the bacteria which would be able to attack various constituents that might be decomposed. The bacteria growth folowing the pH is worthy to be taken into consideration. We have added, to one of the pH attack thresholds of the malic acid and for sugars. E. Peynaud remaked that bacteria strains might be described, in respect to their aptitude of producing a pure malolactic fermentation, by two figures: one indicates the threshold pH for the attack upon sugars, due to which a lot of volatile acidity is formed. The larger is the distance between these two values of the pH, the more suitable these respective bacteria are for the malolactic fermentation of wines. Technologically it is very important to be a ware of this asset, be cause speaking allows to the malic acid to perform its fermentation within wine yet without attacking the sugars which are present at the moment of this action. Therfore we may say that cocci are the most suitable agents in order to perform this transformation.

Table 2 presents the results we have obtained in regard to the influence held by the concentration of the hydrogen ions (the pH) upon lactic bacteria (respectively the *Oenococcus oeni*, strain C.S.II.10), during the malolactic fermentation. For insemination we have ensured a population of lactic bacteria rising to 4×10^4 . it was enough to be able to initiate malolactic fermentation.

The maximum for a population of lactic bacteria that is frequently reached to near the end of the metabilizing process carried upon the malic acid which is present into the wine, is attended at various levels following the respective concentrations of hydrogen ions. The most numerous populations is realized for pH values of 3,4 to 3,7.

This is the explanation for the performing abilities of the strain C.S.II.10 Oenococcus oeni. The malolactic fermentation takes 28 days for pH=2,8 and 25 days for pH=3,1. for values of the pH going from 3,4 to 3,7 we have noticed smaller duration (18 to 16 days).

Table 2

Influence of the concentration of hydrogen ions (pH) upon lactic bacteria (Oenococcus oeni, CS 10 II strain) during the metabolizing of malic acid

(Merlot wine from Banu Maracine, 2008; alcohol 13 vol%, fermentation temperature 15°C)

Determined element		Value of pH 2,8 3,1 3,4 3,7 4×10^4 4×10^4 4×10^4 4×10^4 5×10^8 7×10^4 8×10^2 8×10^6 28 25 18 16			
	2,8	3,1	3,4	3,7	
Population of lactic bacteria at the seeding's moment (CFU/ml)	$4 \ge 10^4$	$4 \ge 10^4$	$4 \ge 10^4$	4×10^4	
Maximum population of lactic bacteria (CFU/ml)	5 x 10 ⁸	7 x 10 ⁴	8 x 10 ²	$8 x 10^6$	
Duration of malolactic fermentation (days)	28	25	18	16	
Attack threshold for malic acid	2,8	-	-	-	
Attack threshold for sugars	-	-	-	3,7	

An important criterion for the evaluation of metabolic activity is the distance between the respective thresholds of attack: the one for the malic acid and the other for sugars.

For the case of our researches we have seen that the respective strain of lactic bacteria does attack the malic acid at a pH of 2,8 while it attackes sugars only at a pH of 3,7. Therefore, we are able to appreciate that our strain might be successfully employed in almost all the cases when malic acid ought to be metabolized (high quality red wines, white wines excessively acid).

The sulphur anhidride represents the most important item able to inhibit the growth of lactic bacteria. Because demonstration was made that the added sulphur anhidride, either before or after the initiation of malolactic fermentation, might compromise this latter we have chosen to perform researches that would evaluate the influence held by the dosages of sulphur anhydride added into wine at various moments. Could they compromise on not this delicate process.

From the dat presented in Table 3, we are easily able to see that various doses of sulphur anhydride, added before the start of malolactic fermentation do influe upon this latter. The pretty considerable upmost population of lactic bacteria and the duration of the malolactic fermentation (20 days) do witness for this influence. For doses of 20 mg/l of free SO_2 the greatest population of the lactic bacteria reduces itself to half. As a consequence the duration of lactic fermentation becomes double reaching to 40 days. If doses of 50 mg/l of free SO_2 should be used, the bacteria would not be active and there would be no fermentation at all.

At wines with a pH of 3,4 the studied phenomena do follow the same sense but, if compared with the wine with a pH of 2,8 the greatest population of bacteria should be even better represented, and the duration of malolactic fermentation should reduce.

In the case of adding sulphur anhydride immediately after the initiation of malolactic fermentation the sense of the phenomena's evolution remains the same, even if SO_2 should be added over a better represented bacteria population (Table 4). We have to notice that at the wines for which were used doses of 20 mg/l of free SO_2 , the bacteria

population is more reduced that in the cases of using no free SO_2 at all or doses of 10 mg/l of it.

Table 3

Influence of the doses of sulphur anhidride (SO₂), added to the wine before triggering the malolactic fermentation upon lactic bacteria (*Oenococcus oeni*, strain CS 10II), fermentation environment Merlot wine, Banu Maracine, 2008, alcohol 13 vol%, fermentation temperature 15°C

Determined	pH value							
element			2,8		3,4			
		SC	D_2 doses			SO_2	doses	
	0	10	20	50	0	10	20	50
Population of lactic	4 x 10 ⁷	4 x 10 ⁷	4 x 10 ⁷	4 x 10 ⁷	4 x 10 ⁷	4 x 10 ⁷	4 x 10 ⁷	4×10^7
insemination (CFU/ml)								
Maximum population of lactic bacteria (CFU/ml)	8 x 10 ⁷	6 x 10 ⁵	3 x 10 ²	Non active lactic bacteria	8 x 10 ⁸	7 x 10 ⁵	4 x 10 ³	Non active lactic bacteri a
Duration of malolactic fermentation (days)	20	20	40	Does not occur	16	17	30	Does not occur

Table 4

Influence of the dosages of sulphur anhydride (SO₂) added into the wine after triggering the malolactic fermentation, upon lactic bacteria (Oenococcus oeni, strain CS II 10), Merlot wine, Banu Maracine, 2008, 13 vol % alcohol, fermentation period 15°C

Determined	pH value								
element			2,8		3,4				
		SO_2	doses			SO_2	doses		
	0	10	20	50	0	10	20	50	
Population of lactic bacteria at insemination (CFU/ml)	4 x 10 ⁷	4 x 10 ⁷	4 x 10 ⁷	4 x 10 ⁷	4 x 10 ⁷	4 x 10 ⁷	4 x 10 ⁷	4 x 10 ⁷	
Population of lactic bacteria after triggering the malolactic fermentation (CFU/ml)	6 x 10 ⁸	6 x 10 ⁷	3 x 10 ⁵	Non- activated bacteria	7 x 10 ³	7 x 10 ²	5 x 10 ²	Not- activated bacteria	
Maximum population of lactic bacteria (CFU/ml)	6 x 10 ⁹	6 x 10 ⁸	3 x 10 ²	Non- activated bacteria	7 x 10 ⁸	7 x 10 ⁶	5 x 10 ³	Not- activated bacteria	

Duration	of	22	23	48	Does not	14	19	29	Does not
malolactic					occur				occur
fermentation	L								
(days)									

Recent researches have pointed out the fact that a relationship of vital interdependence of metabiosis, does exist between the yeasts which perform the alcoholic fermentation and the bacteria which realize the wines' malolactic fermentation. Many substances able to help growth and aminoacids might be placed at the disposal of lactic bacteria by the yeasts, 5-6 days after the start of the alcoholic fermentation, through the processes of excretion and autolysis.

In order to accurately seize the interaction between yeasts and lactic bacteria, these latters being issued from the spontaneous flora, we have recorded for musts to which were added various doses of free SO_2 , the populations of yeasts and lactic bacteria initially present into the must and as well the largest population of lactic bacteria existing at the end of alcoholic fermentation. The results we have obtained are presented in Table 5.

Table 5

Interaction between yeasts and lactic bacteria during the alcoholic fermentation of the Merlot must, Banu Maracine, 2008

Determined element	<i>Must</i> - <i>Wine</i> , <i>Merlot</i> 2008, $pH = 3, 1$					
	Doses of free SO2 mg/l 0 10 20 50 25,64 24,21 24,64 $18,20$ 1 x 10 ⁶ 1 x 10 ⁴ 1 x 10 ² $1 x 10^2$					
	0	10	20	50		
Population of yeasts within the must (millions of cells/ml)	25,64	24,21	24,64	18,20		
Population of lactic bacteria within the must (CFU/ml)	1 x 10 ⁶	$1 \ge 10^4$	$1 \ge 10^2$	1×10^2		
Maximum population of yeasts within the must during the alcoholic fermentation (milions of cells/l)	1,524 millions	1,320 millions	1,240 millions	849 thousands		
Maximum population of lactic bacteria within the must during the alcoholic fermentation (CFU/ml)	$3 \ge 10^2$	$2 \ge 10^2$	$1 \ge 10^2$	Non- activated		
Maximum population of lactic bacteria at the end of alcoholic fermentation (CFU/ml)	$4 x 10^{6}$	$4 x 10^2$	2×10^2	Non- activated		

(yeasts and lactic bacteria do belong to the spontaneous flora)

For the must with no SO_2 at all or for the ones which were provided various doses of free SO_2 , the population of yeasts and lactic bacteria is reduced as the dosage of SO_2 increases, but it still remains at levels which should be able to trigger and to act as catalysts for these two processes. In the case of alcoholic fermentation, the yeasts' population decreases below 849 thousands/ml. This is the minimum amount required in order to achieve the metabolization of sugars.

For the musts going through alcoholic fermentation, the limits of the greatest population of lactic bacteria still enable these latters to initiate the malolactic fermentation. Yet, when we have added to the must 50 mg/l of free SO₂, the cells had shown no activity at all. At the end of the alcoholic fermentation, for the musts with no SO₂ at all or with dosages below 20 mg/l of free SO₂ inclusively, the lactic population is numerous enogh to

start and carry on the malolactic fermentation. If the doses of 50 mg/l of free SO_2 should used, the cells of the lactic bacteria would be inactivated.

CONCLUSIONS

For the red wines, the metabolizing process of the malic acid depends upon the environment's temperature (of the wine). The best convenient temperatures for the wine's quality are the ones of 12-15°C, when malolactic fermentation may be achieved within a reasonable time lapse and it should not affect upon the other components of wine. The concentration of hydrogen ions is decisive for the development of the lactic bacteria's vital metabolic processes. With a pH below 2,8, we cannot speak of the malic acid's metabolizing. This process become more obvious as the environment's reaction comes closer to the acid zone.

The lactic bacteria strain C.S.II.10 *Oenococcus oeni* disposes of a large interval between the attack threshold for malic acid and the attack threshold for sugars. This asset recommends it for performing the malolactic fermentation at red high quality wines, but also for the case of white wines with a too high acidity.

Sulphur anhydride is the most important item which is able to inhibit the growth of lactic bacteria. These latters become not active for doses of beyond 20 mg/l of free SO_2 . If the SO_2 doses should be applied before or after the initiation of the malolactic fermentation, their impact would become more abvious.

The yeasts with a quick growth do inhibit the lactic bacteria, both by consuming the growth substances these latters woauld need and by producing substances which inhibit them. But, through excretion of alcoholic fermentation, the yeasts become able to provide, at the bacteria's disposal, many growth substances and amino acids.

Acknowledgement: This work was supported by CNCSIS –UEFISCDI, project number 1094-PNII – IDEI code 436/2008

REFERENCES

Alexandre H.; Grandvalet C.; Guilloux Benatier M.; Remise Barinavon F.; Tourdot Marechal R.; Les bacteries lactiques en enologie. Edition Tec and Doc.Paris, 2008

Cotea D. Valeriu, Zanoaga V. Cristinel, Cotea V. Valeriu, Tratat de Oenochimie, vol.I,II. Editura Academiei Romane, Bucuresti, 2009

Jose Antonio Saurez Lope, Baldamero Inigo Leal, Microbiologia Oenologica – Fundamentos de vinificacion. Ediciones Mundi-Presna. Madrid. Barcelona. Mexic, 2004

Popa A.; Teodorescu St., Microbiologia vinului. Editura Ceres, Bucuresti, 1990 Popa A.; Popa Daniela; Dragomir Felicia, Microbiologia oenologică. Editura

Universitaria, Craiova, 2004

Popa A., Secretul vinului bun. Editura Alma, Craiova, 2008

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

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

Vol. XVI (LII) - 2011

STUDIES CONCERNING THE NATURAL AND TECHNOLOGICAL CIRCUIT OF LACTIC BACTERIA BEING OENOLOGICALLY SUITABLE

Felicia Tutulescu Dragomir⁽¹⁾, Aurel Popa⁽¹⁾, Angela Popa⁽²⁾

KEY WORDS: lactic bacteria, technological circuit, oenological suitable

ABSTRACT

The distribution and frequency of lactic bacteria within nature have come to be known recently. Many studies have pointed out the fact that the presence of lactic bacteria upon grapes is not as extended as the ones of acetic bacteria or of yeasts (Popa A. and all. 2004; Suarez Lepe A.J., and all, 2004; Croitoru C., 2007; Nielsen J.C., and all, 1996; Ribereau Gayon P.and all., 2004; Sorri T. and all. 1988; Masque M.C. and all. 2008; Guzzon R. and all. 2008). The researchers from the Oenological Institute of Bordeaux have collected and studied a large number of lactic bacteria strains (more than 700), coming from various viticultural regions of the globe and from various habitats. Thus they obtained some information about the situation of these bacteria within the natural and technological circuits (Peynaud E., 1967). During the recent years, credible evidence has been brought concerning the lactic bacteria's natural and technological circuits; for this reason, the respective use made of them or their inactivation, suiting the occurring cases is, noeadays, much closer surveyed (Alexandre H. and all. 2004; 2008; Bae S. and all. 2006; Barbagallo R.N. and all. 2004; Bloem A. and all. 2003; 2007; Cavin J.F., 2006; Couta J.A. and all. 2006; Croitoru C., 2003, 2007; De Revel and all. 2005; Flanzy C., 1998; Popa A., and all. 1990; Rosi I., and all, 2003; Nehme N., 2008).

INTRODUCTION

Oltenia is one of the main viticultural regions of Romania, with an outstanding vocation for producing quality red wines, many of them even being able to benefit from a controlled origin denomination.

Thus, the integration of the malolactic fermentation into the primary wine-making process ought yet to be realized in a very brief time interval, exactly situated immediately after the draught from husks and after the alcoholic fermentation has been achieved. Malolactic bacteria should be able to act as catalysts for the transformation of malic acid into lactic acid lactic acid, but for this they would have to be present in a large enough number, duly endowed with the required enzymes' equipment and the necessary conditions for carrying on the vital and metabolic processes ought to be provided through their environment (must and wine). For the oenologist, in every wine-making campaing it is imperative to dispose of enough information, enabling him to accomplish the mentioned desiderata. In this sense, for each of the viticultural areas, it is necessary to be exactly a

¹ University of Craiova, Horticulture Faculty

² University of Craiova, Agriculture Faculty

ware of the natural and technological circuits of the oenologicaly interesting lactic bacteria. The survey of these circuits allows us to identify and isolate the oenologically interesting lactic bacteria which could provide the conveninent technological performances.

In Romania, such researches had not yet been initiated. Therefore, from 2005 to 2010, our aim was to study the ecological assets of the oenologically interesting lactic bacteria in the quality and vocation of the red wines obtained there Segarcea, Banu Maracine, Samburesti, Orevita, Corcova.

MATERIALS AND METHODS

We have established the climates' elements by making use of the records provided by the meteorological stations located into the vineyards and validated by the Romanian National Administration of Meteorology.

The presence of oenologically interesting lactic bacteria upon the grapes, within the must and wine was pointed out by examining these respective micro-organisms within fixed preparations (smears). The numerical evaluation of lactic bacteria was achieved through the filtering membrane's method, for determining the colonies' forming units (C.F.U). in order to identify the bacteria, we had to:

- isolate the microorganisms within a pure culture;
- study their microscopical features;
- study their colonies' features;
- study their metabolic or bio-chemical features;
- study their antigenical assets;
- study their pathogeneity (the bacteria's)

OBTAINED RESULTS

Elements of the geography and climate which are specific to the studied viticultural areas

In order to express a viticultural area's oenological vocation, we have established the value of the oenoclimate's aptitude index (A) given by: the sum of the temperature degrees (T) and the sum of the effective insolation hours (I) during the vegetation period (01. 04 - 30.09), correlated with the subtraction of the excess of fallen rains (P-250) for the same period of time:

A = T + I - (R-250)

As the value of the index A grows (more than 4500) the vocation of the respective area in obtaining high quality red wines is more obvious, as a consequence of the climate's offer. The studied viticultural areas belong to the oenoclimate zones hillock A3 and hillock meridional A3, which benefit each, though differently from a lot heat and high, from the lack of excessive fallen rains, from long sunny autums with no temperature degrees and the effective insolation areas are recorded (see Table 1) at Banu Maracine, followed by Orevita, Corcova, Segarcea and Samburesti. The chance of obtaining the best red wines is offered as the values of the oenoclimate aptitude's index stand between 4878 (Orevita) and 4627 (Samburesti). For the studies viticultural areas, we may state that, in the important process of achieving the grapes' maturation, (see Table 2) the dominant climate is favourable eith moderate temperatures, which create no difficulties, neither by excess or by insufficiency to the processes of achievement for the grapes' maturation and super-maturation and of harvesting as well as to the development of alcoholic fermentation during the wine-making process. Some other favouring premises for attending harvest more exempted from

deteriorations and which would present a rich microbioal flora oenologically interesting would be the little amount of fallen rains and the weather which is usually sunny enough. The warmest moth of the year is Juky, after which the temperatures begin to decrease, at first slowly then much faster (in September and Octomber). So come to be created the most favouring premises for the grapes' maturation, under circumstances more and more exempted from hygrometrical hardnesses. The bacca's tunicle becomes thinner and the grapes tunicle becomes thinner and the grapes become more vulnerable. Generally, the fallen rains are decresing their amount since August, and even more in September and Octomber. This fact does positively contribute to the preservation of a good sanitary status of the grapes. It largely prevents the appearance of the grapes. It largely prevents the appearance of the grape's gray mildew and the decrease of the presence of yeasts and lactic bacteria.

Presence of lactic bacteria upon the grapes, into the must and into the wine.

The presence, the frequency and the dissemination of lactic bacteria into the nature has begun to be known only recently. In the vineyards and upon the ripened grapes, where the tunicles' dust retains them, their amount is variable, suiting the climate conditions of every year. In Table 3, we present the obtained results. Er have to precise the fact that, upon the grapes the smallest amout of lactic bacteria is recorded in the viticultural years when, during the stage of achievement of the grapes' ripening (September and October)the fallen rains are more frequent, sometimes excessive. On the contrary, the highest amount of lactic bacteria upon grapes is to be recorded for viticultural years, when during the period of the grapes' maturation and harvest the fallen rains are few when there is plenty of heat and light, when the bacca's tunicle doespreserve its integrity and when the contents in sugars, aromatic substances and colouring ones which is accumulated is the highest. In all the 5 studied viticultural areas, the presence of lactic bacteria is obvious, especially in Segarcea, Banu Maracine and Orevita, where a rich regime of heat and light is recorded. Speaking of the environments where from the lactic bacteria were sampled, we are able to state that, upon the grapes and within the must, we dispose of a presence which is modest, but significative. For the case of the exponential phase for the must in alcoholic fermentation, this presence decreases. As shown in Table 4, the highest presence of lactic bacteria is to be recorded during the process of malolactic fermentation.

The diminished amount of lactic bacteria during process of alcoholic fermentation might be related to their of alcoholic fermentation might be related to their nutrition and to the presence, in the environment, of inhibiting metabolites. During the must's fermentation, the yeasts are assimilating more quickly, due to their superior mass. Thus, nutrition deficiencies are created, concerning the bacteria's development, especially in the case of amined acids, like the arginine. During fermentation, the yeasts do elimitate into the environment various metabolites which do perturb the bacteria growth. Ethanol is largely responsible for inhibiting certain speciaes of lactic bacteria even for their lysis, especially when its concentration is larger than 6%. Another very familiar inhibitor of lactic bacteria is the sulphur anhydride. It can be produced (eliminated) by the yeasts, in the case of the alcoholic fermentation. Generally, the obtained quantities are small, cround 10 mg/l, but certain yeast strains are able to produce concentrations reaching to 100 mg/l. yeasts are also producing the synthesis of fact acids with a medium chain (C_6 to C_{12}), ehich are eliminated into the extra-cell environment and which might inhibit the growth of bacteria from the species Leuconostoc oenos. For instance, the decanonic acid is lethal at 30 mg/l. Fat acids (C_{10}, C_{12}, C_{16}) do act synergically with the ethanol existing in the environment. This suggest the existence of an alteration of bacterial cells, probably at the membranes' level. We should also remained that a real inhibitory of the malolactic growth and activity might be remarked only for high concentrations of fat acids. These latters assume an activating role, for concentrations of 12-13 mg/l.

The significant presence of lactic bacteria at the end of the alcoholic fermentation and during the process of the malolactic one might be accounted for by stimulating of bacteria by the yeasts. Yeasts may stimulate the growth of lactic bacteria within wines as well as the malolactic fermentation. Bur this effect is very much variable, suiting the strains. Generally during the alcoholic fermentation, the yeasts do liberate amined acids and vitamins which therefore do facilitate the bacteria growth, enriching the environment with nutritive elements. At the end if the yeast' cells evolutive cycle, and also during the wine's maintain upon the formed deposit, the environment (the wine) becomes by then completed and more suitable for the bacteria nutrition, by the appearance of amined acids and nitrogen compounds with a small molecular weight. The yeasts' autolysis generates the increase of the nitrogen level into the environment, which does flavor the growth of lactic bacteria and the decomposition of the macro-molecules issued from the walls of the yeasts' cells, reaching to concentrations of many hundreds of mg/l. such macromolecules created from yeasts do strongly stimulate the growth of the lactic bacteria from the species Leuconostoc oenos, with a more important biomasiss ontained and with a significant shortening of the latent phase (lag).

These macro-molecules could be partial hydrolysed into the wine theough the Leucinostoc oenos. Their degradation products might improve the environment in the matter of nutritive items (simple sugars, amined acids, alygopeptydes). This sould explain their stimulus effect. Therefore, the peptydomanane could stabilize the medium chained fat acids, which do inhibit the bacteria through their glucadic and peptidic fractions. They also could participate in detoxifying the environment, at the end of the alcoholic fermentation. *Leuconostoc oenos* is inhibited by the decanonic acid, at 2 mg/l, and this effect is indeed increased by the presence of the yeast's macromolecules, for concentrations egual to 0,1 g/l or higher. This detoxifying process was identified into the wine, in the presence of yeasts' membrane cells, by Edward and Beelman (1987) and by Loivau-Funel and collective (1998). It was explained by the fact that the glucodic and peptydic macro-molecules issued from cytoplasma membranes do adsorb the fat acids.

The date presented in Table 3 do prove that, for all the studied viticultural areas, upon the grapes and within the must, the largest ratio of lactic bacteria is represented by the bacillus-type cell ones. Into the must going through alcoholic fermentation and into the wine going through malolactic fermentation, lactic bacteria are represented by coccus-type cells (more than 90%). This is explained by the fact that, during the alcoholic and the malolactic fermentations, the metabolic processes of bacteria are inhibited by items which are a lot and, each of them are as well resisting coccus-form cell is able to stand agoinst these difficulties.

The data presented in Table 5 enable us to analyse what are the species of lactic bacteria which are present upon the grapes within the must and within the wine. For all the studied viticultural areas, on the grapes were found only strains of lactic bacteria belonging to the species *Lactobacillus plantarum*. It is also predominant within must. However in it do appear yeast' strains belonging to the species *Oenococcus oeni* (in Segarcea and Banu Maracine). At Samburesti, corcova and Orevita, in the must, together with the species Lactobacillus plantarum, it is Leuconostoc oenos which appears. The ratio of lactic bacteria found into the must and not belonging to the species Lactobacillus plantarum is at most of 6%. During the processes of alcoholic and malolactic fermentation, the lactic bacteria which are present belong to the species Leuconostoc oenos of which the cells regroup themselves into pairs ann, the most often, into chains. It produces CO₂ through hetero-

fermentation and D9-) lactic acid results too. In the five studied viticultural areas, at the Cabernet Sauvignon red wines, the malolactic fermentation is achieved by the lactic bacteria belonging to the species *Leuconostoc oenos*, because the wines dispose of a concentration of hydrogen ions (pH) which is inferior or equal to 3,4.

Into all the wines resulted from musts created from grapes attacked by mildews we are able to retrieve poly-saccharydes, synthesized by the fungus. Lactic bacteria belonging to the species Leuconostoc oenos are able to make use of such macro-molecules employing them for their own growth. Into the wine these fungus-like poly-saccarydes would absorb the fact acids (in C_8 and C_{10}), therefore attenuating the inhibiting caused by fat acids to the malolactic activity. The Leuconostoc oenos species of lactic bacteria is the one which ensures the development of malolactic fermentation at its best because its vital metabolic processes go on undamaged even under the difficult circumstances which exist into the wine:

- small values of the pH (2,8-3,4)
- small amounts of oxygen
- presence of some considerable amounts of tannin;
- presence of the sulphur anhydride even if in small dosages (50-100 mg/l of total SO₂);
- a high alcoholic degree (12-14 vol% alcohol).

During the research period (2005-2010), we have identified and isolated 77 strains of lactic bacteria, respectively belonging to: Leuconostoc oenos (62) and Lactobacillus plantarum (15). The Leuconostoc oenos lactic bacteria strains we have isolated and identified from musts and wines do present themselves, morphologically, under the form of colonies, round ones, ovoid ones and lobe-shaped ones. Their colour oscillates from white yellow to cream-coloured. The cells have the form of independent cocci, sometimes disposed in chains. As the Leuconostoc oenos species is interesting for the matter of perfecting the malolactic fermentation and since its cell bears the coccus form, we are thus able to draw the conclusions that this specific form of cells does ensure the species' survival, under the hard circumstances offered by the wine which is going through the process of perfecting the combustion of the malic acid. All the strains isolated and identified as belonging to the Leuconostoc oenos species are Gram-positive. They do not produce catalasis and they easily mataboze the main sugars which might be found into must and wine or which might appear due to the cells' lysis. We have to emphasize the significant fact that none among the identified strains is able to metabolize the tartaric acid, which is the main stable acid from within wine. Some of them have also shown a small metabolizing power towards the citric acid. These latters should require, in our opinion, a necessary separated supplement of investigation, because they would somehow exempt us from eventual noxious modifications of microbiological nature which occur into the wine, after the metabolizing process of the malic acid should have been achieved.

CONCLUSIONS

1. Into the main viticultural areas from Oltenia, the oenogically interesting lactic bacteria were identified upon the grapes, into the must and into the wine. The succession of the oenologically interesting bacteria species upon the grapes, into must and into wine is determined by the enzymatic endowment of which each of the species does dispose, in order to duly face the hostility of the environment's circumstances we are discussing of. Into the must and upon the grapes, the species *Lactobacillus plantarum* is predominant. Into must, the species *Leuconostoc oenos* and *Leuconostoc mesenteroides* do join the

former one *Leuconostoc oenoes* becomes predominant into the must going through alcoholic fermentation and especially during the exponential phase, as well as during the going on process of malolactic fermentation.

2. The presence of lactic bacteria upon the grapes (the CFU/ml) stands between 1×10^2 and 1×10^5 . into the must, the presence of lactic bacteria oenologically intristing does amplify, reaching to 2×10^4 . During the must's alcoholic fermentation, the presence of lactic bacteria does decrease, not crossing 1×10^4 . The highest loading of lactic bacteria may be found into the wine which perfects its malolactic fermentation. There, the amount is of about 6 x 10^4 UFC/ml.

3. The diminishing of the presence of lactic bacteria of oenological interest during the development of the alcoholic fermentation process seems to be related to the fact that some yeast' strains bearing a fast growth process do inhibit the lactic bacteria through the consumtion of favourable as well as through substances as through producing inhibiting substances. In fact, we are here the wintnesses of the antagonic struggle between yeasts and bacteria.

4. Upon the grapes, the oenologically interesting lactic bacteria the cell of which is bacillus-shayed are predominant. But into the must, especially into the must going through its alcoholic fermentation, and into the wine which is going through a malolactic fermentation, the predominant bacteria have cells of the coccus form. Thus, we are entitled the state that the coccus form is able to ensure the species' survival under the hostile circumstances offered by the wine which is going to perfect its malolactic fermentation.

5. For the studied viticultural areas, especially during the delicate process of the grapes' definitive ripening and during the technological process of their evolution, the climate conditions of each of them do offered the chance of a significant presence of oenologically interesting lactic bacteria. They constitute a real bank of genes from which we are able to select strains which are endowed with physiological and technological performing assets. There by, they will provide for the created red wines a bright shining colour, an aroma which should outline a more pregnant wine-like floavour and a velvet-like bouquet able to paramount these wines' evolutive process.

Acknowledgements: This work was supported by CNCSIS –UEFISCDI, project number 1094-PNII – IDEI code 436/2008

REFERENCES

Alexandre H., Castello P.J., Remize F., Fernandez E., Zaragoza M., Dizy M., Torres C., Luiz-Larrea F., High tolerance of wild Lactobacillus plantarum and Oenococcus oeni strains to lyophisation and stress environmental conditions of acid pH and ethanol. FEMS Microbiology Letters, 230, 5361. 2004.

Alexandre H., Grandvalet C., Guilloux-Benatier M., Remize- Barnavon F., Tourdot-Marechal R.. Lactic bacteria in oenology. Publishing House Tec & Doc, Paris 2008.

Bae S., Fleet G.H. Heard M.G., Lactic acid bacteria associated with wine grapes from several Australian vineyards. Journal of Applied Microbiology, 100, 712-727. 2006.

Barbagallo R.N., Spagna G., Palmeri R., Tarrini S., Assessment of β -glucosidase activity in selected wild strains of Oenococcus oeni for malolactic fermentation. Enzyme an Microbial Technology, 34, 292-296. 2004.

Bloem A., De Revel G., Bertrand A., Lanvoud-Funel A., Contribution of lactic bacteria to the wines' sylvestral flavour. In Oenologycal Actualities 2003. VI-th

International Oenology Symposium. Publishing House Tec & Doc, Bordeaux, France, pp. 271-273. 2003.

Bloem A., De Revel G., Malolactic Fermentation in Casks. Role of the lactic bacteria in releasing the wine's sylvestral flavour. Oenologists' Review, 123, 25-27. 2007.

Bloem A., Louvaud Funel A., De Revel G., Malolactic fermentation in barrels. Influence of lactic acid bacteria in the release of oak wood volatile compounds. VII-th International Oenology Symposium, Bordeaux, June, 25-th. 2007.

Cavin J.F., Selected malolactic bacteria. International Convention de Spindal AEB Group. Paris, France. 2006.

Couta J.A. Campos F.M., Figueiredo A.R., Hogg, T.A., 2006. Ability of lactic acid bacteria to produce volatile phenols. American Journal of Enology and Viticulture. 57, 166-Croitoru C., Busuioc O.P., Codresi C., Influence of some traded preparations with malolactic bacteria upon the quality and stability of the wines obtained in various Romania viticultural centers. Euro-Food International Symposium, October, 23-th-27-th, University of Dunarea de Jos, Galati, 761-773 2003.

Croitoru C., Busuioc O.P., Codresi C., Influence of some traded preparations with malolactic bacteria upon the quality and stability of the wines obtained in various Romania viticultural centers. Euro-Food International Symposium, October, 23-th-27-th, University of Dunarea de Jos, Galati, 761-773. 2003.

Croitoru C., Carapid P., Busuioc O.P., Codresi C.C., Hortolomei G., Lefter M., New oenological assets of the Oenococcus oeni selected strains of malolactic bacteria. The enzymatic procedure of releasing the flavouring elements from the oak wood. III-rd International Symposium New Bio-technologies used in the modern wine-making in order to prove the wines' quality. Jully 5-th-8-th. pp. 68-72. 2007.

Croitoru C., Reduction of the excessive acidity for whithe wines issued from early harvests through double meta-biosis. XIII-th Oenology International Symposium, 25-th-27 th June, Bordeaux, France. 2007.

De Revel G., Bloem W., Augustin M., Lonvaud-Funel A., Bertrand A., Interaction of Oenococcus oeni and oak wood componds. Food Microbiology, 22, 569-575. 2005.

Edwards C.G., Beelman R.B., Inhibition of the malolactic bacterium Leuconostoc oenos (PSU-1) by decanoic acid and subsequent removal of the inhibitioan by yeast ghosts. American Journal Enology Viticulture., 38: 239-242. 1987.

Flanzy C., Oenology. Scientific and Technological grounds. Publishing Houses Lavoisier Tec & Doc. Paris, France. 1998.

Guzzon R., Cavazza A., Carturan G., Immobilization of malolactic fermentation culture with an innovative technique. 31- st World Congress of vine and wine, June 15-th-20-th, Verona, Italy. 2008.

Lonvaud-Funel A., Masclef J.P., Joyeux A., Paraskevopoulos Y. Study upon the interactions between yeasts and lactic bacteria within grape's must. Conn. Vigne Vin, 22 (1): 11-24. 1988.

Masque M.C., Rico S., Elordug X., Puig A., Capdevila F., Romero S.V., Saurez C., Herreros R., Heras J.M., Palacios A., The pH influence at the stimultaneous inoculation within must of lactic bacteria and yeast strains. 31- st World Congress of vine and wine, June 15-th-20-th, Verona, Italy. 2008.

Nehme N., Study of the interactions between Saccharomyces cerevisiae and Oenococcus oeni: their impact upon the realization of malolactic fermentation in sequential and mixture cultures. Doctoral Thesis at the Doctoral School of Energetical Mechanics Civil Engineering and Environment's Policy. 2008.

Nielsen J.C., Pratal C, Oenology. Tec & Doc, 386-391. 1996.

Peynaud E., Recent studies upon the wine's lactic bacteria. Fermentations and wine-making procedures. Second Oenology International Symposium. 1967.

Popa A., Teodorescu Șt., The wine's Microbiology. Publishing House Ceres, Bucuresti, pp.80-123. 1990.

Popa A., Popa Daniela, Dragomir Felicia, Oenological Microbiology. Publishing House Universitaria Craiova, pp.145-210. 2004.

Ribereau Gayon P., Dubordieu D., Doneche B., Lonvaud A., Tratise in Oenology. Volume 1. Wine's Microbiology. Wine-making procedures. Dunod Publishing House, Paris, France. 2004.

Rosi I., Fia G., Camati V., Influence of different pH values and inoculation time on the growth and malolactic activity of a strain of Oenococcus oeni. Australian Journal of Grape and Wine Research, 9, 194-199. 2003.

Sorri T., Mignot C., Bacteriophages in Oenology. Bull. O.I.V., 61, 691-692. 1988. Suarez Lepe A.J., Imigo Leal B. 2004. Oenological Microbiology- The Grounds of wine-making. Publishing House Mundi-Prensa. Madrid. pp.339-441. 2004.

Average			Average	Amount	Amount from 01.04-30.09			Index of the	Oenocli	Quality wines
Viticultural Latitude Altitude yearly area N (m) temperature (°C)	from yearly fallen rains (mm)	Temperature degrees °C (T)	Hours of effective insolation (I)	Fallen rains (mm) (R)	aptitude A= T+I – (R- 250)	mate zones	which could be obtained			
Segarcea	45 ⁰ 05 [°]	145	11,2	565	3448	1439	288	A3- meridional hill zones	4843	Mostly red wines, aromatic wines
Banu Maracine	44 ⁰ 19 [°]	195	10,9	543	3403	1575	288	A3- meridional hill zones	4939	Mostly red wines, aromatic wines
Samburesti	44 ⁰ 30 [°]	260	10,5	682	3226	1536	395	A3- hill zones	4627	Mostly red wines
Corcova	44 ⁰ 35 [°]	150	10,7	741	3313	1546	375	A3- hill zones	4682	Mostly red wines
Orevita	44 ⁰ 25 [°]	86	11	634	3388	1549	309	A3- meridional hill zones	4878	Mostly red wines

Geographical and climate assets of the studied viticultural areas (on 50 years)

Table 1

461

		September		October				
Viticultural area	Average temperature (°C)	Average amount of rains (mm)	Insolation (hours)	Average temperature (°C)	Average amount of rains (mm)	Insolation (hours)		
Segarcea	17,9	30	214	11,8	20	163		
Banu Maracine	17,7	37	236	11,9	16	186		
Samburesti	16,6	40	282	11,0	31	188		
Corcova	17,4	39	222	11,8	32	173		
Orevita	17,9	31	225	12,1	29	174		

Climate assets of the studied areas, during the months of harvesting grapes and wine-making (average on 50 years)

Table 3

Table 2

The presence of lactic bacteria, cocci and bacilli, in must and wine

Viticultural area	CFU/ml	Environment in which lactic bacteria were isolated							
		Grapes		Must		Must in alcoholic fermentation		Wine in the malolactic fermentation	
		Cocci	Bacilli	Cocci	Bacilli	Cocci	Bacilli	Cocci	Bacilli
		%	%	%	%	%	%	%	%
Segarcea	$1 \times 10^2 - 6 \times 10^3$	33,00	67,00	40,60	59,40	79,50	20,50	99,00	1,00
Banu Maracine	$1 \times 10^2 - 6 \times 10^2$	22,00	77,78	37,50	62,50	89,50	10,50	98,00	2,00
Samburesti	$1 \times 10^2 - 5 \times 10^2$	36,00	64,00	41,70	58,30	81,00	19,00	90,40	9,60
Corcova	$1 \times 10^2 - 4 \times 10^2$	27,00	73,00	38,60	61,40	75,40	24,60	96,50	4,50
Orevita	$1 \times 10^3 - 6 \times 10^4$	20,00	80,00	30,00	70.00	80,00	20,00	95,80	4,20

462

The presence of factor bacteria (Cr 0 7 hil) in different environments							
	Environment in which lactic bacteria were isolated						
Viticultural area	Grapes	Must	Must in alcoholic fermentation	Wine in the malolactic fermentation			
Segarcea	$1 \times 10^2 - 6 \times 10^3$	$1 \times 10^2 - 2 \times 10^3$	$1 \times 10^2 - 1 \times 10^3$	$5x10^2$ - $6x10^3$			
Banu Maracine	$1 \times 10^2 - 6 \times 10^4$	$1 \times 10^2 - 2 \times 10^4$	$1 \times 10^2 - 1 \times 10^3$	$5x10^3$ - $6x10^2$			
Samburesti	$1 \times 10^2 - 5 \times 10^3$	$1 \times 10^3 - 2 \times 10^4$	$1 \times 10^2 - 1 \times 10^4$	$4x10^2$ - 5 $x10^3$			
Corcova	$1 \times 10^2 - 4 \times 10^4$	1×10^{3} - 2×10^{4}	$1 \times 10^2 - 1 \times 10^3$	$3x10^3$ - $4x10^2$			
Orevita	$1x10^{3}$ - $6x10^{5}$	$1x10^4$ - 2 $x10^2$	$1x10^2 - 1 x10^3$	$5x10^4$ - $6x10^4$			

The presence of lactic bacteria (CFU / ml) in different environments

Table 5

Table 4

Lactic bacteria isolated and identified from grapes, must and wine

		Number	The proportion who are (%)				
Viticultural area	Strains identified at species	of strains	Grapes	Must	Must in alcoholic fermentation	Wine in malolactic fermentation	
Segarces	Lactobacillus plantarum	5	100	94	-	-	
Segarcea	Leuconostoc oenos	8	-	6	100	100	
	Lactobacillus plantarum	6	100	92	-	-	
Banu Maracine	Leuconostoc oenos	4	-	4	100	100	
	Leuconostoc mesenteroides	10	-	4	-	-	
Samburesti	Lactobacillus plantarum	2	100	96	-	-	
	Leuconostoc oenos	20	-	4	100	100	
Corroova	Lactobacillus plantarum	1	100	94	-	-	
Corcova	Leuconostoc oenos	10	-	6	100	100	
Omercita	Lactobacillus plantarum	1	100	96	-	-	
Olevita	Leuconostoc oenos	10	-	4	100	100	

463

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

Seria: ✓ Biologie ✓ Horticultură

 Tehnologia prelucrării produselor agricole

🖌 Ingineria mediului

Vol. XVI (LII) - 2011

RESEARCH CONCERNING THE INFLUENCE OF THE SOIL TYPE ON THE QUANTITY AND QUALITY OF THE PRODUCTION OF BLACK GRAPES, INTO THE SAMBURESTI VITICULTURAL AREA

Urucu Iustin¹

KEY WORDS: grapes, quality, soil, influence

ABSTRACT

A tight connection was remarked to and fro the soilo types, their respective physical and chemical assets, as inputs for the wine's quality.

Science long ago it is known that wines obtained from vineards grown on limy soils to have an exquisite finesse. I ssued from skeleton or ferruginous soils, red wines do have a respledid red colour and a remarkable generosity.

It is also known that from the most fertile soils higher amounts of hervest are obtained then from the pauper ones, especially when water supply is its shining and an efficient heating (Carbonneau A., and all, 2007; Condei Gh. 1971; 1977; Dejeu L., 2010; Popa A., 2007, 2008; Fregoni M., 2005).

INTRODUCTION

Unfortunately the certain and complex influence exerted by the soil is yet hardly expresed for oenology, in analytical terms. From 2005 to 2010, our aim was to research upon haw the soil types from the Samburesti vineyard do effectively influe upon the quantity and quality of the black grapes' harvest.

MATERIAL AND METHODS

We have performed research upon black grapes of cabernet Sauvignon, issued from a vineyard sited on six soil types. In order to establish the soils' physical and chemical assets, we made use of the methods recomanded by the Soil'Science International Society. In order to seize the aspects concerning the soils' productivity and the quality of the grapes' harvest, we made use of the methods authorized and recomanded by the Vine and Wine International Organization.

RESULTS AND DISCUSIONS

1. Climate conditions and physical-chemical assets of the soil types

¹ USAMV Bucharest, Horticulture Faculty

The Samburesti vineyard is situated at 44°31' latitide north and 260 m altitude. The average yearly temperature is of 10,5°C, while the annual amount of fallen rain is of around 682mm.

The main climate elements which ocur during the vegetation period and the site's oenoclimaticall aptitudes are presented in Table 1.

In the Samburesti vineyard can be found six types of soil with various physical and chemical assets (Table 2).

For the studied soils, the medium towards large values, the useful water capacity has smal and very smal values. The humus contents of the respective soil types is decreasing, from the surface downwards, except for the types luvical red brown and luvical pseudo-glazed brown, where a slight increase is registered.

Table 1

Geographycal and climate	elements	of the	Samburesti	vineyard
(average	mean for	50 yea	ars)	

Northen				Sum			
latitude		Averagly year's temperature (⁰ C) Sum of the year's fallen rain (mm)	'ear's nm)	Т	Ι	Р	Oenoclimatical
	Altitude (m)		Degrees temperature s (⁰ C)	Hours of insolation (h)	Fallen rain (mm)	aptitude A=T+I-(R-250)	
44 ⁰ 31'	260	10,5	682	3226	1536	395	4627

The phosphorus' contents (P_2O_5) is situated at normal values. For the former 20 cm, the providing of accesible potassium (K_2O) presents a growing scale: it is poor for the soils: ergillaceous illuvial brown, pseudoglazed and luvical pseudoglayed brown, it is mediul from the soil, typical argillaceous illuvial brown, rodical pseudo-glazed brown on sckeleton. The soils' reaction is variable, from the strongly acid one to the acid one. The saturation degree for bases is strong for the luvical red brown but moderated for the soils: typical argillaceous illuvial brown and radical too, as well as for luvical pseudo-glazed brown.

The mobile iron contents lies between 10,4 and 21,8 (ppm) at the soils: lithical argillaceous illuvical brown, typical argillaceous illuvical brown slightly pseudo-glazed (Table 3).

It also lies between 22,6 and 24,5 (ppm) at the soils: rodical argillaceous illuvical brown and rodical pseudo-glazed litihical brown. In the frome of the Bt horizon, ferro-manganical separations do appear including the bobovine ones, which give to the soil a reddish touch.

2. Influence of the soil type upon quantity and quality of the grapes' harvest

The obtained results are presented in Table 4. On the brown luvical pseudo-glazed soil-with a low amount of nutritive elements, with a strongly acid pH (4,5-5,5) and with a medium saturation degree in bases the average grapes' production was of 6300 Kg/ha, coming to 1,5 Kg/vine.

The amount of accumulated sugar was of 193 g/l, and the obtained wines were less extractive, with a weak colouring intensity. The highest grape harvests were obtained from the typical brown argillaceous illuvial slightly pseudoglazed soil (1,8 Kg/vine). This soil is

provided with nutritive elements in a low towards normal ratio. The grapes have accumulated 204 g/l of sugars, and the wines were of a high quality.

For the argillaceous illuvical brown soil, pseudoglazed on skeleton, which is barely provided with nutritive elements, the average grapes' harvest was of 6720 Kg/ha. The accumulated amolht of sugar reaches to 200 g/l. The resulted wines are equilibrated, with a colour shade pronunced enough. For the rodical brown soil pseudo-glazed on skeleton, supplied in normal amounts with nutritive elements and disposing of a good draining, were obtained the amounts of 7000 Kg/ha and 1,65 Kg/vine.

Table 3

Soil types	Depth	Mobil iror	n (ppm)	K_2O_4	Humus
	(cm)	HCl 0,1n	Olson	accessible /100g sol	0⁄0
	0-15	1,2	0,2	9,2	2,029
Luvic pseudo-	16-25	9,4	4,6	5,3	1,168
glazed brown	26-30	3,2	0,35	5,1	1,230
	31-80	4,1	1,6	4,2	1,230
	-	-	-	-	-
	0-20	14,0	4,4	10,8	2,715
Typical	20-45	21,8	7,0	20,4	2,010
argillaceous	46-90	3,7	0,35	19,0	1,476
illuvical brown,	91-120	1,5	0,22	-	0,615
slightly	-	-	-	-	-
	0-10	10,4	3,1	12,8	0,988
Argillaceous	11-42	8,5	3,0	7,2	0,615
illuvical brown,	41-75	0,7	0,2	16,2	0,123
pseudoglazed an	-	-	-	-	-
skeleton					
	0-10	16,2	5,6	13,5	2,090
Rodical brown,	11-52	24,5	7,5	9,5	1,270
pseudo-glazed on	53-90	6,7	2,6	16,7	0,615
skeleton	91-105	4,2	1,7	14,2	0,738
	106-130	0,3	0,18	10,5	0,492
	0-20	9,2	3,0	14,0	1,845
Luvical reddish	21-40	10,8	3,2	12,8	2,465
brown	41-70	7,7	2,8	9,2	0,868
	71-100	3,3	0,4	8,3	0,492
	0-20	11,4	4,0	21,6	2,583
Rodical	21-40	9,4	3,1	9,5	1,942
argillaceous	41-100	22,6	4,8	13,2	0,700
illuvical brown	101-125	10,4	3,2	7,4	0,615

The content in the mobil iron, accessible potasium and humus of the soils from Samburesti vynerad

The presence of $CaCO_3$ at the depht of 105-130 em below is a benefit for the quality of the harvest. The grapes due to it have accumulated 225 g/l of sugars, and the obtained wines were equilibrated, fine well coloured and presenting a characteristical arond.

The reddish brown luvical soil, not enogh provided with nutritive elements, does produce 7150 Kg/ha of grapes, and the resulted wines are of a high quality, extractive ones, with an a dequate colours' intensity.

From the brown argilaceous illuvical soil were obtained 7240 bKg/ka of grapes, the sugars' accumulation reaching to 210 g/l, the wines obtained being extractive alcholically equilibrated, well coloured and of a very good quality.

A significant correlation has been proven to exist between, on one side, the organical matter and the chemical micrelements contained by the soil and obtained unfermented wines. The soils with a poorer contents of organical matter are favourable to the accumulation of larger amounts of sugars. The reciprocal process is occurring too (fig.1).

Table 4

Soil types	Production of grapes kg/ha	Production of grapes kg/vine	Concentration of sugars in must (g/l)	Total acidity in must H ₂ SO ₄)	Antocyens' amount within tunicles mg/kg
Luvic pseudo-glazed brown	6300	1,50	193	6,37	978,7
Typical argillaceous illuvical brown, slightly	7560	1,80	204	6,70	1124,7
Argillaceous illuvical brown, pseudoglazed an skeleton	6720	1,60	200	5,88	1050,5
Rodical brown, pseudo-glazed on skeleton	7000	1,65	222	6,40	1241,8
Luvical reddish brown	7150	1,68	205	6,55	1095,8
Rodical argillaceous illuvical brown	7240	1,70	210	6,95	1191,8

Influence of the soil's type on the quantity and quality of the grape's harvest



Figure 1. The correlation between of amount of humus into the soil and quantity of sugars into the must

A positive and significant correlation is to be remarked (in figure 2) between the soil's contents in mobile potassium and accumulated quantities of sugars.



Mobile potassium (mg/100 g soil)

Figure 2. The correlation between the soil's contents in mobile potassium and the sugars into the must

A distinctly significant positive correlation is also to be remarked (figure 3) between the soil's contents in mobile potassium and the antocyans amount accumulated within the tunicle of the grapes.



Figure 3. The correlation between the soil's contents in mobile potassium and the amount of antocyans within the grapes' tunicles

On the ground of statistical calculus a very accentuated correlation was established between the soil's contents in mobile iron and the quality of antocyans accumulated within the grapes tunicle (figure 4).



Figure 4. The correlation between the soil's contents in the iron and the amount of antocyans within the grapes' tunicles

The soils with a contents in mobile iron from 20 to 25 ppm have flavoured the accumulation of a large quantity of antocyans, such as the case of the soils: rodical brown pseudo-rendzinical on skeleton and rodical brown argilaceous illuvical.
CONCLUSIONS

For the raw materal grapes used in order to obtain high quality red wines, their amount and quality are dependent apart from the climate conditions, of the physical and chemical assets owned by each of the soil types.

The soils' contents in mobile iron, accesible potassium and humus do have an influence upon the qualty indexes of the grapes: the sugars' concentration, the amounts of antocyans, etc.

The studies we have performed until now have pointed out that the highest rank of classification in quality that may be attended by the Samburesti wines of Cabernet Sauvignon from the vineyards sited on the rodical brown soil, pseudo-renzinical on skeleton

In another work we will present the scientifical results obtained by us concerning the influence of the soil type on the wines' organoleptic assets and on their chromatic features.

BIBLIOGRAPHY

Carbonneau A., Deloire A., Jailard B.,- La vigne-physilogie, terroir, culture. Edition Dunod, Paris, 442 p. 2007.

Condei Gh.,- Rezisten a vi ei de vie la unele condi ii nefavorabile i boli parazitare sub influen a îngră ămintelor chimice. Analele IVV, Valea Călugărească, vol. III, Bucuresti. 1971.

Condei Gh., Popa P.– Testarea fertilită ii solului din podgoriile Drăgă ani i Mini pentru analiza agrochimică i diagnoza vegetală. Analele ICVV Valea Călugărească, Vol. VIII. 1977.

Dejeu Liviu,– Caracterizarea solurilor în legătură cu cultura vi ei de vie în centrul Valea Călugărească. Teză de doctorat IANB, Bucuresti. 1984.

Dejeu Liviu,- Viticultură. Editura Ceres, Bucuresti. 2010.

6. Popa A.,- Arealele viticole din Oltenia-România cu voca ie pentru ob inerea vinurilor de calitate cu denumire de origine controlată (DOC). Analele USAMV Cluj Napoca, seria Horticultură. 2007.

Popa A., - Secretul vinului bun. Editura Alma, Craiova. 2008.

Fregoni M.,- Viticoltura di qualita. Editore Phytoline, Affi. 2005.

				Physical and chemical assets								
Soil types	Depht (cm)	Genetical horizon	Total amount of N%	P ₂ O ₅ total %	Mobile P ₂ O ₅ mg/100g soil	Accesible K ₂ O mg/100g soil	Humus %	pН	CaCO ₃ %	SH ml%	SB ml%	V %
Luvic pseudo-glazed	0-15	A0	0,08	0,10	6,4	9,2	2,029	4,55	-	8,25	10,9	60
brown	15-26	B1	0,07	0,07	2,2	5,3	1,168	4,83	-	8,25	16,05	66
	26-30	BB	0,05	0,06	2,0	5,1	1,230	4,82	-	10,7	19,36	66
	30-62	Btw1	0,03	0,05	1,8	4,2	1,230	5,76	-	8,25	18,99	70
	62-120	Btyw2	-	-	-	-	2,337	7,91	0,21	0,91	30,40	97
Typical argillaceous	0-20	A0	0.11	0,14	10,6	10,8	2,715	4,44	-	13,7	15,31	63
illuvical brown,	20-45	Bt1	0,10	0,09	6,8	20,4	2,010	6,11	-	4,58	23,04	85
slightly	45-90	Bt2	0,08	0,07	6,2	19,0	1,476	5,85	-	4,56	22,30	88
	90-120	Cca	-	-	-	-	0,615	8,21	6,94	0,91	-	-
Argillaceous illuvica	10-13	A0	0,07	0,12	18,2	12,8	0,988	6,12	-	4,58	12,74	73
brown, pseudoglazed	13-42	AB	0,05	0,14	10,5	7,2	0,615	6,98	-	0,91	14,57	94
an skeleton	42-75	Btyw	0,04	0,06	0,8	16,2	0,123	8,33	1,05	0,91	31,13	97
	75-110	Cca	-	0,03	0,4	15,0	0,369	7,20	-	1,82	23,04	93
Rodical brown,	0-18	A0	0,08	0,11	20,6	13,5	2,090	4,58	-	11,7	12,74	70
pseudo-glazed on	18-52	AB	0,07	0,12	8,8	9,5	1,270	5,05	-	7,33	17,15	70
skeleton	52-92	At1	0,05	0,09	1,1	16,7	0,615	4,52	-	9,16	21,57	86
	92-105	At2	0,04	0,05	0,7	14,2	0,738	6,24	-	3,67	22,30	96
	105-130	Cc2	-	0,03	0,2	10,5	0,492	7,68	-	0,91	23,19	92
Luvical reddish brown	0-40	(A+B)d	0,06	0,10	9,3	14,0	1,845	4,92	-	4,58	12,74	73
	40-50	AB	0,05	0,12	10,1	12,8	2,465	5,29	-	5,49	12,74	70
	50-82	Bt1	0,03	0,09	6,5	9,2	0,868	5,51	-	5,49	17,15	76
	82-117	Bt2	0,02	0,07	4,7	8,3	0,492	5,26	0,42	5,49	17,52	76
Rodical argillaceous	0-20	A0	0,13	0,12	12,2	21,6	2,583	4,81	-	10,07	13,47	57
illuvical brown	20-40	A/B	0,10	0,09	8,8	9,5	1,942	5,37	-	4,58	16,41	78
	40-100	Bt	0,08	0,06	1,2	13,2	0,700	4,71	-	8,25	27,45	77
	100-125	Ccal	0,06	0,04	0,8	7,4	0,615	7,97	13,04	0,91	-	-
	125-150	Cca2	0,04	0,02	0,2	5,8	0,615	7,74	33,66	0,91	-	-

Physical and chemical assets of the soils from the Samburesti vineyard

Table 2

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

- Seria: ✓ Biologie ✓ Horticultură
 - Tehnologia prelucrării produselor agricole

🖌 Ingineria mediului

Vol. XVI (LII) - 2011

STUDIES CONCERNING THE INFLUENCE EXERTED BY THE SOIL TYPES UPON THE WINES' CROMATIC FEATURES AND ORGANOLEPTIC ASSETS

Urucu Iustin¹

Key words: type soil, wines' cromatic features

ABSTRACT

The soils' thermal circumstances wich are important for the activity of the wine roots consequently for the wine's composition and quality as final result are formed under the reunited influence of insolation of the air's temerature and of the fallen rain's level. The organic manure does improve the soil's structure its aeration its proviousness its power of retaining water and its power to ionize the absorbent complex. The soil's too high contents in nitrogen as well as the fertilizers based on nitrogen do slow down the accumullation of sugars and do create light wines, fragile ones, hard to be stabilized pre-disposed to alteration. The phosphatical and potasical fertilizers yet do flavour the accumulation of sugars.

INTRODUCTION

The researches performed until now (Cotea V., and all., 2009; Dejeu L., 2010; Popa A., 2007, 2008; Ribereau Gayon P., and all., 2004; Teodorescu St., and all. 1987) have get insufficiently demonstrated the importance of the soil participating in the definition of the composition and quality of the grapes and wines. The soils have to reach to the level of an obvious vocation in order to render possible the realization of certain highly valued assets of quality. The fact was demonstrated that for a same favourable area of climatic and even if the kind of vine should be the same but the soil where it would be planted might not be the one which is known by tradition then the wine might cease to be excellent and could become a common wine. Therefore we are entitled to assert that the soils' difference does indeed constitute an inconvenient.

From 2004 to 2010, our purpose was to investigate about haw the soil types from the Samburesti vineyard do influe upon the cromatic features and the organoleptic assets of the Cabernet Sauvignon not red wines.

MATERIAL AND METHODS

Our research was performed upon the Cabernet Sauvignon red wines created from the grapes of vineyard sited upon six types of soil. In another work we have explained the aspects concerning the soils' physical and chemical assets, as well as their influence upon

¹ USAMV Bucharest, Horticulture Faculty

the production af grapes and upon their quality. Our research has focused upon the evolutive dynamics of the total poliphenols (g/l), the evolution of the antocyans' amount (mg/l), the colours' intensity and nuances during the forming, the maturation and the aging of wines, the components wich ensure the intensity of the colour for the cabernet Sauvignon red wines.

The laboratory analyses and the appreciation given upon the wines' organoleptic assets were obtained through the use of the methods autorized and recomanded by the Vine&Wine International Organization.

RESULTS AND DISCUSIONS

The tables 1-5 do present the scientific results we have obtained. At the end of the alcoolic fermentation, the wines have presented a high contents of polyphenols going from 2,8 and 3,45 (Table 1).

Table 1

Contents in tota	l polyphenols for the	Cabernet S	Sauvignon	wines -	vineyard	of
	Sambur	resti				

Soil types	t of total enols after tation (g/l)	Maturation Aging within b within barrels (years)						4 5 6			
	Amoun polypho fermen		Amount of total polyphenols (g/l)								
Luvic pseudo- glazed brown	2,80	1,70	1,98	1,85	1,80	1,75	1,69	1,65	1,63		
Typical argillaceous illuvical brown, slightly	3,35	1,92	2,11	2,05	2,01	1,95	1,92	1,85	1,83		
Argillaceous illuvical brown, pseudoglazed an skeleton	2,95	1,82	2,05	1,98	1,90	1,86	1,80	1,74	1,75		
Rodical brown, pseudo-glazed on skeleton	3,45	1,97	2,15	2,11	2,08	1,99	1,94	1,88	1,86		
Luvical reddish brown	2,85	1,80	2,00	1,94	1,89	1,83	1,78	1,70	1,66		
Rodical argillaceous illuvical brown	3,30	1,88	2,09	2,04	1,99	1,94	1,88	1,80	1,76		

In the formation stage of the wine the contents of polyphenols has been noticed to have decrease at around half of its initial proportions. During the wines' maturation in barrels, the amount of polyphenols is slightly increasing, due to the polyphenols extracted from the tannins submitted to hydrolysis (extracted from the oak wood). During the period of the wine's againg within bottles – during six years – the contents in polyphenols has been remarked to slightly diminish (1,63 to 1,86 g/l). The highest values of the contents in

polyphenols, for the Cabernet Sauvignon wines, were recorded for the wines obtained from the grapes harvested in the vineyards sited on the soils: rodical pseudo-rendizinical brown on skeleton (1,86 g/l) and typical argilaceous illuvical brown, slightly pseudo-glazed (1,83 g/l).

During the evolution of the Cabernet Sauvignon wines the antocyans contents (Tabel 2) has significantly decreased, the most quicly during the former two years of maturatio within barrels and during the former 3 years of againg within bottles.

The accentuated decreases of the contents in antocyans are due to the operations of conditionning and stabilization appied to the wines in their stage of formation, as well as to the effect of the oxidizing process which takes place during the maturation within barrels (vases). After going through the first three years of aging within botles, the antocyans' contents is reduced with about within bottles, the antocyans' amount decreases following a more smooth slope. After the 6-th year of againg within bottles, it reaches to 26-36 mg/l.

Table 2

Soil types	total ıfter n (mg/l)	Maturation within barrels (years)								
	Amount of 1 antocyans a fermentation	I Z I Z S G Amount of total antocyans (mg/l)								
Luvic pseudo-glazed brown	580	370	210	157	98	80	35	29	24	
Typical argillaceous illuvical brown, slightly	680	410	263	198	142	108	50	42	34	
Argillaceous illuvical brown, pseudoglazed an skeleton	645	385	236	175	110	85	40	35	26	
Rodical brown, pseudo-glazed on skeleton	732	428	270	210	160	120	56	44	36	
Luvical reddish brown	672	406	259	190	137	102	49	40	30	
Rodical argillaceous illuvical brown	660	397	245	183	129	96	45	38	28	

Contents in antocyans for the Cabernet Sauvignon wines - vineyard of Samburesti

The Cabernet Sauvignon red wines from Samburesti, at the performant of their alcoholic fermentation, do present high values of their colours' intensity (Table 3) standing between 0,890 nm (pseudo-glezed luvical brown soil) and 1465 nm (rodical brown pseudo-rendzinic soil, on skeleton).

The colours' intensity continues to slowly decrease, in the stage of maturation within barrels reaching to values standing between 0,587 nm and 0,630 nm. After three years of againg within bottles, the colours' intensity has registered slight increases, due to the diminishing of the concentration in free SO₂, after six years of aging it has reached to

values from 0,615 to 0,645 nm. The soils: rodical pseudo-rendzinical brown, slightly pseudo-glazed, on wich the vines were sited where from the grapes were harvested, have led to wines with the highest values of their colors' intensity. Table 4 presents the aspects concerning the absortion for the Cabernet Sauvignon wines of Samburesti.

The absorbant indices from DO 520 and DO 420 present a larger difference between themselves, which is to be remarked. This fact appeared physically through a ruby red colour at the wines issued from the grapes harvested from the soils: rodical brown pseudo-rendzinical on skeleton, argillaceous illuvical rodical brown, typical argillaceous illuvical brown, slightly pseudo-glazed and a red sour cherry colour, with slight shades of brown orrange, at the wines obtained from the grapes grown into the soils, argillaceous illuvical brown, pseudo-glazed on skeleton, luvical reddish brown, luvical pseudo-glazed brown.

The Cabernet Sauvignon wines from Samburesti of maturation within barrels and of aging within bottles apart from the modification of their phisical and chemical features, have also presented changes of their sensitive assets (Table 5).

Table 3

Soil types	Antoyians mg/l	Colours' intensity Iv (1cm)	The component of colour % from Iv			
Luvic pseudo-glazed brown	167	6.11	41.37	45.94	12.69	
Typical argillaceous illuvical brown, slightly	190	7.96	34.93	48.93	16.14	
Argillaceous illuvical brown, pseudoglazed an skeleton	178	6.98	40.26	46.92	12.82	
Rodical brown, pseudo-glazed on skeleton	227	8.93	32.31	49.48	18.21	
Luvical reddish brown	175	5.79	41.36	47.07	11.57	
Rodical argillaceous illuvical brown	215	8.70	34.94	49.14	15.92	

The component of colours of wine - Cabernet Sauvignon wines - vineyard of Samburesti

*Iv – Colours' intensity (DO420+DO520+DO620)

After their phases of maturation and aging, the Cabernet Sauvignon wines do dispose of high alcoholic concentration, of an amount of glicerol high enough, of an intense and good-looking colour.

For the soil: rodical brown pseudo-glazed on skeleton the wines obtained from the grapes of aging within bottles, do own an expressive limpidity, do dispose of a red ruly colour with shades of brick-red, they present a bouguet of an exequiste quality they create an exceptional sensation by their taste and they obviously consolidate an autstending personality. The wines obtained grapes issued from the vineyards sited on the brown pseudo-rendzinical soil skeleton, which disposes of a high contents in calcium carbonate, do also engoy of a particular personality.

CONCLUSIONS

Togheter with the climate conditions, the soil largerly influes upon the wines' quality especially in the case of red wines;

There is a tight connection between the types of soil found in the Samburesti vineyard and the quality of the wines issued from it;

The rodical brown pseudo-rendzinical soil on skeleton suports the vines from which the obtained grapes do produce at Samburesti Cabernet Sauvignon wines which are able to reach for the highest level of quality evaluation.

REFERENCES

Cotea V. Valeriu, Cristinel V. Zănoagă, Valeriu V. Cotea, *Tratat de oenochimie*, vol. I și vol. II, Editura Academia Română, București, 2009;

Dejeu Liviu, Viticultură. Editura Ceres, București, 2010;

Popa Aurel, Secretul vinului bun. Editura Alma, Craiova, 2008;

Popa Aurel, Arealele viticole din Oltenia-România cu voca ie pentru ob inerea vinurilor de calitate cu denumire de origine controlată (DOC). Analele USAMV Cluj Napoca, seria Horticultură, 2007;

Ribereau-Gayon P., Dubourdieu D, Donéche B., Lonvaud Aline, *Traité d'enologie*. vol. I, Microbiologie du vin. Vinifications, 5éme ed. Dunod, Paris, 2004;

Ribereau-Gayon P., Glories Z., Maujean A., Dubourdieu D., *Traité d'enologie*, vol. II, Chimie du vin. Stabilisation et traitements, Dunod, Paris, 2004;

Teodorescu Ștefan, Popa Aurel, Sandu Gheorghe, *Oenoclimatul României*. Editura Științifică și Enciclopedică, București, 1987.

Table 4

D · C(1 1) ·		a · ·	· 1 CC 1 /
I whamles of the colour s i	ntencity of the Cohernet	Nauvianon winec -	VINAVARA AT Samburacti
Dynamics of the colour st		$\alpha a u v i e n 0 n w n 0 5 - 1$	

	he	Matu	Maturation within barrels (years)			Aging within bottles (years)										
~ *	at t ic	1		2	2	1		2	2	3		4	-	5		6
Soil types	sity		Colours' intensity													
	Colours' inter end of the alco	nm	Free SO ₂ mg/l	nm	Free SO ₂ mg/l	nm	Free SO ₂ mg/l	nm	Free SO ₂ mg/l	nm	Free SO ₂ mg/l	nm	Free SO ₂ mg/l	nm	Free SO ₂ mg/l	nm
Luvic pseudo-glazed brown	0,890	0,670	24	0,600	23	0,575	35	0,587	30	0,595	26	0,612	23	0,618	20	0,615
Typical argillaceous illuvical brown, slightly	0,345	1,077	25	0,775	24	0,611	34	0,616	29	0,620	24	0,627	21	0,640	19	0,632
Argillaceous illuvical brown, pseudoglazed an skeleton	0,965	0,785	25	0,660	25	0,586	34	0,598	29	0,682	25	0,615	22	0,620	19	0,618
Rodical brown, pseudo- glazed on skeleton	1,465	1,105	24	0,820	23	0,622	35	0,630	30	0,637	25	0,648	23	0,652	20	0,645
Luvical reddish brown	1,170	1,050	25	0,760	25	0,600	33	0,609	27	0,615	23	0,623	20	0,623	18	0,627
Rodical argillaceous illuvical brown	1,020	0,972	23	0,720	24	0,595	33	0,603	28	0,610	24	0,619	21	0,625	18	0,620

477

Table 5

Soil types				Physical a	nd chemical a	ssets	
	Moment in the wine's evolution	Non- reductive extract g/l	Glycerol g/l	Total polyphenols g/l	Antocyans mg/l	Colours' intensity DO420+DO520	Mark obtained at degustation (1-20)
Luvic pseudo-glazed brown	End of the alcoholic fermentation	27,40	9,25	2,80	580	0,890	16,0
	Maturation within barrels - 2 years	27,18	9,10	1,85	157	0,575	16,8
	Aging within bottles – 6 years	27,05	9,02	1,65	26	0,618	17,3
Typical argillaceous illuvical brown, slightly	End of the alcoholic fermentation	29,60	1,80	3,35	680	1,345	17,0
	Maturation within barrels - 2 years	29,45	10,50	2,05	198	0,611	18,9
	Aging within bottles – 6 years	29,35	10,30	1,85	36	0,640	19,2
Argillaceous illuvical brown, pseudoglazed an skeleton	End of the alcoholic fermentation	28,10	9,55	2,95	645	0,965	16,5
	Maturation within barrels - 2 years	27,88	9,30	1,98	175	0,586	18,0
	Aging within bottles – 6 years	27,75	9,15	1,74	28	0,620	18,4

Organoleptic assets of the Cabernet Sauvignon wines from the Samburesti vineyards

478

Rodical brown, pseudo-glazed on skeleton	End of the alcoholic fermentation	29,75	10,95	3,45	732	1,465	17,5
	Maturation within barrels – 2 years	29,60	10,60	2,11	210	0,622	19,0
	Aging within bottles – 6 years	29,47	10,45	1,88	39	0,652	20,0
Luvical reddish brown	End of the alcoholic fermentation	28,75	10,00	2,85	672	1,170	16,3
	Maturation within barrels – 2 years	28,50	9,75	1,94	190	0,600	17,5
	Aging within bottles – 6 years	28,35	9,62	1,70	32	0,632	18,2
Rodical argillaceous illuvical brown	End of the alcoholic fermentation	29,65	10,30	3,30	660	1,020	17,2
	Maturation within barrels – 2 years	29,50	10,00	2,04	183	0,595	18,8
	Aging within bottles – 6 years	29,28	9,85	1,80	30	0,625	19,6

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

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

Vol. XVI (LII) - 2011

STUDY IN CULTURE OF CUCUMBER HYBRIDS IN NEW TYPES OF FUNCTIONAL SOLAR GREENHOUSES, IN ECOLOGICAL CONDITIONS.

Vinerean Șt.T., Mitrea I.

KEY WORDS: cucumber, hybrid, solar greenhouse, ecological, phenological traits, production

ABSTRACT

The cucumber is a vegetable plant that is grown in fields, greenhouses and hotbeds, ensuring the consumption over a longer period of time, appreciated both on the domestic market. and abroad. Its fruits are consumed after its technical maturity being appreciated in nutrition for its diversified content in nutrients, as well as for its therapeutic effects. Four cucumber hybrids were studied, suitable for ecological culture in greenhouses - solar, in terms of phenological characteristics, the quantity and quality production levels. Modern solar greenhouses have many new constructive features. Thus, they include enough room for screening installations under the roof and along the side walls. Ventilation windows are larger, taking up to 25-50% of the greenhouse roof and we thought of modern solutions for the control of the microclimate factors (temperature, light and humidity).

INTRODUCTION

Vegetables are part of the daily ration of people's food, either fresh or processed, which makes them of major importance for both vegetable producers and consumers.

Achieving high yields of cucumbers grown in solar greenhouses requires their upgrading from the constructive point of view, the ensurance of the growth factors at optimal parameters, the use of the most suitable cultivation environments, and economic efficiency.

MATERIALS AND METHODS

The research was conducted during 2007-2008, for Cycle I of culture.

We chose F1 hybrids of cucumber plants adaptable to the solar ecological culture for this study, namely:

- Mirabele F1
- Kibiria F1
- Caraoke F1
- Capricorn F1

The hybrids studied are parthenocarpic, of the *Cornichon* type, with capacity of fructification on the main stem, with genetic resistance to major pathogens.

The seedlings used in setting up the experimental devices were obtained on the Family Association farm where the research was conducted.

Observation was used as a method of research for the phenological traits and biometric measurements and determinations were made for some morphological characters. Observations and determinations were made on the following attributes:

- Calendar dates concerning the appearance of the first fertile flowers, the ripening and harvesting the first fruits, the growing and harvesting of the last fruits (the consumption maturity);
- Production of cucumbers;
- Production quality

RESULTS AND DISCUTION

Phenological observations were directed towards the appearance of flowers, the fruits technological maturity. The appearance of the first fertile flowers took place within April 19th to 20th in 2007 and in within 22nd to 23rd April 2008 (Table no. 1).

The difference from one year to another is due to the fact that planting was done on different dates. In 2007 they were planted on April 1st and in 2008 they were planted on April 5th. One observes that the interval of time from the planting until the appearance of flowers is shorter at the culture of 2008.

Table. 1

Year	The cultivator	Date of first flowers appearance								
		R1	R2	R3	R4					
	Mirabele F1	20.04	19.04	19.04	19.04					
2007	Kibiria F1	19.04	20.04	20.04	19.04					
2007	Caraoke F1	19.04	19.04	20.04	20.04					
	Capricorn F1	19.04	20.04	19.04	19.04					
	Mirabele F1	22.04	22.04	23.04	22.04					
2008	Kibiria F1	22.04	23.04	22.04	23.04					
2008	Caraoke F1	22.04	23.04	22.04	23.04					
	Capricorn F1	22.04	22.04	23.04	22.04					

Dates concerning flowers appearance

It took about 31 days from the planting to the first harvest, so that the first fruits were harvested on May 10th, in 2007 and on May12th in 2008 (Table no. 2). Like at the first flower appearance, the first harvest was made even within the same variant at different dates, but interval of time is irrelevant, when fruits have reached a size of 9-12 cm in length.

Dates concerning the first harvest

Tabel no. 2

Voor	The cultivator		Date of first flow	wers appearance	
i cai		R1	R2	R3	R4
	Mirabele F1	10.05	10.05	11.05	10.05
2007	Kibiria F1	12.05	13.05	12.05	12.05
2007	Caraoke F1	12.05	12.05	12.05	13.05
	Capricorn F1	11.05	11.05	11.05	10.05
	Mirabele F1	12.05	13.05	12.05	12.05
2008	Kibiria F1	14.05	13.05	14.05	14.05
2008	Caraoke F1	14.05	14.05	14.05	13.05
	Capricorn F1	13.05	13.05	12.05	13.05

The date of the last harvest was considered to be when the quality, quantity and price do not lead to the planned economic effects. At this point the share of the damaged fruit increases and the price reaches a very low level.

As seen in Table no 3, the day of the last fruit harvest was in the middle of July (July 13th to 15th in 2007 and July 16th to 17th in 2008).

Table no. 3

				•						
Voor	The cultivator	Date of first flowers appearance								
i cai		R1	R2	R3	R4					
	Mirabele F1	15.07	13.07	14.07	14.07					
2007	Kibiria F1	15.07	14.07	15.07	15.07					
2007	Caraoke F1	15.07	14.07	15.07	15.07					
	Capricorn F1	15.07	15.07	15.07	14.07					
	Mirabele F1	17.07	16.07	17.07	18.07					
2008	Kibiria F1	17.07	17.07	17.07	16.07					
2008	Caraoke F1	17.07	16.07	17.07	17.07					
	Capricorn F1	16.07	17.07	17.07	17.07					

Observations on the last harvest

The results for the cucumber production are presented in Table 4. The harvesting was repeated every 2-3 days according to the fruit growth rate and the production was expressed in tons/ / hectar.

The highest recorded production is in the Capricorn hybrid, namely 121.2 t / ha, followed by Mirabele F1 (102 t / ha), Kibiria F1 (108.6 t / ha) and Caraoke F1 (91.5 t / ha), the differences among hybrids going up to 24.5%.

Table no. 4

			The cultivator				
Specification	Month	Decade	Mirabele	Kibiria F1	Caraoke	Capricorn	
			F1	Kiulia Pi	F1	F1	
		Ι	-	-	-	-	
	May	II	7,8	5,6	4,2	8,8	
		III	20,0	18,9	14,7	23,4	
The overego	June	Ι	31,8	31,3	24,9	39,8	
2007 2008		II	52,2	55,5	44,1	68,3	
2007 –2008		III	78,3	80,3	64,4	93,5	
		Ι	93,8	100,4	84,4	110,8	
	Iuly	II	102,0	108,6	91,5	121,2	
		III	-	-	-	-	

Productions (t/ha) got at the studied hybrids

The cucumber production falls under three quality levels:

- Extra quality (includes fruits with a length between 9-12 cm, characteristic color, diseases or pests free)

- 1st quality (includes fruits with a length other than the planned one, slightly deformed)

- 2nd quality (includes fruits intensely deformed fruits affected by diseases and pests).

Table no 5

		The cultivator							
Specifica tion	Quality	Mirabele F1		Kibiria F1		Caraoke F1		Capricorn F1	
		t/ha	%	t/ha	%	t/ha	%	t/ha	%
The	Extra	87,1	85,4	88,3	81,3	86,1	94,1	118,2	97,5
average	I-a	4,6	4,5	3,8	3,5	5,4	5,9	3,0	2,5
2007 - 2008	II-a	10,6	10,1	16,5	15,2	-	-	-	-

The production according to its quality at the studied hybrids

Regarding the production quality, the data in Table 5 show that Capricorn and Caraoke hybrids had only Extra and the first quality productions, the percentage being represented by the Extra production (91.4% respectively 97.5%).

CONCLUSIONS

1. The date of the last fruit harvest is in the middle of July (July 13th to 15th in 2007 and July 16th to 17th in 2008).

2. The average production of the two years was 102.0 t / ha at Mirabele F1 and quality II is 10.5% of the whole harvest.

3. From the Kibiria F1 hybrid we got a total harvest of 108.6 t / ha, 15.1% of which represents a quality 2 crop

4. The cucumber production obtained at Caraoke F1 variant was 91.5 t / ha. It is the variant with the smallest production, with no quality 2 fruits.

5. The largest cucumber production was given by the Capricorn F1variant, and was 121.2 t / ha, with no quality 2 fruits.

6. The Capricorn F1 version registered the highest yield percentage for the 9-12 cm size, (Extra quality), the lowest percentage of crop for the 12 to 15 cm size (quality I)

REFERENCES

Atanasiu, N. – Contributions to the Establishment of Culture Technology in the Field of Cucumbers of the Cornison Type in Industrial System. Thesis, Veterinary Medicine Iasi, 1999

Cobalas B. - Studies on the Establishment the Technology of Cucumber Cultivation in Greenhouses Covered with Plastic. PhD thesis, IANB, Bucharest, 1977

Elijah G. - Results of Research and Production on Cucumber Greenhouses Cutting New Systems. Horticulture Magazine, no. 2, 1978

N. Munteanu, Stan N. -Alternatives to Industrial Agriculture: Between Necessity and Possibility. Hortinform 1-17. 1999.

Stoian L., - Biological Vegetable Growing, an Alternative for Romania. Hortinform 12-148. 2004.

Stoian L., - A Practical Guide for Organic Vegetables Cultivation. Tipoactiv Publishing, Bacau. 2005.

V. Stoleru, Imre A. - Growing Vegetables Organically. Risoprint Publishing House Cluj Napoca. 2007.

Voican V., Locksmith V. - Protected Vegetable Culture in Greenhouses and Conservatories, Ceres Publishing House, Bucharest. 1998.

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

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

Vol. XVI (LII) - 2011

THE STUDY OF CULTURE TOMATO HYBRIDS IN NEW TYPES OF SOLAR GREENHOUSES, FUNCTIONAL IN ECOLOGICAL CONDITIONS

Vinerean Șt.T., I. Mitrea

KEY WORDS: tomatoes, hybrid, solar-greenhouse, ecological, phenological traits, early production

ABSTRACT

We do not have time for a healthy diet based on fresh or even cooked vegetables and fruits nowadays, we quickly buy a bag of ready-prepared, beautifully packaged, synthetically flavored food instead of an apple or some fresh vegetables, obtained in organic cultivation systems. We studied four tomato hybrids, suitable for crop production in greenhouses - solar, in terms of phenological characteristics, the production quantity and quality level. Modern solar greenhouses have many new constructive features. Thus, they include enough room for screening installations under the roof and along the side walls. Ventilation windows are larger, taking up to 25-50% of the greenhouse roof and we thought of modern solutions for the control of the microclimate factors (temperature, light and humidity).

INTRODUCTION

Vegetables are part of the daily ration of people's food, either fresh or processed, which makes them of major importance for both vegetable producers and consumers.

Achieving high yields of tomatoes grown in solar greenhouses requires their upgrading from the constructive point of view, the ensurance of the growth factors at optimal parameters, the use of the most suitable cultivation environments, and economic efficiency.

MATERIALS AND METHODS

The research was conducted from 2007 to 2008 for Cycle I of culture. We chose F1 hybrids of tomato plants adaptable to the solar ecological culture for this study, namely:

- Magnus F1

- Ivet F1

- Antalya F1

- CEMI F1

- CEIVII F I

The seedlings used in setting up the experimental devices were obtained on the Family Association farm where the research was conducted. Observation was used as a method of research for the phenological traits and biometric measurements and determinations were made for some morphological characters.

Observations and determinations were made on the following attributes:

- calendar dates concerning the ripening of the first fruits, growing and harvesting of the first fruits, growing and harvesting the last fruit (the consumption maturity);

- tomato production;

- average weight of fruits;

RESULTS AND DISCUTIONS

We determined the ripening of the first tomato fruits daily to establish the phase realization, in order to see the differences from one hybrid to another from May 22nd to June 5th in 2007 and from May 22nd to June 5th in 2008

Table 1

Voor	The cultivator	The day of the fruit ripening process					
i eai		R1	R2	R3	R4		
	Magnus F1	02.06	03.06	02.06	02.06		
2007	Ivet F1	02.06	03.06	02.06	03.06		
2007	Antalya F1	05.06	05.06	04.06	05.06		
	Cemile F1	18.05	17.05	17.05	18.05		
	Magnus F1	04.06	04.06	03.06	03.06		
2008	Ivet F1	03.06	03.06	02.06	03.06		
2008	Antalya F1	05.06	06.06	06.06	06.06		
	Cemile F1	23.05	23.05	22.05	23.05		

Realization of the fruit ripening phase

The data presented in Table 1 show that the fruits get ripened with 15 to 17 days earlier in 2007 and with 16 to 22 days in 2008 at the Cemile F1 variant in comparison to other variants. The moment when the fruits reached the ripening phase differed with one to four days at the other versions. The beginning of the first fruit ripening phase took place after two to five days from the completion of the ripening phase (Table 2).

The beginning of the fruit ripening phase

Table 2

Year Th	The cultivator	The first fruits ripening day					
	The cultivator	R1	R2	R3	R4		
	Magnus F1	05.06	06.06	05.06	05.06		
2007 I	Ivet F1	05.06	06.06	05.06	06.06		
	Antalya F1	09.06	09.06	08.06	09.06		
	Cemile F1	25.05	24.05	25.05	25.05		
	Magnus F1	07.06	07.06	06.06	07.06		
2008	Ivet F1	06.06	06.06	05.06	05.06		
2008	Antalya F1	10.06	11.06	10.06	10.06		
	Cemile F1	28.05	27.05	27.05	28.05		

The fruit ripening was achieved in the CEMILE F1 version during the third decade of May whereas the other variants achieved the fruit ripening during the latter part of the first decade of June.

We conclude that the fruits harvesting was done earlier at the CEMILE F1 version, compared to the other variants, with beneficial financial effects arising from the early

harvesting time. The fruit ripening takes place gradually within an interval of time of approximately 60 days.

Table 3

Table no 4

Year	The cultivator	First fruit ripening date					
		R1	R2	R3	R4		
	Magnus F1	20.07	20.07	19.07	19.07		
2007	Ivet F1	20.07	20.07	19.07	19.07		
	Antalya F1	22.07	22.07	23.07	22.07		
	Cemile F1	15.07	15.07	16.07	16.07		
	Magnus F1	22.07	22.07	21.07	21.07		
2008	Ivet F1	22.07	22.07	21.07	22.07		
	Antalya F1	22.07	21.07	21.07	21.07		
	Cemile F1	16.07	17.07	16.07	17.07		

Achieving the fruit ripening phase

The last harvest of fruits was achieved in latter decade of July for the Cemile F1 variant and for the other variants; the last harvest took place during the third decade of July. These dates are specified in both research years - (table no. 3). The tomatoes production, expressed in t / ha, obtained in the hybrids studied is presented in Table 4, both the total one and in dynamics. The highest total production was recorded in the Antalya hybrid, namely 140.2 t / ha, followed by Cemile F1 (120.2 t / ha), Magnus F1 (95.4 t / ha) and Ivet F1 (92, 8 t / ha), the differences among hybrids going up to 33.8%.

The yields (t / ha) obtained in the hybrids studied

Specification	Month	Daada	The cultivator				
specification	WIOIIUI	Decade	Magnus F1	Ivet F1	Antalya F1	Cemile F1	
The average 2007 –2008	Mai	III	-	-	-	5,2	
	June	Ι	10,6	12,8	18,6	29,9	
		II	33,1	33,4	48,1	60,3	
		III	53,7	53,9	78,5	88,7	
	July	Ι	69,1	73,6	106,7	109,9	
		II	83,9	84,5	128,3	120,2	
		III	95,4	92,8	140,2	-	

Concerning the early production achieved, one can see that during the third decade of May we got 5.2 t / ha only at the F1 Cemile hybrid as it was the earliest one. From the presentation of the dynamic cropping, we draw the conclusion that 91.4% of the Cemile F1 hybrid production capacity is achieved by the end of the first decade of July. Comparing this with what was recorded in the other variants, we find out that at the end of the first decade of July, the registered crop percentage is 79.3% at Ivet F1, F1 and 76.1% at Antalya and 72,4% at Magnus F1. The average fruit weight was different depending on the version. The highest value was determined at the Antalya F1 version (160.8 g), with 25.3% higher than t the Cemile F1 version (128.2 g), with 19.9% in comparison to the Magnus F1 version (135.2 g) and with 15.7% in comparison to the Ivet F1 version (140.6 g). Regarding the fruit weight structure, we have found that most fruits are placed under the 125-150 g group size (48%) at the F1 Magnus variant, followed only by 8% by those in the 100-125 grams group, at the F1 Ivet version, most fruits fall under the 125-150 g weight group, (52%) and about 37% of fruits in the 100-125 grams group. At the Antalya F1 version, we find that many fruits, that is 38%, falling under the 150-200 g weight group, group where the other

fruit variants cannot be included. Also no fruit at the 50-75g weight group can be included; however 49% of the fruits are included in the125-150 g weight group. At the Cemile F1 variant we find that 49% of the fruits are included in the125-150g weight group and 100-125 g and 39% in the 100-125 g group. These two groups put together give a percentage (88%) equal to that of the one at the Magnus F1 variant, although the difference on the average fruit weight is in the detriment of the Cemile F1 variant with 121.4 g.

CONCLUSIONS

- 1. The beginning of the first fruits ripening phase takes place 2-3 days after the completion of the ripening phase.
- 2. Fruit ripening was achieved during the third decade of May in Cemile F1 version and in the other variants fruit maturation was achieved in the latter part of the first decade of June.
- 3. The total production corresponding to the Magnus F1 variant obtained, calculated per hectare, the average of the two years was 95.4 tons. In 2008 the yield was higher than in 2007, by 3.5 tons.
- 5. The tomato production in version IVET F1, the average of the research years was of 92.8 tons / ha. One found that 67% of the total harvest took place during the first to the third decades of June and the first in July.
- 6. The largest tomato production version was made in Antalya F1 variant, and was of 142.2 tons / ha, much higher than the Magnus F1 version (95.4 t / ha) and Ivet F1 (92.8 t / ha).
- 7. The production of harvested tomato was 120.2 t / ha at the Cemile F1variant and ranks in size immediately after the Antalya F1 version before the Ivet Antalya F1 and Magnus F1 versions. Because of the early fruit harvesting, we see that 91.4% of the production capacity is achieved by the end of the first decade of July.
- 8. At the end of the first decade of July, the percentage of registered crop stands at 79.3% (Ivet F1), 76.1% (Antalya) and 72.4% (Magnus F1).
- 9. The fruit average weight differed accorsing to the version. The highest value was determined at the Antalya F1 version (160.8 g), by 25.3% higher than at the Cemile F1 version (128.2 g), by 19.9% in comparison to the Magnus F1 version (135.2 g), and by 15.7% compared to the Ivet F1 version (140.6 g).

REFERENCES

N. Munteanu, Stan N. -Alternatives to Industrial Agriculture: Between Necessity and Possibilities. Hortinform 1-17. 1999.

N. Munteanu, L. Stoian, V. Stoleru, Fălticeanu Marcela, - Technological Bases of Ecological Vegetable Growing. Ion Ionescu de la Brad Publishing House, Iasi. 2008.

Papacostea P., Biodynamic Farm. Ceres Publishing House, Bucharest. 1994.

Stoian L., - Biological Vegetable Growing, an Alternative for Romania. Hortinform 12-148. 2004.

Stoian L., - A Practical Guide for Organic Vegetables Cultivation. Tipoactiv Publishing, Bacau. 2005.

V. Stoleru, Imre A. - Growing Vegetables Organically. Risoprint Publishing House Cluj Napoca. 2007.

Voican V., Locksmith V. - Protected Vegetable Culture in Greenhouses and Conservatories, Ceres Publishing House, Bucharest. 1998.

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

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

Vol. XVI (LII) - 2011

ANALYSIS OF LAVANDULA HYBRIDA ESSENTIAL OILS GROWING IN GREECE

Eleni Wogiatzi¹, Alexandros Papachatzis¹, Helen Kalorizou¹, Athina Tzalahani¹

KEY WORDS: Lavender, Lavandula Hybrida, essential oil, campher, linalool, borneol, cineol, eucalyptol

ABSTRACT

The essential oils content and the chemical compositions of flower and leaves of Lavandula hybrid, taken from various sites in Greece, were assessed. The essential oil was obtained via hydrodistillation and analyzed using Gas Chromatography. The essential oils yield was found to be higher in flowers (0.75 ml/10 g dry drug) compared to leaves (0.065 ml/10 g dry drug). Regarding the active substances, campher exhibits the highest concentration in flowers and leaves while borneol, cineol and eucalyptol had similar concentration but lower than linalool in lavender flowers.

INTRODUCTION

The lavenders are evergreen and shrubby aromatic plants of the family *Labiatae*. They had been cultivated and used throughout centuries in several countries for medical purposes and perfume. Today, levander is cultivated mainly in France, Spain, Hungary and Bulgaria (Dachler- Pelzmann, 1999) for essential oil production. Lavender's essential oil is widely used in fragrance industry including soaps, colognes, perfumes, skin lotions and other cosmetics (Paul *et al.*, 2004). In food manufacturing, lavender essential oil is employed in flavoring beverages, ice-cream, candy, baked goods and chewing gum (Kim & Lee, 2002). Many reports support its use as a sedative, anxiolytic, and mood modulator (Gamez *et al.*, 1990; Buchbauer *et al.*, 1991). The calming and soothing effect of lavenders oil has increase the interest for its usage in aromatherapy (Lis-Balchin and Hart, 1999).

The chemical composition of lavender's essential oil depends largely on the species from which it was obtained (Kustrak and Besic, 1975). Within the same species, the biochemical contents of the essential oil found in the flower, stem, or leaves differ significantly depending on where and under what conditions the plant was grown (Guillen, 1996). The most known species with medical value are *Lavandula angustifolia* (syn. *L. officinalis*), *Lavandula vera* and *Lavandula hybrida*.

The essential oil in *Lavandula hybrida* fresh inflorescence ranging from 1.5 to 2% or 2.5% while the oil yield in dry flowers is three times higher (Dachler- Pelzmann, 1999). Until now, at least 150 active substances have been isolated from the extracted oil. Major

¹ Technological Education Institute of Larissa, Department of Plant Production, Larissa, Greece

components of lavender oil are linalyl acetic and linalool, however 1,8-cineol, borneol and camphor contribute to plant odor (Dachler- Pelzmann, 1999).

The purpose of this experiment was to study the potential of levander for cultivation in lowland areas (75 m above sea level). In addition the composition of volatile compounds and the essential oil suitability for fragrance industry or pharmaceutical usage for insect repellent production were determined.

MATERIAL AND METHODS

Seedlings of *Lavandula hybrid* were planting in rows $(0.8 \times 1 \text{ m})$ in field blocks $(1 \times 2 \text{ m})$ at the Technological Education Institute of Larissa. Plants were fertilized with nitrogen by incorporating ammonium nitrate in soil before planting and thereafter every spring. Lavender flowers and leaves were harvested from mature plants (after 3 and 4 years of cultivation) in full blossom period.

Dry matter content was estimated weighting plant tissues immediately after harvest (fresh mass) and air dried at room temperature in a well aerated room until weight remains constant (dry mass).

A sample (10 g) of air dried lavender flowers or leaves were used for essential oil distillation. Oil was extracted by hydrodistillation using a Clevenger type apparatus. The duration of this procedure was 2 hours.

The volatile constituents of oils were analyzed using GC/MS instrument (Agillent 7890 type gas chromatograph and Agillent 5975 mass-selective detector). Helium was used as carrier gas at a flow rate of 3 ml/min. Separation of oil substances were made with a DB-WAX capillary column (30 m x 0.25mm; film thickness 0.25 μ m).

Essential oil solution $(1 \ \mu)$ in methanol was injected using split mode (split ratio 100:1) and analyzed with the column held to 40°C for 3 min, raised initially to 185°C with 15°C/min heating ramp and then to 250°C at the rate of 10°C/min, isothermal at this temperature for 5 min. Injector and interface temperature was set at 300°C and 230 °C, respectively. The electron impact mass spectra were collected at an ionization voltage of 70 eV over the *m/z* range 30–450.

The components of oil samples were identified with the use of commercial standard of linalool, borneol, campher, cineol and eucalyptol (98% pure). The relative retention time for linalool, borneol, campher, cineol was eucalyptol was 24, 29.3, 27.7, 25.6 and 16.8 min respectively. Totally, the identification time was 61 minutes.

The experiment was a randomized block design with three replications. Data were analyzed using the SPSS statistical package. Analysis of variance was used to assess treatments effect. Mean separation was made using the standard error of differences at the 5% level when significant differences between varieties were found.

RESULTS AND DISCUSSION

There was not significant difference in the dry weight between lavender flowers and leaves (P=0.152). The dry drug yield ranges among species from 400 to1000 Kg/ha (Dachler- Pelzmann, 1999). In this study the annual yield for *L. hybrid* was 627Kg/ha. The essential oil yield of *L. hybrid* fresh flowers varies from 1.5-2% to 2.5%, however the extraction yield increased significantly (3-times) in dried flowers (Dachler- Pelzmann, 1999). The quantity of essential oils depends on harvest period and plant tissue used for extraction. Flowers had higher oil yield (0.75 ml/10 g dry drug) than leaves (0.065 ml/10 g dry drug). The average oil yield was 44.5 l/ha.

The main active substances content show remarkable differences between flowers and leaves (P=0.001). Flowers had greater content in all extracted chemical substances than leaves. Campher and linalool were in higher concentration in dry drug of flowers than other chemical substances. No statistical differences were found in the concentration of borneol, cineol and eucalyptol. In leaves, campher was in greater content followed by eucalyptol, and borneol. Generally, 10 g of flower dry drug consisted by 14.81 ml campher, 13.26 ml linalool, 8.36 ml borneol, 8.18 ml cineol and 3.96 ml eucalyptol, while leaves had 2.37 ml campher, 1.95 ml eucalyptol, 1.03 ml borneol, 0.095 ml linalool and 0.01 ml cineol (Fig 1).



Figure 1. Chemical substances content in lavenders flower and leaf dry drug

CONCLUSION

The essential oil extraction yield and the main chemical substances concentration varied among lavender tissues. Flowers were more productive than leaves. Campher was in greater content in flowers and leaves following by borneol and eucalyptol. During essential oil extraction the temperature increased to 95-100° C, affecting linalool's hydrolysis and thus essential oil quality.

REFERENCES

Buchbauer, G., L. Jirovetz, W. Jäger, H. Dietrich, C. Plank and E. Karamat, Aromatherapy: evidence for sedative effects of the essential oil of lavander after inhalation. *Z. Naturforsch. C*, 46: 1067-1072. 1991.

Dachler- Pelzmann, H. Arznei- und Gewürzpflanzen.2. Auflage. Österreichisher Agrarverlag, Wien. 1999.

Gamez, M.J., Jimenez, J., Navarro, C., Zarzuelo, A.,. Study of the essential oil of Lavandula dentata L. Pharmazie 45: 69–76. 1990.

Guillen M, D., Cabo N, Burillo J. Characterisation of the essential oils of some cultivated aromatic plants of industrial interest. Journal of the Science of Food & Agriculture; 70:359-363. 1996.

Kim, N.S. & Lee, D.S.. Comparison of different extraction methods for analysis of fragrances from *Lavandula* species by gas chromatography-mass spectrometry. *Journal of Chromatography* 982: 31-47. 2002.

Kustrak D, Besic J. Aetheroleum Lavandulae and Aetheroleum Lavandulae hybridae in Pharmacopeia Jugoslavia III. Pharmaceutica Acta Helvetiae; 50:373-378. 1975.

Lis-Balchin, M., Hart, S., Studies on the mode of action of the essential oil of lavender (Lavandula angustifolia P. Miller). Phytother. Res. 13, 540–542. 1999. Paul J.P., J.J. Brophy, R.J. Goldsack, B. Fontaniella Analysis of volatile

Paul J.P., J.J. Brophy, R.J. Goldsack, B. Fontaniella Analysis of volatile components of Lavandula canariensis (L.) Mill., a Canary Islands endemic species, growing in Australia. Biochemical Systematics and Ecology 32: 55-62. 2004.

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

Seria: ✓ Biologie ✓ Horticultură ✓ Tehnologia prelucrării produselor agricole

🖌 Ingineria mediului

Vol. XVI (LII) - 2011

PHISICAL AND CHEMICAL CHARACTERISTICS OF SOME APPLE CULTIVARS GROWN AT VALCEA RESEARCH STATION ROMANIA

Mira Elena Ionică¹, Violeta Nour¹, Marius Gruia¹

KEY WORDS: apple, quality, phenols, dry matter content, dry soluble matter content

ABSTRACT

Apple (Malus domestica Borkh.) is a fruit of great commercial importance. The world's annual apple production is estimated to be in excess of 40 million tons. The European Union is one of the major apple production areas, the largest producer countries being Italy, France, Germany and Spain.

The attractiveness of fruit to consumers is determined by visual attributes that include appearance, size, uniformity, colour and freshness, as well as non-visual attributes such as taste, aroma, flavor, firmness (texture), nutritional value and healthiness. Among these attributes, firmness and aroma appear to be the most important for consumers. Sugars, organic acids and phenolic compounds all contribute to the aroma of apples (Mikulič Petkovšek et al., 2009).

Apples are significant part of the human diet (Wolfe et al., 2003). They have been identified as one of the main dietary sources of antioxidants, mainly phenolic compounds, such as flavoniods, rather than essential vitamins, such as vitamin C, which explain only 0,4% of the total antioxidant capacity (Boyer and Liu, 2004).

Chemical composition of apple fruit is very complex. It consists of numerous organic and inorganic compounds and macro biogenic and micro biogenic elements.

The aim of this work was to evaluate the quality of the apple fruits obtained from 14 cultivars cultivated at Valcea Research Station.

Therefore, the objectives of these researches were to evaluate the physical and chemical characteristics in several apples cultivars. Also it was determinate the content of total phenolic content and compare the value of apple peel in relation with other fruit tissues.

Comparing the characteristics of the apple fruits founded in the selected cultivars we can conclude that all cultivars can be cultivated in the climatic conditions of Valcea Research Station, Romania. Still, they are some cultivars which have a higher adaptability such Generos, Florina, Golden delicious.

INTRODUCTION

Apple (*Malus domestica Borkh*.) is a fruit of great commercial importance. The world's annual apple production is estimated to be in excess of 40 million tons. The European Union is one of the major apple production areas, the largest producer countries being Italy, France, Germany and Spain.

The attractiveness of fruit to consumers is determined by visual attributes that include appearance, size, uniformity, color and freshness, as well as non-visual attributes

¹ University of Craiova

such as taste, aroma, flavor, firmness (texture), nutritional value and healthiness. Among these attributes, firmness and aroma appear to be the most important for consumers. Sugars, organic acids and phenolic compounds all contribute to the aroma of apples (Mikulič Petkovšek *et al.*, 2009).

The orchard managements practices are the key factors in the production of high and qualitative yields apples. These practices can influence the chemical composition of fruits even within the same variety (Lee et all, 2003)

Growing conditions, environmental factors and fruit development can influence the physical and chemical properties of the fruits and the production which is an important factor for maintaining of the varieties in the orchard.

Fruits which in time of optimal ripe have most of the stated compounds in harmony are of great nutritive value, because in our regular diet we have a deficiency in compounds and elements that are in apple (Skendrović Babojelić *et al.*, 2007).

Chemical composition of fruits influence the taste of fruits and therefore contributes to internal fruit quality as well as also influences external quality parameters such as appearance, flavor and health promoting properties (Hudina and Stampar, 2000; Treutter, 2001, Lattanzio, 2003 cited by R. Veberic and F Stampar, 2005). The environmental factors, the agronomic practice, the post-harvest condition or the processing also affect these parameters (Vieira et al., 2009).

Apples are a significant part of the human diet (Wolfe et al., 2003). They have been identified as one of the main dietary sources of antioxidants, mainly phenolic compounds, such as flavoniods, rather than essential vitamins, such as vitamin C, which explain only 0,4% of the total antioxidant capacity (Boyer and Liu, 2004).

Chemical composition of apple fruit is very complex. It consists of numerous organic and inorganic compounds and macro biogenic and micro biogenic elements. Most represented are sugars, acids, pectin, tannins, starch, cellulose, vitamins, enzymes and phytohormones, while most represented chemical elements are nitrogen, phosphorus, potassium, calcium, sulphur, iron and magnesium. Organic compounds' content in fruit depends on fruit cultivar, ripeness, physiological condition of a tree as well as soil and weather conditions (Markuszewski and Kopytowski, 2008).

Phenolic compounds are major antioxidants of our diet. These naturally occurring antioxidants have been reported to contribute ameliorative against oxidative damage caused by free radicals. Phenolic compounds have beneficial influence also against development of diseases like cancer and coronary heart diseases (Lattanzio, 2003).

In apples as well in other fruits, the phenolic content vary among different cultivars, within different tissues of the fruit, growing conditions, cultural practices, ripeness during harvest, post-harvest storage conditions and processing (Imeh and Khokar, 2002; Boyer and Liu, 2004).

The aim of this work was to evaluate the quality of the apple fruits obtained from 14 cultivars grown at Valcea research Station.

Therefore, the objectives of this work were to evaluate the physical and chemical characteristics of several apples cultivars. Also the phenolic content of the apple peel was determinate and it was compared with the phenolic content of the pulp.

MATERIALS AND METHOD

The apple cultivars evaluated in this study were: Idared, Freedom, Pionier, Goldrush, Granny Smith, Golden Delicios, Wagner, Topaz, Pinova, Elstar, Florina, Generos, Sifra and Elista.

All fruits were harvested at the technological ripe stage, at Valcea Research Station during the year 2010. The average air temperature ranged between 4.2^oC in january and 23.1^oC in july.

The fruits used in our researches were picked randomly, placed in paper bags and transported to the laboratory where they were evaluated by physical and chemical analysis.

Physical characteristics

For every cultivar five replications were done (n=5). They were evaluated the dimensions: diameters and height, weight, volume and fruits firmness. Also were calculated specific gravity (m/V), form coefficient (H/D) and the size coefficient: (D+d+H)/3.

Dimensions were measured by a digital beam compass and results were stated in millimeters. Weight was measured by individual weighting with an analytical balance and results have been stated in grams. The volumes were evaluated by the Archimedean property with a volume cylinder the results been stated in cm³. The fruits firmness was evaluated with a digital penetrometer and the results have been stated in kgf.

Chemical characteristics

Dry total matter was determinated gravimetrically based on sample weight loss after being owen- dryied at 105^oC for 8-10 hours.

Dry soluble matter was determinated with a digital refractometer the results have been stated in percents.

The titratable acidity was determinated in 10 ml of filtrate by titration with 0.1 N sodium hydroxide and the results were stated as grams of malic acid at 100 grams of fresh material.

Total phenolic content

For the determination of total phenolic content it was used the photo-colourimetric method described by Singleton and Rossi (1965) with some improvements using a Varian Cry 50 spectrophotometer by reading the absorbance at λ =765 nm.

For the determination of the total poliphenolic content the Folin Ciocalteu regent (2N, Merk), gallic acid (99% purity, Sigma), anhydrous sadium carbonate (99% purity, Sigma) were used.

For establishing the calibration line were made a gallic acid stock solution, from which by consecutive dilutions with ultra-pure water were made five standard solutions with a content of 50, 100, 150, 200 and 250 mg/l gallic acid.

In this study, 1 mL of the extract (diluted 1:1 with ultra-pure water for peel and undiluted for pulp) was mixed with 1 mL ultra-pure water and 5 mL Folin-Ciocalteu regent. After 2 minutes 4 mL of 7,5% sodium carbonate were added. Then the mixture was incubated for 2 hours at room temperature and the absorbance was read at 765 nm using a UV-Vis spectrophotometer. The total phenolic content was expressed in milligrams of gallic acid per 100 grams of fresh matter.

RESULTS AND DISCUSSION

The data obtained concerning the physical properties of the apple cultivars are summarized in table 1. The data from the table represent the average of the determinations made on randomized fruits from each cultivar.

Table 1

The physical properties of the apple cultivars

Cultivar		Dimensions		Weight	Volume	Specific	Size	Form
		mm				gravity (m/V)	coefficient:	coefficient
	D	d	Н	g	Cm ³	g/cm ³	(D+d+H)/3	(H/D
Idared	81.584±1.364	80.102±1.960	67.648±4.337	212.72±18.308	287.8±30.078	0.7406±0.035	76.44±2.397	0.828 ± 0.0421
Freedom	74.122±2.219	72.05±1.68	59.412±3.739	147.1±15.9055	189.2±19.879	0.7768 ± 0.004	68.524±2.349	0.801 ± 0.0289
Pionier	70.31±3.603	68.764±3.581	55.972±3.541	126.38±15.385	156.4±14.519	0.8062 ± 0.036	65.012±3.273	0.796 ± 0.408
Goldrush	65.688±1.031	63.174±2.701	58.95 ± 2.740	131.76±8.4869	145.2±9.549	0.9078 ± 0.041	62.604±1.439	0.897 ± 0.0441
Granny	68.226±2.944	66.488±2.962	58.55±4.711	132.82±17.554	161.4±25.530	0.8266 ± 0.609	64.352±3.321	0.857 ± 0.0370
Smith								
Golden	66.788±2.056	65.47±2.252	57.036±2.83	129.9±9.9940	172±6.164	0.7542 ± 0.388	63.094±1.255	0.854±0.0599
delicious								
Wagner	71.598±3.040	68.856 ± 2.256	49.24±0.869	132.26±12.433	157.6±15.388	0.8582 ± 0.007	63.226±1.899	0.688 ± 0.0240
Topaz	73.28±1.981	72.234±1.870	52.896±2.236	150.74±13.615	167.8±21.170	0.9018±0.057	66.132±1.720	0.721±0.0275
Pinova	65.884±2.538	63.5±2.014	55.208±5.556	113.54±10.153	140.8 ± 14.042	0.8070 ± 0.026	61.526±2.541	0.837±0.710
Elstar	67.36±4.480	63.364±4.084	49.568±3.900	118.02 ± 22.603	146.8±28.691	0.8082 ± 0.082	60.094±3.975	0.735±0.0126
Florina	70.592±2.366	67.298±2.410	57.998±4.068	140.68±14.611	168±18.8680	0.8378±0.029	65.294±2.370	0.821±0.0591
Generos	71.386±1.303	69.35±1.811	56.428±1.829	148.96±9.190	169.2±8.8994	0.8798 ± 0.018	65.716±1.386	0.790±0.0219
Sifra	78.744±3.806	76.294±4.950	51.514±3.415	159.86±28.671	198±36.2491	0.8082 ± 0.027	68.846±3.919	0.653±0.0196
Elista	68.058±2.824	66.844 ± 3.600	48.334±2.707	123.08±13.233	146±4.8990	0.8414 ± 0.722	61.076±2.656	0.710 ± 0.0373

495

The biggest size was found at the Idared cultivar fact proved by the values of the dimensions, weight, volume and size coefficient. The minimum size was found at the Elstar cultivar. Concerning the form of the fruits we found that almost all cultivars have a round form with some exceptions: Wagner and Sifra cultivars where the form was round-flattened.

The analytical data from the apple cultivars are summarized in table 2. The average dry matter content of all cultivars investigated was close to 14.39 %. The minimum dry matter contents were found in Pionier (11.81 %) and Freedom (11.9%), whereas the greatest amounts were found in fruits of Elista cultivar (18,27 %). For comparison, Mitre *et al.* (2009) have reported higher values of the dry matter content for 'Golden delicious' (14.7 %) grown in Central Transylvania, Romania comparing with the value obtained at Rm. Valcea in south of Romania (12.87 %).

Cultivar	Water content	Dry matter	Dry soluble	Titritable	Firmness
	%	content	matter	acidity	kgf
		g/100 g fresh	%	g malic	
		matter		acid/100 g	
				fresh matter	
Idared	86.3788±0.313	13.6212±0.313	11.067±0.606	0.268 ± 0.041	8.328±0.506
Freedom	88.09667±0.204	11.9033±0.204	10.467±0.216	0.268 ± 0.041	4.511±0.437
Pionier	88.18949±0.297	11.8105±0.297	9.683±0.725	0.168 ± 0.364	6.521±0.778
Goldrush	84.14115±0.106	15.8589±0.106	14.117±1.229	0.235 ± 0.609	15.452±0.333
Granny	87.83557±0,.48	14.4110 ± 0.148	12.317±0.534	0.235 ± 0.609	12.630±0.518
Smith					
Golden	85.589±0.290	12.8751±0.290	11.017 ± 0.488	0.134 ± 0.007	8.005±0.714
delicious					
Wagner	87.12488±0.264	12.1644±0.264	10.733 ± 0.280	0.201±0.057	7.762±0.721
Topaz	85.01871±0.215	14.9813±0.215	13.650±0.689	0.469 ± 0.722	7.088±1.051
Pinova	85.38928±0.249	14.6107±0.249	12.550±0.666	0.201±0.035	9.972±0.820
Elstar	83.36757±0.738	16.6324±0.738	15.650 ± 0.784	0.436 ± 0.634	7.278±0.648
Florina	87.47918±0.403	12.5208±0.403	10.750±0.616	0.168 ± 0.033	8.118±0.571
Generos	83.28999±0.218	16.7100±0.218	15.517±1.336	0.302 ± 0.521	10.034±0.999
Sifra	84.80053±0.094	15.1995±0.094	13.417±0.488	0.469 ± 0.554	8.979±0.786
Elista	81.72055±0.538	18.2795±0.538	17.033±0.459	0.335±0.324	6.346±0.981

The analytical data of the apple cultivars

Table 2

Soluble solids content is a good indicator of sugar content of apples and presumably of sweetness (Hoehn *et al.*, 2003). Soluble solids content varied between 10.46% (Freedom) and 17.03% (Elista). High values of soluble solids content were registered also in 'Elstar' (15,65%) and 'Generos' (15.51%) cultivars.

Titratable acidity may be an important tool in predicting taste of apples (Harker *et al.*, 2002). This may be important during the assessment of fruit quality, since consumers often have distinct preferences for acid or sweet tasting apples (Daillant-Spinnler *et al.*, 1996). The average value of titratable acidity was 0.263%. The highest titratable acidity was found in Sifra (0.469%), while in 'Golden delicious' the titratable acidity was only 0.134%.

Also, comparing the analytical data with the firmness of the fruits presented in the same table the lowest firmness were found at Freedom cultivar (4.511 kgf) and Elista (6.346). From the obtained data, in the case of Elista cultivar we could conclude that the stage of fruits maturation was too high meaning that at the moment of determinations, the fruits were over maturated.

The data concerning the total phenolic content are summarized in table 3.

Table 3

The total phenolic content at the apple cultivars					
	Total phenols content				
Cultivar	mg gallic acid/10	0 g fresh matter			
	Peel	Pulp			
Idared	590.91	110.70			
Freedom	297.86	74.22			
Pionier	324.80	40.33			
Goldrush	841.84	125.21			
Granny Smith	636.60	113.75			
Golden delicious	408.52	64.91			
Wagner	472.22	74.32			
Topaz	736.00	130.56			
Pinova	568.54	87.89			
Elstar	287.74	50.65			
Florina	443.53	52.62			
Generos	662.33	79.02			
Sifra	752.28	164.58			
Elista	283.56	48.66			

Polyphenols are important antioxidant constituents of apples and they contribute positively to human health because they possess an antiradical activity (J. Lachman et all, 2006). The data obtained showed that is a high difference between the total phenolic content of apples peel and pulp. These results show that phenols are found in the highest proportion in the peel of the fruits then pulp which have even tenfold lower contents. These results correspond to the values obtained by Vieira et all (2009). The highest content of total phenols in apples peel were found at Goldrush cultivar (841.84 mg gallic acid/100 g fresh matter) whereas the lowest content were found at Elista cultivar (283,56 mg gallic acid/100 g fresh matter). Also the highest content of total phenols in apples pulp were found in Sifra cultivar (164,58 mg gallic acid/100 g fresh matter) and the lowest content at Elista cultivar (48,66 mg gallic acid/100 g fresh matter). High values of total phenols content were also found at Topaz, Sifra and Generos cultivars.

CONCLUSIONS

Comparing the characteristics of the apple fruits founded of the selected cultivars we can conclude that all cultivars can be grown in the climatic conditions of Rm Valcea station, Romania. Still, they are some cultivars which have a higher adaptability such Generos, Florina, Golden delicious. The quality of the fruits resumed by their physical and chemical characteristics shows differences between cultivars which come from the genetic material and climatic conditions. It is need high attention in establishing the harvest maturation of the fruits in function of each cultivar characteristics and vegetation life.

The total phenolic content in fruit fluctuates in function of the anatomic part being higher in the peel of the fruit then in the fruits flesh.

REFERENCES

Boyer, J. and R. H. Li, Apple phytochemicals and their health benefits. Nutrition Journal, 3:5 http://www.nutritionj.com/content/3/1/5. 2004.

Daillant-Spinnler, B., H. J. H. MacFie, P. K. Beyts and D. Hedderley, Relationships between perceived sensory properties and major preference directions of 12 varieties of apples from the southern hemisphere. Food Qual. Preference 7:113-126, 1996.

Harker, F. R., K. B. Marsh, H. Young, S. H. Murray, F. A. Gunson and S. B. Walker, Sensory interpretation of instrumental measurements 2: sweet and acid taste of apple fruit. Postharvest Biology and Technology 24:241-250, 2002.

Hoehn, E., F. Gasser, B. Guggenbühl and U. Künsch, Efficacy of instrumental measurements or determination of minimum requirements of firmness, soluble solids, and acidity of several apple varieties in comparison to consumer expectations. Postharv. Biol. and Tech. 27:27-37, 2003.

Imeh U., Khokar S, Distribution of conjugated and free phenols in fruits: antioxidant activity and cultivar variations. J. Agric. Food Chem., 50 (22), pp 6301–6306, 2002.

Lachman J., Sulc M., J. Sus, O. Pavlikova, Polyphenol content and antiradical activity in different apple varieties. HORT.SCI. (Prague), 33, (3): 95-102, 2006.

Lattanzio V, Bioactive polyphenols: their role in quality and storability of fruit and vegetables. J Appl Bot 77:128–146, 2003.

Lee, K, Y. Kim, D. Kim, H. Lee and C. Lee, Major phenolics in apple and their contribution to the total antioxidant capacity. Journal of Agriculture and Food Chemistry 51:6516-6520, 2003

Markuszewski B. and J. Kopytowski, Transformations of chemical compounds during apple storage. Scientific Works of the Lithuanian Institute of Horticulture and Lithuanian University of Agriculture. Sodininkyste Ir Daržininkyste 27(2):329-338, 2008.

Mikulič Petkovšek, M., F. Štampar and R. Veberič, Changes in the inner quality parameters of apple fruit from technological to edible maturity. Acta Agriculturae Slovenica 93(1):17-29, 2009.

Mitre, I., V. Mitre, M. Ardelean, R. Sestras and A. Sestras, Evaluation of old apple cultivars grown in Central Transylvania, Romania. Notulae Botanicae Horti Agrobotanici Cluj-Napoca 37(1):235-237, 2009.

Skendrović Babojelić, M., K. Ivančić, J. Družić, A. Kovač and S. Voća, Chemical and sensory characteristics of three apple cultivars (*Malusxdomestica* Borkh.). Agriculturae Conspectus Scientificus 72(4):317-322, 2007.

Veberic R. and F. Stampar, Quality of apple fruits (Malus domestica) from organic versus integrated production. Information and Technology for Sustainable Fruit and Vegetable Production, FRUTIC 05, 12-16 September 2005, Montpellier France, 2005.

Vieira FGK, et all, Activity and contents of polyphenolic antioxidants in the whole fruit, flesh and peel of three apple cultivars. ALAN revista, Publicacion Oficial de la Sociedad Latinoamericana de Nutrition, vol.59, no.1, 2009.

Wolfe K, Xianzhong Wu, Rui Hai Liu, Antioxidant Activity of Apple Peels. J. Agric. Food. Chem., 51 (3), pp 609–614, 2003.

UNIVERSITATEA DIN CRAIOVA UNIVERSITY OF CRAIOVA

Seria:	✓ Biologie
	✔ Horticultură
	 Tehnologia prelucrării
	produselor agricole
	🖌 Ingineria mediului

Vol. XVI (LII) - 2011

BACTERIAL CANCER OF MAPLE AND LIME

Antonia Ivascu¹, Mirela Cindea²

KEY WORDS: maple, lime, Agrobacterium tumefaciens (Smith et. Townsend). Con., bacterial cancer, first signaling

ABSTRACT

Maple and lime developing is affected by the different pathogens attack like: Rhytisma acerinum (pp) Br, which caused leaf spot disease of ink; Phyllactinia guttata (Wallr.ex.Fr) Lev., which caused leaf mildew, Mycosphaerella maculiformis (pp) Schrot., which caused brown staining of leaves, etc. In 2008, we identified the presence of bacterial cancer disease at maple and lime, caused by the Agrobacterium tumefaciens (Smith et.Townsend). Con., which was not mentioned before in Romania, at these hosts.

DISCUSSION

Bacterial cancer is a damaging and widespread plants disease, which affecting a wide circle of host plants (more than 180 species of coniferous and dicotyledonous, wild or cultivated, included in 61 botanical families). *Agrobacterium tumefaciens*, the bacteria which caused this disease, was isolated and described for the first time in 1907, by Smith and Townsend.

In Romania, that disease was reported by Traian Savulescu for the first time in 1928, especially in fruit nurseries (apple, pear, cherry, apricot, peach, etc.) and in the vineyards, often with 20-50% frequecy, on infected land.

The cancer attack occurs frequently on the roots and the base of tree stems and less on air organs (stems, branches) like different forms and sizes of tumors, with different shapes and consistent. Tumor surface is rough, irregular, often cauliflower-like inflorescences (V. Severin, 2006).

In recent years (2008-2010), we observed, for the first time in Romania, this plant disease at different species of ornamental trees (maple and lime) in Herastrau Park and the street alignments of Bucharest.

Maple (Acer sp.) is a species which is not only appreciated like ornamental tree. For the fact that different organs (bark, buds and leaves), thanks the tannins content, flavonoids and bitter principles, are used in phytotheraphy. Thus, the buds have a beneficial

¹ Executive Manager at

State Institute for Variety Testing and Registration Bucharest, e-mail: antonia_ivascu@istis.ro,

² Head of Physico-chemical Analysis Laboratory at

State Institute for Variety Testing and Registration Bucharest e-mail: mirela_candea@istis.ro

effect on blood vessels and nervous system, and pieces of bark and leaves are green or dried poultice on inflamed areas of the wrist. Normal development of this species, which is very common in parks and street alignments, is seriously affected by the attack of phytopathogenic agents such as: *Rhytisma acerinum (pp) Br*, which caused leaf spot disease of ink; *Phyllactinia guttata (Wallr.ex.Fr) Lev.*, which caused leaf mildew, *Mycosphaerella maculiformis (pp) Schrot.*, which caused brown staining of leaves, etc

Besides the diseases mentioned, known for a long time, we found, in recent years, a new maple disease, produced by the *Agrobacterium tumefaciens* (Smith et.Townsend). Con., on 30-50 years old trees, which is manifested in the form of tumors (hillock) with various sizes (4-15 cm diameter), dark brown color, rough surface, irregularly arranged on the stem and branches all around (Fig. 1 and 2).

Sometimes, the tumors are so many that covers almost the entire surface of the affected body parts.

The attack is seen commonly in 60-80 years old trees, with partial or complete drying symptoms (fig.1d).

Lime (*Tillia* sp.) s common in all parks in Bucharest and other cities of our country. It is appreciated in terms of appearance. The flowers smell nice and play an important role in nutrition of bees, which producing the famous "lime honey". In the same time, the lime flower is used in herbal medicine as infusion tea . Lime flower infusion is recommended in cases of colds, flu, cold, bronchitis, as it stimulates sweating and helps to lower fever. The volatile oil content gives lime flowers antidepressant and antispasmodic properties.We were able to identify the bacterial cancer on this tree and the attack is manifested like the maple, in the form of large tumors by 10 to 30 cm diameter, brown, irregularly distributed on the surface of the stem (Fig. 3). We have seen lime trees affected by the *Agrobacterium tumefaciens* are weak compared to the healthy in their vicinity. The attack is less common lime than maple.

Because in both maple, as well as the lime, plants was attacked initially in the nursery, to reduce the attack, is recommended the application of preventive measures such as use of healthy seedlings for planting only (obtained from nurseries uncontaminated). Seedlings suspects, coming from infected nurseries will be disinfected by immersing the roots, before planting, and the package in a 1% salt mixture of potassium and 0.4% chalk chloride (Minoiu N., 1997). The seedlings with tumors, will be removal from the nursery and will be destroyed by burning.

After the cancellation of infected nursery, the land will grow 4 to 5 years with cereals, which are not attacked by the *Agrobacterium tumefaciens*. In this way, by applying the rotation, the attack can be reduced because the bacteria do not survive in soil for more than 4-5 years.



Fig. 1 Agrobacterium tumefaciens maple attack (original photo)



Fig. 2 Agrobacterium tumefaciens maple attack (original photo)



Fig. 3 Agrobacterium tumefaciens lime attack (original photo)

REFERENCES

Minoiu, N., Plum diseases and pest. Plum, Ed. Conphys, p: 343-374.1997. Severin V., Plant-bacterial diseases, Ed. Ceres, pp. 244. 2006