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RESEARCHES REGARDING ROOTING GRAPEVINE PLANTING MATERIAL, MODERN METHODS OF CULTURE

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Key words: *rootstock, biological category, density, force of growth, variety*

ABSTRACT

According to the strategy development and adaptation of viticulture in Romania lately they have pursued certain objectives including: lowering the average age of the wine fruit plantations, 17 years. Thus, in our country requires recovery of the production sector propagating material wine through: the establishment of field conservation clones, plantations starting material and basic material for nurseries rootstock and the top-graft cuttings, certified plantations. All this leads to an increase in the number of vines to be produced. Production vines in pots, especially in protected areas will be very successful, because planting can be done in grafting, eliminating the timing of planting field and in addition may be made in whole growing season. New varieties and clones valuable as rootstock cuttings used in experiments conducted at INCDBH Stefanesti came from greenhouse insulator core, which is the national collection of germoplasm wine made from material recovered by thermotherapy and in vitro culture. The variety was studied Feteasca 6 St., a premium wine producers big red wine due to requirements that seek domestic and foreign markets in recent years.

INTRODUCTION

Rooting vine grafted vines in the school practiced for over a century. In recent decades it has been improved and modernized systems technology through this new culture and mechanization in a largely works. The complex works rooted applied in school include: choice of the land, crop rotation, land preparation, planting material preparation, proper planting, maintenance work, harvesting vines, filing and sorting, storing and delivering them (Tiţa 2001).

MATERIALS AND METHODS

Protected space in which it was mounted experience is a cold greenhouse, built in 1987, with an area of 600 square meters, is covered with polycarbonate and includes six bays (four 1.5 m wide and 1 m 2) 4 concrete alleys separated by 0.4 m. the goal of research in this paper is to find solutions that enable favorable recommendation technology for rapid multiplication of varieties lack the concrete conditions of the institute in this period.

New varieties and clones valuable as rootstock cuttings used in experiments performed were from greenhouse insulator core, which is the national germoplasm collection consists of material made healthy wine by thermotherapy and in vitro culture. Category biological material used in grafting was originally propagating material. SO4-4 rootstock choice was imposed primarily due to higher behavior on a variety of soil types and, secondly, for high growth vigor that it offers varieties by grafting (Hamdan 2010). However, it is difficult school rootstock vines in that rooted harder and trigger point calogenezei grafting is delayed by 1-2 days compared to other rootstocks.

The variety was studied black Fetească Șt., a premium wine producers big red wine due to requirements that seek domestic and foreign markets in recent years. This variety, although it has a very old arrived in mioritical lands has been little studied, little has officially registered clones and propagation is hindered because of this. It is a kind of quality that does not require a large aging period before they can be exploited. These qualities make it increasingly attractive to consumers and more sought after by wine producers.

Material and technical basis of INCDBH Stefanesti Arges allowed the experiments to be done both through optimization of technological stages and improved method for rapid multiplication material of superior biological categories vineyard.

Preparation of material for grafting was performed using classic technology. Grafting was performed mechanically, DPA 5, which performs cutting the cuttings shaped Ω reversed and stratification was done in sawdust and resin, baskets of tampering with the ass metal and walls of plastic film.

Through experimental variations placed at planting cuttings grafted it was aimed to determine the timing and uniformity start in vegetative bud graft, maintaining callus from grafting point, a low intake of carbohydrates in reserve rootstock, stimulating rootedness process rootstock for early resumption of vegetation cuttings grafted. Study grafted vine material quality in the most critical period for symbiote - School vines - was carried out under the following experimental variants:

- V_1 witness on semi billons planting densities covered with small black foil planting classical culture (15-20 cuttings per linear meter);
- V_2 planting soil in a greenhouse at high density planting or intensive culture (45-50 cuttings per square meter);
- V_3 nutritional planting in pots at high density planting or culture superintensive (70-80 cuttings per square meter).

Culture system with ground billon use two methods of planting or planting on semi billons protected foil the partial cuttings grafted.

RESULTS AND DISCUSSIONS

Grafted vines producing field (V1)

Culture system with ground billon use two methods of planting or planting on semi billons protected foil the partial cuttings grafted. Choosing culture system and method of planting cuttings field is based on climatic conditions, low temperatures respectively in the period immediately following planting, the physical characteristics of the soil (texture) and irrigation method used (Tiţa 2002, Corbean et al. 2009).

Producing high density grafted vines in the ground under glass or unheated (V_2)

Preparation for planting seedlings, land preparation and fertilization core technology runs on the same requirements as any other experimental variations. Planting is 24-25 cm between rows and 7-8 cm between cuttings at a time. There was thus obtained a density of 50-55 cuttings per m ^{2} (Tiţa I., 2003). Producing grafted vines on the ground in unheated greenhouses and solariums is characteristic obtaining rooted in the biological category basis.

Figure 1. Aspect grafted cuttings planted of sand.

Figure 2. Aspect grafts before parafining.

Producing grafted vines in plastic bags (V_3)

Preparation for planting cuttings runs on the same technological requirements as any other experimental variations. Preparing nutrient mixture is winter using volumetric blends equal parts of ground celery, sand and garden soil plus 10% peat to improve its water retention capacity. Planting is done in bags, pots or PVC padding. There was thus obtained a density of 70-85 cuttings per m ^{2}, depending on the diameter of the growing vessel (Tiţa et al. 2004). Producing grafted vines in pots in unheated greenhouses and solariums is characteristic obtaining biological material originally rooted in the category of Multiply.

Experiments conducted to determine the value of culture in the 3 technology was compared to the growth rate of graft shoots every 30 days starting June 1 and ending September 1. Thereafter work is carried meat to stimulate maturation of the wood.

Figure 3. Vine cuttings before reducing the peaks.

Determining the growth rate of shoots was done by direct measurement node with the landmark basal diaphragm slips, and the landmark of the shoot apical tip pointing (Tiţa 2004).

The data presented in Figure 4, the growth rate of shoots in the first stage of measurements is the fastest V_3 due to rapid heating of the mixture nutrient in bags, slightly lower to V_2 due to conditions in the greenhouse and much weaker V3 due to conditions hygroscopicity and low air temperatures lowered during nights in the spring of 2015.

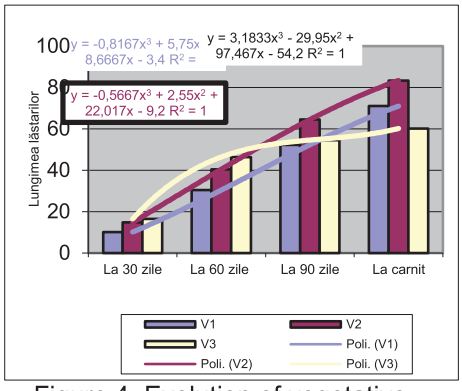

Figure 4. Evolution of vegetative growth.

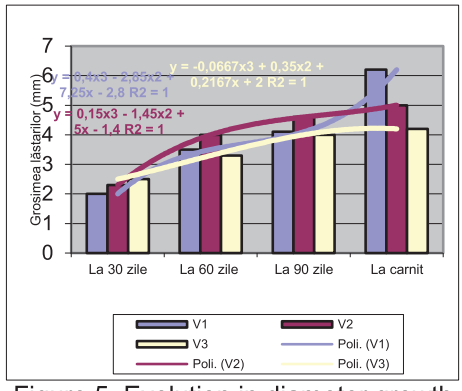

Figure 5. Evolution in diameter growth of shoots.

The average length of shoots ranges between 10.2 cm. V_1 and 16.5 cm. V_3 30 days after planting. The explosion increases recorded in stage II (30 to 60 days) when the shoots were average size of 46.4 cm. V_3 compared to 30.4 cm. V_1. After 60 days the situation is reversed. V_3 slow increases in volume due edaphic limited and are accelerated to V_1 and V_2 because the roots can explore edaphic volume higher and lower density of plants exposed to direct radiation of sunlight a larger number of leaves. Intake of leaves exposed to photosynthetic radiation incident is superior to those who are exposed or partially shaded.

The maximum length of shoots was determined at the end of August, prior to the first meat. Thus V_1 shoots had, on average, 71.0 cm., The V_2 83.4 cm. and 60.2 V_3. These increases were recorded in a very dry year. The irrigation system and the large number (2900) of hours of sunstroke favored vegetative growth of vines field. Rooted greenhouse suffered from intensifying fotorespiration phenomenon due to temperatures above 50^{o}C are maintained in periods of heat over 9 hours per day. In normal years the vines in terms of climate emissions achieved increases 3-4 times higher than in the field.

Developing shoots is ensured by increasing the thickness thereof. Determine the thickness of the shoot was done by measuring with calipers large diameter of the middle of the II internode at the base of the shoot. Shoots thickness generally increases in proportion to the increased length of the shoot. However, the different densities, this proportionality is not held. Figure 5 shows graphically the evolution of growth in diameter at the base of shoots 3 different culture with different densities.

The first phase of shoots determinations thickness differences are significant between experimental variants and shoots ascending order of thickness is tested variants: V_1, V_2, V_3. The following two determinations sequence variants variant changes in favor of vines planted in soil in the greenhouse, followed by

version vines planted in the field and therefore with vines planted in pots. At last measurement greatest thickness had a field calves shoots followed by version vines grown on the soil in the greenhouse and the vines in pots.

Table 1

Comparison between classical and rapid multiplication of the vine

The technology	Year I		Year II		Year III		Total		Increa -ses %
	No. vine	No. grapevines obtained	No. vine	No. grapevines obtained	No. vine	No. grapevines obtained	No. vine	No. grapevi -nes obtained	
Classical	field 30	300	field 30	300	field 30	300	field 30	900	100
Rapidly	Green house 1	-	Green house 40	400	Green house 40	2100	40	2500	277.7

The data presented in Table 1 show that intensive technology for rapid multiplication of new varieties and clones valuable is that with increases of 277.7% compared to conventional technology.

Table 2

The average size of vines harvested in the experimental variants

Specification	V1	V2	V3	Requirements STAS
A. Chord				
The large diameter (cm)	4,5	4,2	3,5	minimum 3 mm
Ripened length (cm)	35	30	30	unspecified
B.Root				
Number of roots ϕ > 2,2 mm	5	4	3	at least 3 radial roots
Total roots	6	10	11	unspecified

The data presented in Table 2 shows that in all 3 versions grafts are obtained that exceed the minimum requirements imposed by law. All 3 variants are supported by European legislation. However there are significant differences between chords thickness and number of roots thicker than 2.2 mm. in favor of vines planted in the field and the total number of roots in favor vines planted in pots nutrients.

CONCLUSIONS

Romanian legislation harmonized with the EU requires appropriate technology for superior biological categories in the process of certification of propagating material wine.

Maintain the top research multiplying improving and propagating material of INCDBH Ştefăneşti wine institute undertakes to develop the technical, material and application of advanced technologies for biological category Originally propagating material wine.

To obtain propagating material originally intended vineyard plantations based parent recommended intensive technology of rapid multiplication of new varieties and clones valuable.

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QUANTITY AND QUALITY IN VARIETY OF TOMATOES ARGEŞ 16, OBTAINED FROM INCDBH ŞTEFĂNEŞTI

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Keywords: *tomatoes, new variety, morphological characters, physiologically ripe, biological resistance*

ABSTRACT

Romania is one of the European countries with the most favorable conditions for obtaining pedo-climatic agricultural production quality and in significant quantities, which may cover a significant share of the domestic demand for food and agriculture. Romanian farming was found and is still in a less pleasant due to the unified European market liberalization, and globalization of trade in such products. Lack of professional organizations of small farmers, but also of legislation protecting them in the early stages of development of vegetable farms, in many cases made the Romanian producers can not cope with foreign competition. Growing vegetables was one of the first practical human activities. The present work has been studied Arges 16 variety, variety approved in 2012 to INCDBH Ştefăneşti, with growth driven variety and great quality.

INTRODUCTION

Tomatoes can be eaten in a variety of ways: fresh as a salad plain or mixed with other vegetables, or cooked in soups, pot, sauces, stuffed tomatoes, industrially processed form of paste, canned broth, juice regular or spicy. Variety studied the work was created INCDBH Ştefăneşti and approved in 2012. Given the market demand for tomato seeds Romanian, Romanian tomatoes general year, researchers at the institute have managed the approval of eight new varieties and quality traits quantitative special to varieties grown lately in our country. Variety falls in the mid early, slightly elongated fruit, large, reaching 140-160 g weight. Climate change turn upside agriculture. Vegetables and grains are suffering from drought, but also large temperature differences. Therefore, researchers are trying to obtain new varieties of tomatoes, peppers or cucumbers to withstand sun burned our fields (Dumitru and Apahidean 2004). Meanwhile, Israel farmers received from tomato seeds that have adapted to our difficult climate, but the taste of tomatoes not the same as many years ago. The tomato fruit is consumed physiological maturity, and those that do not reach this stage (green tomatoes) for the preparation of pickles (Ciofu et al. 2003). The importance of food special tomato is the fact that they are consumed in a variety namely fresh as a salad plain or mixed with other vegetables, sauces, pot, tomatoes filled with different compositions etc, prepared industrially form paste, broth, canned, juice etc. regular

or spicy (Chilom 2002; Măniuţiu 2006, 2008). The provisions of the World Organization for Food and Agriculture (FAO) recommends the consumption of vegetables in varying amounts depending on the age of consumers: up to 12 - 100 g/day over 12 years - 350 g/day, the annual consumption reaching 120 kg vegetables (Cărbunaru 2006).

MATERIAL AND METHODS

The variety was obtained by hybridization between the INCDBH Ştefăneşti Heinz varieties Notorius x 2274. The plants obtained verification productivity was achieved for several years. Through visual analysis over the years 2009-2012 were identified four biotypes of tomatoes which have presented cultural advantages and who deserved to be studied to apply DUS test: distinctness, uniformity and stability varietal genetic lineage. The first stage of the test was run in all 4 biotypes is distinct from the plants from which they originated.

Studied biotype has indeterminate growth, large fruit, which looks pleasant trading. It continued verification productivity and stability through the maintenance of characters from positive in F2 obtained biotypes. It attended harvesting seeds from biotypes representative (selected) for DUS testing by ISTIS 2010.

Was founded tomato crop on experimental variants: plants of F1, F2 plants, plant from F3 to identify characters and segregation of the biotypes agronomic characters intercomparison results with those of a witness in F1. There followed another year of study to verify genetic stability and uniformity characteristics. The variety was approved in 2012.

RESULTS AND DISCUSSIONS

Variety description -The variety of tomato Arges 16

It was obtained by hybridization between varieties Notorius x Heinz in 2274 and was approved in 2012; type of growth: determined; form 5-6 inflorescences per plant (if we reduce the number of child) 6-7 flowers per inflorescence; large fruits (average weight 170 g), oblong, red (44 A), with fewer seeds, pulp firm, resistant storage; pleasant taste (the average acidity of 3.5% w/v and 4.1% malic acid soluble dry substance); rich in antioxidants and organo-mineral nutrients; Baking age - middle; show tolerance for specific harmful organisms tomatoes; suitable for fresh consumption and industrialization; recommended for classical culture or environmental field under shelter and support system. Physiologically: the beginning of flowering is early and late maturity for harvest is very late. Destination: fruits destined for fresh consumption.

Figure 1. Fruits and fruit section.

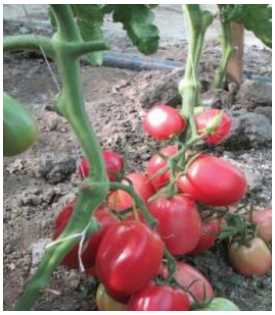
Figure 2. Plants of the variety Argeș 16.

Table 1

Variety denomination – Argeş 16

No.	No. CPVO	Characteristics	States of Expression	Note
1.	2 G	Plant: growth type	determinate	1
2.	10 G	Leaf: type of blade	bipinnate	2
3.	21 G	Fruit: green shoulder (before maturity)	absent	1
4.	26 G	Fruit: size	very large	9
5.	28 G	Fruit: shape in longitudinal section	oblong	4
6.	36 G	Fruit: number of locules	four, five or six	4
7.	37 G	Fruit: colour at maturity	red	5
8.	43 G	Resistance to Melodogyne incognita	highly resistant	3
9.	44 G	Resistance to Verticillium sp. (Va and Vd) Race 0	absent	1
10.	45 G	Resistance to Fusarium oxysporum f. sp. lycopersici	present	9

(By ISTIS, 2012)

For a better determination of the variety of cultural biometric measurements were made. They were to determine the average plant height, number of flowers per plant, average number of fruits per inflorescence, the average size and average weight of fruit (Barrett 2006).

Variety cultural Arges 16 has the following characteristics:

- growth driven; average inflorescence, 6-8 fruit epidermis intense pink color; large and oblong fruit; average fruit weight is 176.3 grams; average diameter, measured at the middle of the fruit 67.5 mm; height (length) of 58.8 mm average fruit.

Laboratory tests were the determination of the water content of total dry matter, ash, polyphenols, flavonoids, anthocyanins, pigments, carotenoids, by refractometry, and by titrimetric method and determined total acidity (Apahidean et al. 2009). From these analyzes revealed the following data shown in Table 2.

Table 2

Laboratory measurements

Variety	Total acidity (g/l)	Solids content	Dry matter	Total polyphenols	Anthocyanins
Argeş 16	4,6	27,5	4,7	401,5	143,70
Notorius (Mt.)	3,1	18,0	4,3	367,2	132,92

- Total acidity, measured in g/L malic acid. Acidity studied biotype (4.8) is higher compared to the control Notorius (3.1). Fruits acidity gives a pleasant taste what they recommend for fresh consumption;

- Solids content, based on the amount of soluble sugars calculated in grams per 100 grams fresh fruit sugars show that biotype studied, its value is higher compared to the control Notorius (18.0%). The content of soluble carbohydrates and sweet taste gives a higher yield in the production of tomato paste;

- Dry matter content, calculated as a percentage comparable to witness Notorious (4.3%). The dry matter content of fruit firmness and gives a higher yield in the production of tomato paste;

- Total polyphenols content ranged from 401.5 at 16 Arges, to 367.2 Notorius variety. Polyphenols are designed to collect the fruit's natural resistance against specific pathogens varieties with particularly important for organic crops;

- Fruit anthocyanins confer nutritional value and food, since organic compounds are antioxidants role in reducing free radicals accumulate in the human body. The most important accumulations were recorded compared to the control cultivar studied.

CONCLUSIONS

Arges 16 new tomato variety is recommended for introduction in culture in Romania, it has the genetic value of Romanian origin.

Arges 16 resistant variety of fruits to transport and storage. Tomato fruit variety Arges 16 sweet and intense aroma specific varieties of tomatoes in old Romanian.

Variety shows feature maturation before - fruit picked ripe reach commercial maturity (dark pink and sweet) without defects.

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THE EFFECT OF THE CHERRY CROWN FORMATION TO STRENGTHEN THE HARVEST TREES, PRODUCTIVITY AND FRUITS QUALITY IN THE SUPER INTENSIVE SYSTEM

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Keywords: *sweet cherry, variety, harvest, growth, branches of fruit.*

ABSTRACT

The researches were made in the intensive cherry orchard, planted in 2010 with cv Ferrovia, cv Adriana and cv Skeena, grafted on Gisela 6, planted at a spacing of 4x2 m and led by a Natural crown improvement system with reduced volume, Slender Spindle and The vessel flattened. The trees formed the first crops in the fourth year after planting. The harvest in the second year of fruiting was damaged by the spring colds. The medium harvest in the third year of fruiting is about 12375-15583 kg/ha, depending on the sort and the crown forming. The Slender Spindle crown thin improved had the biggest productivity. The sorts were uniform over 80% fruits in the size category. Cv Adriana had 85.4% fruits with the diameter between 22-26 mm, cv Ferrovia - 82.5% fruits between 24-28 mm and Skeena - 80% fruits between 24-28 mm. The results are preliminary, but the crown formation with reduced volume, combined with the precocious vegetative mother/father can have the important productivity with excellent quality, in first 3 years of fruiting.

INTRODUCTION

The leading system of the sweet cherry trees should observe the simplicity in the forming process and keeping the crown, the cutting system and to refresh the semi-skeleton branches, early important harvest. It doesn't matter the leading crown system, the forming cutting are very important for the sweet cherry trees, because they provide the forming air and balanced crown in the vertical and lateral sides and cutting final high of the trees according to the culture system (Claverie & Lauri 2005, Blažková & Drahošová 2012, Balan 2015). For cherry culture is important to apply a system of suitable culture for forming branches semi-skeleton predominantly vertical offering high quality fruit gathering of fruits from the ground with hand in order to obtain fruit with superior quality (Long et al. 2014, Asanica et al. 2013). Obviously solving these problems largely depend on sharp of crown (axis structured, Vogel, Slender Spindle, KGB, cup and others) associated with distance of small plants (4-5x2-3 m) and vegetative rootstock (Edabriz, Gisela 5, Gisela , Maxima 14 and others) own a decisive role in ensuring the efficient use of solar energy, level of fruit production, of productivity in high volume manual work

(harvest, cutting), the level mechanization of technological works (Long et al. 2014, Ampatzidis & Whiting 2013, Balan 2014, 2015).

The use small and medium force of rootstock, in cherry culture, changed the objectives of cutting and forming the trees. In the Republic of Moldova began intensive planting of orchards of cherry, using rootstock with small force and free form of crown with low volume, which allow maximizing manual work at cutting the trees and fruits harvest (Cimpoies 2001). Practical argumentation improving the use of crown forms with low volume with a view to obtain production of competitive fruits for the market, efficient using work force it becomes a problem with high value for modern orchards.

MATERIAL AND METHODS

Field experiences were located in the "Prodcar" farming company in Negureni village, Telenesti district. By geographical and ecological point of view this location corresponds to cherry culture. It was studied in terms of training and developing trees, sort of new cherry in the Republic of Moldova culture, Ferrovia, Adriana and Skeena, widely spread in European Communities countries. Orchard was planted in 2010 with vegetative rootstocks of Gisela 6 (*Cerasus vulgaris x Prunus canescens*) grafted at the plant distance 4x2 m. The trees are formed after natural system Crown improved with low volume, thin Spindle improved and Craft delayed flattened. Crown form was oriented to improving the balance between growth vegetative and reproductive organs with the aim to accelerating the process.

The experiment includes repetition of every eighth trees. Measurements were carried out in the field and laboratory conditions according to the research methods approved in fruit tree science. Physical, chemical and technological characters of cherry fruit were studied in harvest time. Diameter and weight of fruit identified by the template provided with openings 26, 28, 30, 32, 34 and 36 mm which correspond to mass 8.5; 10; 11; 5; 13; 14.5; and 16 g suitable. Content of soluble dry substance determined in orchards through using a portable refractometer ATAGO N-20E, which express the facts in Brix %. The fruit solidity was measured helped by AGROSTA dendrometer measured index higher than 250 g/mm^2 favorable for cherry fruits (Long et al. 2014). The harvest establishment for every sort was made particularly through weighing the fruits on different 32 varieties. The middleweight of fruits was made through weighing and counting them from 1 kg of cherry.

RESULTS AND DISCUSSIONS

To modernize cherry crop in the Republic of Moldova is being used vegetative rootstock and spindly crown implemented from the experience of other countries. Cherry varieties Ferrovia, Adriana and Skeena, grafted on Gisela 6 began to harvest in the 4th year at the time of sprouting. The harvest recorded averages of 708.3 kg/ha on the cv. Adriana, 1312.3 kg/ha for cv Ferrovia and 500 kg/ha for cv Skeena. In the second period of fruiting, the trees were partial attacked by the spring cold. When the air temperature during the burgeoning flowers was 6-7°C below and frozen the burgeons situated on the annual branches. It has to be mentioned that the harvest formed properly from the burgeons placed on the annual branches. The researched sorts had the medium results from 4208.3 kg/ha

from Skeena soil until 5000 kg/ha for cv. Ferrovia. In the view of the system effects of crown formation, on fruits harvest, the information from the 1st table place on the first way improved thin Spindle with 4500 kg/ha for cv. Adriana, 5125 kg/ha for cv Ferrovia, and 4375 kg/ha for cv Skeena, at insignificant differences from the other 2 systems forming the crown (table 1).

Table 1

Cherry fruit production according to the sort and the formation system of the crown, kg/ha*

Formation system of the crown	Years			Media (2013-2015)
	2013	2014	2015	
cv. Adriana				
Natural crown improvement with reduced volume	625	4375	11875	5625
Slender Spindle	875	4500	13000	6125
The vessel flattened delayed	625	4000	12250	5625
Media	708.3	4291.6	12375	5791.7
cv. Ferrovia				
Natural crown improvement with reduced volume	1125	4875	13250	6416,7
Slender Spindle	1250	5125	15375	7250
The vessel flattened delayed	1562	5000	14125	6895.7
Media	1312.3	5000	14250	6854.1
cv. Skeena				
Natural crown improvement with reduced volume	625	4250	16000	6958.3
Slender Spindle	375	4375	16000	6916.7
The vessel flattened delayed	500	4000	14750	6416.7
Media	500	4208.3	15583.3	6763.7
DL 5%		435.2	971.8	

*Rootstock Gisela 6, planting distance 4x2, SRL "Prodcar ",2013-2015 period

In the third year of vegetation, the highest medium average of fruit production was recorded in Skeena cv (15583.3 kg/ha) followed by Ferrovia cv (14250 kg/ha) and Adriana cv (12375 kg/ha). Small but significant differences are situated Ferrovia and cv Skeenas, both in the form of spindle improved crown and in the improved low volume natural crown system.

The lowest fruit production were recorded in the Craft system delayed level to all the sorts, namely to Skeena cv where the crop (14750 kg/ha) was significant lower in comparison to the tested varieties. The system effects of crown formation on the harvest is evident at spindle thin improved crown and natural improved crown with reduced volume in comparison with ,,Craft" delayed level with evident differences for all searching sorts. To remark that the difference between crown formation system is important. That is why it is a question about the effects of crown formation for creating the qualified fruits.

The size and the shape are the most important element if the cherry are sold for consumption in fresh condition (Ivanov et al. 2015). The crown forming system and the particular biologic facts influenced the middle diameter of the researched fruits. The fruits of Adriana, Ferrovia and Skeena had the medium value -24, 9 – 28.1 mm the diameter, the differences are important, Ferrovia cv and Skeena cv had the highest forms (tab.2).

The crown formation system at the Craft crown with delayed level were found the best size values (25.7-28.1 mm) and the Slender Spindle (24.8-26.4 mm). The searching cherry sorts had the uniformity about 80% of the size category. Adriana cv formed 85.4% fruits with 22-26 mm diameter; Ferrovia cv - 82.5 % fruits between 24-28 mm and Skeena sort 80% fruits between 24-28 mm.

Table 2

The fruit cherry quality depending on the sort and crown formation*

Formation system of the crown	Fruits diameter, mm	Cherry mass, g	Dry, soluble substance,Brix %	Acidity of fruits, g malic acid/ 100g fresh fruit	Fruits firmness, kg/cm^2
Cv Adriana					
Natural crown improvement with reduced volume	24.9	8.14	16.7	0.67	2.57
Slender Spindle	24.8	8.11	6.5	0.67	2.55
The vessel flattened delayed	25.7	8.40	16.9	0.67	2.56
Media	25.1	8.21	16.7	0.67	2.56
Cv Ferrovia					
Natural crown improvement with reduced volume	26.2	8.57	17.5	0.79	2.51
Slender Spindle	26.4	8.63	17.1	0.75	2.50
The vessel flattened delayed	27.3	8.93	17.8	0.75	2.55
Media	26.6	8.70	17.5	0.76	2.52
Cv Skeena					
Natural crown improvement with reduced volume	26.0	8.59	18.0	0.89	2.98
Slender Spindle	26.3	8.60	18.0	0.85	2.87
The vessel flattened delayed	28.1	9.18	18.6	0.88	2.90
Media	26.8	8.76	18.2	0.87	2.92
DL 5%	1.13	0.42	0.85		

**Rootstock Gisela 6, planting distance 4x2, SRL "Prodcar ", 2015*

The fruit weight is an element influenced by the crown forming system and biological particularities of the sort. Skeena cv showed the middle average-8.76 g, followed by Ferrovia cv -8.70 g, having important differences among them. The dry

soluble material in the fruit had different values at the researched sorts, having the average between 16.7 Brix% (Adriana cv) and 18.2 Brix% (Skeena cv). The forming system of the vessel flattened delayed distinguishes from rising dry soluble material in the fruits, but is not distinctly important - 5%.

As average value of titratable acidity level, Adriana cv recorded the lowest results, of 0.67 g malic acid/100 g fresh fruit and the Skeena cv recorded the highest results, with 0.87 g malic acid/100 g fresh fruit. The rate of soluble solid content and treatable acidity recoded values between 24.9 for Adriana cv, 23.0 for Ferrovia cv and 20.9 for Skeena cv, which is a parameter that determines the taste of the fruit and it is not strongly influenced by the formation system of the crown.

Another important parameter that determines the quality of the cherry fruit is resistance from deformation showing the degree of elasticity of the tissues. When comparing the sorts between them, it was noticed that Adriana and Ferrovia sorts are the most resistant to deformation, having remarkable differences compared to Skeena sort.

CONCLUSIONS

Trees formed the first harvest in year 4 after the flowering. In the second year of flowering, the harvest was affected by the spring cold and recorded averages from 4208.3 kg/ha for the Skeena cv up to 5000 kg/ha for the Ferrovia cv. The average yield in the 3rd year of fructification is about 12375-15583 kg/ha, depending on the sort and the forming system of the crown. The improved thin spindle crown had the biggest production per hectare, on the craft crown with delayed level had the lowest yield but also had the highest values of the fruit size (25.7-28.1 mm) and the dry, soluble substance in fruits (16.9-18.6 Brix%).

The diameter, firmness, average, weight and dry soluble substance of the fruits, depend on biological characteristics of soil and are barely influenced by the formation system of the crown. The sorts distinguish over 80% of fruits with the same size. Adriana cv formed 85.4% fruits with the diameter between 22-26 mm, Ferrovia cv -82,5% fruits with the diameter between 24-28 mm and Skeena cv - 80% fruits with the diameter between 24-28 mm.

Although the results are preliminary, it seems that the formation system of the crown with reduced volume, combined with precocious vegetative mother/father plant may show large yields of fruits of an excellent quality, in the first 3 years of fructification.

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STUDY ON FARMS SIZE IN ROMANIA AND OTHER COUNTRIES OF THE EUROPEAN UNION

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Keywords: *Farm size, land fragmentation, comparative study, population aging*

ABSTRACT

One of the main factors of farms productivity is their size. When discussing about large farms, we can discuss about optimizing all activities and increase profits. In Romania, unlike most other EU countries there is a large fragmentation of land, as well as in neighboring countries (Hungary and Bulgaria), the largest share (over 80%) being held by small farms up to 5 ha. In addition, there is a pronounced aging of the rural population, nearly half of the landowners having over 65 years. To increase the profitability of farms, currently of subsistence in most cases, among other aspects, should be considered to increase the share of medium and large farms and employment of labor in particular younger, having in this way also access to quality technology. All these factors can eventually bring greater productivity, an increase in benefits and therefore the maintaining on a market with increasingly demanding.

INTRODUCTION

The statistical factsheets present the main economic and agricultural data for each country from the European Union: key data, population and economy, CAP expenditure and distribution of direct aids, agricultural input, output and income, agricultural labor input, agricultural prices, agricultural trade and farm structure [http://ec.europa.eu/agriculture/statistics/factsheets/index_en.htm, 2016].

Among the data provided we decided to focus on those related to farm structure. We chose this data because the farm size is an important factor in its profitability. The higher the holding is the more we talk about optimization of processes and higher profits [Raicov M., et. al, 2016]. It also should not be overlooked lowering the average age of those who are working in agriculture; most of those involved today in this work in Romania have over 55 years.

MATERIAL AND METHODS

According to statistical data, Romania has a number of 3.629.660 holdings (year 2016) and 6.577.930 people who are involved in agriculture, from about 8.959.110 people living in rural regions. An relatively large number of farms, taking

into account that other countries with larger area have a much smaller number of farms, for example France, 472.210 holdings [http://ec.europa.eu/agriculture/statistics/factsheets/pdf/fr_en.pdf, http://ec.europa.eu.../ro_en.pdf, 2016].

For the study conducted, we took data offered by EUROSTAT for Romania, Hungary and Bulgaria, comparing them with those of France and Germany. Details are on the structure of farms in these countries, such as the size of the farm, the economic size and age of working people.

RESULTS AND DISCUSSIONS

For the first study, we did compare the size of farms in five countries across 7 categories, from less than 5 hectares and up to the more than 100 ha. Data were expressed as a percentage, to see more clearly the share owned by a certain category in the case of each country.

The results show in France and Germany an almost equal distribution of each category, farms of over 20 ha holding over 50% of the total, while those over 100 ha more than 10%, even 20% in France.

Quite different is the situation in other countries. It can be seen the crowding of categories over 5 ha in a small area, the rest over 85% being owned by farms up to 5 ha.

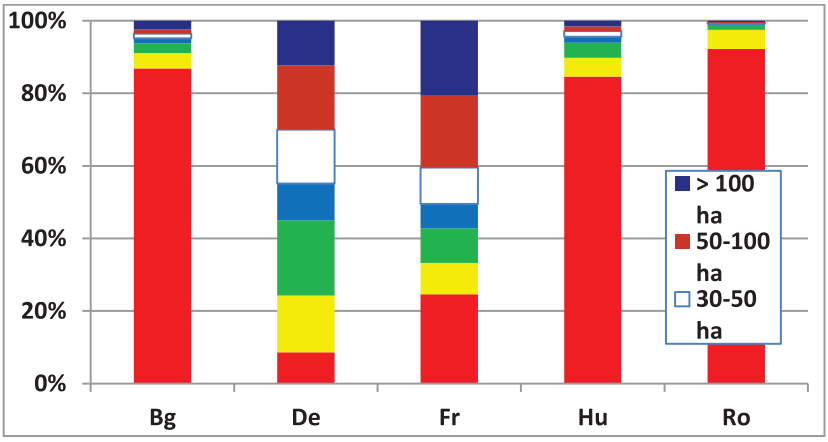

Figure 1. Structure of agricultural holdings by utilized agricultural area (ha), % [processing after http://ec.europa.eu.../bg_en.pdf, de_en.pdf, fr_en.pdf, hu_en.pdf, ro_en.pdf, 2016]

The same situation we have and if we refer to the economic size of the farm. The economic size represents the standard production of an agricultural product (crop or animal) and is the average monetary value of agricultural production at farm-gate, in euros per hectare or per animal. There is a regional standard production coefficients for each product, as an average value during a reference period (generally 5 years). The sum of all standard production per hectare of crop or livestock on a farm is a measure of its overall economic size and is expressed in euro.

In the case of France and Germany we speak of values higher than 50.000 euros to over 50% of farms respectively over 100.000 euros in 40% of cases. This

trend looks that these countries had farms that provide high returns, are more profitable, most of them fitting in the range 8000-500000 euro (over 70%).

That is not the situation in the other three countries where farms with economic size up to 5,000 euros are prevalent, around 75% in Bulgaria, 80% in Hungary and 85% in Romania. Here, the large holdings of over 100,000 euros are almost nonexistent, ranking somewhere below 5% of the total. In Romania, according to statistics, farms with economic size over 25.000 euros represent barely 1% of the total and with more than 500.000 euro did not exist. Is actually quite sad, even if we do not refer to France or Germany where previous values are supraunitary, but we look at our neighbors from the west or south, which have values of 0,3% (Hungary) or 0,5% (Bulgaria) on farms with the economic dimension over 500.000 euros.

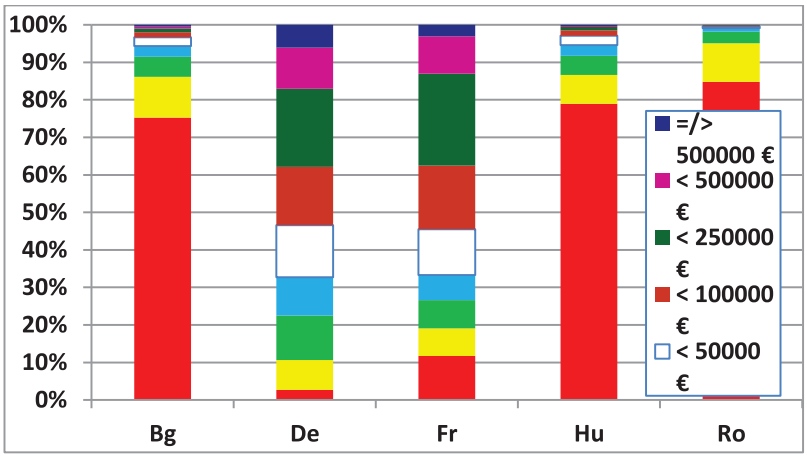

Figure 2. Structure of agricultural holdings by economic size (€), % [processing after http://ec.europa.eu.../bg_en.pdf, de_en.pdf, fr_en.pdf, hu_en.pdf, ro_en.pdf, 2016]

Unfortunately this is not the only problem. If you look at the age of the agriculture workers, it is noticed that both countries, France and Germany, have more than 60% people aged up to 54 years. In Romania, Hungary and Bulgaria, the percentage of over 60% include people over 55 years old, with a level of 30-40% of people over 64 years, exactly the opposite compared to the other. These people can bring after them only the experience accumulated over time, but without the manpower required and in many cases without the knowledge of new technology or more profitable methods, that would bring a the younger ones.

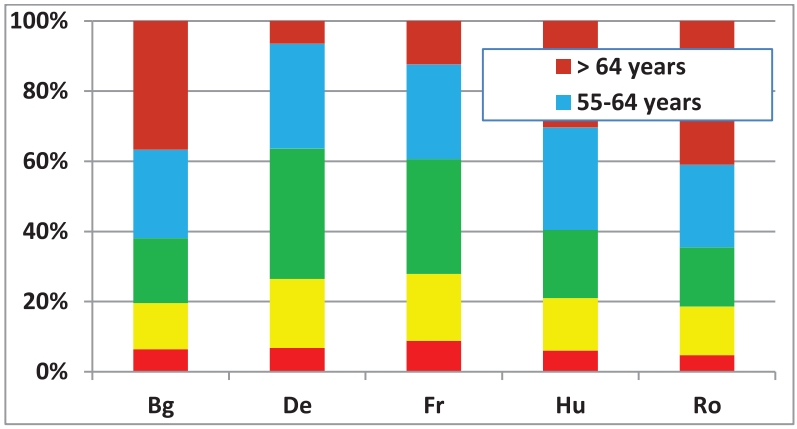

Figure 3. Structure of agricultural holdings by age of holder (years), % [processing after http://ec.europa.eu.../bg_en.pdf, de_en.pdf, fr_en.pdf, hu_en.pdf, ro_en.pdf, 2016]

CONCLUSIONS

Analyzing the data presented above we can clearly see the seriousness of the situation which is found in Romania mainly and both the Hungarian and Bulgarian neighbors. First the size of farms is in most cases small, below the threshold of profitability or with minimal profits. Remedying the situation involves trying to aggregate the land, reduce as much as possible the degree of fragmentation, so that we would have, for the start, as many land with areas of at least 10-15 ha. Further it can go on to create individual or joint properties of hundreds of hectares.

In addition, should be attempted encouraging the persons aged less than 45 years to gradually replace older people, while benefiting from their experience. This is quite difficult to accomplish, given the poverty of the majority of areas where young people go to the city to earn more and come back to the country when are close to retirement. A solution would be increasing farm profitability through consistent and timely aids, prices offered by manufacturers, ensuring more markets and through crop insurance, in fact increasing farmers' incomes, leading to the remains of the rural population in that area.

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COMPARATIVE STUDY REGARDING THE EVOLUTION OF ORGANIC TEMPERATE FRUIT AREA IN ROMANIA AND OTHER EUROPEAN COUNTRIES

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Keywords: *Organic temperate fruit, organic area, comparative study*

ABSTRACT

Since 2004, when were collected for the first time data on land use and organically temperate fruit crop (about 97000 ha), to present date, the areas of cultivated land has increased more than twice. The main fruit grown organic were apples (about half the total), followed by apricots, pears, plums and cherries. Much of this increase is attributed not necessarily to the increase of the amount of land, but to continuous improvement of data availability of culture. Regarding to the conversion period, the available data indicate that more than 20% of the total organic fruit crops grown in the temperate zone are in organic conversion. If this is a real value it means that in the near future (1-3 years depending on the current state of conversion), we should have a considerable increase in the supply of these fruits. Like other European countries, Romania has and had a steady growth of organic temperate fruit area. However, if we refer to regional and European level, even if in terms of cultivated areas we are in mid-table, organic cultivated area in percentage leads us to the end of the list. Adding to what was said, the decrease in recent years of total production and therefore also the above crops, we can lose the opportunity to become one of the main pillars of European exports of such organic fruit.

INTRODUCTION

Organic, or bio, or eco agriculture consist of producing food by avoiding the use of chemical inputs and also try to minimize the environmental and wildlife damage. Organic farming produces clean, unpolluted products and offers guidelines through agricultural diversification in the perspective of protecting the environment and promoting the development of sustainable agriculture.

For temperate fruits, the first data were collected since 2004, currently, the values indicating an increase of area for these.

MATERIAL AND METHODS

We took over data from the last five years consider the main European countries involved in organic farming and USA. We relied on statistics provided by FiBL and IFOAM, selecting values from the 2010-2014 period, basically those

published in 2012-2016. We also took over the Romanian statistical data bases to see more precisely the situation locally.

RESULTS AND DISCUSSIONS

The total area under organic temperate fruit recorded an increase from 2010, about 125.000 ha (1% of the total area of temperate fruit grown in the world) to 2014, over 188.000 ha (1.5% of the total area of temperate fruit grown in the world).

The most important countries in the world growing temperate fruit are China, India, Turkey, Serbia, Iran, Russia and United States, but only five of them provided data on the area of organic temperate fruits (2014), China, Turkey, Serbia, Russia, and United States. For that reason, it can be supposed that the organic temperate fruit area is higher.

The significant temperate fruits are apples, with almost half of the temperate fruit area, followed by apricots, pears, plums and cherries.

Table 1

Significant cultivated temperate fruits, 2014, ha

Main crop	Area
Apples	87.128
Apricots	20.978
Cherries	10.706
Fruit, temperate, no details	19.294
Fruit, temperate, other	8.569
Peaches	4.027
Pears	16.493
Plums	11.671

Source: Willer et al. (2015)

If we refer to Europe, first places on organic temperate fruits cultivated areas are occupied by Poland, Italy and France, followed in recent years by Germany and Romania. It is very good for us to be in the top five, but is just one point of view.

If we look at the share of organic temperate fruit cultivated land in total land, Romania falls to last places, followed by countries that focused more on other crops, tropical fruits, flowers etc., like Netherlands, Spain or Greece.

Fortunately we stand better both at total area converted, as well as at the in conversion. If we refer to the year 2014, we are coming back to first places in both cases above, if most countries recorded decreases in areas, Romania managed to maintain or even increase slightly.

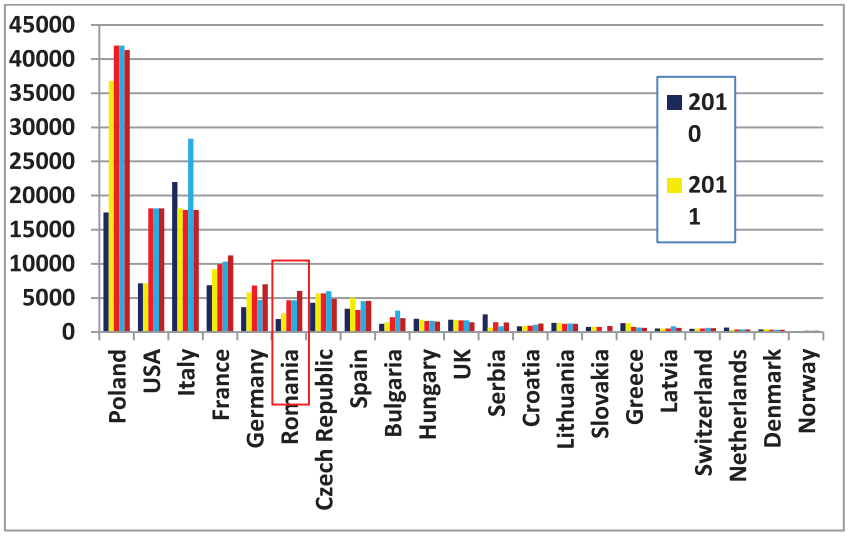

Figure 1. Organic area [ha] in USA and several Europe countries [processing after Willer et al. 2011-2015, Willer et al. 2012]

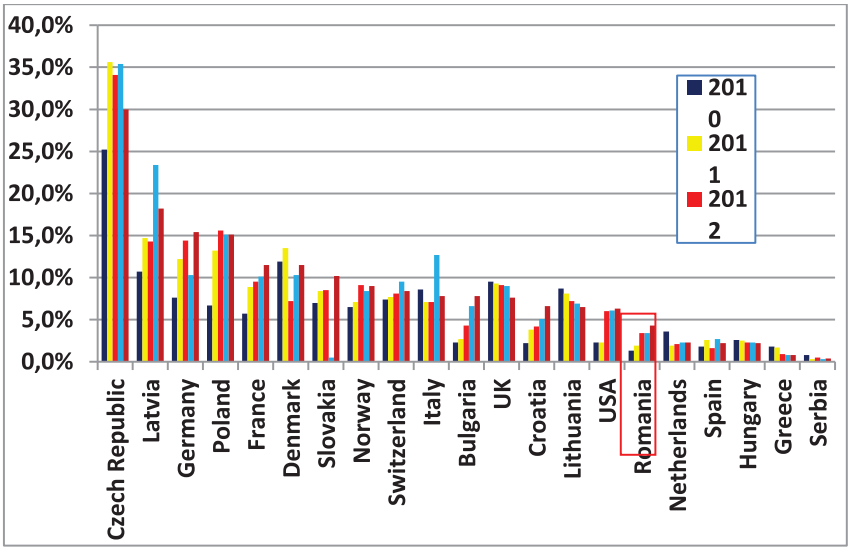

Figure 2. Organic Share [%] in USA and several Europe countries [processing after Willer, Helga et al., 2011-2015, Willer et al., 2012]

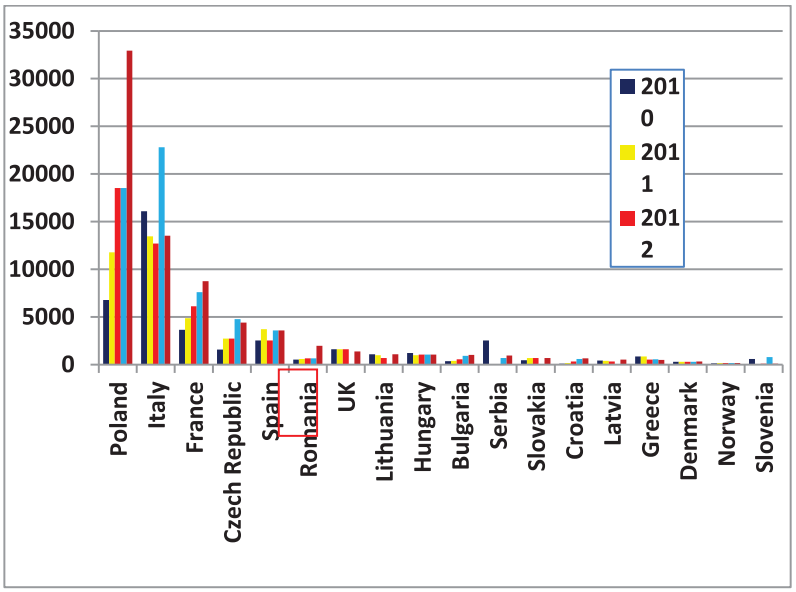

Figure 3. Area fully converted [ha] in several European countries [processing after Willer, Helga et al., 2011-2015, Willer et al., 2012]

If this data are correct, the conversion status indicate that more than 21% of the total temperate fruit area is in-conversion, so we can predict that there could be a considerable increase in the supply of organic temperate fruit in the near future.

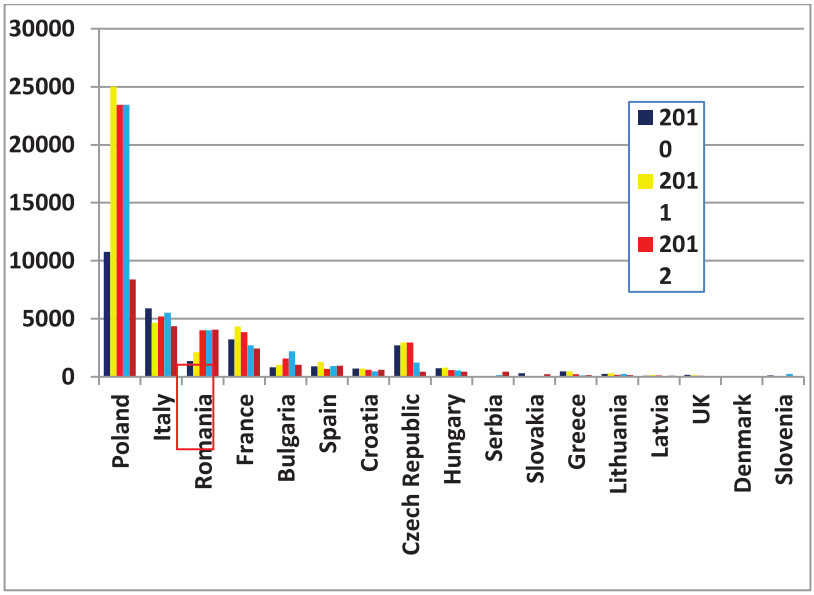

Figure 4. Area under conversion [ha] in several European countries [processing after Willer, Helga et al., 2011-2015, Willer et al., 2012]

Next we wanted to see the situation in two regions of Romania, the southwest and west. For the beginning we wanted to see what are the main crops of fruit and what was the trend of production (tons) in recent years.

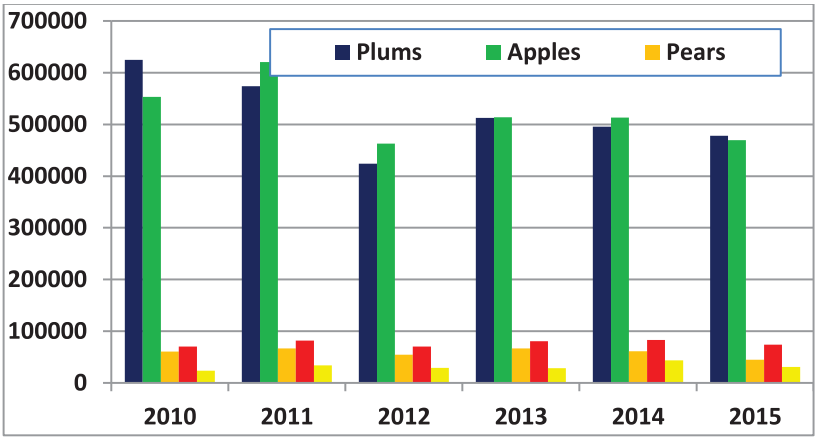

Figure 5. Fruit production, by tree species in Romania, tons
[processing after http://statistici.insse.ro/shop/, 2016]

According to statistics, plums ranks first, followed by apples, the others, pears, cherries, and apricots being at big distance. It can be seen here too, the world tendency of decline in production from over 600.000 tons in 2010 to around 480.000 tons in 2015 (plums) and from over 600.000 tons in 2011 to around 470000 tons in 2015 to apples. The same trend is found to other fruits, to last fruit mentioned not being as noticeable.

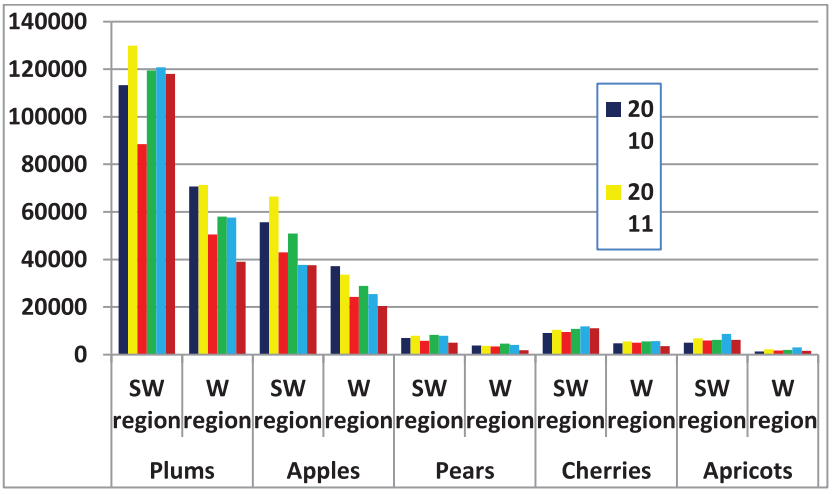

Figure 6. Fruit production, by tree species in South-West and West Regions of Romania, tons
[processing after http://statistici.insse.ro/shop/, 2016]

CONCLUSIONS

Like most European countries, Romania has and had a steady growth of organic temperate fruit area. If we refer to regional and European level, even if in terms of cultivated areas we are in mid-table, organic cultivated area in percentage leads us to the end of the list. Much of this increase is not necessarily attributed to the increase of the amount of land, but to continuous improvement of data availability from 2004 till now. It is therefore very likely that land taken into consideration to be in fact less than the existing ones, many countries (for example India and Iran) continuing not to provide data about the area of organic temperate fruits.

Adding to what was said, the decrease in recent years of total production and therefore also the above crops, we can lose the opportunity to become one of the main pillars of European exports of such organic fruit.

A hopeful fact is the existence of land in conversion, the future organic land, which currently exceeds that of many EU countries. But the condition is to keep the current trend, or even increase current values. Also, we must focus on fruit crops on which we already have an advantage over others, such as plums and even apples, although in the latter case there are renowned competitors, Poland for example holding here a third of the total organic land.

“Our train is in the station ready to go”; we must take care not to lose it.

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OENOTOURISM – A NEW FORM OF MANIFESTATION OF TOURISM IN OLTENIA

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Keywords: oenotourism, wine, touristic product, touristic potential

ABSTRACT

The execution of many touristic products, starting from the resources of a touristic destination, on the one hand, and from the anticipation of the needs and wishes of tourists, on the other hand, must be determined by a thorough knowledge, so that authentic touristic products can be made, with specific elements, building a connection between target consumers and the nature itself and the culture of a destination.

Some wine domains from Oltenia and their vineyards enjoy incredible landscapes and the wine produced here express the typicality of each place through flavors, colors and personality. Wine tourism is more than only visiting a wine cellar, it is the path that the grape itself follows from vineyard to the bottle, it is a state of mind, it is happiness. Oenotourism in Oltenia starts to be more and more appreciated by both experts and wine lovers, Romanians and foreigners, so that this type of "new " tourism can be added to the other types of tourism that exist on the market of tourism products from Oltenia, giving high quality services, at the highest standards and the best technology, in order to attract the target segments of consumers.

INTRODUCTION

Colette said that only wine can make us understand the flavor of the land, we might say that wine connects us to our origins, through a permanent communion of all people.

By setting the major goals of this study was aimed the identification of advantageous and disadvantageous factors of oenotourism and rural tourism, the promoting of the quality wine production, the preservation of the wine production areas and of the ecological image of the wine regions from Oltenia (figure 1).

The expansion of market and demands for traditional, local, quality wine, the protection of art, culture, monumental values and traditional architecture, together with coordination and representation of the interests of householders and local craftsmen. (Cătoiu, I., 2009).

In order to achieve these objectives, it is desired the implication in collecting information about the development of local economy, of infrastructure, the stimulation of the development of the environment and of the enterprising spirit

from rural places and also the implementation of some programs/strategies to protect the environment and nature. (Minciu, R., 2001)

Figure 1. Map of Oltenia region

MATERIAL AND METHODS

The entire space of Oltenia (alike the other romanian spaces) rightly considered “a system of touristic resources” (Cocean, P.,2010) can have as correspondent only one developed product, but other tourism products can be added thus achieving a consolidation of representative and authentic products is subsumed under the adequacy of the combination product/ destination/ market.

The method used in this study was the geographic method, which represents a complex, synthetic approach of the tourism fenomenon in the territory, starting from the existence of potential and built touristic landmarks and from the touristic phenomenon in its complexity, and also from the fact that tourism evolves in the environment, more or less humanized, which is the “raw material” for this and with whom is in close interaction.

Geographic method involves, as a matter of fact, the use of the principles of the distribution in an surface (or area) and geographic integration, specific to geography as a science.

According to this method all information about tourism activities offered by specialists in this field, in relation to the specialization of each, are dispersed, but the overview of the touristic phenomenon results only in the systematization of knowledge and their geographic integration into a territorial and geographis functional system.

It requires a special (expansion, shape, complexity) and positional (geographic) approach of the objectives and of the tourism phenomenon in general, in relation to the areas and forms of the nearness tourism (or at a higher

territorial level), and functional and territorial integration of the touristic activity; a causal approach of the touristic phenomenon, but also an ecological and socio-economic approach through the relationship with the environment and human communities.

RESULTS AND DISCUSSIONS

The major objective of this research was to identify the factors that influence the evolution of oenotourism and also the disadvantageous factors of the activity of win tourism.

A territory can be requested as a touristic destination, to the extent that it provides natural, anthropic touristic resources, infrastructure, whose exploitation, on the background of complex arrangements, can cause a touristic activity and the inclusion of this territory in national and international tourist circuit. (Glăvan, V., 2005)

The territory or geographic area is considered as an essential condition for the existence of the touristic offer, as the demographic factor is the carrier of touristic demand.

Another determinant factor of the tourism offer is the tertiary sector through the development level and structure of services.

Geographic space and its touristic resources have a double determination for tourism:

- quantitative, through optimal capacity of customer reception;
- qualitative, through “attractiveness” or “touristic value”.

Thus, for touristic offer, the territory represents both equipment “support” and production capacities of its component and “raw material” – tourism resources– which can be harnessed through made touristic products. (Glăvan, V., 2005)

The touristic value of the territory or the touristic attractiveness is appreciated by various methodologies concerning the turistic intrinsic value of the components of tourism potential, the geographic position and the environmental quality.

The quality of natural environment and of the historic cultural heritage, the lack of pollution sources are beneficial for the attractiveness of tourist offer because any degradation or destruction of these has big consequences in the dissatisfaction of tourists and the depreciation of touristic destination and even its removal from the market.

The quality of environment and resources also represents a potential component.

The anthropic touristic potential includes the cultural-historical, technical-economic and sociodemographic elements Wich concerns the tourism activity and generalizes some turistic flows by the intrisic value.

The touristic attractions include all the touristic structures from museums, buildings of historical interest, monasteries and national parks to a large variety of touristic activities like fishing, bird watching, mountain research, riding and golf.

The development of wine tasting is an extremely sensible aspect because the tourism represents one of the most competitive economic activities in the world. It's not automatically produced because it is linked to the image and reputation.

In specialized Literature are materialized more categories of determined factors of the touristic demand and of the wine tasting, generaly each with its limits or interferences.

Anyway, the touristic consumption is conditioned by: the disposable income, the spare time, the demographic factors and the touristic motivation. (Glăvan, V., 2005)

Among the disadvantaged factors of viticultural tourism activities we mention:

The quality of services - The competitive services can be ensured only by well prepared and specialized staff, with a proper attitude, with a correct mentality, with a proper behavior and with proper performances.

Creating an educated and skilled workforce requires training, basic education and professional training sessions as well as practically continuous training in the workplace.

The hospitality in itsmodern sens involves the satisfaction of the visitors' requirements and the skills acquired to clinch or even to surpass the visitors' expectations.

If the expectations created by the marketing and promoting activity of tourism cant be satisfacted due to lack of skilled labor, the tourism can(t be sustainable solved.

The succesful and lasting development of wine tasting in Oltenia doestl only depend of tasting the main types of wine, of the atractive lanscape and of the touristic facilities but also of the competitive and quality services.

The hospitality and tourism sector is very important for people: people who provide services for peoplé.

Being one of the most competitive economic activities in the word, the tourism requires comprehension, professionalism, engagement, organization and a effiective development strategy of human resources.

The hospitality and tourism sector involves equally facilities and services.

The workforce offer - The hospitality sector from Romania records a severe shortage of qualified and skilled staff and this affects the general performances in sevices.

However. the shortage of qualified staff is dued only partial to the fact that a big number of people are leaving Romania in order to work in foreign countries, after they've obtained the high or university diploma (but still there aren't prepared enough!), or after they have woked in a hotel for a short time. This shortage of staff has a succesion of motivations:

The current training programs are not focused on developing skills and abilities and they don’t respect the standards.

Many providers of training courses release diplomas and certificates necessary for employment without ensuring a complete and suitable initiation.

A considerable number of young people are leaving the hospitality and tourism section with the purpose of working in foreign countries as a result of the precarious way how a job in the hospitality section is seen and because of the low level of paying.

The management and the supervisory bodies do not own the specific skills of an internal preparation in the workplace in purpose of keeping these skills to the level required by standards and to maintain the desire to succeed

There is no proper and continuous training in the workplace for keeping up with the necessary of skills and knowledge of the existent staff.

The skilled labor crisis will increase further in a fast rhythm as a result of the big number of hotels and new pensions which are currently under construction and those that are provided to be built in the next years.

Some new hotels are under construction in Bucharest and in other cities and places in the country and a big number of new accommodation units is provided for building.

The transport does not only mean transporting people from the point A to the point B, but also assumes transforming a journey into an efficient and confortable experience as part of a general touristic experience.

The transport sub-sector plays an important role in the touristic industry where the aerial, railway, terrestrial and maritime transport plays a major role, offering services to the tourists of the country.

The successful and lasting wine tasting requires a cooperation between all the liability factors and requires forming partnerships between the public sector which must support the wine tasting and the private sector which must offer the facilities and services for different markets and market segments.

Without the understanding of the mutual wine tasting objectives and problems it won't develop in a satisfactorily and beneficial way.

Regarding the ways of promoting-suitable for promoting Oltenia, for all the forms of tourism not only for the viticultural one, the touristic attractions as natural and anthropic resources and the cultural resources of the destination, the interesting fact is that the principal way of promoting is represented by the presentations from conferences and tourism fairs.

The internet also represents a suitable alternative through social networks and websites together with the articles in specialty magazines plus the advertising clips.

It is necessary to specify that these five communication instruments, considered being suitable, form a communicational mix where the communication (Pike S., 2004), of the picture elements of Oltenia must have a unitary character, first considering the identity elements.

Limits

For the generally development of tourism and of viticultural tourism especially from a certain destination, the continuation and the extension of such a complex research is necessary, with the consideration of the multiple components of the touristic products which

It can be realized and offered to other market segments (with demographic and psychographic variable that explains certain preferences or phenomena).

CONCLUSIONS

The multitude of resources/ types of resources does not implicative facilitate the development of tourism in a given region, but instead it requires efforts increased by marketing.

Wine tourism reduces, in fact, the distances between wine lovers and producers and tourists who can see on the scene the process of obtaining the wine and the effort that accompanies this process will be the first promoters of good, authentic wine consumption.

The wine is an emotional, handcrafted, non-industrial product and the consumer can understand it much better if he sees vineyards and the natural scenery in which it was created, knowing the people who created it, including their culinary traditions, specific to the region.

Therefore, it is necessary to know the advantageous and disadvantageous factors that can influence the development of oenotourism in Oltenia, so that it can be introduced on the market of touristic products through the strengths of cellars from Oltenia.

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THE OLTENIAN OENOTOURISM BUSINESS OPP0RTUNITY, PROMOTION AND SPECIFIC MARKETING

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Keywords: Oenotourism,wine,touristic produce,the wine route,wine cellars

ABSTRACT

At the beginning incomprehensible and later too difficult to be accepted, oenotourism imposed itself slowly but consistently on the touristic market of the countries cultivate grape-wines. One of the tourism forms, which in the last twenty-five years now, has reshaped at an European level, is the oenotourism. The wine growing tourism from Oltenia not only includes the promotion of the wine growing societies, but also promotes the societies that work on this domain. The "Wine Route" must become a touristic one focusing on the viticultural produces with tasting points and touristic objectives , cultural and natural which can be developed by up to a ,three day constitutive programme for amateur tourists. The "Wine Route", using the rural tourism and of wine itself, can influence the boom of the local economics and promote quality wines, thus giving good opportunities to familly business. Poetically speaking, it can be considered a real training for wine crops, it's specializations improving life quality.

INTRODUCTION

Oltenian Oenotourism must become topic of a project management being rated as an administrative and planning proces of loads and resources to reach objectives and tell the recorded results. For this such a project should be an aim and completion action. In another words it has a start point and a finish, is planned and controled and leads at the end to clear conclusions. In another train of ideas the project being subjected to a validation and verification process of fesability will make changes in the field.

In a particular way, we can say that the Oltenian oenotourism in order to become a touristic produce it must fulfil the following:

- make clear the objectives highlight the advantages and rectify the deficiencies to be a real attraction.
- conduct the efforts to achieve the goals avoiding the useless of any resource.
- plan, control the human resources, material and monetary ones useful to end the project up successfully.

For tourism, the quality of the product is very important. Knowing that the introduction in the touristic, circuit of some structures that provide low-rate service

can compromise the product or the destination for a long time. (Cocean, P., 2010) Practice shows that the touristic product whenever is compromised it implies much material effort and even human to rebuild it (Glăvan, V., 2005). High-rate oenotourism means good service. It can be eassily understood that the Oltenian oenotourism must also have pathways, modern means of communication and suitable food storage. History, tradition, culture, flavour-mean quality. All these should be discovered and enjoyed just by visiting the Oltenia wine-cellars.

MATERIAL AND METHODS

The method used in the study was ”the geographical method” which is a complex and synthetic approach of the touristic phenomenon that has as startpoint the objectives and the phenomenon itself and the fact that it occurs in a more or less popullated environment, this being the raw material of it and a tight interconditioning with it. The geographical method means the use of the repartitive principles on the surface (or of specific spreading) and the geographical integration, proper to geography, as science. According to this method, the information concerning the touristic activity offered by the specialists in the field in relation to each specialization, is scattered. But on the whole, the touristic phenomenon comes form the systematization of the knowledge and geographic integration of it into a territorial functional touristic system. It also implies a special approach (extension, form, complexity) and positional (geographic) of the objectives and the touristic phenomenon. It has to be in relation to areas and forms of the neighbouring tourism, functional and territorial integration of this activity; not only a causative approach of the phenomenon, but also environmental and socio-economic through the viewpoint of the environment and human settlements conection.

RESULTS AND DISCUSSIONS

Internationally,the Romanian wines image is not so promoted. Many international contests have appreciated the quality, but ordinary clients are unaware of this information. Today we can benefit of the extraordinary tools of the marketing that can sustain and promote our country as a region of wine manufaturers.

There is a new tendency in the viticultural marketing, that of a viticultural tourism which addresses not only to experts but also fans. The more it is know the better for the wine growers who invest in the tourism. This part includes a long chain of actions like festivals celebrations which include visits to wine cellars where people taste the wine,the tourists are given accomodation, the well known open days to wine cellars and like horse rides in special routes. The policy of the oenotourism promotion, although at first it seems simple ,but practisig it the promotional mixture means special abilities to change it into a good opportunity for the locals and for the regions where the touristic belonging is less used. (Minciu, R., 2001). As O. Snak (2001) says "the promotional activity of the touristic product is a special form of communicating which consists in sending messages and informations on different ways to inform the touristic workers and tourists about this product features and the service given by tourism and to develop a positive attitude towards firms that do service ".

The promotion also means support and influence on buying in order to change the clients mentality (Cătoiu, I., 2009). We mention some characteristics of the promotion:

- permanent activity made differently according to the objectives or the budget needed;
- it addresses to actual and future economic agents;
- the promotion of a touristic destination has another purpose too ,besides increasing the number of tourists ,it gives information ;
- how about natural and anthropic resources and their capitalization in useful terms.
- the image improvement of the firm;
- create a unique image;
- the development of the local economy.

The Oltenian Oenotourism has a special way to promote the wines including physical dimension, social and cultural of the viticultural panoramic.

The viticultural tourism from Oltenia is a good marketing opportunity for the wine manufacturers ,but also a way to develope the inside tourism.

The marketing mixture is the essence of the marketing activity of any modern organization ,one of the important elements of the markerting theory which has as elements:

- the product or service given ;
- the price or price list ;
- distribution ;
- promotional activities .

The marketing objectives - the Oltenian Oenotourism are :

extension /diversification of the tourist, their longer stay ,more money invested in the area. All these should be coordonated by the office "The Wine Route" taking into acount the aspects of the long life tourism. The important issues will be a continue development of various products and service of the partener suppliers on the D.V.

- intake a new market and tourists and the development of a rural/local friendly image for tourists.
- marketing instruments will imply publicity web-sites, video presentations (developing the existing one) C.D.D. ,proper markets, promotion campaigns

Tasks:

- we shall have to continue the improvement and develop the quality and the positive image of the Oltenian wines by supporting marketing. For this , we have the following tasks:
- the creation of an unforgetable image of the wines;
- the spreading of the local wine productivity;
- a better known of the viticultural areas and support for the products and touristic service on "the Wine Route" on the national and international markets;
- the creation of a record of wine intake;
- the creation of a professional infrastructure.

Target Groups

There are three target groups of the promotion:

a) young people (18-29).-people who can legally drink alcohol and their training towards the controlled intake of the wine. According to Romanian and foreign studies the young between 18-29 are the buyers of all time.

b) Women (18-49) it is known that woman is the one responsible with slopping within a family. Wine is a way to seduce and a useful tool for hospitability. It can attract people in the culture and world of wine tasters .

c) Wine friends. The age of this group is irrelevant but their loyalty.

These are the ones who promote it in their micro and macro environment the culture of wine intake. Relevant are the older who buy it a lot this promoting the products of Oltenian Oenoutourism.

1. Each moment can be an opportunity to taste the wine; it is good as can be served any time because it freshis us, is healtly, natural and sometimes drinking a glass of wine can be a real benefit.

2. Tradition can be found in all wine from Oltenia ;the traditional techniques used for making them can be feet in the flavour.

3. Wine offers something anytime. Using the wines on the "Wine Route" can give us an alternative to each occasion. It quenches and it is a customary element with main courses ,it is the "Swedish drop" witch can complete the lock of minerals in our bodies thus easing the effects of heart on blood diseases and it can reduce stress.

CONCLUSIONS

The Romanian Oenotourism so including the Oltenian too ,needs a touristic infrastructure to promote its image on the international markets. For this needs not only the wine growers participation but also some government structures implication, travel agencies and marketing specialists. There is an initiative which the producing countries have been using it for a long time but not Romanian due to the lock of the Romanian wines at an international level and market. Romania is concerned a lot about the development of the viticultural tourism .The promotion of the oenotourism abroad can be done by publicity market, media and visits of tourism operators. Marketing specialists in Oenotourism segment , aim and place the market and test the compatibility of the resources and their combination from the point of view of the local communities (taking into account the aim destination of Oltenia). Being an important branch of economy ,the Oltenian oenotourism should evoluate better its research chance and become an important part of the budget addiction .It also needs unique elements and together with some certain objectives to efficiently exploit the tourism in Oltenia. The development of the tourism will contribute to the territorial fitting out and systematization and also to create new work places.

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ASSESSMENT OF THE AGRO BIOLOGICAL QUALITIES OF THE SOME INTRASPECIFIC HYBRID ELITES FOR THE TABLE GRAPES COMPARED WITH THE PARENTAL FORMS BY THE METHOD OF THE DISTRIBUTION ON THE FREQUENCY CLASSES

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Keywords: *agrobiological descriptors, hybrid elites, parental forms, distribution on the frequency classes*

ABSTRACT

This paper highlights the agro biological value of a 21 genotypes resulting from the hybridization of some varieties for table grapes in three distinct combinations (Muscat Iantarnîi x Canner, Victoria x Black Pearl și Victoria x Victoria), selected from the comparative field, but and the hybrid crossing value of the varieties involved in improving by distribution on the frequency classes. To present more conclusive the multitude of data obtained through statistical and mathematical processing, respectively of the descriptive statistics, were formulated the general conclusions regarding the manifestation of the hybrid elites in interaction with the biotic and abiotic factors having regard to the natural variability of all processes and phenomena involved.

INTRODUCTION

Based on data obtained, by statistical and mathematical processing, by the descriptive statistics, general conclusions have been formulated concerning the manner of manifestation of the hybrid elites grape-vine in interaction with the biotic and abiotic factors having regard to natural variability of all processes and phenomena involved.

This presents two aspects: - Representation of the entire distribution, by: numerical (frequency analysis) and graphics (bar, histogram, box plot, stem and leaf); central tendency indicators: mode, average, median; dispersion indicators: amplitude, standard deviation; the indicators of the distribution form; index of asymmetry (skewness) and index of vaulting (kurtosis).

Skewness (skewness) and Kurtosis (kurtosis) în SPSS - Skewness and kurtosis values are normal and equal to 0. In the case of a random sample, extracted from a normal population, it is unlikely to obtain the indices of symmetry and vaulting equal to 0. Must be known if the sample of the analyzed values are derived from a population asymmetric or abnormal vaulted.

The utility of the normality test of the distribution relates to the decision to use parametric tests in the case of the quantitative variables, which are subjected to this condition. Both the K-S test and Shapiro-Wilk are sensitive to the asymmetry

and vaulting. Therefore, when it is used the t test or analysis of variance, vaulting is less important than the asymmetry. For this reason, if the test of normality is significant, it is advisable to check whether this is due to the asymmetry, vaulting or both. For both tests (Kolmogorv-Smirnov and Shapiro-Wilk), is only important the value of *p* (Si G.). this being understood inversely than the classical interpretations of the *p*, therefore:

- Where p (Sig.) is less than or equal to 0.05, then is rejected the hypothesis of normality of the distribution(Distribution of the variable deviates from the normal form);

- Where p (Sig.) is greater than 0.05, then is accepted the hypothesis of normality of distribution (the distribution).

MATERIAL AND METHODS

To underscore the agrobiological value of the hybrid elites from three hybrid combinations combinaţii (*Muscat Iantarnîi* x *Canner*, *Victoria* x *Black Pearl*, *Victoria by self pollination*) and the value of the varieties involved in the process of improvement, it was appealed to the distribution on the frequency classes of the average values obtained. Therefore were introduced into the histograms all the values of the three types of hybrid descendants with the parental varieties (26 genotypes), for characters analyzed. To present more conclusive the plurality of data obtained, it was appealed to the distribution on frequency classes of the average values of determined parameters for the hybrid elites and genitors.

From here results that the result interpretation of the normality test is determined by the simultaneous correlating of the p-value with the sample size. The Gauss distribution for the normal values, in the form of a bell, is represented by two values: *the average value and standard deviation.*

RESULTS AND DISCUTIONS

Analyzing *the total number of eyes per vine plant* for the 21 elites selected resulted from comparative field and five varieties involved in hybridization, is observed: the average value of the sample was 14,69 eye / vine, and the variation coefficient of individual values compared to average was less than 5%. Comparing the empirical distribution (fig. 1) normal, it is observes that the differences are very small, which means that we are dealing with relatively homogeneous population. The coefficient of vaulting had negative value, which shows that predominate values greater than the average of the total number of eyes per vine.

The number of the eyes bursted in the vegetation ranged to 26 genotypes between 6 and 22 eyes/vine plant. Studying the distribution of elites by this indicator it observes that the highest frequencies are recorded between 8-13 eyes/vine plant, approximately 73% of the cases. The indicators of asymmetry (0,5) or excess (- 0,2) of the histogram are very close to those of the normal distribution, which confirms the relative homogeneity of the studied proportion. The maximum amplitude of the variation was 14 viable eyes, and the coefficient of variation of less than 25,9%. The positive value of the vaulting coefficient (0,19) suggestive for an excess near the average, with an emptying of the right flank in the case (figure 2).

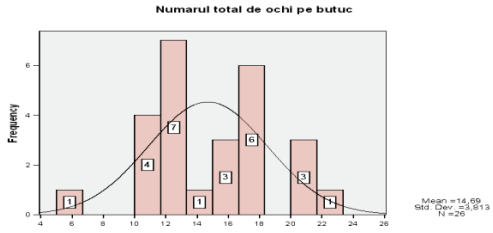

Fig.1. Distribution on the frequency classes of the average values of the total number of eye per plant

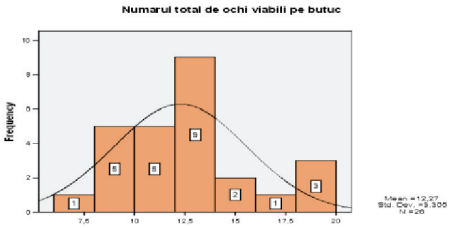

Fig. 2. Distribution on the frequency classes of average values of the total number of viable eye per plant

Percentage of the eyes bursted in the vegetation (figure 3) was between 60 and 100%, predominating have been the elites with the maximum viability. Distribution curve of the percentage of the fertile shoots from the total shoots is asymmetrical. Asymmetry is by the left, which means that predominates, through numbers, elites with a percentage of fertile shoots higher than average. Distribution is to the limit of the homogeneity, the coefficient of variation being over 25%. In this case, the normality is rejected, and the excess is dominant in the right side of the figure, so prevails the elites with the viability in high percentage.

Resembling normal distribution, it was the empirical distribution of the number of *shoots per vine*, (asymmetry and the excess with low values). If on average were 13 shoots per vine, the extremes were 6 minimum and 20 maximum, and the standard deviation by 3,296. The vaulting coefficient (0.88) show the occurrence of the excessive of the numbers next to the average and shape of the curve is leptokurtic (higher than normal) (fig. 4).

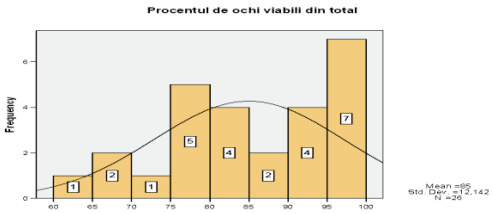

Fig. 3. Distribution on the frequency classes of average values of the total percentage of viable eye per plant.

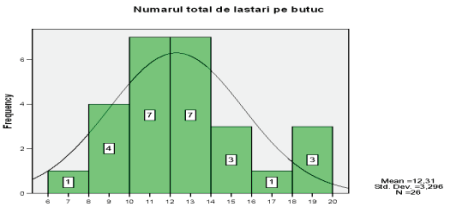

Fig. 4. Distribution on the frequency classes of the average values of the total number of shoots per plant.

A completely different distribution by the vaulting indicators encountered in the case the number of *fertile shoots /vine plant.* The distribution has presented the high asymmetry right, prevailing beeing the elites with a frequency below 6%, elites with values below average (15). The highest value of the fertile shoots recorded *the Muscat Iantarnâi* variety (12 shoots with fruits) which is close to the elite HI13 with the 10 fertile shoots (figure 5).

The distribution of elites per classes of frequency, by point of view of percentage of fertile shoots achieves a symmetrical distribution and platykurtic.

The limits of the oscillation have been between 25 and 80% fertile shoots, average 47,38% and the coefficient of variation 35.7%. 15 genotypes have been under 45% fertile shoots, and 11 elites over this limit (figure 6).

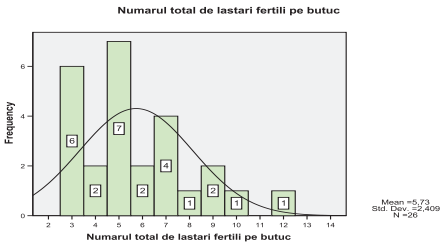

Fig. 5. Distribution on the frequency classes of the average values of the total number of fertile shoots per plant

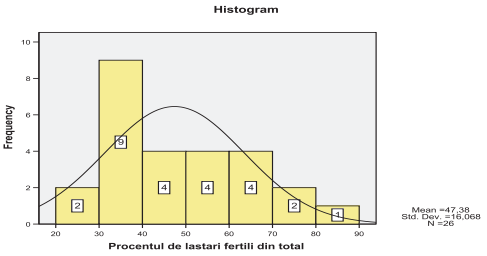

Fig. 6. Distribution on the frequency classes of average values of the total percentage of fertile shoots

Analyzing the indicators of dispersion at *total number of the inflorescences per vine plant*, it is noted that the empirical distribution has a right asymmetry, predominant being elites with 3 and 5 inflorescences /vine plant, (figure 7).

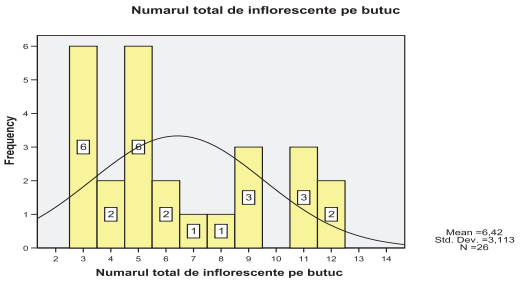

Fig. 7. Distribution on the frequency classes of the average values of the inflorescences total number per plant for F1 genotypes.

The distribution on the frequency classes of the values recorded by the absolute fertility coefficient (A.F.C.) places 16 elites into the class with value 1. The amplitude maximum by oscillation was 0.8 (between 0,8 and 1,6), and the coefficient of variation 17% (fig. 8).

And histogram of the relative fertility coefficient (R.F.C.) places the most elites under the average value of 0,52. Was been rejected the hypothesis of normality, not so intense right asymmetry (predominates elites with values lower than average), but especially because of the excess (intense leptokurtic) by elites near average and very close to it. Only an elite (BP9) had the value (R.F.C.) over 1 (1,3), (figure 9).

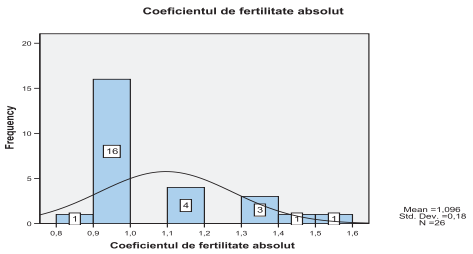

Fig. 8. Distribution on the frequency classes of average values of the A.F.C.

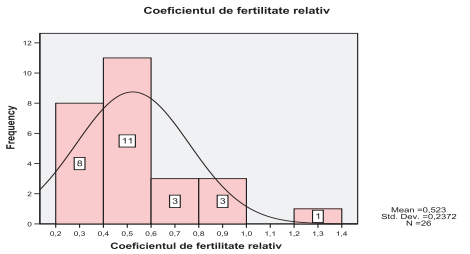

Fig. 9. Distribution on the frequency classes of average values of the R.F.C.

The values of *index absolute productivity* (I.A.P.) For the genotypes studied in the comparative field oscillates between 150 to 676, the coefficient of variation is low (32.2%) (figure 10). Distribution of the values in histogram is asymmetrical left as against the average (434,58), and empirical, rises above the normal in the zone of average values (leptokurtic). Here we find an excess of elites. The lowest value to this indicator registered the elite HI3 (163), very close to the *Muscat Iantarnîi* variety genitor (150) but spaced apart from the average of the elites.

An empirical distribution with intense right asymmetry (predominates elites with values lower than average) and leptokurtic it is found in the case of *the relative productivity index* (R.P.I.). The maximum amplitude of the oscillation was 465 (between 86 and 551), the coefficient of variation being 73%. Elites with an index of relative productivity above the 300 are 6 in number. The frequency of the highest is found in the group of the value 100 (8). (Figure 11).

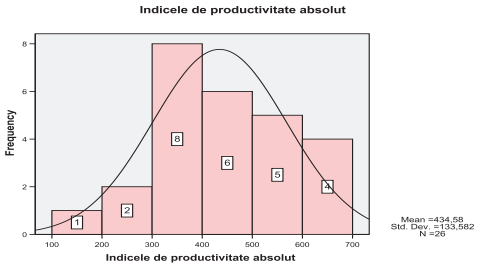

Fig. 10. Distribution on the frequency classes of the average values of the A.P.I

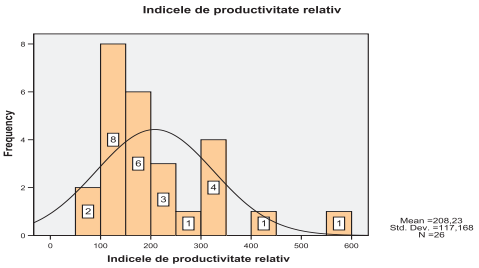

Fig. 11. Distribution on the frequency classes of the average values of the R.P.I.

CONCLUSIONS

The percentage of the eyes burst in vegetation was comprised between 60 and 100%, prevailing being the elites with maximum viability. The curve of the percentage distribution of the viable eyes per vine plant from the total eyes is asymmetrical (the vaulting coefficient is equal to -0.93). Asymmetry is by left, which means that predominates by the numbers, the elites with a percentage of the fertile shoots higher than average.

The indexes values of the absolute productivity (I.P.A.) for the 26 genotypes studied in the comparative field fluctuates between 150 and 676, the coefficient of variation being low (32.2%). The distribution of the values in the histogram is asymmetrical left from the average (434.58), and empirical, rises above by the normal in the zone of the average values (leptokurtic). Here we find an excess of elites. The lowest value of this indicator registered the elite HI3 (163), very close by the genitor variety Muscat Iantarnîi (150) but spaced apart from the average of the elites. The BP9 elites and A19 with values 678-672 were ranked at the far right, surpassing the average and the variety Victoria (611).

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THE OPTIMIZATION OF FERTILIZER CONSUMPTION AT TOMATOES CROPS ON SANDY SOILS

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KEY WORDS: *tomatoes, fertilizer, production*

ABSTRACT

For the tomato crop on sandy soils the insurance with nutrients is one of the most important links in the technology. The tomatoes can be grown in open field direct at the ground or with polyethylene mulch. For the fertilization were used 4 types of fertilizers with different concentrations of soluble nutrients elememte (9-45-15, 26-15-12, 20-20-20 and 15-15-30). The fertilizers were applied during the growing season depending on the requirements of plants. Were used 2 agrofunds in the NPK using the 15-15-15 complex chemical fertilizer. Tomatoes in culture with polyethylene mulch uses the chemical fertilizers more effectively than culture direct at the ground, in all variants of fertilization the largest production was obtained in the crop with mulch. At the culture without mulch highest production was achieved in the variant fertilized with soluble fertilizer dose of 50 kg/ha on the agrofond N 100 P_2O_5 100 K_2O 100 (38.1 t/ha) and culture with mulch recommend fertilizing with 25 kg/ha soluble fertilizer on the same agrofond (38.3 t/ha). Increasing doses of soluble fertilizers at crop with mulch is not justified in terms of yields achieved.

INTRODUCTION

Tomato *(Lycopersicon esculentum* Mill.) is one of the most important vegetable crops grown worldwide and ranks alongside potatoes, in terms of acreage, but in first place for a crop of processing (Mohammed et al. 2013)

On sandy soils in southern Oltenia, the tomatoes occupy a significant share in the structure of vegetable crops (and place after melons). The success of a culture is conditional inter alia by ensuring proper nutrition regime. Removing nutrients from the soil through their absorption into the plant through leaching or other processes entail the reduction of contents of mobile forms of nutrients and gradual decline of the production capacity of soils. For these reasons, it is necessary an objective compensation by applying Chemical fertilizers, both in consumption with the harvests as well as lower of mobility at the nutrients through natural processes (adsorption, fixation, immobilization in humic substances, etc.) (Borlan 1994).

Fertilization should ensure a balance between vegetative growth and fruiting. Choosing of the fertilizer depends on soil characteristics, fertilization technique adopted and the time of fertilization.

Knowing the optimum moment of fertilization is related to diminished absorption of nutrients, moments "critical" of plant life, their relationships with

environmental factors (Voican et al. 1998). The authors recommend as a general rule for determining the optimum moment of fertilization it is done before (and during) the period of growth and strong development of plants.

The frequency of application of fertilizers and fertilization level is dictated by the type of soil. Minerva Craciun Heitz, 2011, concludes that application of complex fertilizers NPK increased the tomato production, in higher doses and maximum effect is equivalent with mineral fertilization and organic fertilization (N200 P200 K299 equivalent to 25 t/ha manure + N100 P100 K100). For sandy soils Toma (1983), recommended fertilization with 30 t/ha manure N 150 P_2O_5 100 K_2O 50.

Nutritional regime influences the quality of tomato fruits especially potassium and the interaction with boron (Huang Jinsheng 2009). The fact that the fertilization with K significantly increase biomass production and accumulation of K in plants has been noted and by other authors (Kubar 2016).

Potassium not only help the increase of fruit production at tomatoes, but also improves fruit quality by increasing dry matter content and vitamin C, increased sugar content and titratable acidity levels (Ni Wuzhong 2002). Ca and Mg contributed to the increase of total production and increase of production earliness (Candilo et al. 1993).

Other factors that influence the frequency of application include the type of crop, level of production, method of providing water and applied water quantity and type of fertilizer applied. Tomato cultivation on sandy soils is dependent on the provision of water, watering method most commonly used being the by sprinkler. Since this method has some drawbacks, must increasingly shift to drip irrigation. New technologies should ensure optimization of water consumption and nutrients through fertigation and soil mulching, and establishing the influence of types of fertilizer for the earliness, size and quality of production of tomatoes grown on the sandy soils.

MATERIALS AND METHODS

For tomato practicing the culture with polyethylene mulch and the culture without mulch. In order to optimize fertilizer consumption depending on the method of cultivation of tomatoes on sandy soils were studied four types of soluble fertilizers with different concentrations elememte nutrients: 9-45-15 (one fertilization), 26-15-12 (one fertilization), 20-20-20 (three fertilizations) and 15-15-30 (three fertilizations). Soluble fertilizers were applied during the growing season depending on the requirements of the plant within 10 days.

At each fertilization have been used in doses of 25 kg/ha (D1) and 50 kg/ha (D2). Were used two agrofunds of the NKP complex chemical fertilizer 15-15-15. There are provided fertilizer levels between 70-150 kg/ha N, 82.5-182.5 kg/ha P_2O_5 and 87-187 kg/ha K_2O. This resulted in seven levels of fertilization (table 1)

Table 1

Fertilization levels studied

Number of variant	N	P_2O_5	$K2_2O$	Assured of:	
				The fertilizer complex 15-15-15	Soluble fertilizer applied through fertigation
b1	0	0	0	0	0
b2	150	100	100	100-100-100	N50*
b3	70	82.5	87	0-0-0	Doza 2
b4	85	91	93.5	50-50-50	Doza 1
b5	120	132.5	137	50-50-50	Doza 2
b6	135	141	143,5	100-100-100	Doza 1
b7	170	182.5	187	100-100-100	Doza 2

* Assured by the application of ammonium nitrate.

RESULTS AND DISCUSSIONS

By mulching the soil with polyethylene maintain soil moisture, weed competition is eliminated and stimulated plant growth due to property plastic to allow raising or lowering the temperature. Due to these advantages ensure a high level of production (table 2).

Table 2

The influence of cultivation method on production tomato

Cultivation method	The production of tomato t/ha	The relative production %	Difference t/ha	Signify-cance
Culture without mulch	31.3	100	Mt.	
Culture with mulch	35.2	112	+4.1	*

LSD 5% = 2,06 t/ha
LSD 1% = 4,76 t/ha
LSD 0,1% = 31,6 t/ha

At the culture without mulch of tomato was obtained in medium a production of 31.3 t/ha. At culture with polyethylene mulch was obtained in average a yield of 35.2 t/ha, resulting in a production increase of 4.1 t/ha, statistically significant. Regarding the influence of fertilization on the yields of tomato notes that it fluctuated within very wide limits, between 25.4-38.4 t/ha depending on the dose applied (table 3).

Table 3

The influence of fertilization upon tomato production

Number of variant	The production of tomato t/ha	Compared to b1			Compared to b2		
		The relative production %	Difference t/ha	The signify-cance	The relative production %	Difference t/ha	The signify-cance
b1	25,.4	100	Mt.		75	-8.4	000
b2	33.8	133	+8.4	***	100	Mt.	
b3	32.8	129	+7.4	***	97	-1.0	
b4	30.1	119	+4.7	**	89	-3.7	0
b5	36.0	142	+10.6	***	107	+2.2	
b6	36.4	143	+11.0	***	108	+2.6	
b7	38.4	151	+13.0	***	114	+4.6	**

LSD 5% = 2.80 t/ha
LSD 1% = 3.80 t/ha
LSD 0,1% = 5.10 t/ha

The lowest production was carried out in the control variant unfertilized, to which in all variants of fertilizer were production increases achieved between 4.7-18.0 t/ha, significantly distinct and highly significant in statistical terms. It may be noted that basic fertilization used greatly influences the production of tomatoes. Thus, application of fertilizers soluble by fertigare in doses of 25 kg/ha on a basic fertilization N50 P_2O_5 50 K_2O 50 ensured a production of 30.1 t/ha, and applied the same dose on a basic fertilization N100 P_2O_5 100 $_2O$ 100 was achieved production of 36.4 t/ha. The soluble fertilizers applied in dose of 50 kg/ha without providing a basic fertilization with NPK were contributed to make production of tomatoes 32.8 t/ha. By applying fertilizers soluble dose of 50 kg/ha on a agrofond of N50 P_2O_5 50 K_2O 50, yields increased to 36 t/ha, and applied on a agrofond N100 P_2O_5 100 K_2O 100 was achieved an average production of 38.4 t/ha.

In variant fertilized only with mineral chemical îngăşăminte it yielded production of 33.8 t/ha. To it by fertilization with soluble dose of 25 kg/ha on the agrofond of N50 P_2O_5 50 K_2O 50 yields achieved are lower. Fertilization of 50 kg/ha on the same agrofond soluble fertilizers can get a production increase of 2.2 t/ha. By fertilization soluble dose of 25 kg/ha on a agrofond N100 P_2O_5 100 K_2O 100 has achieved a production increase of 2.6 t/ha, and by increasing the dose of soluble fertilizer at 50 kg/ha, production growth achieved increases to 4.6 t/ha, statistically significant. Fertilization with soluble fertilizers 50 kg/ha on the same agrofond can get a production increase of 2.2 t/ha. By fertilization soluble dose of 25 kg/ha on a agrofond N100 P_2O_5 100 K_2O 100 has achieved a production increase of 2.6 t/ha, and by increasing the dose of soluble fertilizer at 50 kg/ha, the production of tomato was increases to 4.6 t/ha, statistically significant. Noted the role of phosphorus and potassium in increasing production efficiency. Although the

amount of N provided using two forms of fertilizer is lower than that provided to technological variant, increasing doses of P and K ensures production increases, a fact noted by other authors.

At the same cultivation method, recipe fertilization used influenced differently the tomato production, mulching soil with polyethylene bringing a production increase in all variants (Table 4).

Table 4

The influence of doses of fertilizers on tomato production at same cultivation method

Cultivation method	Fertilizer variant	The production t/ha	Compared to b1		Compared to b2	
			Difference t/ha	The signify-cance	Difference t/ha	The signify-cance
Culture without mulch	b1	22.3	Mt		-8.8	000
	b2	31.1	+8.8	***	Mt.	
	b3	31.0	+8.7	***	-0.1	
	b4	27.6	+5.3	**	-3.5	
	b5	34.5	+12.2	***	+3.4	
	b6	34.5	+12.2	***	+3.4	
	b7	38.1	+15.8	***	+7.0	**
Culture with mulch	b1	28.4	Mt		-8.1	000
	b2	36.5	+8.1	***	Mt	
	b3	34.5	+6.1	**	-2.0	
	b4	32.6	+4.2	*	-3.9	
	b5	37.5	+9.1	***	+1.0	
	b6	38.3	+9.9	***	+1.8	
	b7	38.6	+10.2	***	+2.1	

LSD 5% = 3.95 t/ha
LSD 1% = 5.37 t/ha
LSD 0,1% = 7.2 t/ha

At the culture without mulch, in the control variant was realized a production of 22.3 t/ha, using a basic fertilization with N100 P_2O_5 100 K_2O 100 and fertilization in vegetation with N 50 applied as ammonium nitrate at binding first fruit was achieved a production of 31.1 t/ha, ie an increase of production of 8.8 t/ha. The use of soluble fertilizers in doses of 50 kg/ha without prior fertilization with mineral fertilizers was obtained production of tomatoes 31 t/ha. The same formula applied fertilizer on agrofond N50 P_2O_5 50 K_2O 50 contributes to achieving yields of 34.5 t/ha and a agrofond N100 P_2O_5 100 K_2O 100 production reached 38.1 t/ha.

Using a agrofond of N50 P_2O_5 50 K_2O 50 with fertilization with soluble fertilizer applied in doses of 25 kg/ha was obtained a production of 27.6 t/ha, and by applying fertilization with the same dose on a agrofond N100 P_2O_5 100 K_2O 100, the production of tomato was increased to 34.5 t/ha.

Mulching soil with polyethylene ensure more efficient use of fertilizers applied to tomato plants because as losses of nutrients through washing are reduced. Both the basic fertilization and fertilization phasial influenced tomato

production differently the best fertilization reflected by the yields of tomato made was the one in which was the fertilized with mineral fertilizers at the level of N100 P_2O_5 100 K_2O 100 and fertigarea was done with soluble fertilizers in doses of 50 kg/ha (38.6 t/ha) and in doses of 25 kg/ha (38.3 t/ha).

CONCLUSIONS

The mulching of crop with polyethylene brings significant increases to production depending of the fertilizer used.

By using soluble fertilizers with water, the nutrients are gradually available to plants depending of necessary processes of growth and fruition on the needs of the plant which provides significant production increases.

The influence of soluble fertilizers through fertigare on tomato production is conditioned by basic fertilization with complex mineral fertilizers

At culture without mulch highest production was achieved in the variant fertilized with soluble fertilizer dose of 50 kg/ha on a agrofond N100 P_2O_5 100 K_2O 100 (38.1 t/ha) and culture with mulch recommend fertilizing with soluble fertilizer 25 kg/ha on same agrofond (38.3 t/ha)

Increasing doses of soluble fertilizers crop mulch is not justified in terms of the yields achieved, very small differences in production.

ACKNOWLEDGMENT

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RESEARCH STUDIES ON THE INFLUENCE OF APPLYING SUMMER PRUNING OPERATIONS ON THE QUANTITY AND QUALITY OF TABLE GRAPE VARIETIES PRODUCTION AT ȘIMNICUL DE SUS VITICULTURAL CENTRE

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Keywords: *climate, quality, quantity, table grapes, summer pruning operations*

ABSTRACT

The quality of table grape production depends to a great extent on the environmental conditions that leave their mark on the production areas (regions, vineyards, viticultural centres, etc.) The success of growing table grape varieties depends directly on the ecological conditions and biological and technological features. Summer pruning operations are costly, laborious, manual works, which must be performed on time, differentially from one variety to another depending on the biological specific of the respective variety.

INTRODUCTION

During the last decades, a national and international policy has been promoted for the continuous awareness of viticultural producers with view to increasing the number of areas where table grapes are grown, on one hand, and of viticultural research specialists in order to diversify the grape varieties to be used for fresh consumption, on the other hand. Summer pruning holds greater importance in case of table grape varieties compared to wine grapes, owed to its positive influence over grapes quality.

When summer pruning works are carefully and timely applied, their efficiency is bigger. Summer pruning must be performed with moderation considering that the leaves are useful body parts for the plants and that each variety has a specific leaf area / output ratio. For this reason, both nationally and internationally, several research studies have been conducted to determine which summer pruning operations fit the biological features of varieties best for the determination of a perfect execution time and work intensity. Amongst the authors who conducted such studies are the following: Champa (2015), Cichi et al. (2009), Costea et al. (2013), Dejeu et al. (2008), Gatti et al. (2015), Olteanu et al. (2002).

MATERIAL AND METHODS

Research studies have been conducted on Victoria table grapes varieties in a private vineyard located in Șimnicu de Sus viticultural centre which belongs to

the area selected for the wine production with controlled denomination of origin of "Banu Mărăcine".

The main objective of this experiment has been to establish the best choices of summer pruning operations, as well as their best execution timing in order to get high production quantity and quality levels. There are times when certain operations are not profitable in case of certain varieties, which means no yield increase or, on the contrary, lower yields compared to the witness numbers.

In accordance with the research topic proposed, the observations and determinations were focused on monitoring climate factors for the evaluation of the favourableness of the study year and on analysing the influence of the varied climate regime characteristic to the study years on qualitative parameters. The recording of the climate data was made in the existent meteorological network. The effect of the varied climate and summer pruning applied was evaluated through the analysis of biochemical indexes (content of sugars, organic acids, glucoacidimetric index) and productive indexes (grape berry weight, yield per trunk).

The options experimented were several combinations of summer pruning operations, such as shoot thinning and hedging, partial leaf removal, inflorescence thinning and trimming. The research methodology used is the one specific for this field.

RESULTS AND DISCUSSIONS

Multi-annual average climate data for 2000-2014 are shown in the figures below:

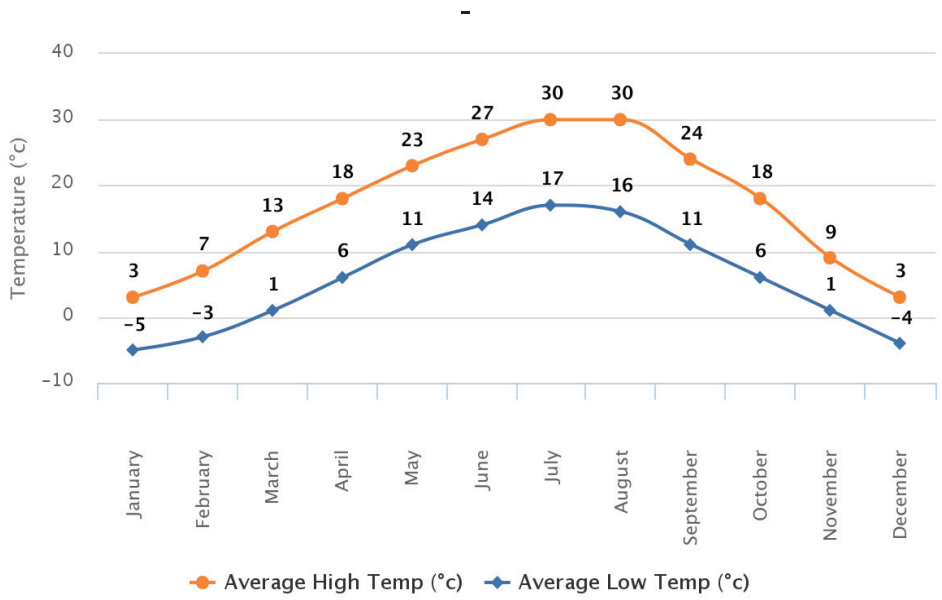

Figure 1. Multi-annual average monthly high and low temperatures (by www.worldweatheronline.com/simnicu-de-sus-weather-averages/dolj).

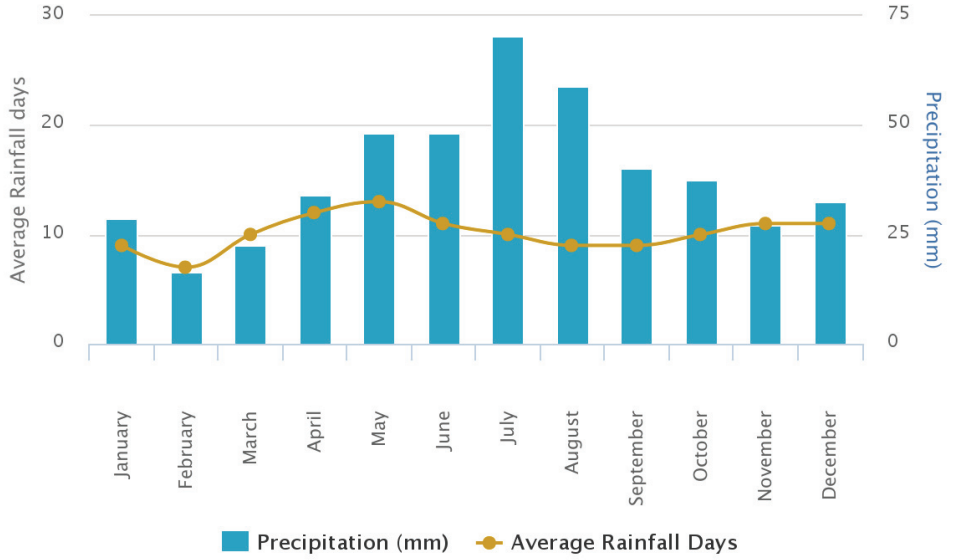

Figure 2. Multi-annual average monthly precipitation and rainfall days (by www.worldweatheronline.com/simnicu-de-sus-weather-averages/dolj).

Figure 3. Multi-annual average monthly air humidity (by www.meteovista.co.uk/Europe/Romania/Simnicu-de-Sus).

An analysis of the multiannual data indicated in the figures above shows that in most of the years Șimnicul de Sus viticultural centre has met the climate conditions required for high quality grape yields.

The climate data during the mature ripening process (July-August) shows a lack of precipitation during 2015. Table 1 shows that during the two-month period there were only 4 rainfall days (over 10 mm), resulting in the early production of grapes which reached their maturity peak about 2 weeks earlier (by www.accuweather.com/ro/ro/simnicu-de-sus).

Table 1

Climate Data of July – August 2015 – Șimnicul de sus

Date	Precipitation	High temp.	Low temp.
31 July 2015	13 mm	30°	17°
20 August 2015	21 mm	29°	16°
22 August 2015	25 mm	28°	16°

The influence of shoot thinning on the quality of production is shown in Table 2.

In case of Victoria variety the production of V4 (witness) was lower compared to other options. The biggest production was 2.46 kg / stock and resulted from V1 (total extra shoot thinning), where the highest content of sugars was also determined. Out of the shoot thinning options, lower results came out from the 20% extra shoot thinning operation.

Table 2

The influence of shoot thinning on the production quality of Victoria variety

Options		Production (kg/stock)	Finished Production (%)	Sugar content (g/l)	Acidity (g/l H_2SO_4)	Glucoacidimetric Index
V_1	Total extra shoot thinning	2.46	91	189	3.5	54.00
V_2	50% extra shoot thinning	2.42	85	183	3.7	49.45
V_3	20% extra shoot thinning	2.30	82	176	4.4	40.00
V_4	No shoot thinning (Mt)	2.05	75	170	4.5	37.77

The influence of partial leaf removal on the quantity and quality of production is shown in Table 3. The best quantity and quality results came out when the leaf removal operation took place in early ripening and the lowest results were obtained in case of the witness option.

Table 3

The influence of leaf removal on the production quality of Victoria variety

Options		Production (kg/stock)	Finished Production (%)	Sugar content (g/l)	Acidity (g/l H_2SO_4)	Glucoacidimetric Index
V1	Leaf removal in early ripening	2.16	89	188	3.5	53.71
V2	Leaf removal after early ripening	2.13	86	184	4.2	43.80
V3	Leaf removal before early ripening	2.06	83	179	4.3	41.62
V4	No leaf removal (Mt)	2.05	75	170	4.5	37.77

Table 4

The influence of shoot hedging on production quality

Options		Production (kg/stock)	Finished Production (%)	Sugar content (g/l)	Acidity (g/l H_2SO_4)	Glucoacidimetric Index
V_1	Shoot hedging in early ripening	2.16	86		4.9	35.71
V_2	Shoot hedging after early ripening	2.12	88	186	4.8	38.75
V_3	Shoot hedging before early ripening	2.23	89	189	4.3	43.95
V_4	No shoot hedging (Mt)	2.05	75	170	4.5	37.77

The shoot hedging also had a positive influence on the quantity and quality of production. The biggest production came out when the shoot hedging operation took place before early ripening (2.23 kg/stock), compared to the lowest production obtained in case of the witness option (Table 4).

Table 5

The influence of inflorescence thinning and trimming on production quantity

Options		Production (kg/stock)	Finished Production (%)	Sugar content (g/l)	Acidity (g/l H_2SO_4)	Glucoacidimetric Index
V_1	Inflorescence trimming after blooming	2.59	93	195	4.3	46.42
V_2	Inflorescence thinning after blooming	2.47	87	190	3.5	54.28
V_3	No inflorescence thinning and trimming Mt)	2.05	75	170	4.5	37.77

The influence of inflorescence thinning and trimming on the production quantity of Victoria variety is shown in Table 5. In case of options where summer pruning operations took place, production numbers were higher compared to the witness option.

The lowest production of 2.05 kg / stock came out in case of V3 option (no inflorescence thinning and trimming), while the highest production of 2.59 kg / stock was in V2 (inflorescence thinning and trimming after blooming).

CONCLUSIONS

The success of growing table grapes cultivars depends directly on the ecological conditions and biological and technological features.

Summer pruning operations require costly, cumbersome manual work and therefore must be performed on time, differentially form one variety to another, depending on their biological specific features.

Further to the research studies made, it comes out that summer pruning operations have led to superior results but, due to the high costs involved, their application into practice can be performed differentially, as follows:

- the shoot thinning has worked on all varieties in different ratios, depending on their biological traits, which in case of Victoria varieties, recommend the total extra shoot thinning;
- the partial leaf removal has determined on all varieties under study the increase of finished production and sugar content and the decrease of acidity;
- the shoot hedging may be performed on all varieties in early ripening;
- the inflorescence thinning is a must for Victoria varieties considering the number of clusters;
- the inflorescence trimming has been the summer pruning operation performed with the best results for Victoria varieties.

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QUANTITATIVE AND QUALITATIVE ANALYSIS OF YOUNG FARMERS TRENDS OF MAGNESIA GREECE

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Keywords: *young farmers, trends, production*

ABSTRACT

In recent years the effects of the global crisis are evident at the level of national economies at more states around the world. In our country we are experiencing the effects of the economic crisis at the last seven years with effects such as the decrease of GDP, rising unemployment, decrease in salaries of employees etc. Occupying with agriculture and more specifically with the sectors of crop production, livestock and beekeeping can be a driver of economy growth and contribute to reduction of unemployment. Aim of this study was to analyze the trends of young farmers at a specific region of Greece. Results showed us in which agriculture sectors young farmers of Magnesia will work and what the future results of this effort will be.

INTRODUCTION

For several years, agriculture is at the center of rapid developments, with continually increasing demands on performing not only traditional roles (production of food and raw materials, job creation, etc.), but also new one, such as contribution to high food quality, environmental protection, integrated development of rural areas.

The adaptation of agriculture to all of these roles and the expectations of citizens is an extremely demanding and ambitious affair, as it requires crowing problems to be overcome. The difficulty is increased by the global economic crisis of recent years, which is developing simultaneously with an agricultural crisis, with clear economic and other dimensions.

The financial crisis that erupted in 2008 in the US and Europe affect the Greek economy, the weakest link in the euro zone, and consequently the Greek agricultural sector. The aim of this study was to detect the course of Greek agriculture on the environment of crisis and deep recession of the Greek economy. The occupation with agriculture and more specifically with the sectors of crop

production, livestock and beekeeping can be a driver of economy growth and contribute to reduction of unemployment.

The study of the trends and the guidelines to be followed by the Young Farmers, who will be started their farm business in the Greek countryside, should be a source of continuously study in order the targets and guidelines to be redefined and as a result the produced products to gain the added value and to be competitive in world affairs. Goal of this study was to analyze the trends of small farm business of Young Farmers of Magnesia not only during the starting period but also at their future status.

MATERIAL AND METHODS

For this purpose, data collected for the region of Magnesia, were obtained under the invitation Measure 1.1.2. "Young farmers" of the Rural Development Program of Greece "RDP" 2007-2013, with a deadline date of 06/06/2014. Aim of the Program was the demographic revitalization of rural areas by the entrance of Young Farmers through the provision of motivations (10.000 to 20.000 euro) in order their initial establishment and the structural adjustment of their holdings to be facilitated by submitting a business plan. Data collected and analyzed concerning the 215 approved beneficiaries of the program in the prefecture of Magnesia, were separated in three directions: i). plant production, ii). livestock and iii). beekeeping. Simultaneously the trends of Young Farmers were investigated, which derive from the image of both the existing and their future status. More specifically: i). the Human Work Units - HWU, ii). Gross Value Added - GVA, iii). the number of cultivated acres and animals, iv). types of crops categorized into: a). arboriculture, b). cereals, c). cotton, s). vegetables, e). floriculture, g). legumes.

RESULTS AND DISCUSSIONS

The results showed that the Young Farmers selected were at their majority males (69%), who had at 65% percent completed compulsory education, while for the first time in percentage size of the order of 18%, people of the higher education decided to deal with Agriculture. Part of the objective of Measure 1.1.2. was reached, as former unemployed, according to the analysis, at percentage of 87.5%, settle in the Greek countryside and indeed most of them (91.7%) in mountainous and disadvantaged areas.

In crop production, the Young Farmers will start their farm business with approximately 3.90 hectares which will be increased at the level of 5.75 hectares in the future state. The GVA currently reaches the level of 15.000 €, while the mean goal of the future picture is the GVA to rise at 21.550 €. Meanwhile, Human Work Units - HWU farm start at 1.24 and end at 1.74.

In animal production, the Young Farmers will start their installation with 97 sheep or goats approximately and they will increase that number at the level of 146 sheep or goats in their future state. The GVA in current state reaches the level of 12.150 €, while the goal of the future picture is the GVA to rise to 18.760 €. Meanwhile, Human Work Units - HWU farm start at 1.11 and end at 1.67.

In beekeeping young farmers will start their installation with approximately 127 beehives, which will be increased at the level of 219, in their future state. The GVA in current state reaches the level of 9.480 €, while the goal of the future picture is the GVA to rise to 16,450 €. Meanwhile, Human Work Units - HWU farm start at 0.70 and end at 1.21.

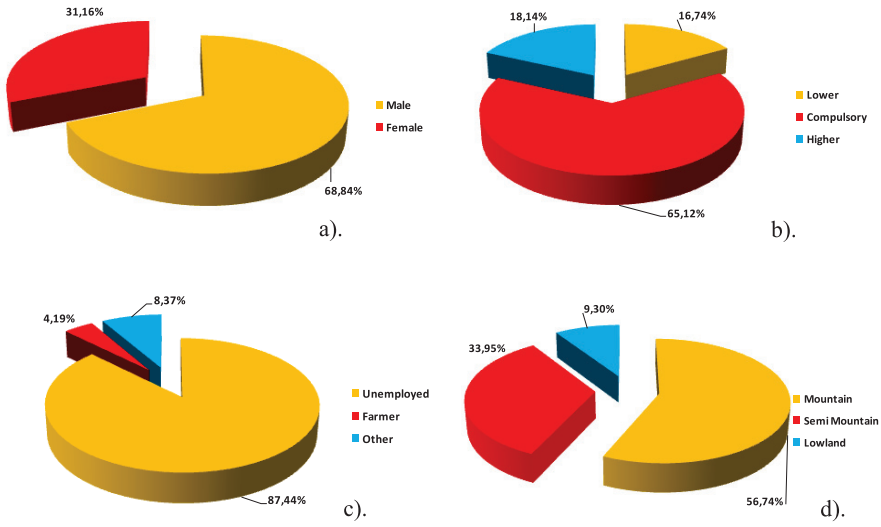


Figure 1. Percentage (%) distribution: a) sex, b) level of education, c) prior professional capacity and d) installation area, of the selected Young Farmers of Magnesia.

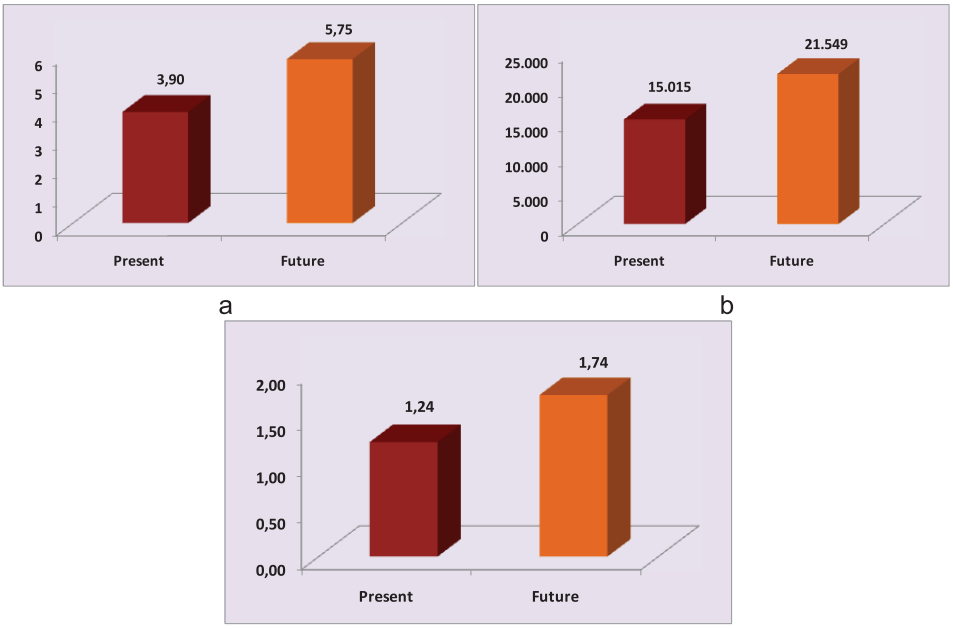


Figure 2. a) Number of acre (n.), b) Gross Value Added (€) - GVA of Crop Production, c) Human Work Units - HWU of Crop Production in the current and future state of the selected Young Farmers of Magnesia.

CONCLUSIONS

According to the results the Young Farmers intend to note an increase of 47% in the number of cultivated hectares, 50% in the number of animals and 73% in the number of bee in their future state. Observing the GVA of the three directions to their future state, a range of over 16.400 € is noted, an amount that can guarantee a dignified living of an agricultural family in Greek countryside. At the same time, the average price of the HWU of the three directions is expected to range at the level of 1.5, a result that highlights the need of covering the working requirements of the Agricultural Business by a second family person.

The full survey results show a clear increase in employment rates and revenue of farms. These can be a starting point in an attempt to increase the Gross Domestic Product of the country and reduce unemployment, while the parallel increase of knowledge of Young Farmers can contribute to production with high added value, which will be highly competitive in world affairs.

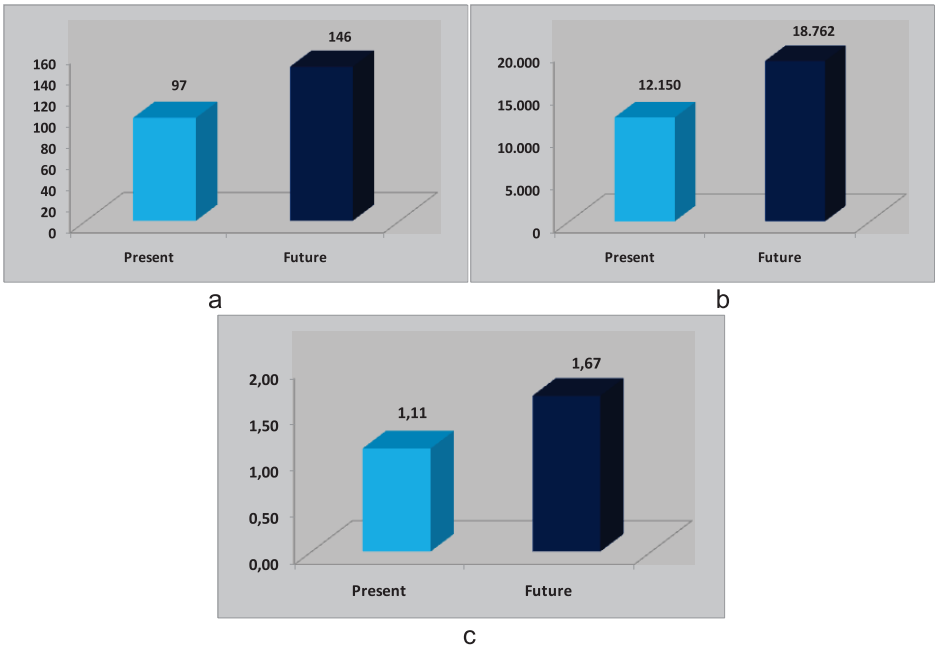
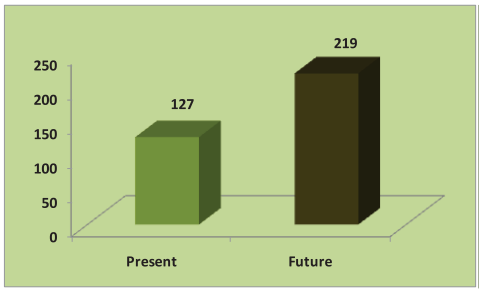


Figure 3. a) Sheep or goats Number (no.), b) Gross Value Added (€) - GVA of Animal Production, c) Human Work Units - HWU of Animal Production in the current and future state of the selected Young Farmers of Magnesia



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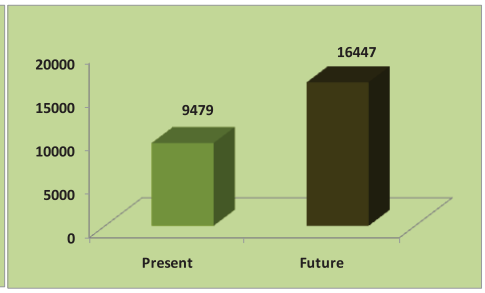

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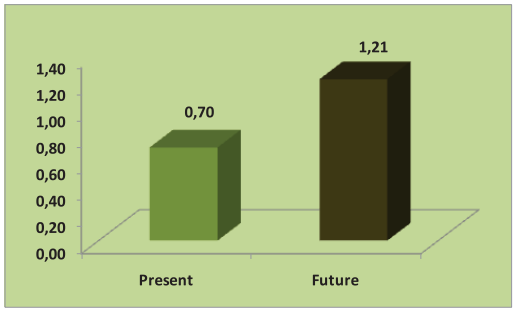
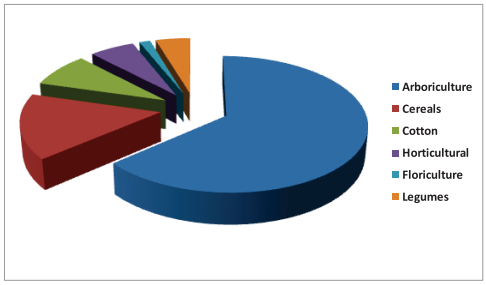


c

Figure 4. a) Beehives number (no), b) Gross Value Added (€) - GVA of Apiculture, c) Human Work Units - HWU of Apiculture in the current and future state of the selected Young Farmers of Magnesia.



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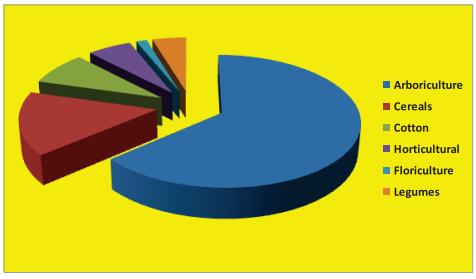

b

Figure 5. Percentage (%) distribution of crop species: a) current situation, b) future state of the selected Young Farmers of Magnesia.

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OPTIMIZATION OF PRODUCTION PROCESS FOR VEGETABLE GREENHOUSE CROPS

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Keywords*: optimization, greenhouse crop, production*

ABSTRACT

The economic crisis experienced by many European States is estimated to affect the eating habits of the population that suffers from its consequences. Modern demands for consumption of quality products should be combined with both respective sale prices and more environmentally friendly production processes, able to attract the consumers. The aim of this work was to optimize the production process in the cultivation of vegetables according to the frequency of price and sales quantities that are formed in the market during the year, the cycle of development and production of plants and the climatic conditions of the target areas.

INTRODUCTION

Greece doesn't have heavy industry and expertise like Nordic EU countries and must focus its GDP growth in tourism and agriculture sector (Lekkos et al., 2015). Food and agriculture sector (ie the agricultural sector and food processing, beverages and tobacco) contributed to 2014 by 7.2% and total gross value added, compared to 12% in 1995. It also represents 15% of total employment in Greece. The trade balance of agro-food products sector in Greece is in deficit. The agro-food sector products are the third largest category of exported products with 19% of total exports, and accounts for 14% of imports. Almost 69% of exports go to EU countries, while 80% of imports of this category come from EU countries. Greece contributes 3.0% of gross value added of the agricultural sector of the EU (Average 2012-2014). Of course the generated added value to agricultural production in Greece lags far behind its main competitors.

This paper focuses on actions that have to be undertaken in the agricultural sector in order agricultural enterprises through the revenue growth to become competitive in the global environment while simultaneously to be the country's growth driver. The aim of this work was to optimize the production process in the cultivation of vegetables in accordance with the frequency of price

and sales quantities are formed in the market during the year, the cycle of development and production of plants and the climatic conditions of the target areas. The immediate consequence of the above will be the reduction of output (energy, production loss), the proper allocation of items produced and the quantities and the increase in revenue of farms.

MATERIAL AND METHODS

For this purpose, data were collected from Vegetable Mega Market of Thessaloniki (http://www.kath.gr) and Vegetable Mega Market of Volos, for the years 2013 and 2014 for four (4) different kinds of vegetables. Data were collected for the vegetables that are presented at the table 1, during the years 2013 and 2014. Mainly this paper focuses on the price per kilogram or piece and simultaneously the quantity that have been sold at Vegetable Mega Market of Thessaloniki and Volos during the year. Data were collected for each day of the year and are presented at figures 1 and 2 with the mean value for each month.

Table 1. Vegetable species

Cucumber	Tomato	Lettuce	Pepper
			

Simultaneously the climatic conditions of the regions of Greece with most land under cover for vegetable crops were investigated. Ierapetra at Creta Island is the region with the most Greenhouses at Greece, followed from Thessaloniki, Athens and the region near the capital and finally Volos at Thessaly.

RESULTS AND DISCUSSIONS

The results of the processing of the vegetable market data showed the periodicity of optimal prices and quantities sold for horticultural products. More specifically, below follows the presentation is four crops of the twenty that are analyzed and it is observed that: i). cucumber has its highest price during January, February and March, ii). tomato during January, March and April, iii). lettuce during January, February and September to October, iv). and finally the peppers during January to April. Mismatch with the price was observed at the results with the variation of the quantities of selling of Vegetable Mega Market of Volos, where more quantities of the above products were absorbed by the market: i). for cucumber during months of July to September, ii). for tomato during months of June to October, iii). for lettuce during months of January and May and June, iv). and finally for peppers from May to August. The consequence of all the above, as discussed, was the fall in prices for the months with great production at prices below cost, with virtually unprofitable production prices for farmers.

The results of the climatic conditions led to the creation of weather graphs (Kittas 1996) that present average monthly values of temperature (^{o}C) day-night in combination with Solar Radiation (MJ m^{-2} d^{-1}) for the regions of Volos,

Thessaloniki, Athens and Ierapetra. Reading weather graphs transfer knowledge of climate data producers and allows them to plan the start of the growing season of vegetables not only for outdoor but also for crops under cover. At the same time they can see the needs for heating, artificial lighting, shading, ventilation and cooling for under cover crops that may be required to meet the best growing conditions.

Analyzing weather graph of Volos is observed that from early October until the end of April the night temperature (^{o}C) is lower than 15^{o}C, a temperature which is considered to be the minimum for optimal number of summer horticultural crops. Similar results are observed in the region of Thessaloniki with the temperature to remain below 15^{o}C and May. In contrast to the area of Ierapetra average night temperatures does not fall to such low levels as at the previous two areas while the duration that the temperature is below 15^{o}C, is from late December to mid-March. The analysis of the data above explains the comparative advantage of Crete over the areas of the mainland in energy consumption, as the requirement for heating during the winter months in crops under protection is for a shorter time and also for smaller temperature range.

Finally, a combined example is presented for crops of tomato and cucumber that is giving the transplanting period during the year according to the climatic conditions of the above areas, the beginning of the harvest period in relation to the best prices of the market. In the figures is presented the time of transplanting, the start of harvest time and the end of it.

CONCLUSIONS

Goal of this work was to create a standard facilitation culture plan of target regions producers, for the definition of net revenue, depending on the type of crop, the beginning and the end of the harvest period, the amount of product produced during the growing season and the climatic conditions. The use of culture plan in combination with the rotation of crops is expected to contribute decisively to the increase of the revenue of agricultural enterprises, the rational use of resources and time, and finally the competitiveness of enterprises in world affairs.

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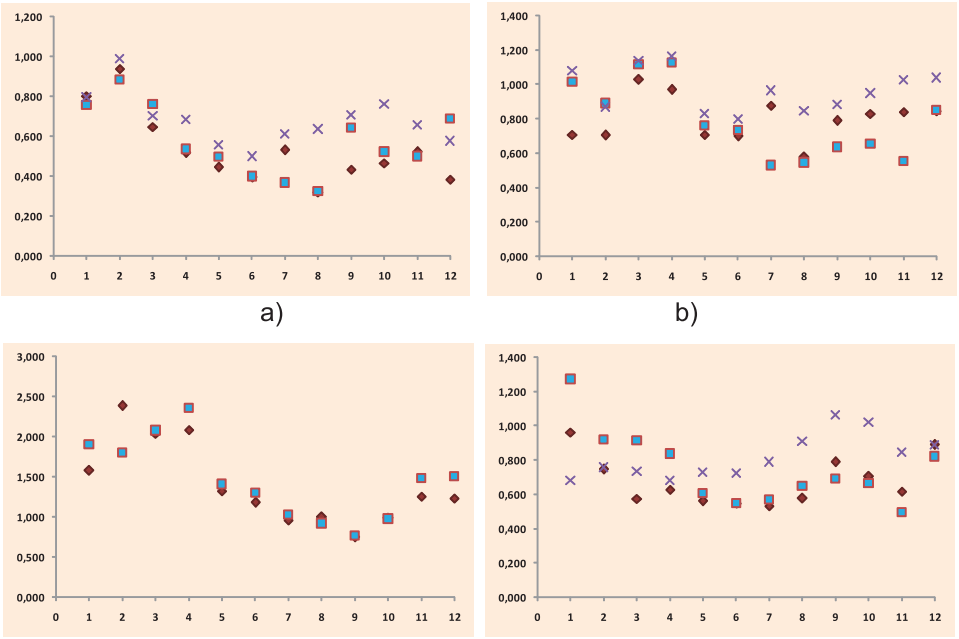


Figure 1. Price Variance (€): a) cucumber, b) tomato, c) lettuce and d) pepper in the Vegetable Mega Market of Volos and Thessaloniki each month for the years 2013 – 2014.

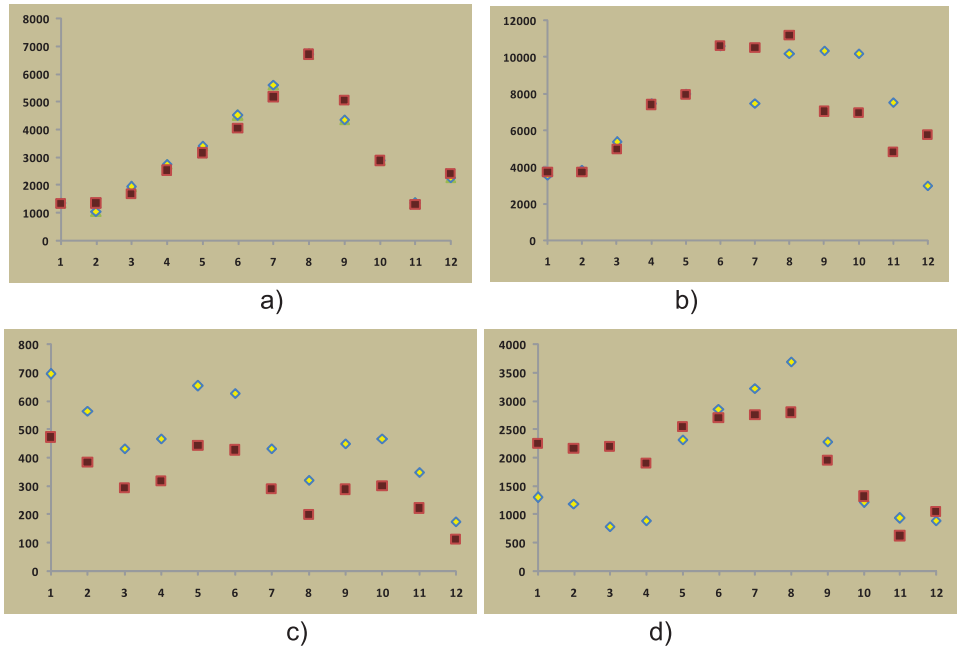
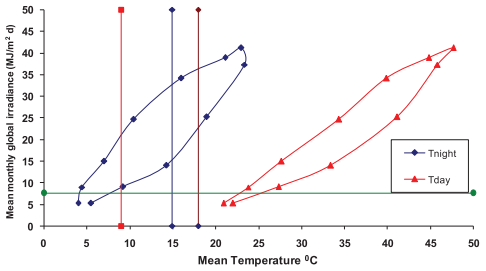


Figure 2. Variation quantities: a) cucumber (pcs.), b) tomato (kg), c) lettuce (kg) and d) pepper (kg) in Vegetable Mega Market Volos each month for the years 2013 to 2014.



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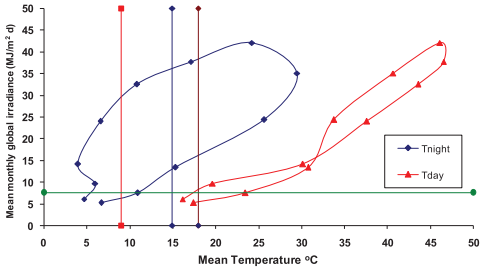

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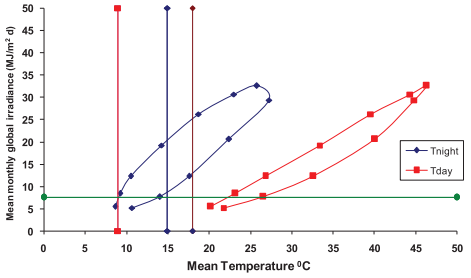

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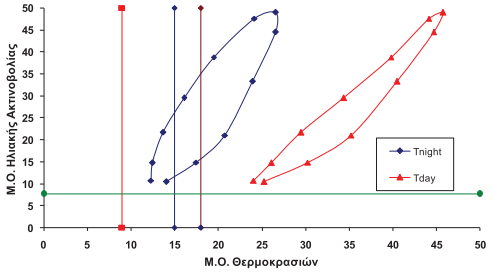
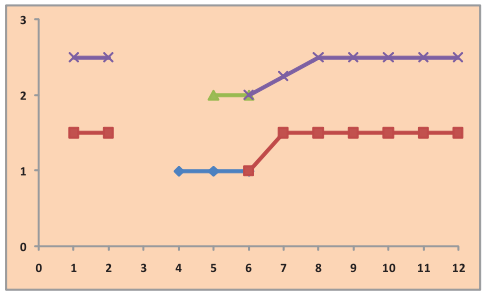


d)

Figure 3. Variation of temperature (ºC) & Solar Radiation (MJ m^{-2} d^{-1}) during the day and night of the region: a) Volos, b) Thessaloniki, c) Athens and d) Ierapetra.



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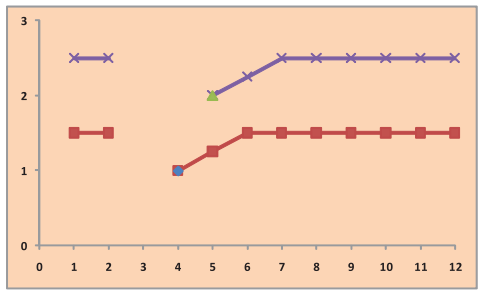

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Figure 4. Transplanting period and start harvesting period for the crops: a) tomato and b) cucumber in the regions of Thessaloniki (top) and Volos (down).

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STRUCTURE RESEARCH AND MANAGEMENT MEASURES OF ALDER RIPARIAN FOREST IN LAKE VOLVI, N. GREECE

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Keywords: *riparian forest, management, sructure, Alnus glutinosa,lake Volvi*

ABSTRACT

Volvi lake is a protected area that belongs to the National Park of lakes Koronia Volvi and Macedonian Tempi, wich belongs in Natura 2000 network, in the wetlands of the Ramsar Convention. In this lake a riparian forest survives, which is a remnant of a larger primeval riparian forest with significant ecological importance. The aim of this research is to study the structure of riparian alder stands, to assess their ecological value and propose measures for their management. The survey recorded that the riparian forest of Alnus glutinosa is one-storey forest, in wich the average Dbh is 52.10 cm. The natural regeneration of riparian forest species is non-existed. The stands of common alder need management measures because of the strong presence of human activities in the area.

INTRODUCTION

Riparian forests are the natural ecosystems which receive the most pressure from human activities. The management of these ecosystems belonged to the responsibilities of the forestry service. In the last decade with the establishment and operation of protected area Management Bodies (M.B.) the interest in the protection, conservation and recovery of riparian forests, particularly those belonging to one operator jurisdiction, has increased. The national Greek Forest Service has developed and implemented several studies concerning restoration of riparian forests such as forests at Volvi lake (Efthimiou et al. 2014), Nestos delta and Agras lake (Grigoriadis et al. 2016).

Riparian forests have significant ecological, scientific and research interest because they support rich biodiversity and there is currently lack of sufficient knowledge about them. The study of riparian forest structure is the basic tool for the ecological assessment and proper management (Efthimiou, 2000; 2012; Efthimiou et al 2015).

The alder is a riparian forest specie that occurs to a limited extent in the remaining riparian forests of the country. Forests of *Alnus glutinosa* are characterized as priority habitat and protected in accordance with the European Directive 92/43/EEC and this habitat have the code 91E0 (Korakis, 2015). One of the areas that grow natural stands of alder is the natural riparian forest next to Nea Apollonia of Volvi lake.

The riparian forest of Nea Apollonia in Volvi lake, is a protected area, which belongs: to the National Park of Lakes Koronia Volvi and Macedonian Tempi, the Natura 2000 network and the Ramsar's wetlands network. The management becomes by the Forest Service Office and Management Body of National Park of Lakes Koronia Volvi and Macedonian Tempi.

The aim of this research is to record and study the structure of alder riparian forest, ecological assessment and proposal management measures.

MATERIAL AND METHODS

A. Sample plots and data collection

In order to study the structure of the riparian forest of Nea Apollonia, three representative sample plots were established, 0.05 hectare (Ha) in size. In each sample plot were measured diameter at breast height (Dbh) and total height of all trees with a diameter greater than 4 cm. The measurements were made in Autumn 2012. Additionally all trees were classified according to the IUFRO classification system. The statistical analysis was carried out by the use of SPSS ver. 21.

B. Study area

As a research area selected the natural riparian forest of Lake Volvi, found near to Nea Apollonia (Map. 1). Located on the old highway Thessaloniki – Kavala and it is at a distance of 45 km from Thessaloniki. This is a natural riparian forest, a remnant of the large riparian forest that surrounded the ancient Mygdonia lake (Stravon). In the middle of the last century the area of riparian forest was almost three times the current (*source* Mnanagement Body of lakes Koronia-Volvi). This shrinkage of riparian forest shows intense pressure from human activities and especially changes in land use of the needs for new agricultural lands.

Map 1. Study area

The natural riparian forest of the study area occurs on a substrate comprising the fan alluvial, alluvial deposits, alluvial valleys, lake sediments. Located in West, SouthWest part of her Apollonia village with Dominant species: *Salix alba, Populus alba, Populus nigra, Ulmus minor, Alnus glutinosa*. Also important is the presence of climbing plants, *Periploca graeca, Humulus lupulus, Hedera helix*. In understorey *Rubus sp., Sambucus ebulus Phytolacca americana*, *Aristolochia clematitis*, *Urtica dioica* and *Parietaria officinalis* dominate. In the study area according to the national Natura 2000 data base observed seven species listed in the Annexes to Directive 92/43/EEC and 10 other important species listed

in the National Red Data list (Arabatzi et al 1996). In the region of the neighboring lakes Volvi and Koronia recorded 248 species of birds, a figure equal to 58% of the total of Greece, of which 106 nest in the area.

RESULTS AND DISCUSSIONS

The alder stands is only a small part of the riparian forest of the region. Upstairs tree dominates the species *Alnus glutinosa*. In Understorey, *Hedera helix, Humulus lupulus, Rubus sp., Solanum dulcamara* dominate.

By recording and analyzing the data structure of alder stands found that this is pure stands, at the stage from logs to thick logs, with an average diameter (Dbh) of 52.10 cm and an average height of 25.95 m. The highest tree found 36 m and the largest diameter was 100 cm.

The overall density of the cluster amounts to 139 stems per hectare (ha), with a total circular area 5.07 m^2 ha^{-1}. As shown in the Fig. 1, the alder having diameters from 30 cm to 100 cm and with a greater incidence in a diameter of 34 cm. The distribution of diameters classes appears in three partial diameters groups, the first comprising trees with diameters 30-38 cm, the second of 50-70 cm and the third is a few stems with diameters of 90-98 cm (Fig. 1).

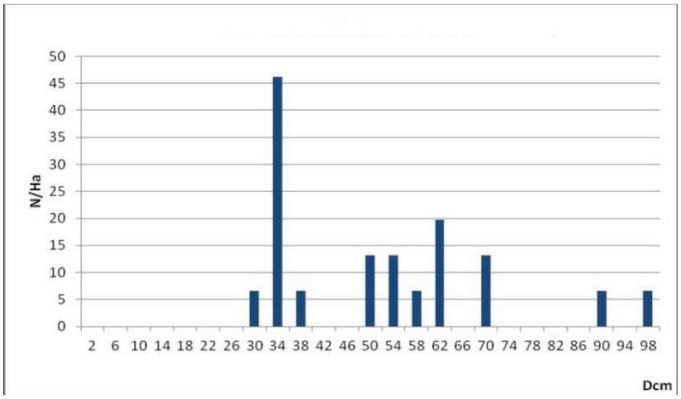

Figure 1. Histogram of diameter (D) distribution of *Alnus glutinosa* plots.

The distribution of the amount given in Figure 2 shows that it's single-storey stands of *Alnus glutinosa*. The vitality of common alder characterized as normal and have average price 18.09.

CONCLUSIONS

Pure stands of alder found in riparian forest of lake Volvi at Nea Apollonia, is a remnant of the natural riparian forest area after downsizing and conversion of more land to agricultural crops. The distribution of diameter's classes (Fig. 1) shows a strong human intervention in the stands of alder, with intense logging and grazing in the past. Another major problem of the forest is the absence of natural regeneration, as there were people with diameter less than 30 cm. This is probably due to continued grazing and easy access to it. It should be investigated although associated with possible fall of groundwater (from large irrigation needs for intensive agriculture in the region) or another possible factor that must be identified and suspended to ensure natural regeneration. Only in this way can ensure the existence

and future of riparian forest with alder. Much of the Understorey occupied by *Rubus* which may create conditions unsuitable for the germination of alder's seeds.

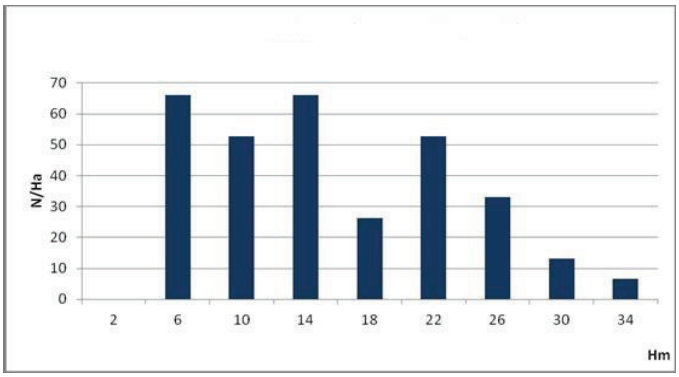

Figure 2. Histogram of height (H) distribution of *Alnus glutinosa* plots.

Some other measures of riparian forest management are the most effective and intensive protection, creation of fence in forest in places in which doesn't exist or has been destroyed, and of course putting obstacles to prevent direct and easy access to the forest. Traffic must be strictly controlled to guide accompaniment for ecotourism, environmental education and research. The artificial reforestation with alder may be another appropriate management measure, after scientific study drawing where appropriate locations will be indicated.

ACKNOWLEDGMENTS

The authors wish to thank the Forest Service of Stavros and the Management Body of lakes Koronia Volvi, for their help in the field work.

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THE STUDY OF SOIL WATER REGIME IN SOUTHERN MOLDAVIA WITH REFERENCE TO DEALU BUJORULUI VINEYARD

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Keywords*: rainfall, moisture, vine, water regime*

ABSTRACT

The vineyards in the south of Moldova are increasingly affected by climate change occurring over the last period. Reducing crop quality and quantity a hub of grape vineyards and affecting the occurrence of early winter frosts and excessive negative temperatures, the late spring frosts and drought of the vegetation period, result in significant losses for vineyard property. Witnessing lately to torrential rainfall, prolonged drought, excessive years of normal or dry years followed by rain. All these aspects influence of soil water reserves have mostly hydric deficit since June. The paper presents analysis of rainfall and soil humidity regime. For analysis of rainfall were recorded at weather station data used to SCDVV Bujoru. They collected soil samples monthly, on the horizon 0-100 cm, from 20 to 20 cm. With hydro index was calculated soil moisture in the soil available. Analyzed during the early vegetation period the soil water reserve is located in the humidity range of 55-70% of assets and soil water deficit is greatest in August.

INTRODUCTION

Climate variability affects all sectors of the economy, but agriculture is the sector most vulnerable given the dependence on weather developments during the growing season of crops and increasing the duration and intensity of dangerous weather phenomena in the context of global warming (ANM 2014). Changes in climate regime falls within the global context, particularization geographic region in which our country is located. Today we are witnessing global change in climatic factors due to the amplification of global warming caused by the greenhouse effect. Climate change occurred more frequently in the last decades by increasing air temperatures, a considerable decrease of precipitation (rain and snowfall) and extreme weather events (Enache et al. 2007). Soil water is the most limiting factor of agriculture productivity in most parts of the world. The plant growth and crop yield (Havlin et al. 1999) are primarily affected by soil water availability during the growing season, which depends heavily upon soil water recharge, summer precipitation, and efficiency of soil water storage in the profile.

MATERIAL AND METHODS

The research was performed in plantations Research and Development Station for Viticulture and Winemaking Bujoru. They were processed and analyzed by specialized data on precipitation and soil water content accessible on 0-100 cm

profile. In assessing the potential resources available precipitation were considered data recorded at the weather station Tg. Bujor (AgroExpert system). Have been characterized the months in the period 2006-2015, in terms of rainfall. If monthly quantities of water were 25% below the average multiannuality months were considered dry, with rainfall deficit. The months with the amount of water greater than 25% above the annual average rainy months were considered surplus rainfall. The months with the amount of water greater than 25% above the annual average rainy months considered were, with surplus rainfall. Months the amount of rainfall was between -25% ÷ 25% of the annual average were considered normal. In years when there were rainy months and months dry have made compensation proportionate, so that year was considered normal when the number of rainy months was equal to the months dry or was considered rainy or dry if the respective number of months rainy or dry was higher. Years when there was no one months registered rainy or dry, was regarded as truly normal years (Topor 1964).

RESULTS AND DISCUSSIONS

Observations and measurements were made during 2006-2015 and taking into account the intended purpose data obtained were compared to the annual average. Monthly rainfall were compared to the annual average and has been established the percent deviation positive or negative from normal (table 1, 2).

Table 2

Deviation from multiannual average of the precipitation(%)

month	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
I	26.0	139.5	-34.4	117.7	-40.5	-29.3	82.8	60.0	-21.9	25.6
II	-43.7	20.3	-93.2	10.4	13.5	-30.2	32.3	83.3	-75.0	85.4
III	52.1	61.4	45.7	52.1	-58.8	-79.8	-65.5	47.6	9.4	121.0
IV	48.5	-60.2	3.3	-64.9	-27.1	46.8	-49.0	-12.3	98.4	-12.3
V	-16.7	-34.8	26.3	-40.8	115.0	-32.9	141.3	86.7	-91.5	-71.2
VI	7.9	33.9	-46.5	20.6	77.2	-37.2	-80.8	25.8	-46.5	-16.4
VII	37.0	-98.0	9.9	-38.8	101.6	85.0	-46.3	-63.2	67.5	-54.5
VIII	89.5	17.9	-79.8	-71.8	-17.3	-42.4	-52.5	67.9	13.2	53.1
IX	-14.6	-9.4	23.6	39.0	-49.9	-87.1	-39.0	405.2	-91.6	-45.4
X	-76.2	83.3	-33.3	8.6	135.8	-13.6	29.6	39.5	37.0	128.4
XI	-84.1	103.7	-47.8	-51.2	-26.1	-99.3	-76.9	31.5	81.0	277.6
XII	-69.2	120.7	89.8	6.9	69.2	-67.9	235.4	-16.6	43.0	-96.1

Depending on the monthly rainfall recorded, the numbers of years normal, rainy and dry seasons are presented in table 3 (Topor 1964). In the period 2006-2015 was alternation of 1-2 normal years followed by 2 years of drought. The normal and droughty years were generally grouped. It totaled the period 2006-2015, the number of rainy, droughty and normal years. From of ten years analyzed, five were normal, four droughts and one rainy (figure 1).

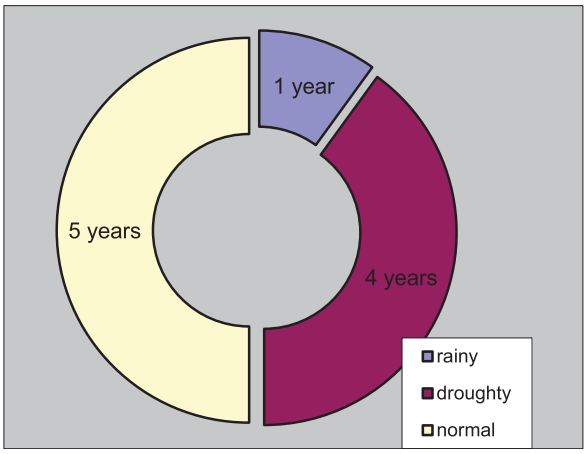

Figure 1. Characterization of the years.

It was analyzed over a period of ten years, months, in terms of rainfall, both annually as well as during the vegetation and winter period (figure 2). In droughty years the dry months were recorded in the vegetation period, especially in July, August and September (figure 2). The driest years were 2011 and 2012. During 2011 there were 9 drought months of which four were deficient during the vegetation period in 2012 was seven months deficient from that 5 during the vegetation period.

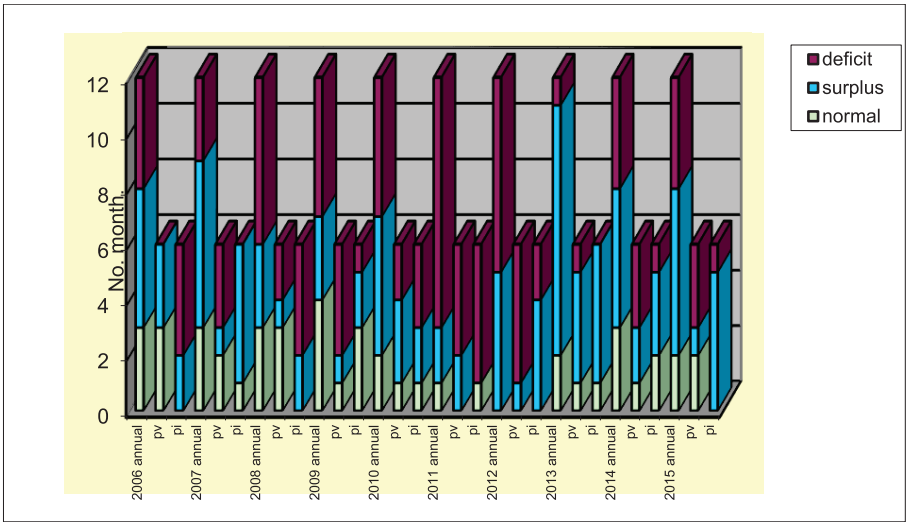

Figure 2. Normal, excess and deficit rainfall, annually and during the growing season and winter.

In the analyzed period, 40% of the months were droughty, 19.1% normal and 40.9% months surplus. During the vegetative period drought months vegetation predominates (45%) and the normal months are in proportion of 23.3%

(figure 3). Soil moisture was presented per 0-100 centimeters profile (table 4). It was influenced both by the evolution of precipitation and vegetation phenophase.

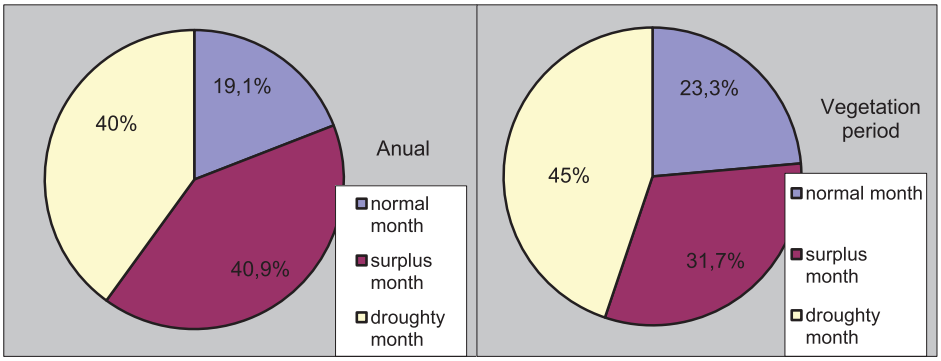

Figure 3. Annual pluviometric characterization and in the vegetation period.

Initial water reserve in the soil on April 1 is influenced by both of the previous year character as well as the winter rainfall. Except for the years 2010, 2014 and 2015 when the initial reserve minimum moisture content is lower, the soil moisture content in rest of the years on April 1, It is superior to its but not reach the level of field water capacity. July onwards, the soil moisture in most years it is lower than minimum moisture plafon reaching in September at 10-15% of the range of available moisture content (figure 4). The most affected year was 2012 when soil moisture tends to wilting coefficient since July.

Table 4

The dynamics of soil moisture on the vegetation period, average per 0-100 centimeters profile

Month	Year									
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
	Soil moisture (mc/ha)									
IV	2045	1693	1748	1915	1496	2230	1655	1889	1580	1490
V	1796	1439	1379	1588	1635	1862	1695	1603	1942	1512
VI	1273	1133	1129	1280	1665	1913	1596	1877	1857	1378
VII	1392	1400	1027	1502	1585	1626	908	1718	1424	1000
VIII	1044	1247	1041	1038	1558	1520	805	937	1092	1620
IX	1104	980	1062	1208	1312	1193	821	1049	943	1029
FC =2615			WC=611			MMC=1613			RAMC=2004	

CONCLUSIONS

In Dealul Bujorului vineyard in the period 2006-2015, hydrological risk was emphasized. Evolution rainfall directly influenced soil hydric regime of vineyards. Is remarked downward a trend in rainfall especially during the vegetation period.

In droughty years the dry months were recorded in the vegetation period, especially in July, August and September. The driest years were 2011 and 2012. During 2011 there were 9 drought months of which four were deficient during the

vegetation period in 2012 was seven months deficient from that 5 during the vegetation period.

It was noted an alternation of 1-2 normal years followed by 2 years of drought. The normal and droughty years were generally grouped.

The soil moisture and degree of water supply were influenced by developments accessible precipitation, diurnal average consumption of the vine and the ability to restore the water supply in winter period.

July onwards, the soil moisture in most years it is lower than minimum moisture plafon reaching in September at 10-15% of the range of available moisture content. The most affected year was 2012 when soil moisture tends to wilting coefficient since July.

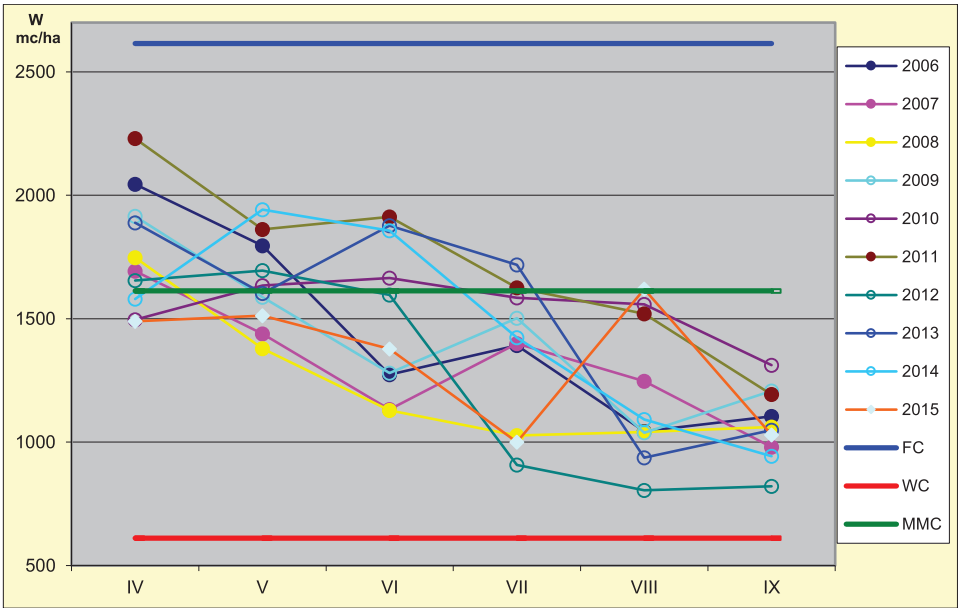

Figure 4 Evolution of soil moisture compared to the coefficient of wilting, field capacity and the minimum moisture content

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***2014 ANM Cod de bune practivi agricole în contextul schimbarilor climatice actuale şi previzibile

Table 1

Monthly distribution of precipitation in the 2006-2015 period (mm)

Month	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Normal
I	27.1	51.5	14.1	46.8	12.8	15.2	39.3	34.4	16.8	27.0	21.5
II	10.8	23.1	1.3	21.2	41.0	13.4	25.4	35.2	4.8	35.6	19.2
III	40.6	43.1	38.9	40.6	11.0	5.4	9.2	39.4	29.2	59.0	26.7
IV	54.2	14.9	37.7	12.8	26.6	53.6	18.6	32.0	72.4	32.0	36.5
V	40.0	31.3	60.6	28.4	103.2	32.2	115.8	89.6	4.1	13.8	48.0
VI	77.7	96.4	38.5	86.8	127.6	45.2	13.8	90.6	38.5	53	72.0
VII	31.8	1.0	55.5	30.9	101.8	93.4	27.1	18.6	84.6	23	50.5
VIII	92.1	57.3	9.8	13.8	40.2	28.0	23.1	81.6	55.0	74.4	48.6
IX	34.4	36.5	49.8	56.0	20.2	5.2	24.6	203.6	3.4	22.0	40.3
X	7.7	59.4	21.6	35.2	76.4	28.0	42.0	45.2	44.4	74.0	32.4
XI	4.7	60.1	15.4	14.4	21.8	0.2	6.8	38.8	53.4	111.4	29.5
XII	9.4	67.3	57.9	32.6	51.6	9.8	102.3	4.1	43.6	1.2	30.5
Annual	430.5	541.9	401.1	419.5	634.2	329.6	448.0	713.1	450.2	526.4	455.9
vp	330.2	237.4	251.9	228.7	419.6	257.6	223.0	516.0	258.0	218.2	295.9

Table 3

The rating year depending on the character of the month (No)

Specification	2006		2007		2008		2009		2010		2011		2012		2013		2014		2015	
	a	vp	a	vp	a	vp	a	vp	a	vp	a	vp	a	vp	a	pv	a	vp	a	vp
normal month	3	3	3	2	3	3	4	1	2	1	1	0	0	0	2	1	3	1	2	2
month surplus	5	3	6	1	3	1	3	1	5	3	2	2	5	1	9	4	5	2	6	1
month deficit	4	0	3	3	6	2	5	4	5	2	9	4	7	5	1	1	4	3	4	3
rating year	N		N		D		D		N		D		D		R		N		N	

a- annual; vp-vegetation period; N-norm Plot Area : D- droudhty

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THE BIODEGRADATION OF *POSIDONIA OCEANICA* L. AND *OCIMUM BASILICUM* L. FOLIAR TISSUES IN SOIL DURING INCUBATION, AND THEIR EFFECTS ON SOIL CHEMICAL PROPERTIES

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Keywords: *Posidonia oceanica, basil, soil chemical properties*

ABSTRACT

The present work was carried out in vitro (incubation experiment), and five g of air dried and well milled Posidonia oceanica or basil foliar tissues, were applied and mixed with 50 g of soil in two separate experiments, each in four folds. All treatments were incubated for 15 weeks at a constant temperature of 28 ^{0}C and after the incubation period, suitable chemical analyses were performed. The results showed that the basil are subjected too much greater biodegradation, in comparison to the foliar tissue of posidonia oceanica. The basil as compared with the oregano, increased the soil salinity, and elevated the available contents of P, K, Cu and Mn, while and both materials increased the content of samples in available forms Zn and Fe.

INTRODUCTION

In modern alternative forms of agriculture (biological agriculture) is mandatory to replace chemicals with natural additives. Between them, the plant debris for their role in the soil fertility, the plant essential oils for their role as pesticides against soil-borne pathogens (Gravanis et al. 2004). The addition of various materials in the soil, affects the composition and biological activity of microflora, which determines the biochemical status of soil fertility. When applying of organic fertilizers in the soil, dominate microbial nutrition (Gougoulias et al. 2013, Riber et al. 2014).

Our previous studies have shown, the effect of oregano and basil on degradation of organic fertilizers, and it was found that the presence of foliar tissues of oregano, act a slowing effect on degradation of organic fertilizer, while the presence of basil, accelerate it (Chouliaras et al. 2007, Gougoulias et al. 2010).

Posidonia oceanica is a Mediterranean seagrass that produces onshore deposits. Many authors have studied the use of *Posidonia oceanica* as substitutes or complements to peat for substrate preparation with satisfactory results or as a Growing Medium for the Soilless Cultivation of Tomato (Mininni et al. 2015,

Montesano et al. 2013). Also, studies have shown that the *Posidonia oceanica*, can be used as composting material with poultry droppings for improving soil fertility for horticulture (Tangour et al. 2015), while according to (Grassi et al. 2015) seagrass-based compost is a promising, sustainable fertilizer. While there are some potential for the use of banquettes of *Posidonia oceanica* as forage source for ruminant nutrition (Castillo et al. 2014).

In this work the biodegradation in soil of *Posidonia oceanica* was studied in vitro, in comparison with the biodegradation of basil, and the consequences of that biodegradation on chemical properties of soil were approached.

MATERIAL AND METHODS

In coastal areas of the island Skopelos accumulate large quantities of seaweed-sea *Posidonia oceanica*, and because of the environmental problems created transported to landfills. October 2015 held the collection of *Posidonia oceanica* from the coastal areas of island Skopelos, Greece.

Because of the high salinity found in the *Posidonia oceanica,* EC =16.85 dS m^{-1}, extract (1part sample :10 part H_2O), stirred the material for one hour with distilled water, ratio (1: 5), filtration, air dried, and use. *Ocimum basilicum* cultivated in the experimental farm of Thessaly TEI.

Incubation experiment: 5 g air-dried and milled leaf tissues of *Posidonia oceanica* or basil, were applied to 50g of soil (Table 1) and their effects on the chemical properties of soil, after 15 weeks of incubation at 28 ^oC were studied. The experimental design was completely randomized with four replications. During the first three weeks of the incubation period, the moisture was maintained at two-thirds of field capacity, but for the next three weeks the soils were left to dry. This process was repeated until the end of the incubation period according to (Wu and Brookes 2005) they reported that the alternation of drying and rewetting soil samples enhances mineralization of both soil biomass organic matter and non-biomass organic matter. Soil aeration and regulation of moisture enhance the growth and metabolic activity of aerobic soil microorganism (Gordon et al. 2008; Chouliaras 1994). At the end of the incubation period, soil samples were analyzed.

Methods of analyses: Samples were analyzed using the following methods which are referred by (Page et al. 1982).

Organic matter was analyzed by chemical oxidation with 1 mol L^{-1} $K_2Cr_2O_7$ and titration of the remaining reagent with 0.5 mol L^{-1} $FeSO_4$.

Both ammonium and nitrate nitrogen were extracted with 0.5 mol L^{-1} $CaCl_2$ and estimated by distillation in the presence of MgO and Devarda's alloy, respectively. Available P forms (Olsen P) was extracted with 0.5 mol L^{-1} $NaHCO_3$ and measured by spectroscopy. Exchangeable forms of potassium and sodium ware extracted with 1 mol L-1 CH3COONH4 and measured by flame Photometer. Available forms of Mn, Zn, and Cu were extracted with DTPA (diethylene triamine pentaacetic acid 0.005 mol L^{-1} + $CaCl_2$ 0.01 mol L^{-1} + triethanolamine 0.1 mol L^{-1}) and measured by atomic absorption.

Organic phosphorus was measured after mineralization by combustion of the sample and subtraction of the mineral phosphorus amounts, which had previously been estimated in the laboratory. The mineral amounts were extracted with 1 mol L-1 H2SO4 and all forms were measured by spectroscopy.

For the determination of total metals Mn, Cu and Zn , 1 g of material, digestion at 350 ^0C + 10 ml HNO_3 + 5 ml $HCLO_4$. According to the method

described by (Varian 1989), the samples were analyzed by Atomic Absorption (Spectroscopy Varian Spectra AA 10 plus), with the use of flame and air-acetylene mixture.

Table 1

Chemical properties of soil samples, posidonia foliar tissues and basil

Property	Soil	*Posidonia oceanica* Air dried material	Basil, air dried material
Texture	Sandy Loam	-	-
pH (1part : 5parts H_2O)	7.77 ± 0.3	-	-
Electrical conductivity, extract (1part substrate:5parts H_2O) dS m^{-1}	0.50 ± 0.03	2.56 ± 0.3 extract (1:10)	-
Organic matter (%)	0.85 ± 0.04	-	-
$CaCO_3$ (%)	8.60 ± 0.7	-	-
N -total (g kg^{-1})	1.56 ± 0.13	4.55 ± 0.4	26.9 ± 1.8
$N\text{-}NH_4^+$ (mg kg^{-1})	34.8 ± 5.2	-	-
$N\text{-}NO_3^-$ (mg kg^{-1})	109.4 ± 13.4	-	-
Exchangeable-K (mg kg^{-1})	266.8 ± 9.4	-	-
K-Total (g kg^{-1})	5.22 ± 0.2	0.71 ± 0.05	37.7 ± 1.7
Exchangeable-Na (mg kg^{-1})	214.4 ±8.5	-	-
Na-Total (g kg^{-1})	0.60 ± 0.02	10.67 ± 0.5	2.81 ± 0.17
CEC (cmol kg^{-1})	18.6 ± 0.8	-	-
P -Olsen (mg kg^{-1})	12.3 ± 2.2	-	-
P -Total (g kg^{-1})	0.35 ± 0.02	0.48 ± 0.04	5.7 ± 0.6
Cu –DTPA (mg kg^{-1})	1.18 ± 0.04	-	-
Zn -DTPA (mg kg^{-1})	1.03 ± 0.08	-	-
Mn -DTPA (mg kg^{-1})	1.74 ± 0.08	-	-
Cu –Total (mg kg^{-1})	-	44.8 ± 3.3	47 ± 2.9
Zn -Total (mg kg^{-1})	-	61.6 ± 3.7	68 ± 3.7
Mn -Total (mg kg^{-1})	-	66.1 ± 7.1	310 ± 17.5
Fe-Total (g kg^{-1})	-	326 ± 14.2	140 ± 6.2

Data represent average means and SE deviation. (n)=4

Statistical analysis: Data analysis was made using the MINITAB (**Ryan et al. 2005)** statistical package. Analysis of variance was used to assess treatments effect. Mean separation was made using Tukey's test when significant differences (P=0.05) between treatments were found.

RESULTS AND DISCUSSIONS

The results of the laboratory experiment (Figure 1) showed that basil organic matter added to the soil, was subjected to strong biodegradation (about 36.5 %), in comparison with the *Posidonia oceanica* foliar tissues which, after a long incubation period, was found to be very resistant.

Nitrate forms and Ammonium content (Table 2) either by the addition of Posidonia or by the addition of basil, was not showed significantly differences. The available forms of P were increased by Posidonia or basil treatments. Moreover the greatest increase was observed when basil were added.

The addition of Posidonia or basil increased both the Zn-available and Fe-available forms.

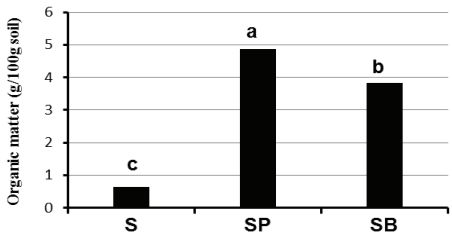

Figure 1. Effect of posidonia and basil on soil content in organic matter. (Bar values with the same letter on the top are not significantly different according to Tukey test (P > 0.05)); S, control (soil); SP, posidonia 5 g per 50 g of soil; SB, basil 5 g per 50 g of soil.

The addition of Posidonia or basil increased Mn-available forms, the greatest increase of Mn-available was observed where basil was added. Also, the addition of basil increased Cu-available forms, while it was not changed by the addition of Posidonia.

Table 2

Effect of *Posidonia oceanica* and *Ocimum basilicum* on soil content

Treatments	Property						
	Available forms (mg kg^{-1} soil)			DTPA - (mg kg^{-1} soil)			
	P-Olsen	N-NH_4^+	N-NO_3^-	Cu	Zn	Mn	Fe
S	14.2c	23.8a	62.6a	1.20b	1.11b	1.08c	0.90b
SP	48.8b	14.0a	42.0a	1.68b	21.98a	16.41b	3.40a
SB	128.0a	11.2a	56.4a	2.40a	20.20a	29.20a	3.36a

S, control (soil); SP, 5 g *Posidonia* per 50 g soil; SB, 5 g basil per 50 g soil; Columns with the same letter do not differ significantly according to the Tukey's test (P=0.05).

The organic-P decreased by the presence of plant tissues *Posidonia oceanica* and basil, in comparison with the control (Table 3), a finding that should be related to the conditions of degradation of organic material in the soil. Also the available forms of exchangeable-K were increased by *Posidonia oceanica* or basil treatments, while the greatest increase, was also observed where basil was added. The exchangeable Na forms, were increased by *Posidonia oceanica* or basil treatments, while the greatest increase, was observed where *Posidonia oceanica* was added. Electrical conductivity were increased by Posidonia oceanica or basil treatments, while the greatest increase, was observed where basil was added, due to the greater biodegradation of organic matter, and to ions liberation, while it was not changed by the addition of oregano foliar tissues. The decrease in the value of pH was greater by the addition of algae when compared to the corresponding one of oregano.while the pH either by the addition of *Posidonia oceanica* or by the addition of basil, was not showed significantly differences.

Total Na or total K and P contents were increased by the addition of Posidonia and of basil (Table 4). Moreover the greatest increase of total Na was observed where Posidonia was added, this remark is explained by the higher content of Posidonia in Na, while the greatest increase of total K or total P was observed where basil was added. Also, the addition of Posidonia or basil increased both the total Cu or total Zn.

Table 3

Effect of *Posidonia oceanica* and *Ocimum basilicum* on soil content

Treatments	Property				
	Exchangeable forms (mg kg^{-1})		(mg kg^{-1})	(Extract 1: 5 in water)	
	Na	K	P-organic	EC (dS m^{-1})	pH
S	207.0c	266.8c	89.2a	0.52c	7.69a
SP	2610.0a	302.7b	37.6c	0.85b	7.66a
SB	869.4b	2020.0a	69.0b	1.14a	7.49a

S, control (soil); SP, 5 g posidonia per 50 g soil; SB, 5 g basil per 50 g soil; EC: Electrical conductivity; Columns with the same letter do not differ significantly according to the Tukey's test (P=0.05).

The addition of basil increased total Mn, while it was not changed by the addition of Posidonia. Contrary, the addition of Posidonia increased total Fe, while it was not changed by the addition of basil.

Table 4

Effect of *Posidonia oceanica* and *Ocimum basilicum* on soil content

Treatments	Property						
	Total forms (mg kg^{-1} soil)						
	Na	K	P	Cu	Zn	Mn	Fe
S	388.2c	3014.0c	375.2c	16.00b	48.2b	559.0b	740.6b
SP	5750.0a	5239.6b	2170.0b	24.22a	219.6a	544.9b	3354.4a
SB	1820.0b	9820.0a	8240.0a	22.80a	224.5a	5998.8a	762.0b

S, control (soil); SP, 5 g Posidonia per 50 g soil; SB, 5 g basil per 50 g soil; Columns with the same letter do not differ significantly according to the Tukey's test (P=0.05).

CONCLUSIONS

The results of the experiment showed that the foliar tissues of Posidonia added in soil, are subjected to less degradation, in comparison with the tissues of basil, after a long incubation period. The tissues of basil compared with tissues of Posidonia, increased the content of the samples of total salts and available forms P, K, Cu and Mn. Moreover, no significant change between the control and the interventions with the tissues of Posidonia and basil, are found in the content of samples in inorganic forms of nitrogen (NH_4^+ and NO_3^-). These results, confirm the role of posidonia and basil as organic soil amendment, and very possibly is important components for composting products.

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THE BIODEGRADATION OF DRY BLOOD IN SOIL, AND EFFECTS FROM MIXTURE MANURE AND DRY BLOOD ON SOIL CHEMICAL PROPERTIES

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Keywords: *dray blood, manure; soil chemical properties*

ABSTRACT

The present work was carried out in vitro (incubation experiment), and five g of dry blood were applied and mixed with 50 g of soil. Also manure (7.14 g) mixed at four different ratios 0, 0.3, 0.6 0.9 of dry blood, was added to 50 g of soil. The results showed that the decomposition of soil organic matter that added as manure in soil, was higher of the decomposition of soil organic matter that added as dry blood in soil. Moreover, that decomposition of soil organic matter added as manure or preexisted organic matter in soil, was higher by dry blood biomass addition, where dry blood was incorporated at 0.3 g per 50 g of soil. The addition of dry blood in the soil, increased available forms of ammonium, P, Zn and Fe. The addition of dry blood in the mixture (soil plus manure), at the two greater rates, increased nitrate forms of nitrogen, the cation exchange capacity, the electrical conductivity, and total forms of Cu and Zn.

INTRODUCTION

The amendment of cultivated soil with organic materials, affects the chemical, physical and biological properties of the soil (Diacono και Montemurro 2010, Herath et al. 2013). The use of organic materials, has been adopted widely, because of biodegradation of soil organic matter by microorganisms of soil, and improve soil fertility (Gomez et al. 2014, Gougoulias et al. 2014). The amendments of soil using compost from agricultural waste, is an agricultural practice to improve soil fertility, contributing to environmental protection (Poulsen et al. 2013). Moreover, animal by-products is a source of nitrogen (Gaskell and Smith 2007).

The aim of this research was to investigate the effect on soil organic matter and on soil chemical properties of the application of dry blood.

MATERIAL AND METHODS

The manure of the experiment obtained from the farming establishments of TEI of Thessaly, while the soil derived from the same region. The blood obtained from the municipal slaughterhouses of Larissa, was dried at 105 ^{0}C and was used.

Incubation experiment: In this study, 5 g dry blood containing 1.04 g of organic matter (Table 1) was added to 50 g of soil air-dried, poor in organic matter. Also, 7.14 g of a composting material (manure) containing 2 g of organic matter, were added to 50 g of the soil. Into 50 g of this soil plus 7.14 g of the composting material (manure), 0, 0.3, 0.6 and 0.9 of dry blood were added and their effects on the chemical properties of soil, after 15 weeks of incubation at 28 ^{o}C were studied. The experimental design was completely randomized with four replications. During the first three weeks of the incubation period, the moisture was maintained at two-thirds of field capacity, but for the next three weeks the soils were left to dry. This process was repeated until the end of the incubation period according to (Wu and Brookes 2005) they reported that the alternation of drying and rewetting soil samples enhances mineralization of both soil biomass organic matter and non-biomass organic matter. Soil aeration and regulation of moisture enhance the growth and metabolic activity of aerobic soil microorganism (Gordon et al. 2008). At the end of the incubation period, soil samples were analyzed.

Methods of analyses: Samples were analyzed using the following methods which are referred by (Page et al. 1982).

Organic matter was analyzed by chemical oxidation with 1 mol L^{-1} $K_2Cr_2O_7$ and titration of the remaining reagent with 0.5 mol L^{-1} $FeSO_4$.

Both ammonium and nitrate nitrogen were extracted with 0.5 mol L^{-1} $CaCl_2$ and estimated by distillation in the presence of MgO and Devarda's alloy, respectively.

Available P forms (Olsen P) was extracted with 0.5 mol L^{-1} $NaHCO_3$ and measured by spectroscopy.

Exchangeable forms of potassium and sodium ware extracted with 1 mol L-1 CH_3COONH_4 and measured by flame Photometer.

Available forms of Mn, Zn, and Cu were extracted with DTPA (diethylene triamine pentaacetic acid 0.005 mol L^{-1} + $CaCl_2$ 0.01 mol L^{-1} + triethanolamine 0.1 mol L^{-1}) and measured by atomic absorption.

Organic phosphorus was measured after mineralization by combustion of the sample and subtraction of the mineral phosphorus amounts, which had previously been estimated in the laboratory. The mineral amounts were extracted with 1 mol L-1 H_2SO_4 and all forms were measured by spectroscopy.

For the determination of total metals Mn, Cu and Zn , 1 g of material, digestion at 350 ^{0}C + 10 ml HNO_3 + 5 ml $HCLO_4$. According to the method described by (Varian 1989), the samples were analyzed by Atomic Absorption (Spectroscopy Varian Spectra AA 10 plus), with the use of flame and air-acetylene mixture.

Statistical analysis: Data analysis was made using the MINITAB (Ryan et al. 2005) statistical package. Analysis of variance was used to assess treatments effect. Mean separation was made using Tukey's test when significant differences (P=0.05) between treatments were found.

RESULTS AND DISCUSSIONS

The results of the laboratory experiment showed that decomposition of soil organic matter added as manure or preexisted organic matter in soil, was higher by dry blood biomass addition, where dry blood was incorporated at 0.3 g per 50 g of soil (Figure 1). Moreover, decomposition of soil organic matter that added as

manure in soil, was higher of the decomposition of soil organic matter that added as dry blood in soil.

Table 1

Chemical properties of soil samples, manure and dry blood

Property	Soil	Manure air dried material	Blood dried material
Texture	Sandy Loam	-	-
pH (1part : 5parts H_2O)	7.87 ± 0.4	7.25 ± 0.34	8.67 ± 0.3
Electrical conductivity, extract (1part substrate:5parts H_2O) dS m^{-1}	0.52 ± 0.03	1.43 ± 0.05	2.80 ± 0.2
Organic matter (%)	0.82 ± 0.04	28.0 ± 1.1	-
$CaCO_3$ (%)	8.56 ± 0.7	-	-
N -total (g kg^{-1})	1.58 ± 0.10	7.77 ± 0.3	15.82 ± 0.8
$N\text{-}NH_4^+$ (mg kg^{-1})	34.8 ± 2.2	-	-
$N\text{-}NO_3^-$ (mg kg^{-1})	69.4 ± 5.4	-	-
Exchangeable-K (mg kg^{-1})	226.8 ± 8.6	-	-
K-Total (g kg^{-1})	5.11 ± 0.08	2.74 ± 0.1	0.55 ± 0.02
Exchangeable-Na (mg kg^{-1})	204.8 ± 5.5	-	-
Na-Total (g kg^{-1})	0.57 ± 0.01	0.46 ± 0.03	0.70 ± 0.03
CEC (cmol kg^{-1})	18.2 ± 0.6	-	-
P -Olsen (mg kg^{-1})	10.1 ± 1.9	-	-
P -Total (mg kg^{-1})	342.8 ± 0.02	214.4 ± 11	11.8 ± 1.6
Cu –DTPA (mg kg^{-1})	1.0 ± 0.02	-	-
Zn -DTPA (mg kg^{-1})	0.97 ± 0.04	-	-
Mn -DTPA (mg kg^{-1})	1.34 ± 0.08	-	-
Cu –Total (mg kg^{-1})	-	37.5 ± 1.9	30 ± 2.2
Zn -Total (mg kg^{-1})	-	133.2 ± 7.2	104.5 ± 5.4
Mn -Total (mg kg^{-1})	-	204.2 ± 14.4	< 0.1
Fe-Total (mg kg^{-1})	-	2801.0 ± 128	2785.0 ± 140
Mg -Total (mg kg-1)	-	191.1 ± 7.8	156 ± 6.8

Data represent average means and SE deviation. (n)=4

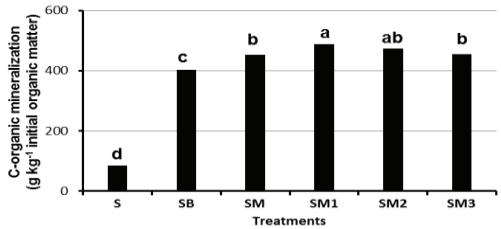

Figure 1. Effect of dry blood added rates on soil organic C mineralization. Columns in each characteristic of each graph with the same letter do not differ significantly according to the Tukey's test (P=0.05). S, soil; SB, (soil plus dry blood); SM, control, (soil plus manure); SM1, SM2 or SM3, dry blood 0.3 , 0.6 or 0.9 g per 50 g soil, respectively.

The available forms of P and Zn in the soil, after a long incubation period, were increased by manure or dry blood treatments (Table 2). Moreover, the

greatest increase was observed when manure were added. Also, the addition of manure increased Cu-available, Mn-available, and nitrate forms of nitrogen, while it was not changed by the addition of dry blood. The addition of dry blood increased Fe-available and ammonium forms of nitrogen, while it was not changed by the addition of manure.

The addition of dry blood in the mixture (soil plus manure), at highest rates at the end of the incubation period increased available forms of Fe, and nitrate forms of nitrogen (Table 2). While, the available forms of P, Cu and Zn in the mixture (soil plus manure), decreased by the addition of dry blood, in all treatments at the end of the incubation period. Moreover, the addition of dry blood in the mixture (soil plus manure), in the all treatments, was not changed ammonium forms of nitrogen and available forms of Mn, after a long incubation period.

Table 2

Effect of manure and dry blood on soil available forms of P, N, Cu, Zn, Mn and Fe

Treatments	Property						
	Available forms (mg kg^{-1} soil)			DTPA - (mg kg^{-1} soil)			
	P-Olsen	N-NH_4^+	N-NO_3^-	Cu	Zn	Mn	Fe
S	13.2^{f}	20.6^{b}	68.6^{e}	1.18^{c}	1.14^{d}	1.48^{b}	0.90^{c}
SM	175.5^{a}	35.6^{b}	273.4^{c}	1.92^{a}	7.77^{a}	26.33^{a}	1.02^{c}
SB	27.8^{e}	278.6^{a}	76.5^{e}	1.10^{c}	5.26^{b}	1.45^{b}	3.05^{a}
SMB1	171.1^{b}	28.1^{b}	213.0^{d}	1.51^{b}	5.14^{b}	26.67^{a}	1.02^{c}
SMB2	159.4^{c}	35.5^{b}	548.8^{b}	1.23^{c}	3.96^{c}	24.67^{a}	0.78^{c}
SMB3	145.1^{d}	22.4^{b}	1237.1^{a}	1.51^{b}	4.92^{b}	29.67^{a}	1.36^{b}

S, soil; SM, 5 g manure per 50 g soil; SB, 5 g dry blood per 50 g soil; SMB1, 5 g manure per 50 g soil plus 0.3 g dry blood; SMB2, 5 g manure per 50 g soil plus 0.6 g dry blood; SMB3, 5 g manure per 50 g soil plus 0.9 g dry blood; Columns with the same letter do not differ significantly according to the Tukey's test (P=0.05).

The cation exchange capacity after a long incubation period, increased by Manure or dry blood treatments in the soil (Table 3). Moreover, the greatest increase was observed when manure were added. Also, the addition of manure increased K-available, organic P and the salinity of the soil, while it was not changed by the addition of dry blood. Moreover, the addition of dry blood increased exchangeable-Na, while it was not changed by the addition of manure. The increase of exchangeable Na forms did not cause any sodification risk, with exchange sodium percentage (4.28%).

The addition of dry blood in the mixture (soil plus manure), at highest rate at the end of the incubation period increased the exchangeable Na, while in the two greater rates increased the cation exchange capacity and the electrical conductivity (Table 3). Also, the addition of dry blood in the mixture (soil plus manure), it was not changed available forms of K, in all treatments at the end of the incubation period.

The total forms of Na, K, P, and Fe in the soil, after a long incubation period, were increased by manure or dry blood treatments (Table 4). Moreover, the addition of manure increased total forms of Mn, while it was not changed by the addition of dry blood. The addition of dry blood increased total forms of Cu and Zn, while it was not changed by the addition of manure.

Table 3

Effect of manure and dry blood on soil exchangeable forms of Na and K, CEC, organic P, EC and pH

Treatments	Property					
	Exchangeable forms		CEC	organic	EC	pH
	Na	K		P	(Extract 1: 5 in water)	
	(meq 100 g^{-1} soil)		(cmol kg^{-1})	(mg kg^{-1})	dS m^{-1}	
S	0.700^{b}	0.69^{b}	18.40^{d}	86.2^{c}	0.54^{d}	7.77^{b}
SM	0.740^{b}	1.52^{a}	22.59^{b}	1444^{a}	0.64^{c}	7.90^{b}
SB	0.845^{a}	0.89^{b}	19.71^{c}	106.0^{c}	0.55^{d}	8.39^{a}
SMB1	0.695^{b}	1.485^{a}	20.19^{c}	458.3^{b}	0.56^{d}	7.82^{b}
SMB2	0.730^{b}	1.56^{a}	27.40^{a}	402.2^{b}	1.12^{b}	7.44^{b}
SMB3	0.805^{a}	1.55^{a}	27.88^{a}	420.8^{b}	1.88^{a}	7.13^{c}

S, soil; SM, 5 g manure per 50 g soil; SB, 5 g dry blood per 50 g soil; SMB1, 5 g manure per 50 g soil plus 0.3 g dry blood; SMB2, 5 g manure per 50 g soil plus 0.6 g dry blood; SMB3, 5 g manure per 50 g soil plus 0.9 g dry blood; CEC, cation exchange capacity; EC, electrical conductivity; Columns with the same letter do not differ significantly according to the Tukey's test (P=0.05).

The addition of dry blood in the mixture (soil plus manure), at all treatments at the end of the incubation period increased the total forms of Cu and Zn. Moreover, the addition of dry blood in the mixture (soil plus manure), it was not changed total forms of K and Mn, in all treatments after a long incubation period (Table 4).

Table 4

Effect of manure and dry blood on soil total forms of Na, K, P, Cu, Zn, Mn and Fe

Treatments	Property						
	Total forms (mg kg^{-1} soil)						
	Na	K	P	Cu	Zn	Mn	Fe
S	358.4^{d}	2984^{c}	382.4^{d}	10.0^{e}	42.2^{d}	549.2^{b}	760.0^{c}
SM	477.7^{c}	4162^{a}	2144^{a}	10.3^{e}	42.4^{d}	1216^{a}	8110^{b}
SB	573.2^{a}	3122^{b}	473.8^{c}	20.6^{b}	59.3^{a}	568.4^{b}	8305^{a}
SMB1	453.8^{c}	4162^{a}	1197^{b}	13.7^{d}	48.0^{c}	1133^{a}	8237^{a}
SMB2	465.7^{c}	4162^{a}	1122^{b}	17.1^{c}	53.7^{b}	1125^{a}	8152^{b}
SMB3	513.5^{b}	4162^{a}	1110^{b}	24.0^{a}	55.1^{b}	1308^{a}	8101^{b}

S, soil; SM, 5 g manure per 50 g soil; SB, 5 g dry blood per 50 g soil; SMB1, 5 g manure per 50 g soil plus 0.3 g dry blood; SMB2, 5 g manure per 50 g soil plus 0.6 g dry blood; SMB3, 5 g manure per 50 g soil plus 0.9 g dry blood; Columns with the same letter do not differ significantly according to the Tukey's test (P=0.05).

CONCLUSIONS

The decomposition of soil organic matter that added as manure in soil, was higher of the decomposition of soil organic matter that added as dry blood in soil, after a long incubation period. Moreover, the decomposition of soil organic matter added as manure, was higher by dry blood biomass addition, where dry blood was incorporated in the mixture (soil plus manure) at rate 0.3 g per 50 g of soil.

The addition of dry blood in the soil, increased available forms of ammonium, P, Zn and Fe. Moreover, the addition of dry blood increased

exchangeable-Na. The increase of exchangeable Na forms did not cause any sodification risk. The addition of dry blood in the mixture (soil plus manure), at the two greater rates, after a long incubation period, increased nitrate forms of nitrogen, the cation exchange capacity, the electrical conductivity, and total forms of Cu and Zn.

These results, confirm the role of dry blood as it is a valuable material for soil amendment, improves soil chemical and biological properties, while that recycling constitutes a useful practice for environment protection.

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GENETIC DIVERSITY BASED ON THE MORPHOLOGICAL TRAITS OF THE WALNUTS FROM THE LOCAL POPULATIONS OF WALNUT TREES (*JUGLANS REGIA L.*) ON THE LEFT SIDE OF THE JIU RIVER

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Keywords: *walnut, biodiversity, traits*

ABSTRACT

36 genotypes of walnut (Juglans regia L.) were studied in the sand area on the left side of the Jiu River, Oltenia District, Romania, in order to identify genotypes of promising perspective in local populations of Bechet, Sadova and Ostroveni and to analyze genetic diversity based on morphological traits of walnuts. Walnut weight and the percentage of kernel are the most important characteristics affecting fruit quality and a genotype. Average weight of fruit in all 36 genotypes was 12.06 g and the medium value of kernel percentage was 49.41%. The highest coefficient of variation for fruit weight (21.69%), respectively for kernel weight (23.16%) was calculated from the genotypes of Bechet population. Average fruit weight ranged between 7.62-20.90 g in Bechet population, 8.91-14.05 in Ostroveni population and 10.51-13.04 g in Sadova population. The average weight of kernel ranged from 3.92-10.90 g, 4.53-6.41 g, 5.00-6.33 g and the kernel percentage was between 46.37-56.82%, 45.60-57.09% and 46.35-51.06% in the 3 areas from the left side of the Jiu river, indicating a high potential of selection.

INTRODUCTION

Juglans regia L. grows and flourishes well in areas with average annual temperature of 8-10ºC, with hot summers, mild winters and a wide range of soils (Cociu 2003). The spontaneous flora is an important source of genetic diversity for walnut because pollination is free, the flowering of male and female flowers on the same tree is shifted in time and female flowers are almost always fertilized by pollen from another walnut (Bordeianu et al.1967, Cociu 2003, Godeanu et al. 2004, Cosmulescu et al. 2010, Cosmulescu et al. 2012).

Genetic variability existing in wild and weedy flora enables selection of genotypes with the most relevant characteristics for the environmental and economic conditions of each region to improve actual walnut assortment or creating a new range of early fruit bearing, frost resistance, starting in late vegetation and flowering and resistant to anthracnose and bacteriosis, high and steady productive potential every year and high percentage of fruit kernel. Genetic variability enables the use of valuable selections in conservation programs that ensure avoiding their loss due to genetic erosion (Godeanu et al. 1997, Botu et al. 2001, Botu et al. 2014). Local populations of walnuts from different areas enable

selection of superior genotypes adapted to climate change (Cosmulescu & Botu 2012). Valuable genotypes have been identified in local populations in southwestern Romania (Cosmulescu & Botu 2012, Cosmulescu 2013) and Epirus in Northern Oltenia (Tsampas & Botu 2013). In other countries too have also been identified and selected valuable genotypes coming from spontaneous flora: Ladakh region of India (Sharma et al. 2007, Angmo et al. 2015), Amasya province of Anatolia, Turkey (Keles et al. 2014), North-western Himalayas in India (Pandey et al. 2004, Sharma et al. 2014), Iran (khadi-Khub et al. 2015, Ebrahimi et al. 2011), Pakistan Karakoram region (Hussain et al. 2016).

Starting from the existing genetic diversity in the sand areas on the left side of Jiu river, this paper aims to identify promising genotypes in walnut populations in this area and analyze genetic diversity based on morphological features of walnuts.

MATERIAL AND METHOD

36 genotypes were studied in the areas Bechet (22), Ostroveni (9) Sadova (5) Dolj. All the trees in the study come from seed and are found in weedy flora. The selected genotypes were identified by their complete location with numeric characters. The genotypes selected from Bechet were labeled with B, those from Ostroveni with O and those from Sadova with S. The observations were conducted on a sample of 100 randomly selected walnuts from each genotype. The characteristics were recorded using descriptors UPOV and IPGRI, aiming to observe the large and small diameter, length of walnut, fruit weight, kernel weight, and kernel percentage.

For statistical analysis, Microsoft Excel and XLSTAT-Pro were used. All data were expressed as means ± standard deviations for each selection and populations. Data were subjected to Pearson correlations. Frequency distribution table for nut weight and kernel percentage characters were also prepared in order to identify the dominance in particular characters and most prevalent ranges.

RESULTS AND DISCUSSIONS

Physical characteristics of the fruit are a criterion for selection of walnut genotypes. Table 1 presents data on variability between genotypes of walnut selected from the areas of Bechet, Ostroveni and Sadova.

The average value for the large diameter of fruit varied between 24.81mm and 37.48 mm in Bechet area, between 27.14 mm and 32.83 mm Ostroveni, and between 29.98 mm and 33.48 mm in Sadova area respectively, and the average fruit diameter was 31.30 mm in all 36 genotypes. The lowest coefficient of variation of the large diameter of fruit was observed in the Sadova (4.64%) indicating a high uniformity for this purpose. The results are similar to other existing information in the specialty literature. Previous research has shown that the large diameter of 25.39 mm and 38.61 mm varied between 25.70 mm and 45.32 mm, respectively, among the 80 analyzed genotypes in the region of Galicea and Malaiesti (Cosmulescu 2013), between 2.57 cm and 4.06 cm at 109 genotypes studied in Oltenia (Cosmulescu & Botu 2012).

The average length of nut varied between 31.86 mm and 53.06 mm in Bechet population, between 32.84 mm and 38.61 mm to 31.17 mm in Ostroveni population and between 41.72 mm in Sadova population and the average length of walnuts was 36.77 mm in all 36 genotypes. The lowest coefficient of variation of fruit length was observed in Ostroveni (6.46%).

Table 1

Variability of fruit characteristics for the studied genotypes

Characteristics		Genotype		
		Bechet (n=22)	Ostroveni (n=9)	Sadova (n=5)
Walnut length (mm)	Average	37.04	35.35	38.13
	Minimum	31.86	32.84	31.17
	Maximum	53.06	38.61	41.72
	Standard deviation	4.82	2.28	4.29
	Coefficient of variation (%)	13.02	6.46	11.25
Large diameter (mm)	Average	31.49	31.05	30.97
	Minimum	24.81	27.14	29.98
	Maximum	37.48	32.83	33.48
	Standard deviation	2.35	1.69	1.43
	Coefficient of variation (%)	7.48	5.45	4.64
Fruit weight (g)	Average	12.26	11.60	12.02
	Minimum	7.62	8.91	10.51
	Maximum	20.90	14.05	13.04
	Standard deviation	2.66	1.71	0.98
	The coefficient of variation (%)	21.69	14.76	8.19
Kernel weight (g)	Average	6.11	5.67	5.78
	Minimum	3.92	4.53	5.00
	Maximum	10.90	6.41	6.33
	Standard deviation	1.41	0.65	0.49
	Coefficient of variation (%)	23.16	11.49	8.56
Kernel percentage (%)	Average	49.75	49.27	48.15
	Minimum	46.37	45.60	46.35
	Maximum	56.82	57.09	51.06
	Standard deviation	2.89	4.06	2.07
	Coefficient of variation (%)	5.81	8.24	4.31

Nut weight and kernel percentage are the most important characteristics affecting fruit quality and a genotype. Average weight was 12.06 g in all 36 genotypes and the average percentage of kernel was 49.41%. The highest coefficient of variation for fruit weight was found in Bechet (21.69%) and for the proportion of kernel in the area of Ostroveni (8.24%). Average fruit weight ranged between 7.62 g and 20.90 g in Bechet population, between 8.91 g and 14.05 g in Ostroveni population, and between 10.51 g and 13.04 g in Sadova population. The smallest fruit was found in B15 genotype and the largest in B29 genotype.

Regarding the fruit weight of the previous research in different areas of Romania it showed that it ranged between 6.61 g to 20.66 g in genotypes from the South-West Oltenia (Cosmulescu 2013) and between 29.60 g-40.10 g in North Oltenia genotypes (Tsampas & Botu 2013). Also, a high variety of fruit weight was observed in other geographical areas namely: District Gumushacikoy in Anatolia, Turkey (8.93-13.92) by Keles et al. (2014), in Iran (7.52-17.73 g; 3.60-20.28 g) by Ebrahimi et al. (2011) and khadi-Khub et al. (2015) respectively. Research by

Mousavi et al. (2015) indicates an average fruit weight of 17.27 g to the selectioned genotypes in Bakhtiari Province (Iran).

Kernel weight in genotypes of Bechet population ranged between 3.92 g and 10.90 g, between 4.53 g and 6.41 g in Ostroveni population and between 5.00 g and 6.33 g in Sadova population. The highest coefficient of variation for kernel weight of fruit was calculated on the genotypes in Bechet population, 23.16%, respectively. Referring to kernel weight, the previous research reported kernel content of 2.95-8.59 g and 3.51-9.07 g in Malaesti genotypes, respectively Galicea - Romania (Cosmulescu 2013), 4.00-9.83 g to the Iran genotypes (Ebrahimi et al. 2011), 1.32-10 g (Khadi-Khub et al. 2015) in Iran, and of 10.11 g to the genotypes of Bakhtiari Province of Iran (Mousavi et al. 2015).

The kernel percentage ranged between 46.37 and 56.82% in Bechet population, between 45.60 and 57.09% in Ostroveni and between 46.35 and 51.06% in Sadova, the lowest percentage of kernel being found in B2 genotype (46.37%) and the highest, in O5 genotype, 57.09% respectively. These data show variations of fruit from a genotype to another indicating a high potential in selection of new genotypes in the sandy area on the left side of Jiu river.

Similar data on variability of genotypes regarding the kernel percentage were obtained in Gumushacikoy District - Turkey (47.80-58.98%) by Keles et al. (2014), in the Oltenia District- Romania (41.66-63.17%) by Cosmulescu (2013), in Iran (38.78-67.05%) by Ebrahimi et al. (2011). A high content of kernel (62.88%), above the highest limits obtained at the studied genotypes was found in the genotypes selected from Bakhtiari Province of Iran (Mousavi et al. 2015).

Walnut genetic diversity of genotypes in different geographical areas indicates a high potential in the selection of superior genotypes, high commercial value, adapted to local geographical conditions. A large variety of fruit characteristics was found in local populations of Galicea - Romania (coefficient of variation for nut weight of 23.32%; Cosmulescu 2013) in Iran (a variation coefficient of 9.02 for nut diameter, Khadi-Khub & Ebrahimi 2015); Gilgit and Hunza Nagar in Pakistan Baltisan (coefficient of variation of 56.04% for nut length, 25.45% for nut weight, a percentage of 13.13% for kernel, Hussain et al. 2016).

To identify the distribution of measured values for fruit weight and, respectively, the kernel percentage in the fruit populations in Bechet, Ostroveni, Sadova, statistical analysis was used, the data obtained are being presented in Tables 2, 3 and 4.

Table 2

Distribution of walnut genotypes in Bechet population in terms of fruit weight and kernel percentage

Fruit weight (g)			Kernel percentage (%)		
Class	Frequency	%	Class	Frequency	%
7.62	1	4.55%	46.37	1	4.55%
10.94	6	31.82%	48.98	11	54.55%
14.26	13	90.91%	51.59	6	81.82%
17.58	1	95.45%	54.20	2	90.91%
More	1	100%	More	2	100%

From the analysis of data obtained, in Bechet population, 19 genotypes (59.09%) of the 22 studied had an average fruit weight between 10.94-14.26 g, and 17 had the percentage of kernel between 48.98-51.59%. 50% of genotypes had kernel percentage between 46.37 and 48.98% (Table 2).

Table 3

Distribution of walnut genotypes in Ostroveni population in terms of fruit weight and kernel percentage

Fruit weight (g)			Kernel percentage (%)		
Class	Frequency	%	Class	Frequency	%
8.91	1	11.11%	45.60	1	11.11%
10.62	2	33.33%	49.43	5	66.67%
12.33	2	55.56%	53.26	1	77.78%
More	4	100%	More	2	100%

In Ostroveni population, 4 of the 9 genotypes analyzed had fruit weight over 12.33 g and 5 had kernel percentage between 45.6 and 49.43% (Table 3).

Table 4

Distribution of walnut genotypes in Sadova population in terms of fruit weight and kernel percentage

Fruit weight (g)			Kernel percentage (%)		
Class	Frequency	%	Class	Frequency	%
10.51	1	20%	46.35	1	20%
11.77	1	40%	48.97	3	80%
More	3	100%	More	1	100%

In Sadova population, 3 of the 5 remaining genotypes in the study had fruit weight of 11.77 g and also 3 had kernel percentage between 46.35- 48.97% (Table 4). 11 out of 36 genotypes studied of the three areas can be considered as promising in terms of kernel percentage, with a content of more than 50%: O12 (50.19%), B36 (51.05%), B29 (51.10%), B15 (51.26%), B1 (51.58%), S3 (51.60%), B16 (52.35%), B11 (54.42), O6 (54.82%), B5 (56.82%) O5 (57.09%).

The correlation coefficients calculated for Bechet area (Table 5) indicate significant positive correlation between fruit weight and kernel weight (r = 0.96), fruit weight and walnut length (r = 0.89), kernel weight and walnut length (r = 0.84), fruit weight and large diameter (r = 0.82). A negative correlation was calculated between kernel percentage and walnut length (r = -0.09) and kernel percentage and fruit weight (r = -0.02).

For Ostroveni area, correlation coefficients calculated (Table 5) show a significant positive correlation between kernel weight and fruit weight (r = 0.86), fruit weight and walnut length (r = 0.82), walnut weight and the large diameter (r = 0.80). Negative correlations were found between kernel percentage and walnut length (r = -0.52) and fruit weight (r = -0.62).

Table 5

Correlation coefficient of different characteristics for the selected fruit genotypes*

Traits	D			L			Fw			Kw			Kp		
	B	O	S	B	O	S	B	O	S	B	O	S	B	O	S
D	1	1	1												
L	0.64	0.56	0.36	1	1	1									
Fw	0.82	0.63	0.62	0.89	0.82	0.73	1	1	1						
Kw	0.81	0.80	0.70	0.84	0.70	0.91	0.96	0.86	0.87	1	1	1			
Kp	0.64	0.03	0.15	-0.09	-0.52	0.41	-0.02	-0.62	-0.10	0.22	-0.15	0.30	1	1	1

* D= The large diameter (mm); L= walnut length(mm); Fw = fruit weight (g); Kw =kernel weight (g); Kp =Kernel percentage (%)

Correlation coefficients calculated for Sadova area (Table 5) indicate positive correlation between kernel weight and walnut length (r = 0.91), kernel weight and fruit weight (r = 0.87) and a negative correlation between kernel percentage and fruit weight (r = -0.19).

Significant positive correlations were found by Cosmulescu & Botu (2012) between fruit weight and kernel weight (r = 0.60) and between fruit weight and the large diameter (r = 0.56), by Ghasemi et al. (2012) between fruit weight and kernel weight (r = 0.86), by Cosmulescu (2013) between walnut weight and walnut diameter (r = 0.86 and r = 0.89), walnut weight and its length (r = 0.76 and r = 0.72). Also, positive correlation between fruit weight and kernel percentage has been found in Iran by Khadi-Khub et al. (2015). Negative correlations were also found by Hussain et al. (2016) between kernel weight and walnut length (-0.02), kernel percentage and walnut length (-0.09), kernel percentage and walnut diameter (-0.25), and kernel percentage and walnut weight (-0.76).

CONCLUSIONS

Evaluation of genotypes on their own roots in the sandy area left of Jiu river indicate that in this area of Romania there are valuable genetic walnut resources which allow the selection of genotypes of interest that can be included in collections, conservation for research, avoiding their loss due to genetic erosion. Given that sandy area is a sensitive area in terms of climate, it requires the identification of promising genotypes adapted to local climate. Research will continue in order to determine the adaptability of these genotypes to the current climate changes.

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RESISTANCE TO DOWNY MILDEW (*PLASMOPARA VITICOLA*) UNDER FIELD CONDITIONS OF NEWLY SELECTED CANDIDATE VARIETIES AND ELITE FORMS

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Keywords: *resistance, downy mildew, variety, hybrid, damage index*

ABSTRACT

Study was carried out at the Institute of Viticulture and Enology, Pleven to determine the resistance to downy mildew under field conditions of newly selected varieties, candidate-varieties and hybrids. The control variety of Vitis vinifera L. – Bolgar had the highest damage index while from the elite hybrid forms, throughout the whole period of study, the lowest damage index had V 38-93. All newly-selected candidate-varieties and elite hybrid forms had relatively low damage index during the period of the study and demonstrated enhanced resistance to downy mildew. The higher resistance to downy mildew under field conditions of interspecies varieties and hybrids was due to their origin and was genetically predetermined.

INTRODUCTION

Regardless its great variety diversity, cultural vine Vitis vinifera L. is known for its strong sensitivity to the fungal disease downy mildew (Plasmopara viticola). It is the most important vine fungal disease in many grapes growing countries over the world, while in France it is one of the most studied (Rafaila et al. 1968; Branas, 1951; Galet, 1977). The first observations on the differences in susceptibility to the disease dated back to the last century. Allard (1960), Husfeld (1933) and later Boubals (1958) reported the first evidence of resistance to the vine mildew plain. They noted that sustainable varieties react with the formation of necrotic spots on the leaves. The appearance of the trait "ability necrotic response" is the reason that restricts its distribution in tissues and is the main factor for the robustness of the vine to mildew.

Experiments for increasing the resistance to downy mildew of Vitis vinifera L. varieties have been carried out in almost all countries with developed viticulture. Sexual hybridization has been relevant to the present as a selection method for obtaining new varieties of table and wine grape varieties with increased resistance to downy mildew (Ivanov, Valchev 1971; Valchev, 1978, 1990; Stoev, 1984; Ivanov, 2011).

The method of interspecies hybridization in vine selection had allowed both in scientific and applied aspect new immune and resistant varieties to be created, analogues of those from Vitis vinifera L. (Ivanov, 2011). Crossing European varieties with high quality grapes with wild American vine species characterized by

resistance to *downy mildew,* oidium, phylloxera and low temperatures is early in the application of the method of interspecific hybridizationRich gene fund has been obtained at the Institute of Viticulture and Enology, Pleven by interspecies hybridization (of candidate-varieties and elite hybrid forms) that has been continuously enriched and improved.

The objective of the study was to determine the response of a group of newly selected candidate-varieties and elite hybrid forms to downy mildew under field conditions.

MATERIAL AND METHODS

A trial was set with cuttings at their own root under field conditions for determining the response of some varieties and newly selected candidate-varieties and elite hybrid forms to the fungus Plasmopara viticola, the agent of downy mildew. A trial area was isolated with dimensions 1.0/1.5 m at the Experimental Base of the Institute of Viticulture and Enology, as it was ensured gravity irrigation and sprinkling of the rooted cuttings.

The trial variants were the varieties Bolgar (reference for susceptibility), Muscat Kaylashki (reference for resistance), Milana (rose table grapes), candidate-varieties V 1-40 (Miro), V 8-2 (Nayden), V 6-18 (Vit) and the elite hybrid forms - V 39-80, V 29-7, V 29-27, V 32-2 and V 38-93.

Every year during the vegetation period (July and August) it was accounted the degree of damages caused by downy mildew on the leaves of the studied varieties and hybrids. On the average of 100 leaves per variety were assessed according to the seven-score scale:

Score **0** – no attack;
Score **1**- up to 5% of the leaf blade was attacked;
Score **2** - from 6 to 15% of the leaf blade was attacked;
Score **3** - from 16 to 25% of the leaf blade was attacked;
Score **4** - from 26 to 50% of the leaf blade was attacked;
Score **5** - from 51 to 75% of the leaf blade was attacked;
Score **6** - from 76 to 100% of the leaf blade was attacked.

Diseases that cause blots on bodies spread is defined as the proportion of the stain part and indicate the index, which is calculated by the formula Mc. Kinney (1923):

$$i = \frac{\sum(n.k)}{N.K}100 \qquad \text{where,}$$

i – index of disease, %;
n – the number of plants in category;
k – degree assault assessment scale adopted by;
N – the number of all tested plants;
K – highest perceived category (ball)
Σ - the sum of the work

RESULTS AND DISCUSSIONS

Data on the degree of downy mildew attack on the leaves of the control varieties and hybrid forms for 2011 are presented in Table 1.

Table 1

Degree of downy mildew attack on leaves of selected candidate-varieties and elite hybrid forms in 2011

Variety / Hybrid	Accounted leaves	Diseased leaves	Damage index
	number	%	
Bolgar – control	100	88.0	53.5
Milana	100	89.6	61.9
V 39-80	100	72.0	41.3
V 29-7	100	58.0	27.3
V 8-2 (Nayden)	64	74.4	50.8
V 1-40 (Miro)	83	80.7	55.8
V 29-27	65	87.7	48.5
V 32-2	57	91.2	70.2
V 6-18 (Vit)	100	92.0	51.7
V 38-93	100	27.0	5.5
Muscat Kaylashki - control	100	42.0	11.1

The highest rates of the damage index by downy mildew on the leaves were found in the control Bolgar variety, Milana variety, hybrid V 29-27 and candidate-variety V 6-18 (Vit). For the rest of the hybrid forms and candidate-varieties the damage index was also high, close to the range of the control variety for susceptibility. The lowest rate of the damage index had the interspecies hybrid V 38-93, that was even lower than the index of damage of the control variety for resistance, Muscat Kaylashki.

Table 2

Degree of downy mildew attack on leaves of selected candidate-varieties and elite hybrid forms in 2012

Variety / Hybrid	Accounted leaves	Diseased leaves	Damage index
	number	%	
Bolgar – control	100	66.0	14.8
Milana	61	1.6	0.2
V 39-80	100	8.0	1.3
V 29-7	100	7.0	1.2
V 8-2 (Nayden)	52	11.5	1.9
V 1-40 (Miro)	100	21.0	3.7
V 29-27	100	5.9	0.7
V 32-2	68	11.7	1.3
V 6-18 (Vit)	100	21.0	3.7
V 38-93	100	2.0	0.3
Muscat Kaylashki - control	100	0.0	0.0

In 2012, because of the extremely high summer temperatures and low humidity significantly lower levels of damage from downy mildew on the leaves of all studied varieties and hybrids were accounted (Table 2). The damage index by downy mildew on the leaves was within the range from 0 to 14.8 in 2012, while for 2011 it varied from 11.1 to 70.2. The highest damage index was recorded in the control variety Bolgar, while the lowest index had the interspecies control variety Muscat Kaylashki. The rest varieties, candidate-varieties and hybrids had similar index but again the lowest rate was accounted for the interspecies hybrid V 38-93.

Table 3

Degree of downy mildew attack on leaves of selected candidate-varieties and elite hybrid forms in 2014

Variety / Hybrid	Accounted leaves	Diseased leaves	Damage index
	number	*%*	
Bolgar – control	200	50.0	54.0
Milana	100	21.0	4.5
V 39-80	100	45.0	15.0
V 29-7	100	34.0	8.0
V 8-2 (Nayden)	100	40.0	8.0
V 1-40 (Miro)	100	44.0	12.0
V 29-27	100	38.0	11.0
V 6-18 (Vit)	100	33.0	8.0
V 38-93	100	6.0	1.0
Muscat Kaylashki - control	100	0.0	0.0

Table 4

Degree of downy mildew attack on leaves of selected candidate-varieties and elite hybrid forms in 2015

Variety / Hybrid	Accounted leaves	Diseased leaves	Damage index
	number	*%*	
Bolgar – control	100	50.0	5.00
Milana	200	0.5	0.08
V 39-80	200	2.0	0.41
V 29-7	200	2.0	0.33
V 8-2 (Nayden)	200	1.0	0.16
V 1-40 (Miro)	200	1.5	0.41
V 29-27	200	1.0	0.25
V 6-18 (Vit)	200	2.0	0.41
V 38-93	200	0.0	0.00
Muscat Kaylashki - control	200	0.0	0.00

The results of the trial from 2014, given in Table 3, showed again that the highest damage index caused by downy mildew on the leaves had the control variety of Vitis vinifera, Bolgar – 54. The lowest damage index had the interspecies control variety Muscat Kaylashki – 0 and the interspecies hybrid V 38-93 – 1.0. The rest varieties, candidate-varieties and hybrids had relatively low damage indices, within the range from 4.5 for variety Milana to 15.0 for V 39-80.

The results obtained from the study carried out in the year 2015 for determining the damage index caused by downy mildew on the leaves of the selected varieties and hybrid forms are presented in Table 4. Except the control variety for susceptibility – Bolgar with index 5.0, all other studied varieties and hybrids had low index. It varied from 0 for Muscat Kaylashki and V 38-93 to 0.48 for V 39-80, V 1-40 and V 6-18.

CONCLUSIONS

During the four-year period of the study for determining the resistance to downy mildew under field conditions of a group of newly selected varieties, candidate-varieties and hybrids, the control variety of Vitis vinifera – Bolgar showed to be highly susceptible, having the highest damage index. From the elite hybrids during the whole period the lowest damage index was obtained for the elite interspecies hybrid form V 38-93.

All newly selected candidate-varieties and elite hybrid forms had relatively low damage index during the period of study and demonstrated enhanced resistance to downy mildew. However, the observations should be continued and supplemented by researches under laboratory conditions.

The varieties and elite hybrid forms obtained by the interspecies hybridization method revealed higher resistance to downy mildew that was genetically predetermined and was due to their interspecies origin.

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THE CROWN OF THE SWEET CHERRY TREES FORMATION ACCORDING TO THE NATURAL CROWN IMPROVED WITH REDUCED SIZE

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Keywords: *cherry, variety, branches of fruit, ramification angle*

ABSTRACT

This paper presents the study of the cheery trees crown formation according to the natural crown improved with reduced size. The orchard was planted in 2010 with vegetative mother/father of Gisela 6 (Cerasus vulgaris x Prunus canescens), grafted with cherry sort - Ferrovia, Adriana and Skeena, having 4x2 m planting interval. The trees extend in the vertical way at 3-4 m high, they have the trunk of 50-60 cm high and well developed crown. There are 2 levels of branches at 60-70 cm distance. At the first level, 3-4 branches are placed uniform winding (spiral), round the crown at 8-12 cm distance between them, other 2-3 branches extend at 60-70 cm higher from the first. Upper the second level there is only semi-skeleton and fruit branches arranged uniformly around it (axis).

INTRODUCTION

At present, in the world the cherry yield (production) continues to grow due to using some mother/father plant with small size (Edabriz, Gisela 5, Gisela 6, Maxima 141), of some precocious and productive sorts, of some anticipated trees planted at large density (1000-1250 trees/ha). Fruit growers must apply the best technology for the new combination of mother/father plant, to establish the measure to adopt the new sorts to the natural condition and specific technology of different fruit-growing area. In this way, there is the small crown volumes associated with small distance of trees. These crown have an important role to assure the effective using of sun energy, fruit production, the manual working in huge capacity (cutting, gathering), the mechanization level of technological work (Balan 2009, 2014, 2015; Asanica et al. 2013). For the combinations of mother/father plant with weak strength, are indicated the system of the crown with small (reduced) volume: Super Slender Axe (SSA) Upright Fruiting offshoots (UFO), Tall Spindle Axe (TSA), Kym Green Bush (KEB) (Whiting et al. 2005, Long et al. 2014). These crown forms were imposed by the suitable time and rich harvest, the local condition of the climate (sunlight, rainfall, air drainage) and soil, diversity of sorts, the mother/father plants, the forming way of the crown and the branch cutting. Among the technology elements of the cherry trees, we have chosen the grow system: Natural crown with reduced volume“, using it in the

intensive orchards from RM. The practical arguments, the improvement of the crown forms with reduced volume in consideration of getting the fruits production competitive in the world, effective using of manual working, they become an important problem for the modern cherry orchards.

MATERIAL AND METHODS

The experiment in the field were made in ,,Prodcar" company in Negureni village, Telenesti department. According to geography and ecology, the territory corresponds to cherry culture. Three sorts of new sweet cherry were studied for Moldova, but well-known in Europe. The sorts are Ferrovia, Adriana and Skeena. The plantation was planted in 2010 with vegetative rootstocks of Gisela 6 (*Cerasus vulgaris x Prunus conescens*), grafted. At the planting distance 4x2 m it was a density of 1250 trees/ha. The technology was standard applied in the intensive sweet cherry orchards. Now the orchard is in good condition, the protecting works were carried out on time. The experiments include 4 repetitions of every 8 trees. The measures were made in the field conditions and in laboratory in accordance with the methods, approved and described by Balan et al. (2001). The number, average length and annual branches are determined through measuring methods and determination at 32 trees in a variant. The number of harvest burgeon (bud). May bunch, and their place on different branches were analyzed in autumn after falling leaves through counting at 3 evidence trees of every repetition.

RESULTS AND DISCUSSIONS

During 2010 vegetation, the trees have grown in the form of rod (wand) and began the forming crown in the spring of 2011. **The first year** the cutting was made in the dormant period, in the spring at bud less and vegetation period. The trees were cutting at 90-100 cm high from the soil until a strong burgeons. If the trees form the weak branches in the crown, there branches shorten at the knot 2-3 cm, but the axis shortens at 90-100 cm. When the trees form the anticipated branches, well-developed, in the forming area of the crown, were chosen 3-4 branches for the first level formation and one for center axis. The selected branches for the first level were chosen with a bigger angle of detachment- 45 degree, the 8-12 distances, uniform around the axis. The extension branch of central ax shortens if it has the length of 80-90 cm, but the selected branches shorten 1/4 - 1/3 from their length but to protect the secondary. Short branches with horizontal position upper than the first level, they remain untouched. The branches are cut at the ring having 60-70 cm high. The weak rods (wand) are shortened at 25-30 cm high from the soil above an ideal burgeon. At the beginning of vegetation only one (offshoot) from suitable burgeons is protected to grow, but other offshoots are reduced. In June, on the growing offshoot forms anticipated offshoots. At maturation they become wooden branches of the first category.

After burgeoning less, the trees without ramification the burgeons blind on the trunk at 50-60 cm high, 2 burgeons were well-developed in the top, but next 4-5 burgeons blinded (failed). This proceeding helps the growing of offshoots on the extension central axis, avoids the natural range and allows the getting the huge ramification angle. In spring, when the offshoots have 20-30 cm length, 3 secondary well-developed branches were chosen for forming the branches from the first level and one vertical for central axis. The useless offshoots on the axis were eliminated. In the both burgeons develop, in this case is selected the weakest

offshoots to continue the axis, but the second offshoots is eliminated. In the period of vegetation, the strong offshoots with sharp angle changed 60 degree according to vertical. They form the strong branches with the same size. When the lateral offshoots have 10-15 cm, was made the changing helped by toothpick, tongs or the tie at 60-degree angle from vertical position. When the tree has 3 offshoots, especially for the vertical growing trees, which the offshoot have 20-30 cm length, they shorten till 15-25 cm form creating the growing conditions of the anticipated offshoots. In the summer they are selected and structured for the future branches. In June if the offshoots have 80-90 cm length, they are shortened for forming the ramification in the vegetation period of the same year and create the crown of the trees quickly.

The second year, in spring the chosen branches shortened till 80-90 cm at an interior burgeons, with exception when this work was made in the last summer. The interior burgeon grows in a strong offshoot, but the exterior burgeon situated lower; it grows in an offshoots orientated to horizontal side of the crown, which will become a strong and long branch. In the next year the vertical and strong branch changes at the ring (Balan, 1997) or shortens at the knot 10-15 cm (Zahn, 1992) and then the growth turns into horizontal branch. The extending branch of center branch we cut it upper the principal cutting branches use less branches at the forming strong branches are eliminated are shortened at knot 10-15 cm. On the center and on the strong branches in necessary place were made some incision above the burgeon, cutting 2-3 rings from alburn, for obtaining the ramification. During vegetation when the offshoots have 20-30 cm length, there are 3-4 offshoots on every strong branch; when will be used for expensing the strong branch, but 2-3 offshoots for forming the first secondary strong branches. The rivals of the offshoots were eliminated and offshoots with vertical side, others were taken at 15 cm. The used offshoot for extension of the strong branch must be marginal and to form and angle of 60 degrees forming the secondary branches are bilateral exterior.

In the third year, in the springtime the extension branches of the central axis and of the strong branches were shortened until 80-90 cm for creating the new branches for strong branches and secondary branches. The chosen strong braches from the second level, with a bigger cutting angle then others, they balance in the growing. To rise the ramification angle is used the method of cutting, exposed early. On every strong branch from the first level, plan the secondary branches. The branches are selected to be secondary branches, with more 60-degree angle, they must not shorten, and because they begin to form, the harvest burgeons. On the strong branches and secondary branches cut the thick branches, which pass the half of the production, and those, which are orientated to vertical at the knot according to Zahn, mentioned by Cimpoies (2001). During vegetation, if in the crown are the productive growing, more 80-90 cm, in the middle of June, the top shortened for ramification and to hurry the tree formation and to protect their harvest.

Ferrovia, Adriana and Skeena sorts grafted on Gisela 6, they began to have the harvest burgeon in third year of planting trees. The capacity of the harvest is in the connection with the annual branch length and the quantity is reduced. The number of flowered burgeons on the annual branches differ to their length (table 1). For Skeena sort on the short branches till 20 cm length there are 26.9% the flowers, on the branches with 20-40 cm length – 43.6%, and on the long branches

with 40-80 cm – 29.5%. The some things happen with Adriana and Ferrovia sorts. In the period of growing and fruiting of the sweet cherry, it is necessary to have the branches in the crown, with biologic potential with 30-45 cm length, but for gathered fruit to have 4-5 leaves (Babuc 2012).

Table 1

The number of flowering buds on cherry branches of various lengths annual pcs.
Rootstock Gisela 6, planting distance 4x2, SRL "Prodcar ", trees 3 years old

Variety	The number of flowering buds	The length of the branches					
		0-20 cm	%	20-40 cm	%	40-80 cm	%
Skeena	101.6	27.3	26.9	44.3	43.6	30.0	29.5
Adriana	86.2	24.3	28.2	36.6	42.5	25.3	29.3
Ferrovia	102.0	28.0	27.4	44.0	43.1	30.0	29.5
Average	96.6	26.5	27.5	36.3	43.1	28.4	29.4

The fourth year and the next years repeat the previous work on the new extension of the annual branches. Strictly choose the branches for the second level which balance between them, but the extension branch of the ax is shortened till 25-30 cm upper then cutting part. On the strong branches from the first level form the secondary strong braches and the semischelet branches. The important branches situated on the ax between the levels, shorten at the knot 10-15 cm, to be transformed through cutting in the harvest branches. The orientation angle of strong branches through cutting is corrected and orders the superior branches and inferior branches.

The density of the May branch depends on the branch length and on the age (table 2).

Table 2

The density of branches bouquet in cherry wood of 2 to 3 years
Rootstock Gisela 6, planting distance 4x2, SRL "Prodcar ", trees 4 years old

Variety	wood of 2 years			wood of 3 years		
	Length, cm	Bouquets of May, pc	Bouquets of May, pc/m. linear	Length, cm	Bouquets of May, pc	Bouquets of May, pc/m. linear
Skeena	34.3	9.0	26.2	23.7	7.3	30.8
Adriana	30.8	9.8	25.8	21.1	7.3	34.5
Ferrovia	31.1	15.6	50.2	21.3	9.8	46.1
Average	32.1	11.5	35.8	22.0	8.1	36.8

The 4 years trees form the fruit on the one-year branches and develop the May branches. The quantity of the harvest is equal to the number of flowering burgeons. The density of Ferrovia sort was more then 50.2 bunches/m but Adriana sort had the lowest density -25.8% bunches/m. For the 2 years trees, the density of flowering burgeon is bigger at Ferrovia sort – 46.1 bunches/m. Skeena, Adriana, Ferrovia sorts have productive branches in the second at third year of growing. The construction of the sweet cherry trees is influenced by the biological elements. The length of the branches for Adriana, Skeena and Ferrovia, in fifth year of vegetation, is 50.7 – 56.2 m/tree, annual branches – more than 80%. The annual number of branches in the first 2 years of vegetation, they grow moderate, but in 2 years the geometrical progress is better and it has 64.3 – 72.3 bunch/tree.

The medium length of the annual branches is about 65 cm and it is an important element in the crown formation. The most suitable length of the annual growing is 80-90 cm to hurry the tree formation and to begin to harvest. The intense growing of the trees in the first years of vegetation allow a quick formation of the crown.

CONCLUSIONS

The sweet cherry tree is characterized by an important protected influence and natural ranges of the branches. To obtain the lateral ramification in the suitable place it is necessary the influence of fruit growers. Were made the principal crown formation and branches cutting at the super intensive system. The crown formation according to" Natural crown having the reduced volume" was orientated to grow the vegetative parts and the harvest effects.

The sweet cherry formation after improving natural system with reduced volume combines with the using the mother/father with small and middle size (Edabriz, Gisela 5, Gisela 6), planted at 4-5 cm distance between the rows and 2-2.5 m between the trees. The crown trees extends on the vertical till 3-4 m high, the base crown diameter is 1.5 -2.5 m, but the superior part -0.8 – 1.2 m. These trees have a trunk of 50-60 cm high and developed ax, where are 2 levels of strong branches at 60-70 cm interval. In the first level 3-4 branches are placed in the uniform spiral around the ax at 8-12 cm distance between them, others 2-3 strung branches extend at 60-70 cm high from the first. Higher than the second level, on the axis are placed uniformly around, in the oblique position, only the semi-skeleton and harvest branches which replace constantly. On the strong and secondary, the branches form the harvest branches, of trimming.

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THE RELATION BETWEEN THE SOIL CONTENT OF MACROELEMENTS AND THE PLANT, FOR SOME APRICOT VARIETIES

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Keywords: *mineral elements, soil, correlations*

ABSTRACT

The measurements were made for three apricot varieties, within the plantation of the Horticulture Faculty, during 2011-2012. It was measured the degree of soil supply with macroelements NPK, pH and soluble salts and the content of mineral elements of the plant during three phenophases: growth of the buds, blooming and fruit maturation for several tree organs – leaves, fruit, one year and two years branches. The obtained results showed that the soil ensured good conditions for tree growth. The plant's content of mineral elements was at the maximum level during the blooming phase, and among the analyzed organs, maximum values were recorded for leaves, while the minimum ones for the two years branches. Correlations between minerals in soil and plant showed the dependency between the two through generally negative correlations.

INTRODUCTION

Apricots are very looked for by consumers, both as dessert fruit and for various processing. The high demand of fruit is determined by their qualitative and technological properties, by the complex biochemical composition and very pleasant taste, specific flavor etc. (Hoza, 2000).

The biochemical composition of fruit contains a series of elements important for human nutrition, among which, (for 100 g pulp): 10.6-21.7% dry substance, 6-16.6% total sugar, 0.55-1.1% pectin, 1.09-1.64% proteins, 0.6-0.86% minerals like: K 75-112 mg%, P 21-32 mg%, Ca 6-14 mg%, Mg, S, Na, 0.41-3.20 mg% vitamin A, 8-27 mg% vitamin C, 35-38 mg% vitamin P, 0.72-1.8 mg% vitamin E; the energetic value is of 21-77 calories for 100 g etc. (Souci et al. 1981).

The requirements of mineral elements of various species are related to the biological characteristics of the species and even of the variety (Hoza 2010). As for any living organism, we can distinguish also for plants an age determined by its vital cycle and an annual vegetation cycle within which different vegetation phases can be identified. For fruit growing trees, the need for nutritional substances and the assimilation of mineral elements change in relation to the vegetation phases (Shear and Faust, 1980) and are influenced by the rootstock through its capacity to take from the soil certain minerals (Blajik and Paunovic, 1981).

Minerals at optimum levels for plants have a favorable action over the ongoing of physiological processes of plants as well as over the harvest. If their level is not within optimum levels, the plants are stressed; physiological diseases also called physiological disorders or physiopathies can appear, having a negative influence on the production.

The consumption of soil minerals (according to Trocme and Gras 1965), for plum and apricot trees, through their leaves, is around: 3.5 kg/t nitrogen, 1.05 kg/t phosphorus and 5.50 kg/t potassium.

The existence of a correlation between the concentration of nutritional elements in the analyzed organ and the supply state depends on the species, age and physiological condition of the plant (Davidescu and Davidescu, 1992).

Sanchez-Alonzo and Lachica (1987) noticed that during the vegetation period, the content N, P and Zn from the leaves of the plum variety Golden Japan decreased, while the concentration of Ca, Mg, S, Fe, Mn and Cu increased. Kenworthy (1969) recommended taking samples of leaves after 8 – 12 weeks since complete blooming, in order to better show the mineral supply state of the plant.

Carpena (1968) noticed differences among the mineral composition of apricot leaves from the offshoots base till their peak. As a result, Kenworth and Larsen (1982) recommended taking leaves for analysis from the middle of annual offshoots, which have an intermediate content of minerals, between leaves from the base and from the apical ones.

With the present experiment, we proposed to verify the existence of a correlation between the content of minerals in soil and the plant, in order to ensure a balanced nutritional state for the plant during the vegetation period.

MATERIAL AND METHODS

Three apricot varieties were used for analysis: Dacia, Tudor and Augustin, cultivated in the teaching field of the Faculty, within a plantation with 5/4 m planting distance, 6 years old trees, managed as free palmet. The orchard technology was the one used for fruit bearing plantations, the soil was maintained grassy and the irrigation was made by dripping. The soil specific measurements were made at two level of depth (0-20 cm, respectively 20-40 cm) according to the ICPA methodology. Plant measurements were the following:

The measurement of nitric nitrogen was made using the phenoldisulphur acid method. The sample of 30 g of fresh soil was stirred for 5 minutes with 90 ml K_2SO_4 n/10. After filtering, 10 ml extract was evaporated to dryness, afterwards 1 ml of disulphur phenol acid, 15 ml of distillated water and NaOH 12 % were added. After the color turned yellow, the solution is increased to 100 ml using distillated water and is colormetrised in parallel with standard solutions.

The measurement of ammonia nitrogen was made using the Nessler reactive method 20 ml was taken from the extract obtained for measuring nitric nitrogen, 1 ml Serignette 50 % sal and 1 ml Nessler reactive were added, and after 30 minute was colormetrised in parallel with standard solutions.

The measurement of total phosphorus was made using the ICPA agreed method. A quantity of 1 g of soil was introduced in a Kjeldahl balloon in which 10 ml of concentrated H_2SO_4 were added; afterwards, the solution was boiled to complete mineralization (with color). The solution is brought to 100 ml through repeated washes, then 20 ml of extract are passed through a rated balloon 100 ml, and the following are added: 6 ml potassium ferrocyanide 10 %, 3,5 ml

H_2SO_4 2N and ammonia 10 %, until the color is reddish. It is brought to the sign and filtered. 50 ml of solution are taken and passed through a rated balloon of 50 ml and 15 ml of ammonia nitrovanadate are added. The extinction of the solution is measured at the band wave of 445 nm with standard solutions in parallel.

The measurement of mobile phosphorus was made spectrophotometrically. In a 500 ml bottle 5 g of soil and 20 ml of acetate solution (ammonia lactate) are added, and stirred for 90 minutes. After filtering, are put in a separate vessel 25 ml of extrac, 2 ml molybdenic reactive and 1 ml clorurostanos reactive. The extinction of the molybden blue color is colormetrised in parallel with standard solutions.

Mobile potassium was measured flamophotometrically. 5 g of soil are put in a 500 ml vessel with 20 ml of acetate – ammonia lactate 1n. Stir for one hour and then filter. The content of mobile potassium was measured using a photometer with flame, using for this purpose a scale of measures with different potassium concentrations.

The measurement of total soluble salts was made conductometrically, using watery extracts obtained from 1 g of soil and 2,5 ml of distillated water.

The pH-ul of soil solution was measured potentiometrically, using a pH-meter. In a 50 ml Berzelius glass put 8 g of soils and 20 ml of distillated water, then stir. The combined electrode of the pH-meter is introduced and the pH value is read from the scale of the device.

RESULTS AND DISCUSSIONS

From the analyses performed for the soil an almost neutral reaction resulted, with small deviations per depth and variety, with a slight tendency to decrease from the surface to the depth (table 1) and fitted with the tolerance limits for the plum tree (6.81-7.33). The content of mineral salts varied between 0.011 and 0.020%, with a slight tendency to decrease vertically, but which did not highlight salinization problems of the soil.

Table 1

pH and soil state of mineral supply

Nr. crt.	Variant	pH	Total soluble salts %	N mineral ppm	PO_4^{3-} ppm	K ppm	P_{AL} ppm	K_{AL} Ppm
1.	Dacia (0-20 cm)	6.99	0.0179	13.0	Sld	50.0	108.4	320
2.	Dacia (20-40 cm)	7.26	0.0204	2.75	Sld	30.0	120.8	420
3.	Tudor (0-20 cm)	6.81	0.0121	7.50	Sld	20.0	60.0	280
4.	Tudor (20-40 cm)	7.14	0.0118	2.25	Sld	15.0	64.4	220
5.	Augustin (0-20 cm)	7.15	0.0166	1.50	Sld	24.5	62.4	260
6.	Augustin (20-40 cm)	7.33	0.0134	7.75	Sld	25.0	73.2	300

(Sld – under the detection limit)

Mineral nitrogen, measured as the sum between the nitric and ammoniac forms, showed a very good supply state, the limits being between 1.25 ppm and 13 ppm; higher values were recorded at the soil surface for the Dacia and Tudor varieties and at depth (20-40 cm) for the variety Augustin. The soluble phosphorus content, measured in watery extracts, was low, the recorded values varying between undetectable and 7.80 ppm. Assimilable phosphorus was not detected, and the reserve of potentially assimilable phosphorus, extracted in acetate-lactate ammonia, varied between 60 and 120.8 ppm, the obtained results indicating a potential supply degree with assimilable phosphorus high for 3 samples and very high for the other 3, the optimum values being between 70-100 ppm (according to Davidescu and Davidescu, 1992).

The content of assimilable soluble potassium varied between 15.0 and 50.0 ppm, which showed a low supply (variants 2 - 6), medium (variants 1).

The supply degree of the soil with soluble potassium (potentially assimilable), extractable in acetate-lactate ammonia, varied between 220 and 420 ppm, thus showing a very good supply degree.

Measurements for the plant were made during three different phases: March (growth of the buds), May (blooming) and August (beginning of bud differentiation), and the results were different depending on the moment of measuring, analyzed organ and variety (table 2).

Table 2

Minerals from some apricot organs

Variety	Organ	Minerals %		
		03.08.2011	21.03.2012	10.05.2012
Dacia	II year branch	1.35	2.07	4.15
	I year branch	1.41	2.74	4.97
	Leaves	5.53	nd	11.30
	Fruit	nd	nd	6.79
Tudor	II year branch	1.67	2.00	2.42
	I year branch	1.91	2.18	6.58
	Leaves	7.11	nd	10.60
	Fruit	nd	nd	7.57
Augustin	II year branch	1.85	5.10	4.15
	I year branch	1.78	6.78	5.47
	Leaves	4.77	nd	10.30
	Fruit	nd	nd	6.16

The highest average content of minerals, out of the 4 analyzed organs, was recorded during the blooming phenophase (10.05), when it had a content of 6,70 %. For leaves, the lowest content of minerals was measured in august, during the debut of the sleep period for the trees. In this period, of preparation for the winter, a part of the minerals with higher mobility degree are moved from the leaves to the perennial organs, in order to ensure a higher resistance degree for frost and to ensure a proper input of minerals during spring, when vegetative growths start again. During this phase, the average mineral content of leaves for the three apricot varieties was 5.80 %.

The average mineral content for the analyzed organs, during the three phenophases, recorded values between 5.80 % (Dacia) and 6.79 % (Tudor).

Large differences were recorded for the mineral content of different analyzed fruit growing organs. Thus, on 10.05, the highest mineral content was measured for the leaves, with values between 10.30 and 11.30 %, followed by fruit, for which the content varied between 6.16 and 7.57 %. The mineral content for the one year branches varied between 2.42 and 4.15 %, being the lowest, while for the two years branches it was between 4.15 şi 6.79 %. From the obtained analytical data, it resulted that measuring the nutrition degree of the plants through foliar diagnosis should be made in May, when the plants have the highest demands for mineral substances to support the growth and blooming processes.

Correlating the quantity of minerals measured for the plant, with the macroelements from the soil, certain correlations were highlighted, which showed that correlations change direction depending on the phenophase. Thus, soil nitrogen was consumed more during the growth of the buds and blooming phases, when negative correlations were recorded (fig. 1 a, b), while after fruit maturation (August) the correlation was positive (fig. 1 c.). The values of the correlation coefficients were low for all moments of analysis.

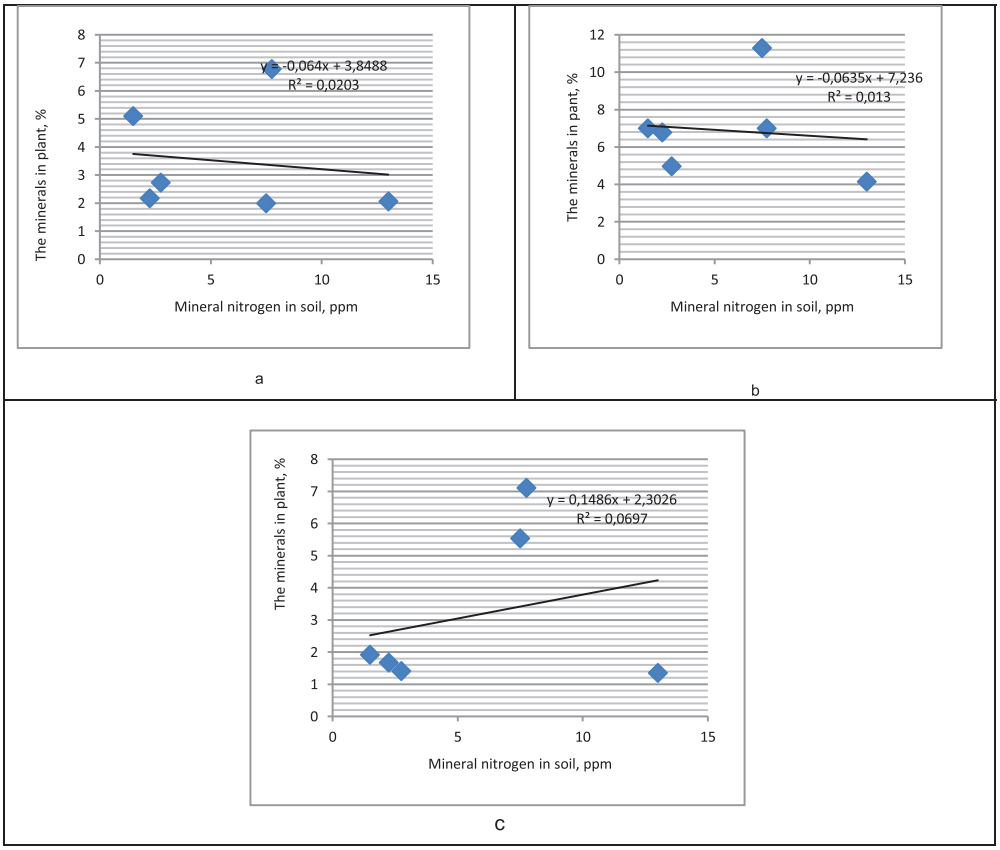

Figure 1. Correlation between soil nitrogen content and minerals from the plant: a- March, b - May, c - August.

For phosphorus, all correlations were negative, showing a decrease in the soil reserve as trees grew and fructified, the highest consumption being recorded for May when the value of the correlation coefficient was $r^2 = 0.56$, compared to 0.073 for March and 0.21 for August (fig. 2, a, b, c).

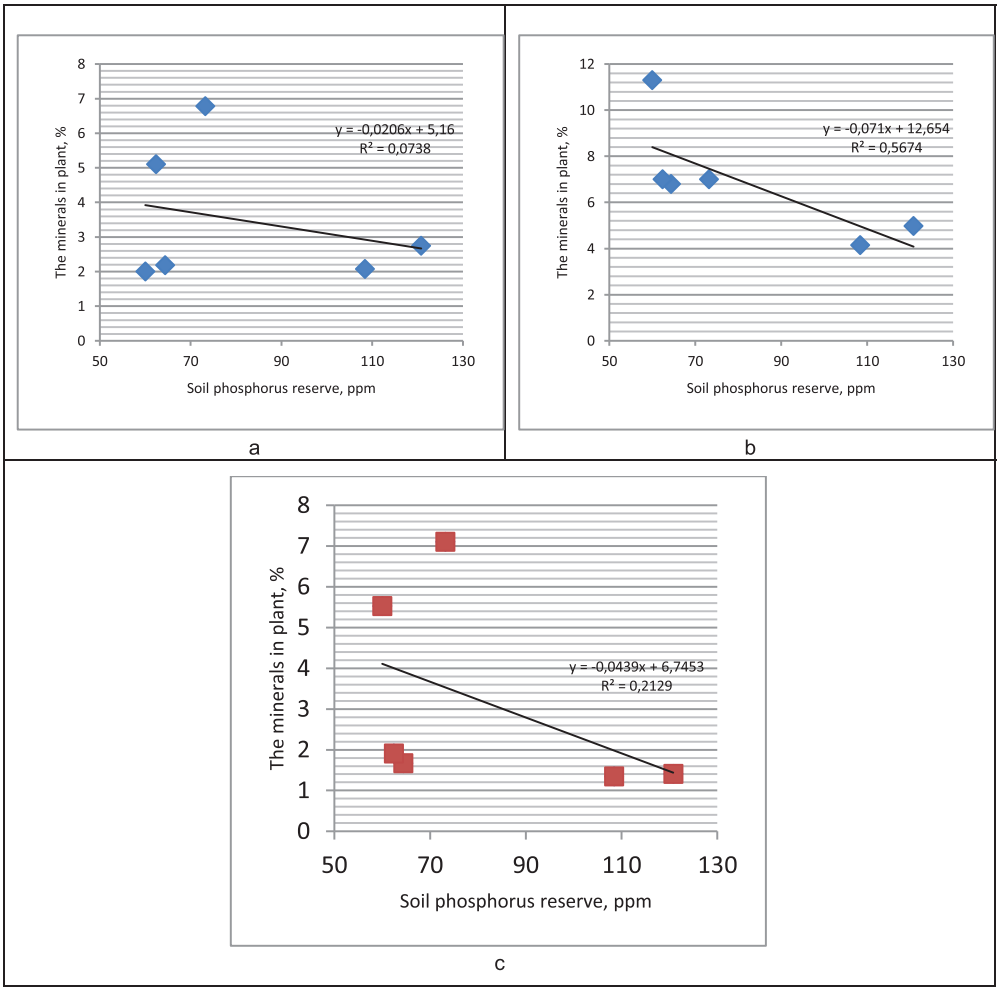

Figure 2. Correlation between the soil phosphorus and minerals from the plant: a- March, b - May, c - August.

For potassium, the situation was similar to phosphorus, but with different correlation coefficients depending on the measurement moment; the highest consumption was apparently also in May, when the correlation coefficient was also greater (fig. 3, a, b, c).

CONCLUSIONS

From the present study, the following conclusions can be drawn:

- Soil reaction was within limits of favorability for the species, and the content of soluble salts does not present problems regarding tree growth;
- The soil supply state with NPK proved very good for N and K and medium for P;
- Regarding the plants, the highest average content of minerals was recorded in May;
- Among the analyzed organs, the highest mineral content was recorded for leaves, while the lowest for two years branches;
- Among the varieties, differences were observed related to the values obtained for each of the three measurements;
- Correlations made between the soil minerals and the plant showed an indirect relation; as plants grew, the soil reserve of NPK decreased.

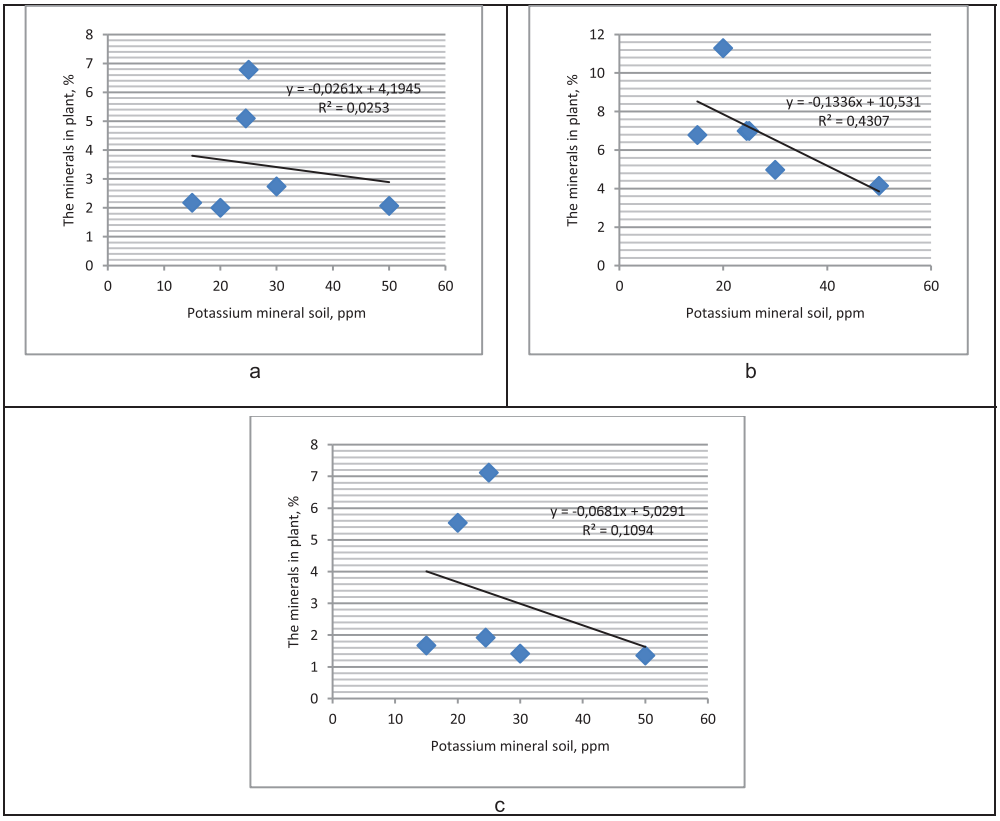

Figure 3. Correlation between soil potassium and plant minerals:
a- March, b - May, c - August.

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THE EFFECTS OF GROUNDWATER USED FOR THE APPLICATION OF FOLIAR FERTILIZER TO SUMMER-AUTUMN TOMATO CROP

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Keywords: *tomatoes, foliar fertilization, groundwater, production, soluble dry matter*

ABSTRACT

This paper presents preliminary studies regarding the effect of using different water sources to prepare the solution for the application of foliar fertilizer Agrocean B on summer-autumn tomato crop. The Agrocean B product is both fertilizer and growth stimulator with a high content in seaweed extract from Laminaria digitata, being CE fertilizer that can be used in organic agriculture. Application in the vegetation phase of the summer-autumn tomato culture of three foliar fertilization with Agrocean fertilizer in dose of 2 l/ha and an amount of a solution of 500 l/ha/application, using various sources of groundwater for the preparation of the solution, determined increased production per unit area by 10.6% to the variant where for the preparation of the solution it was used distilled water, up to 33.98% at the variant in which for the preparation of the solution it was used water from source 2. Also and an increase of the fruit content in dry soluble matter by 5.3% at the variant to which distilled water was used for the preparation of the solution, up to 11.8% to 12.9% for the variants where for the preparation of the solution was used water from sources 1 and 2 respectively.

INTRODUCTION

Groundwater constitutes the largest reservoir of freshwater in the world, representing more than 97% of all available freshwater reserves on Earth (excluding glaciers and polar ice caps). The remaining 3% is composed mainly of surface water (lakes, rivers, wetlands) and soil humidity. Until recently, the attention paid to groundwater was mainly referred to its use as drinking water (for example, ca. 75% of the EU residents depend on groundwater for water supply), but it is also acknowledged that they constitute an important resource for industry (cooling water) and agriculture (irrigation).

Due to the specific conditions of formation and movement of groundwater in the aquifer layer, their quality is determined by the geological structure of the crossed layer and by hydrodynamic factors. Knowing the lithologic structure in an area allows to draw conclusions about the possibilities of groundwater accumulation (Bucur 2009).

The salts loading is achieved by dissolving soluble salts: chlorides, sulfates, nitrates, etc., from the soil layers located above the phreatic layer, by solubilizing the mineral compounds of the aquifer, after the chemical reactions taking place at this level in the presence of water (Savin 2005).

Foliar fertilization is made with any fertilizer substance applied in liquid form on the leaves. Modern foliar fertilizers are concentrated solutions that use high purity technical elements. The fertilising elements in this situation are in solution, soluble, and thus very accessible to plants.

MATERIAL AND METHODS

In the year 2015 it was studied the effect of different water sources used at preparing the solution for the application of Agrocean B foliar fertilizer on summer-autumn tomato crop. The experience has been placed in the experimental didactic field of S.D. Banu Mărăcine Center.

The applied technology was specific to the summer-autumn tomato crop, with differences imposed by the experimental variants, as follows:

V_1 = no foliar fertilization;

V_2 = foliar fertilization with Agrocean B, solution prepared with distilled water;

V_3 = foliar fertilization with Agrocean B, solution prepared with water from source I;

V_4 = foliar fertilization with Agrocean B, solution prepared with water from source II;

The application dose: Agrocean B - 2 l/ha

The foliar fertilization:

- the first application: 10 days after plantation;
- the second application: 12 days after the first;
- the third application: 12 days after the second.

The amount of solution used was 500 l/ha/application, and the water sources used in preparing the solution were:

- distilled water;
- source I - Argetoaia village, Dolj county;
- source II - Orodel village, Dolj county.

The biological material used:

- summer-autumn tomato, Romec 554 J variety.

In order to obtain the production data and establishing the values of some morphological characteristics, biometric determinations and measurements were carried out.

The biometric measurements were made at the physiological maturity of the fruit, namely:

- the plant height;
- the fruit weight.

The determinations made were for:

- soluble dry substance;
- production per unit area.

The production data obtained were interpreted statistically by analyzing the differences limit (DL) and using the multiple test Duncan.

RESULTS AND DISCUSSIONS

The water samples were colected from each village, from five wells within a radius of 500 m, the chemical composition of the two water sources used being shown in Tables 1 and 2.

There were registered exceedances of the maximum allowable concentrations for chloride, sodium, potassium for the water collected from Argetoaia village, and for the samples taken from Orodel village there can be observed overcomes in the case of nitrates, ammonium, potassium and sodium.

Table 1

Chemical characteristics of water (mg/l) collected from Argetoaia village

Specif.	NO_3	NO_2	PO_4	NH_4	Cl	Fe	CCO-Mn	pH	Na	K	Durity
Median	25.44	0.066	4.12	0.21	1135.4	23.2	16.36	7.158	102.8	211.2	16.88
CMA	50	0.5	5	0.5	250	200	5	8.5	150	12	5

Table 2

Chemical characteristics of water (mg/l) collected from Orodel village

Specif.	NO_3	NO_2	PO_4	NH_4	Cl	Fe	CCO-Mn	pH	Na	K	Durity
Median	53.92	0.17	1.684	0.9	30.32	29.92	7.02	7.678	176.96	19.5	28.72
CMA	50	0.5	5	0.5	250	200	5	8.5	150	12	5

Analyzing statistical the obtained results for the absolute production of the experimental variants compared with the unfertilized variant (V1), taken as a reference, the data in Table 3 shows that fertilization in the vegetation period with Agrocean B 2 l/ha for which at the preparation solution it was used water from source 2 (V4) determined an increase of 33.98%, the positive difference being statistically assured as significant in a distinct degree. The foliar fertilization in which for the preparation of the solution it was used water from source 1 (V3), presented an absolute production increase of 19.33%, the positive difference being statistically assured as significant. Hence, the chemical composition of the water used in preparing the application solution, alter the effect of the foliar fertilizer Agrocean B applied to the summer-autumn tomato crop.

Table 3

Synthesis of the production results

Specif.	Total production (t/ha)	Relative production (%)	Difference ± t/ha	Significance degree
V4 = Foliar fertilization with Agrocean B + water from source 2	40.766	133.98	+ 10.34	* *
V3 = Foliar fertilization with Agrocean B + water from source 1	36.308	119.33	+ 5.882	*
V2 = Foliar fertilization Agrocean B + distilled water	33.516	110.16	+ 3.09	
V1 = no foliar fertilization	30.426	100.0	-	

DL 5 % = 5.725 t/ha
DL 1 % = 8.161 t/ha
DL 0,1% = 12.003 t/ha

Analyzing the multiple comparisons by Duncan test of the absolute production from the results obtained for the experimental variants (Table 4), it is shown that there are significant differences between the fertilization with Agrocean B by 5% for which the solution was prepared with water from source 2 (V4) and the reference variant (V1), as well as for the variant fertilized with Agrocean B in which for the preparation of the solution distilled water was used (V2).

Table 4

Multiple comparison (Duncan test)

Classification	Variant	Production	X – 30.426	X – 33.516	X – 36.308
I	V4	40.766	10.34 * (6.074)	7.25 * (5.932)	4.458 (5.683)
II	V3	36.308	5.882 (5.932)	2.792 (5.683)	
III	V2	33.516	3.09 (5.683)		
IV	V1	30.426			

s_x x qn_2 = 1.776 x 3.20 = 5.683
s_x x qn_3 = 1.776 x 3.34 = 5.932
s_x x qn_4 = 1.776 x 3.42 = 6.074

Regarding the influence of fertilization with Agrocean B at a dose of 2 l/ha in a quantity of 500 l/ha of solution on the morphological characteristics of the summer-autumn tomato plants (Fig.1), it can be observed an increase of the average height from 74.6 cm registered at the reference variant, up to 103.8 cm for the fertilezed variants. Thus, the fertilization with Agrocean B in which for the preparation of the solution distilled water was used (V2), caused an increase in the average plant height by 11.6%, and at the variants in which for the preparation of the solution the two sources of water were used, the vegetative growth of the tomato plants, were higher by 36.9% (V3) and 39.1% (V4) respectively.

The use of water from sources 1 and 2 for the preparation of the fertilizer solution for the foliar application, have increased the average plant height by 22.7% (V3) and 24.6% (V4), compared with the variant where distilled water was used (V2), mainly because of their mineral composition.

By plotting the fruit weight variation for ROMEC 554 J variety depending on the specific experimental variants (Fig. 2), it was found that the variant with no fertilization, taken as reference (V1), the production has shown fluctuations, namely, the chart shows two peaks, one with the highest frequency for the value of 95 g and the second peak for the value of 75 g. The application in the vegetation period of foliar fertilization with Agrocean B fertilizer at a dose of 2 l/ha in a quantity of 500 l/ha solution using different sources of water for the preparation of the solution, resulted in an increase of the average weight of the fruits besides triggering uniformity values for this character. The most uniform distribution of the values for the average fruit weight was achieved at the variant to which water from source 2 was used in the preparation of the solution (V4), followed by the variant which was performed using water from source 1 in the preparation of the solution (V3).

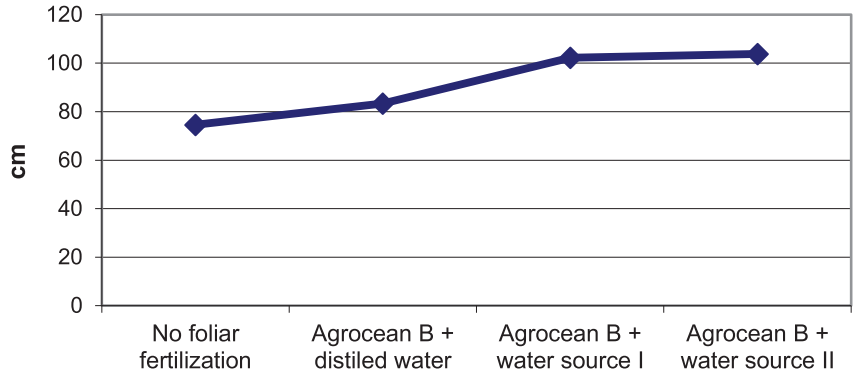

Figure 1. The average plant height (cm) per experimental variant.

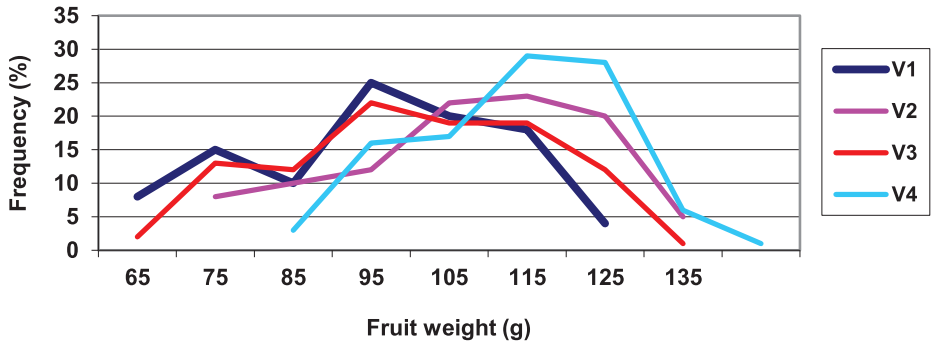

Figure 2. The fruit weight variation of ROMEC 554 J variety per experimental variant.

Also the fertilization with Agrocean B foliar fertilizer using different sources of water to prepare the solution it resulted in an increase of the soluble dry substance content of the tomato fruits (Fig. 3), by 5.3 % at the variant to which distilled water was used in preparation of the solution (V2), up to 11.8% and 12.9% for the variants in which water from sources 1 and 2 were used for the preparation of the solution (V3 and V4 respectively). Given the yields achieved per unit area of 30.4 - 40.7 t/ha, and that this is related to the total dry substance, increasing the soluble solids content is important for improving the quality of summer-autumn tomato fruits.

CONCLUSIONS

Based on the analyzed data there were issued the following conclusions:

- There were registered exceedances of the maximum allowable concentrations for chloride, sodium, potassium in the case of Argetoaia village, and for the samples taken from Orodel village there were observed exceedings for nitrates, ammonia, potassium and sodium;

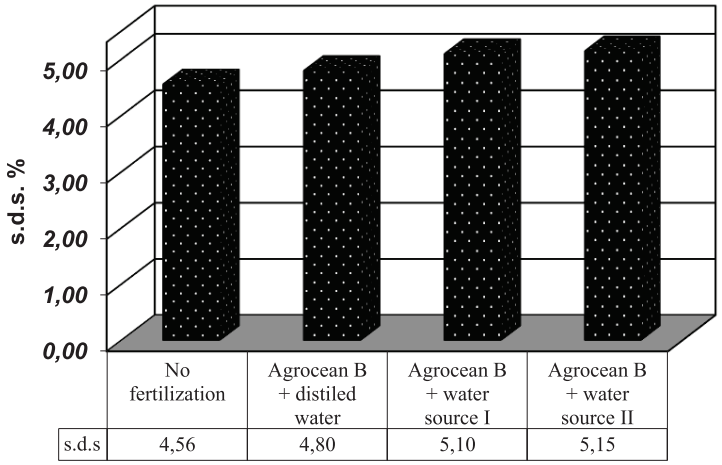

Figure 3. The soluble dry substance of the tomato fruits per experimental variant.

- The application of Agrocean B fertilizer for three foliar fertilization at a dose of 2 l/ha in a quantity of 500 l/ha using different sources of water for the preparation of the solution applied to summer-autumn tomato crop in the field, revealed that in the pedo-climatic conditions of the experimentation, the production increased by 3.1 t/ha up to 10.3 t/ha;

- The fertilization with Agrocean B 2 l/ha in which for the preparation of the solution, water from source 2 and 1 was used (V4 and V3), resulted in an increased production with 33.98% and 19.33%, respectively;

- Agrocean B fertilization using different sources of water to prepare the solution, resulted in an increase of the average height of tomato plants from 74.6 cm to the reference variant up to 103.8 cm;

- Also, using this fertilizer, increased the average weight of the fruit and increase soluble dry substance content of the tomato fruits by 5.3% to 12.9%.

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THE EFFECTS OF FOLIAR FERTILIZATION OF EARLY TOMATOES - PRODUCTION AND PROFITABILITY RATE

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Keywords: *hybrid tomato, foliar fertilization, production, rate of profitability*

ABSTRACT

This paper presents the results obtained in two years of experimentation concerning the effects of foliar fertilization applied to the early tomato crop in the greenhouse with CROPMAX product at a dose of 1 l/ha/application, AGROCEAN at a dose of 5 l/ha/application, and F - 114 fertilizer at a dose of 5 l/ha/application, and an amount of solution of 500 l/ha/application. The application of foliar fertilization was performed four times, at an interval of 10-12 days after planting and resulted in increased production per unit area in 2014 ranging between 23.8% and 50%, based on the applied fertilizer, compared with the reference variant, an increase in the weight of the fruits from 14.2% to 34.7%, and the profitability rate was 201.7% at the variant fertilized with CROPMAX, and 139.3% for the fertilized variant with F 114 product.

INTRODUCTION

In the framework of modern technologies of the cultivation of vegetable plants, foliar fertilization aimes to supplement the necessary nutrients for plants during the growing phases.

Extraroot phasial fertilization is mainly applied to crops in greenhouses in a number of 3-5 in an interval of 10 - 15 days (Ciofu 2003).

Good results were obtained in our country for tomatoes, cucumbers, peppers, spinach, radishes, cabbage and so on by spraying the plants when necessary, to add fertilizer with microelements.

The foliar application of the Golden fertilizer to the cultivated tomatoes, Roma variety at a dose of 1600 ml/100L, it showed significant effects by increasing the average weight of fruits from 80.77 g to 94.35 g, the ascorbic acid from 16.35 mg/100 g to 17.14 mg/100g, and the production per unit area of the plants in the agro-climatic conditions of Peshawar, Pakistan (Anwar 2015).

MATERIAL AND METHODS

The studies were conducted in a private property in Izbiceni village, Olt county, in the period of 2014 - 2015, the experience being placed under unheated solarium, 4 repetitions were made, and as biological material, the early hybrid tomato *PRECOS F1* was used. The following foliar fertilizers were tested: AGROCEAN - 5 l/ha/ application, F 114 - 5 l/ha/ application and CROPMAX -

1l/ha/application, compared with the reference variant (unfertilized, sprayed with water), the quantity of solution used was 500l/ha/ application, the first application was 12 days after planting, and the next at intervals of 10 days of each other.

Determinations were made for: the average production, production by quality categories and the average fruit weight for each experimental variant, calculation and interpretation of the experimental data, as well as the rate of profit.

RESULTS AND DISCUSSIONS

The synthesis of the obtained results for the production in the two years of experimentation (Table 1) shows that compared to the reference variant, the variant fertilized 4 times with Cropmax presented a production increase of 50 %, the positive difference of 6.52 kg/4.2m^2 being statistically ensured to a significant degree both against the error and to the interaction *variants x years*.

Table 1

The significance of the production differences

Foliar fertilized variant	Production kg/4,2 m^2	Relativ production %	Differences ± kg/4,2 m^2	Significance	
				Error	Interaction
Cropmax	19.56	150.0	+ 6.52	*	*
F 114	19.02	145.9	+ 5.98	*	
Agrocean	16.15	123.8	+ 3.11		
Reference	13.04	100.0			
			DI 5%	5.689	6.481
			DI 1%	7.790	11.910
			DI 0.1%	10.495	26.370

Concerning the quality of the tomato production for the experimental variants according to the STAS SR 1421/2003 specifications, from the average of the two years of experimentation summarized in Table 2, there can be seen an increase in the percentage of extra quality fruit from 14.2 % for the reference variant (no foliar fertilizer) to 22.7 % for the variant fertilized with Agrocean, to 26.3 % for the variant fertilized with Cropmax and up to 34.7 % for the variant fertilized with F – 114. Compared to the reference variant, the foliar fertilization applied 4 times during the vegetation phase, with the three studied products, increased the percentage of extra quality fruit for all variants, ranging from 59.8% to 144.4%.

From the synthesis data of the average weight of fruits obtained in the two years of experimentation (Table 3), it is found that compared to the reference variant (V1), the variant fertilized 4 times with Cropmax presented a weight increase of 53.21 %, the positive difference being statistically ensured to a significantly distinct degree from error and significantly from the interaction *variants x years.*

Table 2

Tomato production according to quality classes (average of the years 2014 - 2015)

Variants	Quality category		
	Extra quality (%)	First quality (%)	Second quality (%)
V1= No fertilization	14.2	46.2	39.6
V2= Foliar fertilization with Agrocean	22.7	45.0	32.3
V3= Foliar fertilization with F 114	34.7	45.3	20.0
V4= Foliar fertilization with Cropmax	26.3	51.1	25.6

Table 3

The significance of the average weight (g/fruit)

Variants	Average weight g/fruit	Relative weight %	Differences ± g/fruit	Significance	
				Error	Interaction
V4	158.70	153.21	+ 55.12	* *	*
V3	129.62	125.14	+ 26.04		
V2	124.45	120.16	+ 20.88		
V1	103.58	100.00			
			DI 5%	29.038	53.614
			DI 1%	46.800	98.462
			DI 0.1%	63.05	218.168

Analyzing the economic efficiency related to the absolute yields achieved, from the data contained in Table 4, there is an increase in the total costs of 23089.74 RON/ha for the variant fertilized with CROPMAX and by 30633.32 RON/ha for the fertilized variant with F 114, mainly, due to manual labor costs (harvesting, transport and manual sorting), and of the other related expenses (manual application of fertilizer and material costs). The calculated income was 46572 RON/ha and a profit of 23482.26 RON/ha for the fertilized variant with CROPMAX, for the fertilized variant with F 114 the calculated income was 42714 RON/ha with a profit of 12080.68 RON/ha.

The profitability rate that reflects most accurately the economic efficiency, was 201.7 % for the fertilized variant with CROPMAX and 139.3 % for the variant fertilized with F 114, which means that for 1 RON invested there were generated 2.017 RON and 1.394 RON profit for each experimental variant.

Table 4

Total costs, additional income and profitability rate

Variant	Total costs - lei/ha -	Income - lei/ha -	Profit - lei/ha -	Profitability rate %
Foliar fertilization with Cropmax	23089.74	46572	23482.26	201.7
Foliar fertilization with F 114	30633.32	42714	12080.68	139.4

CONCLUSIONS

Based on the analyzed data there were issued the following conclusions:

- The phasial fertilization of the hybrid tomato Precos F1 variety by applying the Cropmax product during the vegetation period in a dose of 1l/ha/application, presented a production increase of 50%, the positive difference being statistically ensured to a significant degree, both from the error and from the interaction variants x years;

- Applying foliar fertilizers during the vegetation period, increased the percentage of extra quality fruit from 14.2% at the reference variant to 22.7 % for the variant fertilized with Agrocean, to 26.3 % for the variant fertilized with Cropmax and up to 34.7 % for the variant fertilized with F - 114;

- The average weight of the fruit showed an increase statistically assured in a significant distinct degree;

- The profitability rate for Precos F1 tomato hybrid, in the experimental conditions, was of 201.7 % to the CROPMAX fertilized variant, which means that for 1 RON invested 2.017 RON profit was generated;

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THE INFLUENCE OF GROWTH RETARDANTS AND SUBSTRATE VOLUME ON GROWTH OF *HEMIGRAPHYS REPANDA* L.

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Keywords: *Hemigraphis repanda L., Cycocel, nutrition space, growth control*

ABSTRACT

Hemigraphis repanda L. Hallier is a colorful foliage plant with green and purple colored leaves with great potential for commercialization. This study was undertaken to determine if reduced nutrition space and plant growth regulators could limit excessive growth, while improving its overall quality. The H. repanda plants were exposed to four treatments: V1-6cm/water; V2-8cm/water; V3-10cm/water (Control); V4 -10 cm/Cycocel 0.2%. The reduction of the substrate volume caused slower growth compared to the control plants (V3), the effects being comparable to those produced by the Cycocel treatments. Cycocel treated plants produced more lateral shoots resulting in a compact and dense bush-like appearance, which improved aesthetic value of Hemigraphis as a container-grown interior plant.

INTRODUCTION

The plant size, growth rate and the degree of branching represent important criteria for determining the stage of commercial plant. In producing potted plants, height control is often necessary to achieve desirable plant size and shape (Chen & Meister 2006, Milandri et al. 2008). There are different categories of control tools available to producers: biological, mechanical, environmental and chemical (Larcher et al. 2011).

It is standard practice in the industry to treat young plants several times with chemical plant growth regulators (PGR) such as Alar, Cycocel or Bonzi etc to reduce internode length to obtain shorter, more compact plants. It is important to note that this effect is temporary and the plants will achieve their full height potential when planted out in the field and grown full season (Perkins 2001).

The plants reaction to the growth retardants application or to cultivation methods for height reduction has been studied for many species, and the often contradictory results highlight the plant reaction differences between species and even between the varieties within a species (Mandă & Nicu 2012). The height of plants can be controlled by a number of non-chemical cultural methods, such as: applying water stress (Manda et al. 2008, Nicu & Manda 2012), reduction of substrate volume (Poorter et al. 2012), mechanical methods (Latimer 1998), DIF - difference between day and night temperature (Blanchard & Runkle 2011) etc. In some species these are the only methods that can be used. (Gargul et al. 2014).

Hemigraphis repanda (L.) Hallier (syn. *Ruellia repanda* L., *Strobilanthes sinuata* J. R. I. Wood), *Acanthaceae* family, is a species native to the tropical rain forests of the Malay Archipelago, commonly known as Dragons Breath, Dwarf Waffle Plant, and Narrow Leafed Flame Ivy. It is a creeping, evergreen perennial herb, can reach up to 15 cm height. It is easy rooting at the nodes (shoot tips are raised above the surface). The leaves are oblong-lanceolate, 6 cm long and 1.5 cm wide, deeply serrated, dark-purple green, red bottom. Inflorescence terminal, the flowers are small, 15 mm long. In late spring is covered by white flowers, that contrast nicely with the dark foliage (Saakov 1983, Moylan et al. 2004, Moylan 2002, Moylan & Scotland 2000). *H. repanda* can be grown in partial sun light/semi shade but can tolerate bright sunlight. If planted in full shade color of the leaf fades. It needs fertile and well drained soil. Is being used in landscape for ground cover and borders during summer. It can also be an excellent hanging basket plant and an ideal plant in mixed color container garden, window boxes, miniature garden. The consulted academic literature shows that until now no studies on the *H. repanda* growth control have been conducted. Pennisi (2008) studied the effect of PGR (Topflor, A-Rest) on *H. alternata* and the results show that the applied treatments did not have the effect of reducing the plant height or obtaining more branched plants. Topflor caused a notable increase of the leaf colour, but phytotoxicity occurred at higher concentrations.

The aim of this study was the growth control of the Hemigraphis repanda plants and improving its aesthetic value, by 2 methods: the chemical method - application of growth retardants (Cycocel); cultivation method (non-chemical) – keeping the plants in small pots.

MATERIAL AND METHODS

The research was carried out between 2013 and 2014 in the greenhouse of the Floriculture discipline of the Faculty of Horticulture of Craiova, a temperate greenhouse, with average temperatures ranging between 18 and 20°C.

The vegetal material was formed by rooted cuttings of *Hemigraphis repanda* L., obtained from the collection of the Floriculture discipline, that were exposed to four treatments: V1-6cm/water; V2-8cm/water; V3 (Control) - 10cm/water; V4 -10 cm/Cycocel 0.2% (2000 ppm).

For V1, V2, V3 the rooted cuttings were planted in a 2:1 mixture of peat + perlite in pots of different sizes: 6 cm (0,24 l), 8 cm (0,32 l), 10 cm (0,4 l). At V4 the rooted cuttings were planted in pots of 10 cm (a size recommended in the literature) and 3 foliar treatments with Cycocel 0.2% (2000 mg L-1) were applied at a two-week interval. For simplicity variants were noted as: V1 - 6cm/w, V2 – 8 cm/w; V3 - 10cm/w (Control); V4 – 10cm/Cc. During the 6 months since the experiment placement it was observed the evolution of the vegetative growth rate of *H. repanda* plants under the influence of applied treatments. The observations consisted of biometric measurements: the average plant height, the average number of shoots/plant, the average length of shoots, the average leaf size.

RESULTS AND DISCUSSIONS

The average height of the plant of Hemigraphis varied widely depending upon the culture conditions. The two methods used to reduce the plant size, led to significant reductions in plant height from 14 cm (V3) to 6.6 cm (V1) and 6 cm (V4).

The graph 1 show the differences between the three variants that were plants grown in pots of different sizes (V1-6cm, V2-8cm respectively V3-10 cm diameter), the highest values, ranging from 9.2 to 14 cm, being recorded at V3 (Co), where the plants benefited from optimum substrate volume. For V4, where treatments with Cycocel were applied, the average height of the plant recorded the lowest values ranging, from 2.2 to 6 cm, compared to the untreated variants.

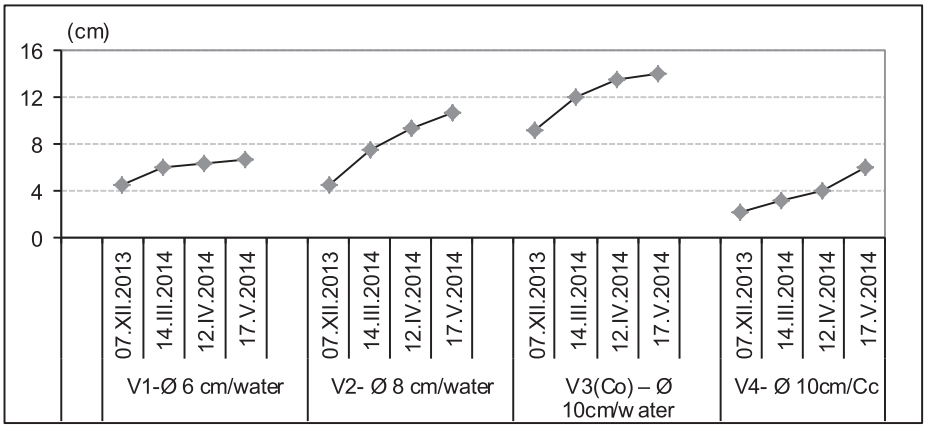
We can notice in graph 2 that the average values of the length of internodes were increasing throughout the experimental period excepting V1, which recorded a stagnation after the second determination. The highest values of the internodes length was recorded at V3 Mt (2.5 cm), followed by V2 (2 cm) and the lowest value of this parameter was recorded in V1 and V4 (1 cm) at the last determination. Reducing the volume of substrate (V1) and the treatment with Cycocel (V4), led to a reduction in the length of internodes with above 50%, from 2.5 cm (V3-Mt), 2 cm (V2) respectively to 1 cm (V1, V4) (graph 5).

In terms of the average size of the leaves, there was found that after 5 months from the first treatment, the higher value of the average length of leaves was recorded at V3 (4.7cm), and the lowest value corresponds to V1 (3.5 cm), as an effect of reducing the substrate volume. The variant in which the plants were treated with Cycocel (V4 - 4 cm) recorded an intermediate value close to V1 (3.5 cm). The average width of the leaves has developed similarly, with the proviso that the variant that has been treated with Cycocel 0.5% recorded the highest value of this parameter, although the average length of the leaves was almost the lowest (graphs 3 and 5).

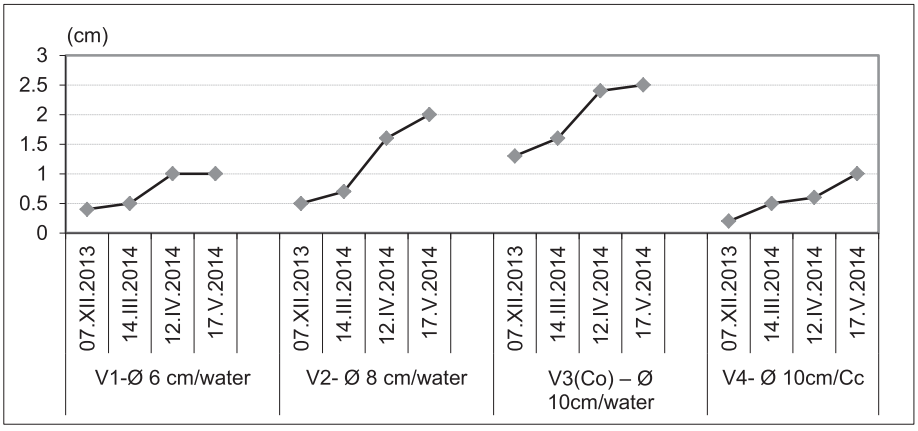
Analyzing the data in terms of dynamics, the average number of shoots/plant has been increasing throughout the period of experimentation in all the variants. The values recorded in the second determination varied within narrow limits, ranging from 7 shoots (V1) to 11 shoots (V3). There were recorded high differences among the treatments at the last determination. The highest value of the average number of shoots/plant was obtained at the plants treated with Cycocel (V4 - 25 shoots). The average number of shoots / plant was between 12 and 16 shoots at V1-6cm/water, V2-8cm/water, V3-10cm / water, and the pots size does not influence considerably this parameter (graphs 4 and 5).

Obtaining branched and compact plants is an important aspect for ornamental plants. The data obtained show that the average number of shoots per plant increased by 50% at the plants treated with Cycocel (V4- 25 shoots) in comparison to the plants grown in a minimum substrate volume (V1-12 shoots).

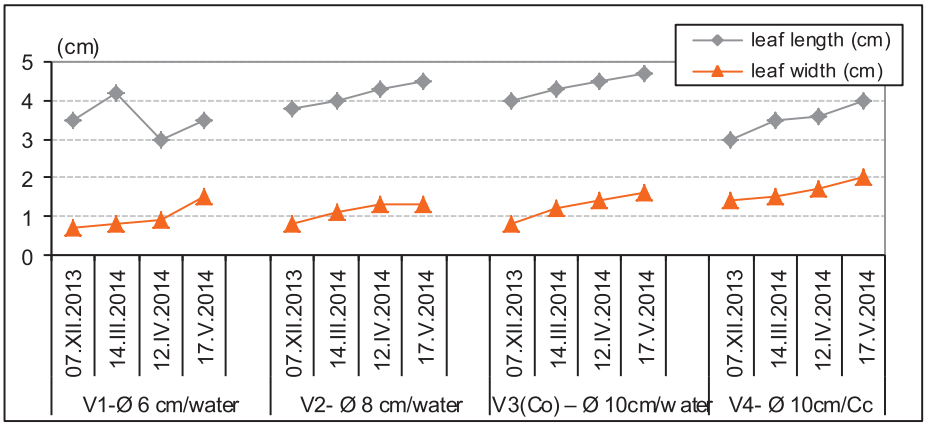
Studies of Pennisi (2008) on growth of *Hemigraphis alternata* showed that neither PGR was reliably effective at controlling growth of *Hemigraphis* at the rates used. The current study showed that reducing the volume of substrate (V1) and the treatment with Cycocel (V4), led to a reduction in the length of internodes with above 50%; Cycocel treated plants, also produced more lateral shoots resulting in a compact and dense bush-like appearance, which improved aesthetic value of *Hemigraphis* as a container-grown interior plant. Once again it is confirmed that there must be determined the best method or product to control the plant growth for each species/variety.



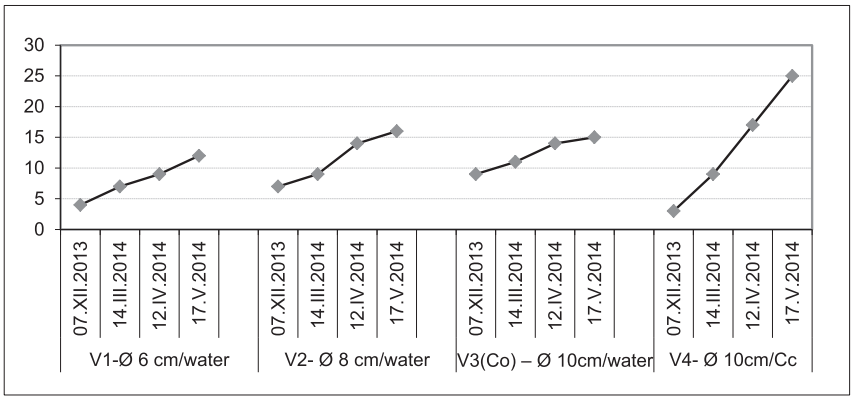
Graph 1. The average height of plants.



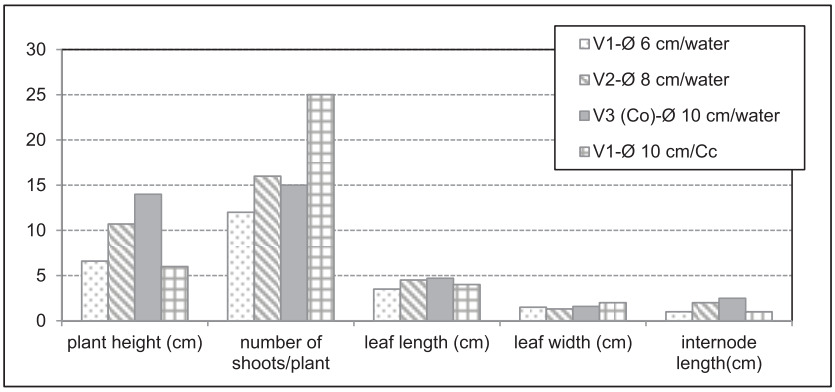
Graph 2. The average length of internode (cm).



Graph 3. The average size of leaves.



Graph 4. The average number of shoots/plant.



Graph 5. The effect of treatments applied on growth and morphology of *H. repanda* plants at the last determination.

CONCLUSIONS

The two methods used to reduce the plant size led to significant reductions in plant height from 14 cm (V3-10cm/water) to 6.6 cm (V1-6cm/water) and 6 cm (V4-10cm/ Cc). By reducing the substrate volume, the plant height reached levels comparable to those treated with Cycocel (6.6 cm at V1,6 cm at V4).

The applied treatments have led to a reduction of the length of internodes with more than 50%, from 2-2.5 cm (V2, V3-Mt) to 1 cm (V1, V4) and a reduction of the average dimensions of the leaves from 4.7 cm (V3) to 3.5-4 cm (V1, V4 respectively). The current study showed that Cycocel treated plants also produced more lateral shoots resulting in a compact and dense bush-like appearance, which improved aesthetic value of Hemigraphis as a container-grown interior plant.

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THE INFLUENCE OF PLANTING DENSITY ON THE FRUIT QUALITY AND ECONOMIC EFFICIENCY IN THE APPLE ORCHARD

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Keywords: *apple tree, planting density, fruit quality, profitability*

ABSTRACT

The prospect presents a research which determines the optimum density limit for orchards. The author made an experience with planting scheme 4 x 1.5 m; 3 x 1.0 m; 3 x 0.66 m and 3 x 0.33 m. The varieties Golden Delicious and Idared grafted on rootstock M9 were studied. High density planting promoted increase in productivity by 44-51% at a young age. In the variant where it was planted 10 000 tree/ha the share of the fruit of the highest category is reduced to 16-24%, that resulting decline in profitability to 149-246% compared with a controlled scheme. According to the received information, the optimum density limit for apple grafted on rootstock M9 we believe is 3 x 0.66 m or 5000 tree/ha.

INTRODUCTION

The increase of productivity and quality for the apple planting is determined by the development of the sector. One of the most efficient elements in this process is the increase of trees per unit area. The plantation of small rootstocks, new varieties, formation and location of tree systems in the orchard during the last 20 years, permitted to increase the planting density of apple trees in the Republic of Moldova from 500-1000 trees per 1 ha, till 2-3,5 thousands (Balan et al. 2001; Cimpoieş 2012). The issue of optimization of the perimeter is very important in horticulture. Numerous researches were made in different soil-climatic zones (Агафонов 1983; Gonta 2003; Mica 2010; Babuc 2012; Babuc et al. 2013). When designing the actual orchard it was established that more than 60% of the existing orchards do not provide a rational use of ecological resources.

The main direction of current research in this field is to determine the optimal level of density for the existing variety-rootstock combinations and for the technologies used for cultivation. The purpose of our research was to establish the productivity, and the effect of super-dense planting systems on the economic efficiency of apple tree growth.

MATERIALS AND METHODS

The orchard described in the research was planted in 2008 in the farm “M. Pachiu”, Orhei region, Republic of Moldova. Two varieties of apple trees had been taken as objects of the research: Golden Delicious and Idared, grafted on rootstock

M9. We studied several schemes of planting:

1. 4 x 1.5 m or 1666 trees per 1 ha (control). This scheme is recommended in Moldova for the middle varieties of apple trees grafted on rootstock M9.
2. 3 x 1.0 m or 3 333 trees per 1 ha.
3. 3 x 0.66 m or 5 000 trees per 1 ha
4. 3 x 0.33 m or 10 000 trees per 1 ha.

RESULTS AND DISCUSSIONS

The results of the described research show that the density of planting trees has a big influence on the productivity of planting (tab. 1). In 2012 a doubling of the number of trees in the scheme 3 x 1.0 m in comparison with the controlled scheme, gave an increase of 38% of productivity for the Golden Delicious variety, reaching 60.3 t/ha. However, the subsequent two-fold increase of number of trees per 1 ha gave a lower increase of yield: 4.2% and 12.2% in comparison with the previous year.

Table 1

Productivity of apple trees depending on variety and planting distance, t/ha

Variety	Planting distance,m	2012	2013	2014	2015	Average 2012-2015
Golden Delicious	4 x 1.5	37.6	30.6	33.1	28.7	32.5
	3 x 1.0	60.3	33.0	48,7	40.4	45.6
	3 x 0.66	62.9	26.1	47.0	41.5	44.3
	3 x 0.33	71.6	29.1	48.5	34.2	45.9
Idared	4 x 1.5	33.8	30.2	39.7	34.1	34.5
	3 x 1.0	58.4	35.3	47.8	42.3	45.9
	3 x 0.66	66.6	37.7	53.7	47.0	51.3
	3 x 0.33	68.7	41.6	70.4	29.8	52.6

In 2013 a sharp decline in productivity of plantations was noted, especially at the Golden Delicious variety, due primarily to the overload of trees in the previous year. In the controlled scheme the overload represented only 18.7%, but after the increase of planting density till 3 x 1.0m, and specially till 3 x 0.33m, the reduction was respectively 45.3 и 59.4%, which was even lower than in the controlled scheme. In 2014 the productivity increased in comparison with 2013 in all variants of the research. The difference between variants in Golden Delicious variety (0.2 -1.5 t/ha) wasn't as big as in the Idared variety (6.7-22.6 t/ha).

In 2015, a similar pattern is stored in the productivity of plantations, against the background of no significant decrease compared to the previous year.

In general, analyzing the average yield for the last 4 years it is clear that for both varieties is typical the increase of productivity as a result of density growth. However, if in the controlled scheme we can observe an uniformity data in fruiting during the period, the high-density versions, due to high yields in some years has been a sharp drop in its next year and a manifestation of the periodicity of fruiting. Most clearly this phenomenon is observed in Golden Delicious variety.

An important indicator of the effectiveness of various schemes of planting is also the product quality of fruits. The technical regulations "Requirements to the

quality and sales for fresh vegetables and fruits" approved by the decision of the Government of Republic of Moldova Nr. 229 from 21.12.2009, standard, shows that the index of quality is determined by the commercial aspect of the product and its physical properties (size, form, color etc.). The size determined by the maximum cross-sectional diameter or by the weight.

Table 2

Commercial aspects of apple fruits in dependence with the density of tree planting distance, year 2014

Variety	Planting density, tree/ha	Weight kg/ tree	Diame-ter, mm	Average weight, g	Proportion, kg		Extra+I category, %
					Extra +I category	II category	
Golden Delicious	1666	19.87	74	163	18.68	1.19	94
	3333	14.61	73	161	13.44	1.17	92
	5000	9.39	66	144	8.17	1.22	87
	10000	4,85	62	112	0.53	4.32	16
Idared	1666	23.83	78	172	22.88	0.95	96
	3333	14.34	75	166	13.34	1.00	93
	5000	10.73	71	145	9.65	1.08	90
	10000	7.04	63	118	1.69	5.35	24

Analyzing the values of average fruit weight (tab. 2) it should be noted that an increase in planting density decreases it. So, if in the controlled scheme the average weight of the Golden Delicious fruit totaled 163 g, then with increasing density to 5000 trees / ha, it decreased by 12%, and at a density of 10 000 trees / ha was only 112 g. With the average weight correlates the diameter of fruit, which decreases from 74 mm in the controlled scheme to 62 mm in the option with the highest thickening. And although for all varieties and quality categories the minimum size is 60 mm in diameter, or 90 g in weight, market demand for apples is at a minimum diameter of 70 mm for the category ,, Extra" and 65 mm for category I of quality. In this connection, the quality of the fruit in the option with a maximum diameter of fruit thickening was below market requirements.

Analyzing the market index of fruits, it can be observed that with the increase of planting density the fruit share of ,,Extra" and I category of quality decreased in both studied varieties (with 94-96% in the control, to 87-90% at density of 5000 trees/ha). In the option with the highest proportion of thickening the proportion of commodity fruits accounted for Idared - 24%, and for Golden Delicious only 16%.

The purchase prices strongly influenced the economic efficiency of apple trees growth, which in 2014 due to a number of factors were the lowest during the years of research, amounting to 3.8 lei / kg for Idared variety, to 4.5 for Golden Delicious, and just 0.48 lei / kg for industrial processing.

Analyzing the data in table 3 we made a conclusion that not always indicators of economic efficiency rise with increasing yields. The poor quality of fruits in a variant with 10 000 trees per hectare density of planting and their realization in the industrial processing at a very low price has led to a decrease in the value of gross production by varieties on 49-61% compared with the controlled scheme, despite the fact that the yields in these variant were almost twice as high.

Table 3

Economic efficiency of apple tree growth, depending on the planting trees density

Variety	Plantation distance, m	Product-ivity, t/ha	Profit from sales, k lei/ha	Production cost, k lei/ha	Profit, k lei/ha	Profitability level, %
Golden Delicious	4 x1.5 м	33.1	140.91	40.1	100.8	251
	3 x 1.0	48.7	202.80	48.9	153.9	315
	3 x 0.66	47.0	186.9	46.8	140.1	299
	3 x 0.33	48.5	54.5	51.7	2.8	5.0
Idared	4 x1.5 м	39.7	145.6	48.0	97.6	203
	3 x 1.0	47.8	170.7	51.8	118.9	230
	3 x 0.66	53.7	186.1	54.9	131.2	239
	3 x 0.33	70.4	89.9	58.3	31.6	54

The increase in production costs in the variant with high thickening is mainly associated with a large number of cutting trees and high yield. All these factors led to net income in the variant with the 3 x 0.33 m scheme of planting made by species just 31.6 and 2.8 thousand lei / ha, and the level of profitability did not exceed 54% and 5%. At the same time, the profitability of Idared reached the largest value in the experiment - 239% in the variant with the landing 3 x 66 m circuit, and for a variety Golden Delicious -315% in the variant 3 x 1.0 m.

CONCLUSION

The data obtained allow us to conclude that the increase in density of apple trees planting from 1666 to 10 000 trees/ha increases the yield by 44-51%. However, a high planting density and limiting both air and soil space leads to tension in the struggle for life factors, and, as a result, reduce fruit quality. In a variant with a density of planting trees reaching 10.000 trees/ha the proportion of fruits of higher quality and of those of first category is reduced to 16-24%, resulting in a drop in profitability level 149-246% compared with the controlled scheme. Based on the results of the research the optimal limit for thickening of apple varieties Golden Delicious and Idared grafted on M9 rootstock is 5000 trees per 1 hectare at planting scheme 3 x 0.66 m.

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INCREASING PRODUCTIVITY OF APPLE OCHARD BY USING THE GROWTH REGULATOR BASED ON PROHEXADION-CALCIUM

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Keywords: *Apple, growth regulator, prohexadion - calcium, terminal shoot, yield.*

ABSTRACT

The experimental plot is placed in the orchard "Codru-ST" Ltd. founded in 2000 year. The study subject of the experience was Florina apple variety grafted on M 9 rootstock. The distance of plantation is 4.0x1.0 m. The research was conducted during the period of 2014 year. The tested agent was Prohexadion - calcium (Regalis Plus), which was sprayed in different period. The first application of Regalis Plus at 2.5 and 1.25 kg/ha was apply at the end of flowering, when terminal shoots are 2 to 5 cm in length. Apply a second application of 1.25 kg/ha after the first an interval of 3-6 weeks, depending on growth conditions. During the research, it was studied the mean fruit weight, yield, the number of fruits formation and theirs type. It was established that, Regalis Plus at 2.5 and 1.25+1.25 kg/ha influence on the mean fruit weight, yield and number of fruits formation.

INTRODUCTION

In recent decades, the fruit practice uses more and more retarded acting growth regulators to maintain the correlation between growth and fruiting apple trees (Babuc et al. 2013; Cimpoieş 2012, Pesteanu et al. 2013). It was used growth regulators like Alar, Cultar, Paclobutazol etc., but because it was detected residues in fruits, they were banned from further use (Ghena et al. 2003).

In recent years, more frequently, the growth of apple trees is influenced by Apogee preparations, Regalis 10WG, Regalis Plus whose active ingredient is calcium prohexadion ones it is produced by German concern BASF (Basak 2007).

The growth regulator based of prohexadion calcium inhibits production of giberilinic acid in the plant, reduces shoots growth by forming short internodes, and forms a larger amount of barbed rod rings and spurs (Greene 2007; Pesteanu et al. 2014). In addition, increases the fruit production per unit of surface and the fruits color is more intense due to less annual growth in trees crown (Babuc et al. 2013). The trees blossoming in the next year is more uniform (Costa et al. 2000).

MATERIALS AND METHODS

The research was conducted during 2014 in apple orchard, founded at the "Codru ST" LTD in the fall of 2000. The subject of study was the apple variety Florina grafted on M9. The planting distance was 4.0 x 1.0 m.

The trees were treated with the growth regulator Regalis Plus whose active ingredient is prohexadion calcium, a product of the firm "BASF", Germany.

In the experimental area, as shown in Scheme experience (table 1), in the first variant was not carried out any intervention on the tree.

Table 1

The experiences scheme on establishing the influence of growth regulator Regalis Plus on apple trees

Variants	Active ingredient	Mode of application
Witness, without treatment	-	-
Regalis Plus, 2.5 l/ha	Prohexadion calcium, 100 g/kg	Trees were treated at the end of blossoming, when the length of annual shoots were 2.0-5.0 cm.
Regalis Plus, 1.25 l/ha+1.25 l/ha	Prohexadion calcium, 100 g/kg	Two treatments: first – at the end of blossoming, when the lengths of annual shoots were 2.0-5.0 cm; second - 3-6 weeks later.

In the second variant, it was made just one treatment (24.04.14) in dose of 2.5 l/ha, after trees blossoming, when the annual shoots length was 2.0 – 5.0 cm.

In the third variant were made two treatments in dose of 1.25 kg/ha. First treatment was made after blossoming, when the length of annual shoots was 2.0-5.0 cm (24.04.14) and the second on 3-6 weeks later (25.05.14).

The plots locations were made into blocks where each variant had three repetitions. Each repetition consisted of seven trees.

The average weight of a fruit on the tree and on a surface unit was established during harvest. The amount and type fruit formations were calculated in the autumn, after the leaves fell from the trees in each variant.

RESULTS AND DISCUSSIONS

The use of the growth regulator with retardant action Regalis Plus influenced on the average weight of fruits and on the production (table 2).

The lowest numbers of fruits were obtained in the version control where no treatment was made – 45 pcs/tree with the average weight of 214 g. When using the growth regulator, the number of fruits increases, but the average weight of a fruits decreases to 190 – 175 g.

The lowest average weight was obtained in the variants treated with growth regulators Regalis Plus in dose of 2.5 kg/ha – 175 g, and the highest values were registered when the dose of use was 1.25+1.25 kg/ha – 184 g.

This reduction was possible due to greater binding of ovaries and obtains a greater number of fruits. The average weight of a tree in the variants where treatments with the growth regulator with retardant action were made decreased by 14.1-18,3% compared with the control variant, but most fruits were of high quality.

The production of fruits in a tree is a close correlation between the number of fruits in the trees crown and their average weight. The conducted investigations prove that the lowest yield in a tree and a unit area was obtained in the control variant, which was respectively 9.63 kg and 24.07 t/ha.

When treatments with the growth regulator Regalis Plus were made in dose of 2.5 kg/ha, the fruit production increases to 12.07 kg/tree and 30.17 t/ha. The difference between this variant and the variant control was 2.44 kg/tree and 6.10 t/ha. When treatments with the growth regulator Regalis Plus were made in dose of 1.25+1.25 kg/ha, the fruit production increased compared with the control variant with 1.78 kg/tree and 4.45 t/ha. The difference between the treated variants and the control variant is statistically proven.

Table 2

The influence of the growth regulator Regalis Plus on the average weight and production of apples on the Florina variety

Variants	Average weight, g	Production		Difference to witness, t/ha	In % to witness
		kg/tree	t/ha		
Witness, without treatment	214	9.63	24.07	-	-
Regalis Plus, 2.5 kg/ha	175	12.07	30.17	+6.10	125.3
Regalis Plus, 1.25+1.25 kg/ha	184	11.41	28.52	+4.45	118.5
DL 5%	-	0.53	1.47	-	-

The results of the shown study demonstrate that an increase in production with 18.5% compare with witness variant was obtain when treatments with the growth regulator Regalis Plus were are in dose of 1.25+1.25 kg/ha and with 25.3 % when the treatment dose was 2.5 kg/ha.

The obtained results show that between the treated variants the highest production was obtained when the treatment with Regalis Plus was made in dose of 2.5 kg/ha. In the variant where the treatment dose was 1.25+1.25 kg/ha the fruit production decreased, but the fruits quality is the highest.

The growth regulator with retardant action influences on the quantity and the type of bearing formations (table 3). If in the witness variant, without treatment the quantity of the bearing formations was 133 pcs/tree, then in the variant treated with the growth regulator Regalis Plus their number increased to 164-176 pcs/tree.

Table 3

The influence of the growth regulator with retardant action Regalis Plus on the quantity and the type of the bearing formation on Florina apple variety

Variants	The quantity of bearing formations, psc/tree	Type of bearing formations, %			
		Spurs ringed	Spears	Rods	Multi-annual spurs
Witness, without treatment	133	40.5	7.3	9.8	42.4
Regalis Plus, 2.5 kg/ha	176	46.7	14.4	11.7	27.2
Regalis Plus, 1.25+1.25 kg/ha	164	43.0	12.1	16.5	28.4

The highest quantity of bearing formations was registered in the variant where was treated with Regalis Plus in dose of 2.5 kg/ha – 176 pcs/tree which is about 24.5% more than witness variant. When the treatment with the growth regulator Regalis Plus was made in dose of 1.25+1.25 kg/ha, the quantity of bearing formations was 164 pcs/tree or an increase with 18.9% comparing with witness variant. The decrease in the quantity of the bearing formation happened because of a lower excitability of the fruit buds compared to the control variant.

Investigating the bearing formations, in the variants treated with the growth regulator Regalis Plus compared with the witness variant increases the number of spurs ringed, spears and rods, and it decreases the amount of multi-annual spurs.

In the control variant, the amount of multi-annual spurs was maxim being 42.4% the amount of spurs ringed decreased to 40.5% and the mount of spears and rods was respectively 9.8 and 7.3%. In the variant treated with Regalis Plus in dose of 2.5 kg/ha, it is noticeable and increase of spurs ringed and spears compared with rods and multi-annual spurs. While in the variant treated with Regalis Plus in dose of 1.25+1.25 kg/ha, the amount of spurs ringed and spears decreased compared with the rods and multi-annual spurs. This is explained by the fact that when the treatment was made in dose of 2.5 kg/ha the development of sprouts decreases more which allows the short sprouts to grow, but when the dose of treatment is 1.25+1.25 kg/ha the long spouts grow more.

The research results show that a more rational weight between annual and multiannual bearing formations was recorded when using growth regulator Regalis Plus as dose 1.25+1.25 kg/ha**.**

CONCLUSION

The productivity of Florina apple trees in the control variant was lower than in the variants treated with Regalis Plus by 18.5 – 25.3%.

The quantity of bearing rods in the trees crown increases when treatments with prohexadion with calcium were made by 18.9 – 24.5%.

First treatment needs to be made at the end of blossoming period when the length of the annual sprouts is 2.0 – 5.0 cm and the second one 3-6 weeks later depending of the climate conditions during that period.

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TEMPERATURE INFLUENCE ON THE ESTHETIC QUALITIES OF VEGETABLES CULTIVATED ON GREEN WALLS IN BUCHAREST

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Keywords: *temperature, green walls, vegetables, esthetics*

ABSTRACT

This paper presents the effects that temperature variation can have over the esthetics of vegetables in the case of cultivation in green walls, in urban circumstances. Given the fact that small urban gardens will have a more demanding microclimate, the variations will be exacerbated by existence of a high percentage of construction existing in the same area. All these variations have an impact on the growth and appearance of plants and may generate a less interesting image during the whole length of the year.

INTRODUCTION

Implication in human life of vegetables growing in green walls develops on two levels:

- social and economic, more concrete levels, with a very clear outcome for building an environmental sustainability for urban agricultural operations (Cather Amanda, 2008);
- esthetic, which is more challenging to evaluate, given the fact that the wellbeing of urban life has to include also different types of human interaction, which can be found on top two layers of Maslow's hierarchy of needs.

But what is attractive to the basic consumer of a green wall is difficult to quantify and needs to be tested through surveys and consumer interactions (Orsborn S., Cagan J., Boatwright P., 2008).

The esthetic layer has some coordinates that have to be taken into consideration because these are easier to evaluate:

- percentage of occupied space on the wall during absence and growth periods (Bucharest climate do not allow winter vegetables cultivation on green walls);
- the color display obtained by using different species of vegetables;
- the intensity of color that can be reached.

Given the fact that these qualities can be quantified more easily, the project will study what are the implications of variations of temperature over the development and esthetics of vegetables grown in green walls.

MATERIAL AND METHODS

The constructed green wall has a north-west and bears columns and rows of felt pockets filled with soil in which has been planted different species and cultivars of vegetables.

The species taken into consideration for this study are Lactuca sativa, Solanum lycopersicum, Capsicum annuum, which are just a part of the species cultivated in this experiment.

The plants had been provided with the necessary care, for the nutritional needs and phytosanitary measures so no other restrains should appear in the course of the experiment.

The temperature has been recorded during the 2015 and 2016 years, in the months of April, May, June, July and August and some graphic drawings of how this has variated during those periods comparing with the multiannual media.

RESULTS AND DISCUSSIONS

Recorded temperatures had been translated into the following graphics:

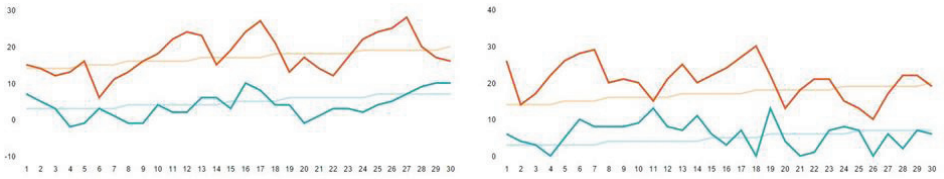

Figure 1. Temperatures for April month, years 2015 and 2016.

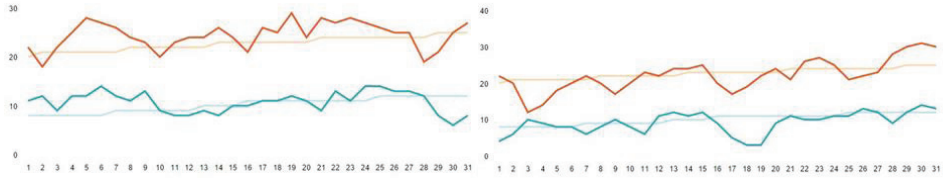

Figure 2. Temperatures for May month, years 2015 and 2016.

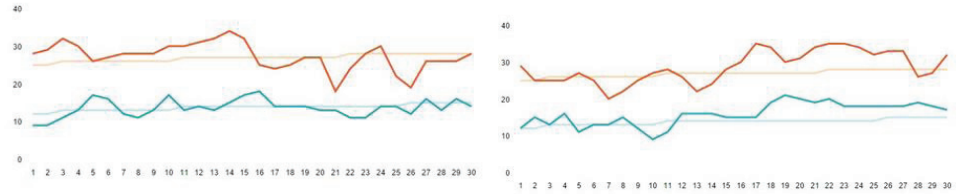

Figure 3. Temperatures for June month, years 2015 and 2016.

As it is obvious from the graphics (figures 1-5), the temperature had many variation that can be related to climate change due to global warming effects (Parry et al. 2007). This has resulted in many implications during the experiment:

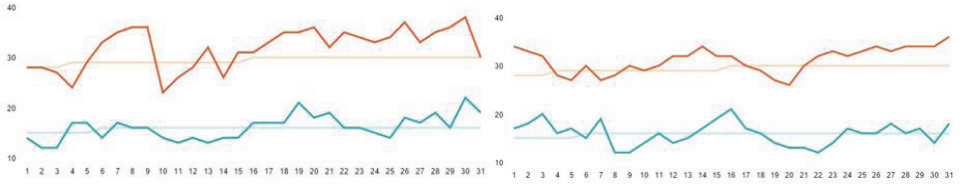

Figure 4. Temperatures for July month, years 2015 and 2016.

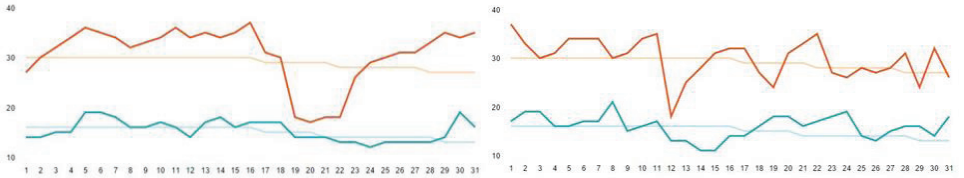

Figure 5. Temperatures for August month, years 2015 and 2016.

Lactuca sativa had a very small window of growth between the moment when temperature was high enough to plant outside and the moment in which was too high for proper cultivation and plants begun to bolt, resulting in change of texture and form and the loss of percentage of occupied space on the wall (table 1);

Solanum lycopersicum and Capsicum annuum had problems with suddenly dropping temperatures but mostly with too high temperature that lowered the number of flower which are setting fruits, pollen becoming unviable at 32 °C during daytime and 24 °C during nighttime, which happened more frequently during months of July and August. After the sudden drop in temperature at the end of August 2016 plants entered in a new phase of growth, setting fruits again. But high temperatures made the leaf mass growing process easier resulting in good percentage of occupied space on the wall (table 1);

High temperatures made possible a higher display of color at the moment of setting fruits for Solanum lycopersicum and Capsicum (table 2);

For both Lactuca sativa and Capsicum annuum a slightly lower temperature made the color of the leaves intensify (figures 6 and 7).

Figure 6. *Lactuca sativa* plants in high and normal temperatures.

CONCLUSIONS

After this experiment it becomes very clear that temperature has implications on the esthetics of vegetables cultivated in green walls by maximizing and minimizing the natural processes in plants.

Figure 7. Same *Capsicum annuum* plant in high and normal temperatures.

Table 1

Percentage of occupied space for different cultivated species

Specie	Lactuca sativa	Solanum lycopersicum	Capsicum annuum
Percentage	63%	100%	87%

Table 2

Percentage of color display for different cultivated species

Specie	Lactuca sativa	Solanum lycopersicum	Capsicum annuum
Percentage during cold periods	28%	7%	4%
Percentage during hot periods	0%	28%	23%

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✓ Environmental engineering

EFFECT OF SALICYLIC ACID ON GROWTH AND FLOWERING OF AFRICAN MARIGOLD PLANTS

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Keywords: *African marigold, ornamental plant, salicylic acid, foliar application*

ABSTRACT

Tagetes erecta L. is one of the most important annual ornamental plants in urban landscape, in parks and gardens, with a remarkable economic importance and traditional medicinal uses in many countries. The experiment was conducted to study the effect of exogenous salicylic acid (SA), in two levels (100 and 200 ppm), compared to the control (water), on vegetative growth and ornamental characteristics of plants.
The results showed that foliar treatments with salicylic acid increased plant height, number of branches, flower diameter, number of flowers per plant, the highest values being obtained from the 200 ppm application. However, the lowest number of days to flowering was recorded by the plants treated with 100 ppm SA.

INTRODUCTION

Tagetes erecta L. (Compositae family), known as the African marigold or Mexican marigold, is an annual species, native to Mexico and Guatemala and naturalized in the rest of Central America. It is widely cultivated all over the world, as a popular ornamental garden plant. There are numerous ornamental cultivars, differing in flower colour, flower head size and plant height (Setshogo 2005).

It has straight stems, branched at the top, a height of 40-100 cm, depending on the cultivar. The plants can reach up to 30-50 cm in diameter, have rapid growth and a specific odor, which is strong and pungent. The dark green leaves are pinnate-compound, opposite or alternate, with 11 to 17 linear-lanceolate or elliptical lobes and serrated edge. The flowers are placed in solitary, terminal, simple or double heads, of 5-12 cm in diameter and they have a creamy white, yellow, orange colour. The fruit is a linear black achene, 7-10 mm long, and it has pappus. It blooms from June to October.

It is a species less demanding, tolerates drought and semi shade, it adapts to any type of soil, but for a proper growth and development it is cultivated in loamy, well-drained soil with regular watering and in sunny locations.

It is used as an ornamental plant in parks, gardens and green spaces, in flower beds, mixed borders, flower bands, or even planted in pots for the decoration of balconies and terraces or in decorative planters in the paved spaces, but also as cut flowers, alone or in combination with other annual plants.

Besides the decorative value, it has therapeutic properties, in many countries, being used in traditional medicine to treat various diseases.

There are presented significant pharmacological activities in many scientific papers such as antioxidant, analgesic (Bashir & Gilani 2008; Pérez Gutiérrez et al. 2006), antibacterial (Kiranmai & Ibrahim 2012; Motamedi et al. 2015; Verma & Verma 2012), digestive, diuretic, sedative, emmenagogue, anthelmintic (Karwani & Sisodia 2015), antiinflammatory, carminative, stomachic, hepatoprotective activities (Dixit et al. 2013; Gopi et al. 2012; Khulbe 2015), etc.

The African marigolds can be used for natural pest control, to reduce populations of nematodes in the soil (Hooks et al. 2010; Wang et al. 2007), because the different parts of the plant contain bioactive compounds that have insecticidal, nematicidal and fungicidal effects (Nikkon 2009; Setshogo 2005; Vasudevan et al. 1997).

Flowers are rich in carotenoids that are currently used as food colorants and added in many nutritional supplements (Gupta 2014; Hadden et al. 1999; Šivel et al. 2014). Fresh and dried flowers are also used to dye wool, silk and cellulose fibers (Setshogo 2005).

The salicylic acid (SA) has an important role in improving plant resistance to biotic and abiotic stress factors such as: drought (Hosseini et al. 2015; Yao et al. 2016), salinity stress (Bayat et al. 2012; Singh & Gautam 2013), damaging effects of heavy metals (Moradkhani et al. 2012; Afrousheh et al. 2015), extreme temperatures (Huang et al. 2016), etc.

Numerous physiological and biochemical processes of plant growth and development, including photosynthesis, stomatal closure, membrane permeability, ion uptake and transport, enzymes activities, seed germination, induction of adventitious roots, vegetative growth, flowering, etc., are influenced by exogenous application of salicylic acid, considered a plant growth regulator (Hayat & Ahmad 2007; Pacheco et al. 2013; Fahraji et al. 2014; Sardoei et al. 2014).

Salicylic acid induce flowering of different ornamental plant species, such that plants will flower much earlier as compared to the untreated plants, when they receive a foliar spray of salicylic acid and increase the number of flowers per plant (Martin-Mex et al. 2005; Martin-Mex et al. 2010).

Salicylic acid has positive effects on the bioproductivity of horticultural and ornamental plants (Larqué-Saavedra & Martin-Méx 2007; Hayat et al. 2010).

The paper presents the obtained results on the effect of foliar treatments with salicylic acid in different concentrations, on the growth and flowering of *Tagetes erecta* L. plants.

MATERIAL AND METHODS

The biological material was represented by *Tagetes erecta* L. seedlings, obtained from seeds commercially available. The seeds were selected and sown in plastic trays, in a permeable substrate, consisting of a mixture of peat and perlite (2:1) in March, under greenhouse conditions. After two weeks from emergence, uniform seedlings were transplanted to 10 cm diameter plastic pots (one plant/pot), filled with mixture of peat, manure and sand (1:1:1), and the mature seedlings were planted in the field in May.

There were applied foliar treatments with salicylic acid (SA), which were repeated on weekly intervals (three treatments) and the experimental variants were: V_1 - control plants (water); V_2 - 100 ppm SA and V_3 - 200 ppm SA.

The observations were undertaken in 2015 in the research area of the floriculture discipline, from the Faculty of Horticulture in Craiova, during the plant vegetation, in order to determine the influence of the various concentrations of exogenous salicylic acid applied as foliar spray, on the growth and flowering of African marigold plants.

The study of the main morphological characters was done through observations and biometric measurements, analyzing plant height, number of main branches per plant, leaf length, number of flowers per plant, flower diameter, number of days to flowering.

RESULTS AND DISCUSSIONS

The data presented in this paper indicate that the exogenous application of salicylic acid improved some characteristics of African marigold plants, such as plant height, number of main branches, flower diameter and the number of flowers per plant.

The results show the positive effect of treatments with salicylic acid on plant height. In figure 1, it is noted that the highest plants were those that were treated with 200 ppm SA (63.8 cm), in comparison with the control plants of which the average height was 59.7 cm. The foliar treatments with salicylic acid caused an increase in the number of main branches per plant, the greatest value in this regard was recorded by the plants treated with 200 ppm SA (14.5 branches/plant), and the lowest value was recorded by the control plants - 11.0 branches per plant.

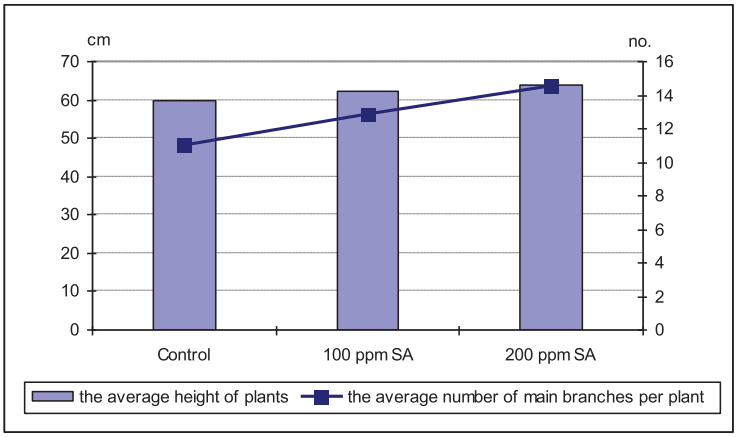

Figure 1. Effect of salicylic acid on plant height and number of branches/plant.

The leaves length was not affected by the applied treatments, obtaining similar average values for all variants, ranging from 15.8 cm at the control plant to 16.1 cm at the 200 ppm SA variant (figure 2).

The flowers diameter is one of the most important qualitative characteristics of ornamental plants. The largest diameter of the flowers has been achieved at 200 ppm SA (6.3 cm) and control plants had the smallest diameter of the flowers - 5.5 cm (figure 3).

The average number of flowers per plant was positively influenced by the applied treatments, being obtained higher values than that of the control, at both

used concentrations, as shown in figure 4. The highest value in this regard was registered after using salicylic acid 200 ppm (45.4), compared with the control plants, which recorded an average value of 37.8 flowers/plant.

In this experiment, plants treated with different concentration of SA, flowered early. The data in figure 5 show an earlier flowering with five days at the plants treated with 100 ppm SA and with three days for those treated with 200 ppm SA, compared to the control plants. The lowest number of days to flowering was recorded at 100 ppm SA (46.0), and the highest number at the control plants that bloomed at 51.0 days after they were planted in the field.

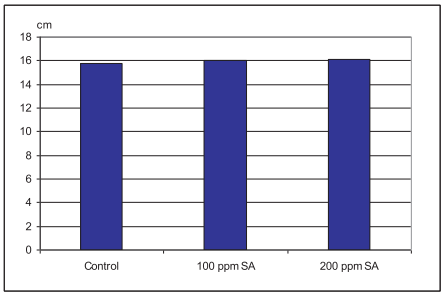

Figure 2. The average leaf length.

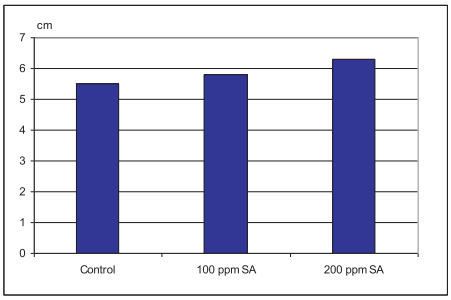

Figure 3. The average flower diameter.

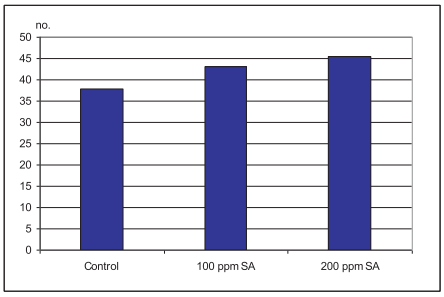

Figure 4. The average number of flowers/plant.

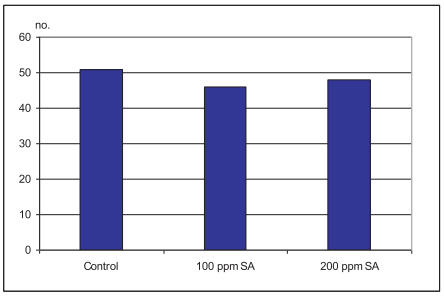

Figure 5. The number of days to flowering.

CONCLUSIONS

The results of this study show the positive effect of salicylic acid on the main morphological analyzed characteristics, indicating that the foliar application may influence the growth and flowering of the African marigold plants.

Both concentrations of used SA, caused an increase in the plant height, number of branches, flower diameter and number of flowers per plant, compared to the control, but the treatments with 200 ppm SA had the best effect. The plants treated with 100 ppm SA had earlier flowering, registering the lowest number of days to flowering.

However, further research is needed to elucidate the role of salicylic acid in the growth and development of plants by determining the response of plants to different methods of application, concentrations, number and intervals between treatments, and the establishment of optimal timing of application.

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ASPECTS CONCERNING THE IMPROVING OF SOME TECHNOLOGICAL SEQUENCES ON WATERMELON CROP BY PLANTING DENSITY

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Keywords: *sandy soils, planting density, grafted watermelon*

ABSTRACT

This paper represents a part of broader research program conducted within CCDCPN Dăbuleni-Romania, on a crop of watermelons created in open field. The aim of the study was to present the obtained results regarding the comparative study of two varieties – autochthonous variety Oltenia and Romanza F1 hybrid derived from import – to establish and recommend the cultivar with superior productivity characteristics, depending on planting density, applying mulching technology and fertirrigation.The two studied cultivars were planted on three densities, namely: 3000 plants/ha, 4000 plants/ha and 5000 plants/ha, in mulched culture, both grafted and also un grafted. The decrease in the number of plants/ha from 5000 to 3000 plants/ha, leads to the increasing of fruits number per unit area, the density of planting influencing the total fruits production, as defining technological sequence for the watermelon culture.

INTRODUCTION

The global consumption of watermelon - *Citrullus lanatus* (Thunb.) Matsum. & Nakai, known also with common name of wild watermelon, sweet melon (English), egusi melon (English, Kenya), pastèque, melon d'eau (French) - is bigger than of other cucurbitaceae (Robinson & Decker-Walters,1997), so that the global production extended with 2,9-3,7×106 ha in the period 1999-2003 (FAOSTAT,2004). Suggestions reffered to planting density on a large scale indicates the fact that doesn't exist enough knowledge about their effects. Many vegetables producers use mulch and drip irrigation as a common practice. Both technologies were developed to stimulate the crop growth and to improve the efficient use of water (Brien et. al.1979, Elmstrom et al.1981). The competition for water and nutritive substances on high plant density, could be responsible for the decrease in plant growth and for the plants yield (Knavel 1988, Dinu et al. 2004). Grafting has appeared as a necessity, representing a solution to solve many problems. The grafting procedure determines the increase of the production level and of profitability, especially to the crops established by seedling, mulched with

polyethylene foil. Grafting can be regarded as an important link in the production of watermelons. It is a vegetative propagation method by which two partners (the graft and the stock) come into contact, accepting each other and live together for a long time as a new entity. By grafting increases the plants resistance on attack of some pathogen agents, with particular reference to the attack of *Fusarium oxysporum*, increases the resistance to stress factors, increases efficiency of use of fertilizers and of water to from irrigation. Regarding to the fruit weight average it is known that plants grafting generally cause the increasing of the average weight of fruits. It is a cost effective method of cultivation, the production expenses due to grafted seedlings production being much lower than the value of production spore value, obtained on grafted culture and a lower level of spending with fertilizers, the water for irrigation and phyto-sanitary treatments. In terms of diseases occurence, the high plant density per hectare may cause faster spread of pathogens. This thing entitles us to take in study densities of lower plants than those recommended for the watermelon grafted and un grafted plants. Although it is a costly operation, it was found that the use of black polyethylene mulche improves the earlieness, raises the yield, improves fruit quality and increases profitability. When are used grafted plants, planting density can be reduced by up to 50% compared to the un grafted ones. The new technologies should ensure the optimization of water consumption and nutrient elements, through fertirrigation and land mulching, as well as establishing the influence of some types of fertilizers and some active substances biostimulative on earliness, size and production quality of watermelons grown on sandy soils. The aim of researches consist of developing an improved technology of watermelons culture by introducing in study some varieties and extra earliness hybrids of watermelons, and also the study of experimental versions behavior of different culture density.

In order to achieve the intended purpose we studied the following issues:

- Setting the behavior of watermelons varieties and hybrids under different cultural densities;
- Setting the behavior of watermelons varieties and hybrids under mulching conditions with black foil of polyethylene.

MATERIAL AND METHODS

The grafted and non-grafted seedlings production was done in hothouse-solarium with double protection. It was studied the watermelon hybrid of *Romanza F1* and *Oltenia* variety. The stock was from *Lagenaria siceraria* variety, namely *Macis F1*. The grafting method was that by “joining with a cotyledon” after elaborated technology by CCDCPN Dăbuleni. It is the most used grafting method, being done both manually and mechanically.

Plant density per hectar was realized according to the following variants:

C1 – 5000 pl/ha by planting seedlings at a distance of 2 m between rows and 1 m between plants in the row.

C2 -4000 pl/ha by planting seedlings at a distance of 2 m between rows and 1.25 m between plants in the row

C3 – 3000 pl/ha by planting seedlings at a distance of 2 m between rows and 1.60 m between plants in the row

The crop irrigation was done by dripping. In the growing period were done 4-6 watering, with the norm of 350-400 m3/ha. Chemical analyzes respected lab procedures, in accordance with applicable standards.

RESULTS AND DISCUSSIONS

Taking into account the three variants of plants density per hectar (Table 1), the following watermelons production were obtained.

Table 1

The influence of planting density on the watermelons production

Density pl.	Prod.t/ha	Prod.rel.%	Dif.t/ha	Significance
C_1	29.5	100	Ct	Ct
C_2	37.7	127.8	- 8.2	0
C_3	25.2	86.4	- 4.3	

DL 5%=8,26
DL 1%=11,38
DL 0,1%=15,67

It was resulted that the planting density had a significant negative influence on the watermelons production. On a density of 5000 pl./ha it was achieved a production of 29,5 t/ha; on a density of 4000 pl./ha it was achieved a production of 37,7 t/ha, while de lowest production was obtained on a density of 3000 pl./ha. Applying different planting density at the two cultivars according to the studied planting density, the following watermelons productions were obtained (Table 2).

Table 2

The influence of planting density on the watermelons production at the two cultivars

Density pl.	Cultivar	Prod.t/ha	Prod.rel.%	Dif.t/ha	Significance
C_1	Romanza F1	22.7	63	- 13.6	0
	Oltenia	36.3	100	Ct.	
C_2	Romanza F1	33.7	81	- 8	
	Oltenia	41.7	100	Ct.	
C_3	Romanza F1	22.4	80	- 5.7	
	Oltenia	28.1	100	Ct.	

DL 5%=11,66
DL 1%=16,06
DL 0,1%=22,11

Oltenia variety registered the biggest production of watermelon. On a density of 5000 pl./ha it was achieved a production of 36,3 t/ha; on a density of 4000 pl./ha it was achieved a production of 41,7 t/ha, and at 3000pl./ha it was achieved a production of 28,1 t/h. The production differences between the two cultivations are negatively significant. It can be concluded that for watermelons, the used cultivar, the culture method and planting density along with other technological links influenced the fruits quality (table 3). The best quality results were achieved from both varieties of crop, at plants from grafted crop, at a planting density of 3000 plants /ha. Both to *Romanza F1* variety and also to *Oltenia* variety, the quality traits percentage increase with reducing the number of plants/ha.

Table 3

The influence of variety, of cultivation method and of planting density on watermelons fruits quality - 2015

Cultivation	Culture method	Planting density (Plants/ ha)	Water %	SUT %	SUS %	Titratable acidity g malic acid at 100g s.p	Sugars %	C vitamin mg/100g s.p	Nitrates (NO^-_3) mg/kg fruct
Romanza F1	Grafted	5000	91,85	8,15	8,0	0,17	6,65	7,04	75
		4000	90,56	9,44	9,0	0,15	7,50	8,8	90
		3000	89,77	10,23	10,0	0,13	8,85	8,8	115
	Non-grafted	5000	92,52	7,48	7,0	0,12	5,85	7,04	90
		4000	91,93	8,07	7,5	0,08	6,25	7,92	115
		3000	91,06	8,94	7,8	0,05	6,50	11,44	141
Oltenia	Grafted	5000	89,04	10,96	10,0	0,18	8,37	7,92	80
		4000	90,02	9,98	9,8	0,10	8,15	9,68	95
		3000	88,53	11,47	10,2	0,16	8,50	10,56	126
	Non-grafted	5000	91,47	8,53	7,8	0,18	6,55	12,32	65
		4000	90,25	9,75	9,6	0,13	8,00	14,08	118
		3000	89,65	10,35	9,9	0,12	8,20	12,32	138

Growing vegetables plants on sandy soils is strictly dependent of the provision of water, the used method being that of dripping. The irrigation by dripping allows control in soil of administrated water, the control of fertilizers dosage that are applied to diseases and to the noxious. By increasing planting density can ensure from the beginning a bigger foliar surface and a high photosynthetic efficiency.

Progressing in vegetation and when the plants growth develops, appear the foliar floor overlap, the shading occurs and as a consequence of it, the positive initial effect of density becomes negative.

The content of total dried substance percentage increases with the decrease of number of plants/ha, and the highest values were determined on Oltenia variety in grafted culture, at a density of 3000plants/ha (11,47%).

With the increasing of total dried substance, decreases the water quantity from the watermelon fruits. The soluble dries substance presented the highest values at fruits obtained from grafted plants, planted at a density of 3000 plants/ ha (10% at *RomanzaF1* cultivar and 10,2% at *Oltenia* cultivar).

With the increasing of total dried substance, decreases percentage the water quantity from the watermelon fruits.

The titratable acidity presented high values at fruits obtained from the culture with a density of 5000plants /ha (0,17 g malic acid at 100g fresh substance at *Romanza* cultivar and 0,18 g malic acid at 100g fresh substance at *Oltenia* cultivar).

The sugars content from the water-melon fruits was influenced by the studied cultivation, by the planting method and by the planting density. The sugars are the primary product resulted in photosynthesis process, can be influenced by the intensity of this physiological process. Thus by increasing the culture density it can ensure from the beginning a greater foliar surface and a high photosynthetic efficiency.

The content of C vitamin is a character variety and can be influenced by the culture conditions and by the climate ones. The highest values were determined at *Oltenia* cultivation, in un grafted culture, on a density of 3000 plante/ha.

It was determined also the nitrates content in the middle of fruits, and the obtained values show in some variants an exceeding of LMA from the standards in force, (100 mg/kg product). The nitrates content was between 65mg/kg product in *Oltenia* cultivar, in non-grafted culture, at a density of 5000 plants/ha and 141mg/kg product in *Romanza* cultivar, in non-grafted culture, at a density of 3000 plants /ha.

Goreta et al. (2005) and Sanders et al. (1999) demonstrated that the plants efficiency on different densities was higher at one time with the planting density decreasing.

CONCLUSIONS

The efficiency of watermelons culture on sandy soils of Southern Oltenia differ from a planting density to another one, therefore the recommended planting density to the producers for the watermelons cultivation remains uncertain.

The best results have been obtained on *Oltenia* cultivar, in grafted culture, at a density of 3000 plants/ha (11,47% total dried substance, 10,2% soluble dried substance, 0,16 g malic acid at 100g s.p, titratable acidity, 8,50% sugars, 10,56mg/100g fresh substance).

By reducing the number of plants/ha from 5000 to 3000 it takes place an improvement of the nutritional quality of fruits.

Along with technological factors, the climatic factors have a significant influence on the nitrates content from plant. The effect of climatic conditions is manifested in particular through the humidity factor, which favors the vegetative growth, especially when it occurs in droughty summers, preceded by wet periods. The big nebulousness the humidity excess, the low air temperature are conditions that contribute to the nitrates accumulation in plant and fruit.

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RESEARCH REGARDING THE CULTURE OF WATERMELON WITH GRAFTED PLANTS – POSSIBLE ECOLOGICAL CULTURE

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Keywords: *watermelon, non-grafted, quality production*

ABSTRACT

This paper aims to highlight the production characters and the qualitative one of a range of genotypes of grafted watermelons, by improving some technological sequences. The researches were conducted at CCDCPN Dabuleni-Romania, under field conditions, on some genotypes of watermelons: Oltenia - aboriginal variety being planted both in grafted culture and also non-grafted, and the hybrid Romanza F1 – coming from import and being planted grafted and non-grafted. It was followed the biochemical character and the obtained production which differ from one cultivar to another.

INTRODUCTION

Research regarding the watermelon grafting were made in many watermelons growing countries and aimed to establish the method of grafting, the behavior of some grafted cultures on different stocks, the grafting effectiveness on noxious agents and different technological variants (Lee. M., 1994, Yetisir H. N., 2003, Chouka, &. Jebari, 1999). In our country, the method is less known (Elena Ciuciuc & Toma V., 2007, Elena Ciuciuc et al., 2010). To increase the profitability, it is necessary the permanent improvement of the cultivation technology of watermelons. For this end it was followed the behavior of some cultivars of grafted watermelons, (Toma V. et al., 2007), the establishment of some methods to increase the earliness production of grafted watermelons, the influence of the different stocks (Ciuciuc Elena et al., 2010). The culture of watermelons with grafted plants makes it possible the ecological culture, the grafting leading to increased plant resistance to stress factors, increasing the production level, eliminating the treatments to combat some pathogen agents and make a better use of organic fertilizers in the sandy soils of southern Oltenia, this area being considered as an favored agricultural area, due to the natural low fertility, to the excess heat, and to the insufficient rainfalls (Toma V. et al., 2011). This sector starts to develop very fast in the world, as people begin to manifest a deep interest in reducing the risks that could cause unconventional farming practices on human health and on the environment. Environmental area has given a growth rate of over

30% annually, Europe and Latin America recording the fastest growth areas in 2010, demonstrating that expansion of such areas is supported by an intensive marketing of organic products (Dinu Maria & Soare Rodica, 2015). The grafted seedlings can be obtained in spaces less endowed, such as hothouses and heating solarium, with watering plant and shading system. It can be obtained good results also in solariums equipped with heating system, or with biological heating, in which are installed tunnels with width of 1,5m. This type of shelter is noted for easier arrangement and low costs, being available for every cultivator. The best conditions for grafting are temperatures of ≈22-28^{0}C, relative humidity of 100% and the light intensity very low in the first 5-7 days. The grafting process influences positively the development of the radicular plant system, making it more vigorous and the production being higher (Chouka & Jebari, 1999). The dimension of the watermelon grafted fruits due to radicular plant system it is higher compared to the non-grafted ones, and many growers choose grafting for this reason. Over time, many researchers said that grafting doesn't influence negatively the growth, the development and the plants yield. The watermelon (*Citrullus vulgaris L.*) – Cucurbitaceae family- recognized as excellent source of A and C vitamine, has an energetic value of 26-29 cal./100 g s.p. with a water content of 89-94%, in sugar of 7-11%, at 100 g s.p the fruits containing 0.2g fat, 0.5g protein, vitamin A, complex B, vitamin C, vitamin H, vitamin PP, 12 mg phosphorus, 2.5mg potassium, 0.2mg iron and 7mg calcium (Ciofu et al, 2003). It is the species that can survive also to the desert climate, but with available groundwater. Over 1200 genotypes are cultivated in 96 countries over the world (www.fao.org/nr/water/cropinfo_watermelon.html, www.wichcountry.co/tpo-10-countries-with-the-highest-watermelon-producing).
Through the experiences made on CCDCPN Dabuleni we intend to identify the grafted watermelon cultivar that will give value to the sandy soils in order to improve the assortment.

MATERIAL AND METHODS

The experience was founded by the randomized blocks method in four repetitions. It was a three-factorial experience. The surface of a variant was of 20m^2. The production of grafted seedlings and non-grafted ones was made into a hothouse - solarium with double protection. It was sowed the watermelon hybrid *Romanza F1* and *Oltenia* stock variety that was from the *Lagenaria siceraria* species, namely Macis F1. Observations were made in the field as well as in laboratory analysis, thus pursuing some of the most important aspects. The total production was determined by several weighing on harvesting stages being expressed in t/ha. The grafting method was that by "joining with a cotyledon" after the technology elaborated by CCDCPN Dabuleni. It is the most used grafting method, being done both manually and mechanically. The graft seeds were sown on nutritive layer, with 4-5 days before the stock. The stock seeds were sown in alveolar trays. The age of the seeds grafted on planting was of 35 days. The fertilization was made at level N 150 P2O5 100 K2O 100. The plants density per hectare was carried out according to the following variants: 5000pl/ha through seeds planting on a distance of 2 m between rows and 1 m between plants in the row; 4000pl/ha through seeds planting on a distance of 2 m between rows and 1,25 m between plants in the row; 3000pl/ha through seeds planting on a distance of 2 m between rows and 1,60 m between plants in the row. The biochemical determination that targeted the quality of fruits production referred to:

- Water and total dry substance (%) determined by gravimetric method;
- Soluble dry substance (%) determined by refractometry method;
- Total sugars (%) determined by Fehling Soxhlet method;
- Vitamin C (mg/100 s.p.) determined by iodometric method;
- Nitrates (mg/kg product) determined by potentiometric method.

The experience has been placed on a sandy soil with a condition of uneven supply of biochemical properties. For determination accomplishment it was used watermelon fruits harvested at physiological maturity. The obtained data were interpreted statistically by the variance analysis.

RESULTS AND DISCUSSIONS

Studying the autochthonous variety *Oltenia* and the imported hybrid *Romanza F1,* observing that the biochemical attributes and the obtained production vary from one cultivar to another, the ultimate goal consisted of identifying and recommending to the producers from the cultivation area the cultivar with the highest productivity and with fruits of high quality compared to the non-grafted plants. The variability of climate in South-West of Romania, where the summers are droughty and warm, provides favorable conditions for growing watermelons. In the founded experience in this research field of CCDCPN Dabuleni was conducted starting with July 14, 2015. To determine the production at cultivars of watermelon used in the research activity was studied the variety influence upon the production of watermelons (table 1), the influence of the cultivation method on the production of watermelons (table 2), the influence of the cultivation method on the same variety of watermelons (table 3) and the variety influence on the production of watermelons in the same cultivation method (table 4). In terms of the agricultural year 2015, after the moment of culture establishment a hailstone occurred, the effect being felt throughout the growing period, being confirmed also in the final production. It was necessary to take measures for culture recovery, by filling the gaps with seedlings of the same age.

Table 1

The variety influence on the production of watermelons

Variety	Prod.t/ha	Prod.rel.%	Dif.t/ha	Semnif.
Romanza F1	26,2	74	-9,2	0
Oltenia	35,4	100	Mt.	

DL 5%=13,33
DL 1%=30,78
DL 0,1%=97,96

On *Oltenia* variety it has been obtained a production of 35.4 t/ha compared with *Romanza F1* hybrid which registered a production of only 26.2 t/ha, the difference of 9.2 t/ha wasn't ensured from statistically point of view.

From the point of view of the cultivation method, on the grafted culture it was obtained a production of 38.2 t/ha, and on the non-grafted culture only 23.4 t/ha, the difference between the two types of culture being negatively significant.

In the studied cultivars, the cultivation method registered significant negatively differences only on *Oltenia* variety thereby obtaining a production of 49

t/ha on grafted culture and on the non-grafted culture a production of only 21.7 t/ha. On *Romanza F1* cultivar weren't significant differences, the productions being of 27.4 t/ha on grafted crop and of 25.1 t/ha on the non-grafted crop.

Table 2

The influence of the cultivation method on the production of watermelons

.Cultivation method	Prod. t/ha	Prod.rel.%	Dif.t/ha	Semnif.
Grafted	38,2	100	Mt.	
Non-grafted	23,4	61,2	-14,8	o

DL 5%=9,73
DL 1%=16,1
DL 0,1%=30,13

Table 3

The influence of the cultivation method on the two varieties of watermelons

Variety	Cultivation method	Prod.t/ha	Prod.rel.%	Dif.t/ha	Semnif.
Romanza F1	Grafted	27,4	100	Mt.	
	Non-grafted	25,1	92	-2,3	
Oltenia	Grafted	49	100	Mt.	
	Non-grafted	21,7	44	-27,3	oo

DL 5%=13,62
DL 1%=22,54
DL 0,1%=42,18

Table 4

The variety influence on the production of watermelons in the same cultivation method

Cultivation method	Variety	Prod.t/ha	Prod.rel.%	Dif.t/ha	Semnif.
Grafted	RomanzaF1	27,4	56	-21,6	o
	Oltenia	49	100	Mt.	
Non-grafted	Romanza F1	25,1	116	-3,4	
	Oltenia	21,7	100	Mt.	

DL 5%=16,49
DL 1%=32,66
DL 0,1%=87,89

The two cultivation method under study presented significant negatively differences only in the grafted culture, on *Oltenia* variety yielding a production of 49 t/ha compared to *Romanza* where was obtained a production of only 27.4 t/ha.

The biochemical composition of the watermelon fruits it is complex and varied, being a genetic particularity of species and variety. Analyzing the influence of cultivar and of the cultivation method about the watermelon fruits quality from the data from table 5 we can see that the best results were obtained on *Oltenia* cultivar in grafted culture, (10.80% total solid substance, 10% dried soluble substance, 8.51% sugars,9.39 mg C vitamin). It was reported that grafting could have negative effects on fruits quality, depending on the used stock (Lee,1994; Traka-Mavrona et. al.,2000), but in our experiments we haven't been detect any detrimental effect of grafting fruit quality. Similar results were also reported by Yetișir et. al.,2003, Miguel et. al, 2004. Plants grafting influenced the fruits quality, it were obtained percentage increases of the total dried substance content, of dried soluble

substance and of sugars. The C vitamin content was with 2,06mg bigger in non-grafted version comparative with the grafted one.

Table 5

The influence of the cultivation method on watermelon fruits quality - 2015

Cultivation method	Water %	SUT %	SUS %	Titrable acidity g malic acid at 100g s.p	Sugars %	C vitamin mg/100g s.p	Nitrates (NO^{-}_{3}) mg/kg fruit
Grafted	89,96	10,04	9,34	0,15	8,43	8,80	97
Non-grafted	91,15	8,85	8,27	0,11	6,89	10,86	111

Table 6

The cultivar influence on watermelon fruits quality - 2015

Cultivar	Water %	SUT %	SUS %	Titrable acidity g malic acid at 100g s.p	Sugars %	C vitamin mg/100g s.p	Nitrates (NO^{-}_{3}) mg/kg fruct
Romanza F1	91,28	8,72	8,05	0,12	7,27	8,51	104
Oltenia	89,83	10,17	9,55	0,15	8,05	11,15	104

The climate conditions during the vegetation period of the watermelon crop have influence in a determinate way the nutritional quality of fruits, and also the maturation process. During the intensive growth of plants and fruits, were recorded normal temperatures for that period, and the soil humidity was maintained at normal levels from rainfalls and irrigations. On fruits maturation phase, that corresponds to June and July months, the climatic conditions were favorable for the watermelon crop, (144,2 mm rainfalls, maximum temperatures of 36.1^{0}C – 39.2^{0}C). At watermelons, the cultivar and also the cultivation method, along the other technological links, influenced the fruits quality. The plants grafting influenced the fruits quality, were obtained percentage increase of the total dried substance content, soluble dried substances and sugars. The two cultivars, *Romanza F1* and *Oltenia* have well behavior from the qualitatively point of view in terms of sandy soils, but better results were obtained on *Oltenia* cultivar.

CONCLUSIONS

Following the obtained results it can be considered that the study of the watermelon assortment should be continued to enable the all cultivars to show full genetic potential, depending on the climate conditions of each year.

Among of the two studied cultivars under cultivation on field, the highest productions were made by *Oltenia* variety in grafted culture - 49 t/ha.

The grafted plants lead to a better plants and efficiency growth without harmfull effects on fruits quality. The positive effects of grafting may change depending on the used stock. Although there are many problems associated with

growing vegetables using grafted plants, the need of grafted seedlings is increment. On large scale the grafted seedlings commercialization will extend rapidly in many developed countries, and his tendency could lead to the use of vegetable grafted seedlings all over the world.

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SOME BIOCHEMICAL CHARACTERISTICS OF TOMATO CULTIVARS MADE IN ROMANIA

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Keywords: *tomato, lycopene, carbohydrate, β-carotene*

ABSTRACT

The purpose of the research was to check the culture of tomatoes in tomato field 5 cultivars that are recommended for industrialization, production and performance determining fruit quality in some cultivars used in the south of Romania. The experiments were conducted in the Buzau County on a plot of 500m^2 in three repetitions. Biological material used in the experiment consisted of cultivars: Darsirius, Kristinica, Maratonus, Heinz1350, Missouri with growing all determined and recommended for industrialization. During the harvest were made quality and quantity determinations. Quality determinations made from tomatoes harvested were soluble solids content, carbohydrates, lycopene and beta carotene. The content of soluble carbohydrates is also conducive to being in the low limits and between 2.32% and 2.79%. Based on the results highlighted cultivars Darsirius with 2.79%, 2.74% at Kristina and Missouri with 2.64%.Lycopene pigments varied between 5,74mg / 100g f.m.at cultivar Kristina and 4,68mg / 100g f.m. at Maratonus, values that are raised for tomatoes and qualify these cultivars for industrial processing. Analyses carried out five cultivars for industrialization shows that the biochemical characteristics are normal and they can be used for field crops for industrialization. Effectuate research can be extended to other cultivars proposed for testing new cultivars for industrialization in Romania.

INTRODUCTION

Lycopene is the pigment principally responsible for the characteristic deep-red color of ripe tomato fruits and tomato products. It has attracted attention due to its biological and physicochemical properties, especially related to its effects as a natural antioxidant.

Tomatoes represent the major source of lycopene compounds, and are also considered an important source of carotenoids in the human diet. Lycopene in fresh tomato fruits occurs essentially in the all-trans configuration. Lycopene is an open-chain unsaturated hydrocarbon carotenoid present in certain organs of many plants which has a structure similar to vitamin A (Ngyuen & Schwartz 1999). The conjugated double bonds serve as chromophores, and several carotenoids are yellow to red in color.

Lycopene is orange-red in color, and is the major pigment associated with the red color of tomato, hence the name (Lyco as in *Lycopersicon esculentum*) (Wann & McFerran1960, Schunk 1903). .

The importance of lycopene was originally assigned to aesthetics only, but has recently been shown to confer a variety of health benefits to humans, including prevention of several types of cancer and reduced risk of heart disease (Frankceshi et al. 1994, Giovanucci et al. 1995, Kohlmeier et al. 1997). Increasing clinical evidence supports the role of lycopene as a micronutrient with important health benefits, because it appears to provide protection against a broad range of epithelial cancers.

The purpose of the research was to check the culture of tomatoes in tomato field 5 cultivars that are recommended for industrialization, production and performance determining fruit quality in some cultivars used in the south of Romania.

MATERIAL AND METHODS

The experiments were conducted in the village Bradet, Buzau County on a plot of 500m^2 in three repetitions, repetitions being a 14m^2 surface; and plant spacing was 70 x33cm, the number of plants on repetition is 60, the density of the culture was 43290plants / ha.

The experience was achieved by applying establishing a culture of transplants on land by planting works prepared by the autumn and spring works. Experimental culture was achieved by planting transplants on May 5, 2015.

Biological material used in the experiment consisted of cultivars listed in Table 1: Darsirius, Kristinica, Maratonus, Heinz1350, Missouri with growing all determined and recommended for industrialization.

Table 1

Experimental variants

No	Experimental variants	Provenance	Type of growth
1	Darsirius	Romania-SCDL Buzău	determinated
2	Kristinica	Romania-SCDL Buzău	determinated
3	Maratonus	Romania-SCDL Buzău	determinated
4	Heinz1350	Holland Farming	determinated
5	Missouri	Holland Farming	determinated

Transplants used were aged 45-46 days, being produced in a dual solar protection and hot bed of fresh manure nutrient mixture. On layer 8-9cm thick seeds were distributed at a density of 450-460 pieces / m^2, projecting for future planting density of 400 plants / m^2.The sown in rows spaced from 8cm to the distance between plants in the row of 2.5-3m and depth of 1-1.2cm. Transplants sprung at a density of 400 plants / m^2 (approximately 8 cm between rows and between plants in the row 3-3.2cm) .At the time of planting, transplants had a height of 20-22cm, being well tempered. The seedlings were removed the day planting (March 6th), 2-3 hours before performing this work.

There were performed specific works for tomato culture and pesticide treatments applied were necessary. Tomato harvest began on July 23 to 26 and was made on repetitions and variants.

During the harvest were made quality and quantity determinations

Quality determinations made from tomatoes harvested were soluble solids content, carbohydrates, lycopene and beta carotene.

Determination of soluble solids and carbohydrates were determined in tomato juice using refractometric method with laboratory apparatus Abbe.

The contents of lycopene and carotenoid in tomato fruits have been analyzed respectively extracted from tomato fruits with acetone- hexane (4:6) and the determination was made with spectrophotometre method at 663nm, 645nm, 505nm and 453nm. From these values, the content of lycopene and β-carotene could be estimated using equation proposed by M. Nagata and I. Yamashita, 1992.

RESULTS AND DISCUSSIONS

Table 2

The content of tomato fruit cultivars tested in biochemical components

No. var.	Cultivars	Soluble substances %	Carbohidrate %	Lycopene mg/100g f.m.	B-caroten, mg/100g f.m.
1	Darsirius	5.12	2.79	4.74	0.40
2	Kristinica	5.20	2.74	5.74	0.56
3	Maratonus	5.38	2.32	4.68	0.30
4	Heinz1350	5.06	2.35	4.73	0.35
5	Missouri	5.17	2.64	4.82	0.40

Biochemical contents of tomatoes is a very valuable indicator because of their composition and the quantity of raw material depends finished product is obtained whether tomato paste or juice.

Chemicals in fruit controls both the organoleptic and determining the appearance of color, keeping some technological traits.

Examining the results we can say that if the higher soluble substance is at Maratonus 5.38% and the lowest is 5.06% at Heinz 1350 cultivar and at other soluble solids content cultivars are close. Soluble substance values fall within the limits described in the literature for this feature.

The content of soluble carbohydrates, is also conducive to being in the low limits and between 2.32% and 2.79%. Based on the results highlighted cultivars Darsirius with 2.79%, 2.74% at Kristinica and Missouri with 2.64%.

With respect to the color of vegetables, this property is determined by the presence of a wide range of pigments, of which mention the carotenoid, xanthophyll, lycopene and chlorophyll. Red pigment lycopene is controlled exclusively, but it can be changed or altered in part by the presence of other pigments.

The intensity of the red coloration which is determined by the ratio between the lycopene pigment groups on the one side and the other groups of pigments on the other hand. If our experience oscillates between lycopene pigments 5,74mg /

100g f.m.at cultivar Kristina and 4,68mg / 100g f.m. at Maratonus, values that are raised for tomatoes and qualify these cultivars for industrial processing.

B-carotene varies between 0.56 mg / 100g f.m. Kristinica and 0.30 mg / 100g f.m. to Maratonus. These amounts are within the presented literature for these compounds.

This analyzes show that all cultivars used in the culture can be analyzed for industrialization.

CONCLUSIONS

Analyses carried out five cultivars for industrialization shows that the biochemical characteristics are normal and they can be used for field crops for industrialization.

Effectuate research can be extended to other cultivars proposed for testing new cultivars for industrialization in Romania.

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The results were part of a research made in Romania for a doctoral these.

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UNIFORMITY OF SOME TOMATO CULTIVARS GROWN FOR INDUSTRIALIZATION IN ROMANIA

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Keywords: *industrial tomato, uniformity of production, cultivar*

ABSTRACT

The proposed research aims is the characterization of cultivars of tomato production by gravimetric analysis obtained. Biological material used in the experiment consisted of five cultivars Darsirius, Kristin, Maratonus, Heinz1350, Missouri growing all determined and recommended for industrialization. Determination of the main morphological variability and fruit weight is a major concern because of known degree of uniformity of characteristics that determine homogeneity or inhomogeneity of vegetables. Also fruit uniformity is paramount in processing the fruit that facilitates uniform enforcement in good condition preliminary operations of the applied technology, thus reducing specific consumption. Distribution of tomato fruit production of cultivar Darsirius shows that most fruits are between 110 and 170g / fruit. In cultivar Kristina tomatoes harvested in fall 35% weight 110g / fruit and the vast majority of them are between 90 and 150g / fruit. Maratonus has larger fruit. The largest proportion of fruit falls between 170 and 270g / fruit. 1350 Heinz cultivar distribution is uniform, the highest proportion of fruit partitioned between weights from 130 to 270g / cultivar Missouri fruit. În have a uniform distribution of tomatoes, an amount almost equal weights between 150 and 330g /fruit.

INTRODUCTION

Vegetable production in Europe is 2/3 of production to world; The main producing countries are Italy (28.3%) and Spain (23.8%) (Stoian, 1998). European Union of 27 Member States ranks second in the world after China in terms of production of vegetables, with a level of around 125 million tons annually (Indrea & Apahidean 2007). The data presented by FAO yearbooks are found in Europe can be seen an increase in production of vegetables. Among the major producing countries of vegetables are Italy, Spain, France, Poland and Greece. In Romania ranks first in tomatoes grow vegetables in greenhouses, solariums and field with an area of 44 thousand hectares and a production of 711 000 tones in 2014 and the annual average consumption per person was 174.4kg (Romanian Statistical Yearbook). The resources of fresh tomatoes for market in the year 2013/2014 increased by 13.9% to 509,000 tons compared to the previous year but fell 20% from the peak (2008/2009 - 636 200 tones). On the other hand, exports of fresh tomatoes only reached 2,300 tons in 2013/2014 and the domestic consumption of

fresh tomatoes (without own consumption) decreased by 20.2% to 506 300 tones from the peak achieved in 2008/2009 to 634 400 tones. The highest share in domestic consumption represents human consumption (65.1% - 329.6 thousand tons), which increased by 24.1%. The amount of canned tomatoes for the manufacture fell by 2.9% in 2013/2014 compared to the previous year. (www.capital.ro/importurile-de-rosii-proaspete). These data show the current situation in our country and tomatoes is why they try raising production tomato varieties that can be used for industrialization. The proposed research aims is the characterization of cultivars of tomato production by gravimetric analysis obtained.

MATERIAL AND METHODS

The experience was achieved by applying establishing a culture of transplants. On land by planting works prepared by the autumn and spring works, experimental culture was achieved by planting transplants on 5 May. The transplants used were aged 45-46 days, being produced in a dual solar protection and hot bed of fresh manure. The transplants were sown in rows spaced from 8cm to the distance between plants in the row of 1-1,2cm.La 2,5-3m and depth of planting date, planting had a height of 20-22cm, being well tempered. The Transplants were removed on the day of planting, 2-3 hours before performing this work. Biological material used in the experiment consisted of five cultivars Darsirius, Kristin, Maratonus, Heinz1350, Missouri growing all determined and recommended for industrialization. The experiments were conducted in Buzau County plots of 500m^2 each cultivar in three repetitions, repetitions being a 14m^2 surface; and plant spacing was 70 x33cm, the repetition number of plants is 60, the density of the culture was 43290plants / ha. During the vegetation were carried out necessary maintenance work including pesticide treatments required by culture.

The products used for chemical control were:

• ACROBAT MZ (ecological) -2.0 kg / ha - for tomatoes hand;

• SUPER CHAMP 250 SC (ecological) - 2.5 l / ha - for tomatoes hand;

• ALCUPRAL PU 50 (0.5%) - 4-5 kg / ha - for hand tomato blight, leaf spot and blistering fruit;

• TOPSIN OF PU 50 (0.1%) 1,0 kg / ha - to withering of the plants, *Fusarium*;

• FASTER 10 EC (0.03%) - Green aphid;

• ACTAR 25 WG -0.2 kg / ha - for biting mining;

• MOSPILAN 20 SP (0.025%) – for Colorado beetle. Harvesting tomatoes was carried out from June, July realizing staggered to 3-5 days. It has been used in drip watering. The maximum period of harvest were harvested 100 fruits/cultivar and their classification was made according to their weight.

RESULTS AND DISCUSSIONS

Determination of the main morphological variability and fruit weight is a major concern because of known degree of uniformity of characteristics that determine homogeneity or inhomogeneity of vegetables. Mechanical harvesting to execute very interested homogeneity of vegetables, case in which the better yield and quality work. Also fruit uniformity is paramount in processing the fruit that facilitates uniform enforcement in good condition preliminary operations of the applied technology, thus reducing specific consumption. For the reasons set out in

cultivars experienced determined how evenly the weight of 100 fruits from each cultivar. The results are shown in Figures 1, 2, 3, 4, 5. Distribution of tomato cultivar production Darsirius (Fig. 1), The majority of tomatoes is between 110 and 170g.In cultivar Kristinca (Fig. 2) tomatoes harvested in fall 35% in weight of 110g and the vast majority of them are between 90 and 150g.

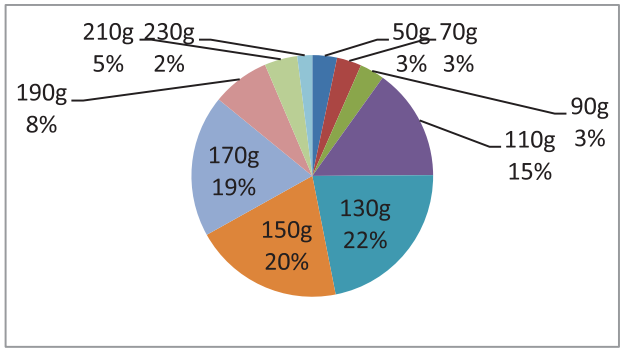

Figure 1. Change in weight of tomato cultivar Darsirius.

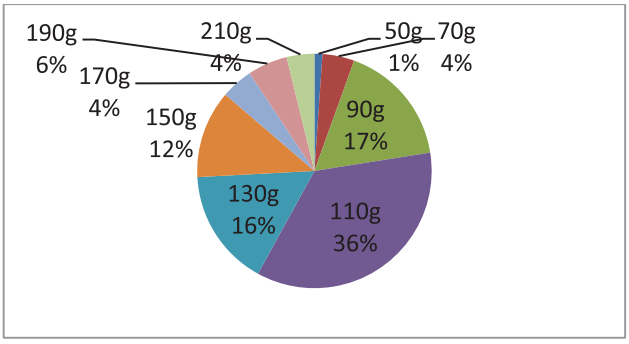

Figure 2. Variation of weight tomato cultivar Kristinica.

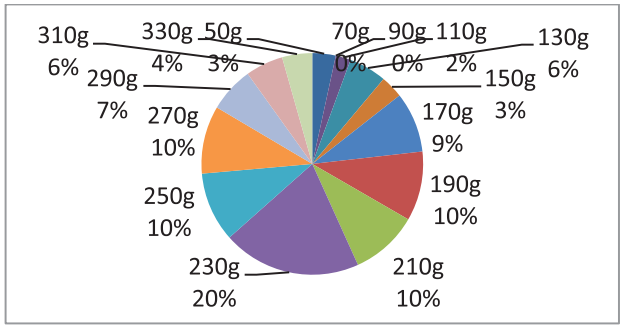

Figure 3. Changes in weight tomato cultivar Maratonus.

Maratonus has larger fruit (Fig. 3). The highest proportion falling between 170 and 270g. Heinz cultivar (Fig. 4) Distribution is uniform, the largest proportion of these are distributed between weights ranging from 130 to 270g.

In cultivar Missouri (Fig. 5) have a uniform distribution of tomatoes that almost reached the same weights between 150 minimum and maximum 330g.

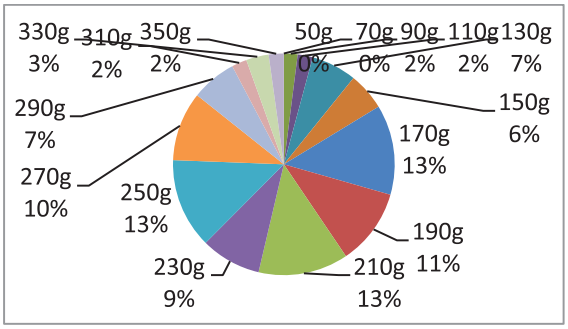

Figure 4. Changes in weight Heinz 1350 tomato cultivation.

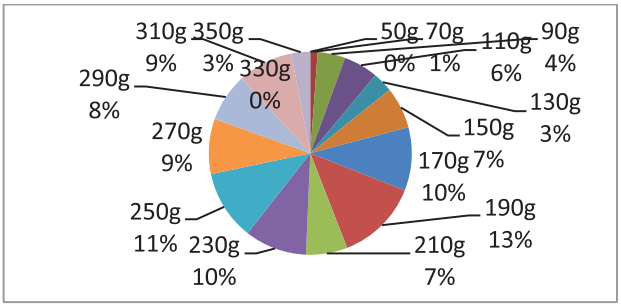

Figure 5. Changes in weight tomato cultivar Missouri.

CONCLUSIONS

Distribution of tomato fruit production of cultivar Darsirius shows that most fruits are between 110 and 170g / fruit. In cultivar Kristina tomatoes harvested in fall 35% weight 110g / fruit and the vast majority of them are between 90 and 150g / fruit. Maratonus has larger fruit. The largest proportion of fruit falls between 170 and 270g / fruit. 1350 Heinz cultivar distribution is uniform, the highest proportion of fruit partitioned between weights from 130 to 270g / cultivar Missouri fruit. În have a uniform distribution of tomatoes, an amount almost equal weights between 150 and 330g /fruit.The analysis of these characteristics can say that tomato cultivars Maratonus, Daisirius and Kristinica have appropriate characteristics for industrialization.

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The results were part of a research made in Romania for a doctoral these.

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EVALUATION OF POLYPHENOLS CONTENT AND ANTIOXIDANT ACTIVITY OF LEAVES FROM SOME TEMPERATE FRUIT TREES UNDER ENVIRONMENTAL CONDITIONS OF THESSALY REGION, GREECE

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Keywords: *leaves fruit trees; phenols; phenol fractions; FRAP activity*

ABSTRACT

Leaves from four species of fruit trees (cherry tree, pear tree, apple tree and chestnut tree) were analysed for phenolics content and antioxidant activity, using methanol extracts. The trees grown in the Kallipefki of Thessaly region, at an altitude 1050 m. It was found that the content of total phenols (TP), varied from 7849 to 10157 mg (GAE)/kg (d.w.), Non-flavonoid phenols (NFP) from 2272 to 3222 mg (GAE)/kg, Flavonoid phenols (FP) from 5577 to 7098 mg (GAE) /kg, and F-3-ols from 1116 to 1420 mg(CE) /kg CE, depending on the fruitful trees type. The chestnut tree leaves exhibited the highest ferric reducing antioxidant (FRAP) power, equal to 62.38 μmol FRAP/g (d.w.), while the cherry tree leaves exhibited the lowest, equal to 46.12 μmol FRAP/g. The leaves from the fruit tree species under consideration are regarded as potent sources of biologically active phenol compounds for pharmaceutical purposes, and as natural pesticides.

INDRODUCTION

The increased interest in phenolic compounds in human food and animal, are related with their health benefits due to its antioxidant properties. The production of free radicals in cells human and animal causes the oxidation of biological macromolecules, that make causality for many diseases (Pokorny et al. 2001).

The leaves of many plant species contain polyphenols and essential oils, have been used as spices, drinks or sources natural antioxidants for food and pharmaceutical industry (Benavente-Garcıa et al. 2000, Pokorny et al. 2001).

Also, leaves high in essential oils and phenolic compounds have been used as substitutes of pesticides in organic agriculture (Rhouma et al. 2009).

The purpose of the present research is to evaluate the antioxidant activity the contents of total phenols and the major phenol fractions in the leaves from some temperate fruit trees under environmental conditions of Thessaly region, at the end of their vegetation period.

MATERIAL AND METHODS

The trees grown in the Kallipefki of Thessaly region, at an altitude 1050 m. Leaves from 4 fruit trees species were the subject of study. Cherry tree (*Prunus avium*), pear tree (*Pirus communis*), apple tree (*Pirus malus*), chestnut (*Castanea sativa Mill*). The leaves were collected from all species in the first ten-day of September, where it is accepted that the active photosynthesis activity of the leaves is reduced, dried in the sun, ground with the leaf stems in size diameter < 0,15mm. The samples were stored at –18 ^{o}C and were further subjected to various analyses. The chemical properties of soils where the trees are grown are presented in Table 1.

Table 1

Chemical properties of soils where fruit trees grown

	Cherry tree	Pear tree	Apple tree	Chestnut tree
property	Soil depth (0-30) cm			
Texture	Loam	Sandy loam	Sandy loam	Sandy loam
pH	7.2 ± 0.04	7.3 ± 0.05	7.5 ± 0.05	5.7 ± 0.04
EC (dS m^{-1})	0.60 ± 0.02	0.65 ± 0.02	1.10 ± 0.05	0.70 ± 0.03
$CaCO_3$ (%)	0.5 ± 0.03	1.7 ± 0.06	8.2 ± 0.3	0.7 ± 0.02
Organic matter (%)	1.7 ± 0.09	1.5 ± 0.09	3.0 ± 0.4	2.5 ± 0.2
N-inorganic (mg kg^{-1})	117 ± 9.4	152 ± 11	320 ± 26	177 ± 13
K- Exchangeable (mg kg^{-1})	304 ± 14	320 ± 15	417 ± 22	314 ± 14
P -Olsen (mg kg^{-1})	10.0 ± 0.5	11.2 ± 0.8	16.0 ± 0.9	24 ± 1.6
	Soil depth (30-60) cm			
Texture	Loam	Sandy loam	Sandy loam	Sandy loam
pH	6.8 ± 0.04	7.5 ± 0.04	7.7 ± 0.03	5.9 ± 0.03
EC (dS m^{-1})	0.24 ± 0.02	0.15 ± 0.02	0.70 ± 0.04	0.42 ± 0.04
$CaCO_3$ (%)	1.7 ± 0.04	2.2 ± 0.06	10.4 ± 0.4	0.75 ± 0.03
Organic matter (%)	1.2 ± 0.06	1.2 ± 0.05	2.2 ± 0.09	2.0 ± 0.09
N-inorganic (mg kg^{-1})	85.0 ± 6.2	88.4 ± 7.2	172.2 ± 14	98.4 ± 11
K- Exchangeable (mg kg^{-1})	148.2 ± 7.4	78.0 ± 4.6	212.0 ± 12	172.0 ± 11
P -Olsen (mg kg^{-1})	6.0± 0.5	6.0 ± 0.4	9.2 ± 0.7	14.4 ± 1.1

EC, Electrical conductivity; pH; extract (1part soil:5parts H_2O). Data represent average means and standard deviation (SD)

Preparation of the methanol extracts: The leaves extracts were obtained after twofold treatment of 10 g sample with 60%-methanol solution after 1-hour storage at dark and room temperature. The collected extracts after centrifugation (filtration) were brought to 50 ml with aqueous methanol and further used for chemical analysis (Meyer et al. 1997).

Methods of analyses

Total polyphenols (TP): The amount of total polyphenols (TP) was determined with the Folin–Ciocalteu (F.C.) reagent according to the method of

(Singleton and Rossi 1965) using the microvariant proposed by (Baderschneider et al. 1999), and were expressed as gallic acid equivalent (GAE) in mg/kg dry weight.

Nonflavonoid phenols (NFP): The content of NFP was determined with the F.–C. reagent after removing the flavonoid phenols (FP) with formaldehyde according to the method of (Kramling and Singleton 1969) and was expressed as gallic acid equivalent (GAE) in mg/kg dry weight.

Flavonoid phenols (FP): Flavanoid phenols were determined as a difference between the content of total phenols (TP) and nonflavonoid phenols (NFP). Their amount was evaluated as gallic acid equivalent in mg/kg dry weight.

The total flavanols (F-3-ols, catechins and procyanidins) were assayed using p-DMACA reagent after the method of (Li et al. 1996) and were presented as catechin equivalent (CE).

Ferric reducing antioxidant power assay (with FRAP reagent): The ferric reducing antioxidant power (FRAP) of the plums extracts was evaluated according to the method of (Benzie and Strain 1999) and the results were expressed as μmol FRAP reagent/g dry weight.

Soil was analyzed using the following methods which are referred by (Page et al. 1982).

Organic matter was analyzed by chemical oxidation with 1 mol L^{-1} $K_2Cr_2O_7$ and titration of the remaining reagent with 0.5 mol L^{-1} FeSO4.

Inorganic nitrogen was extracted with 0.5 mol L^{-1} $CaCl_2$ and estimated by distillation in the presence of MgO and Devarda's alloy, respectively.

Available P forms (Olsen P) was extracted with 0.5 mol L^{-1} $NaHCO_3$ and measured by spectroscopy.

Exchangeable form of potassium was extracted with 1 mol L^{-1} CH_3COONH_4 and measured by flame Photometer (Essex, UK).

The results are means of four parallel samples. Data analysis was made using the MINITAB (Ryan et al. 2005) statistical package. Analysis of variance was used to assess treatment effects. Mean separation was made using Tukey's test when significant differences (P=0.05) between treatments were found.

RESULTS AND DISCUSSION

The content of total phenols (TP) in the leaves from the fruit species studied ranges from 7849.0 to 10157.0 mg GAE/kg d.w. (Figure 1). The highest content was found in the leaves from chestnut, and the lowest in the leaves of cherry trees.

The content of flavonoid phenols (FP) in the leaves from the fruit species studied it is higher in chestnut leaves and lowest in the leaves of cherry trees. While, the content of non-flavonoid phenols (NFP) in the leaves from the fruit species studied is higher in chestnut tree leaves, apple tree and pear tree compared with the leaves of cherry trees (Table 2).

The subgroup of flavanols (F-3-ols) is included in the flavonoid fraction. Due to the great interest towards the antioxidant properties of flavanols (catechin, epicatechin and their condensed dimeric, trimeric and oligomeric forms, known as procyanidins) we have determined them as a separate fraction. The amount of F-3-ols determined as catechin equivalent (CE) in the leaves from the studied fruit species, it is higher in chestnut leaves and lowest in the leaves of cherry trees (Table 2).

It has been established that the amount of TP and phenol fractions in the leaves from many tree species, in view of their resistance to pathogens and diseases, varies and depends on the cultivar type, the season, the soil climatic conditions, and agricultural techniques (Mayr et al. 1994).

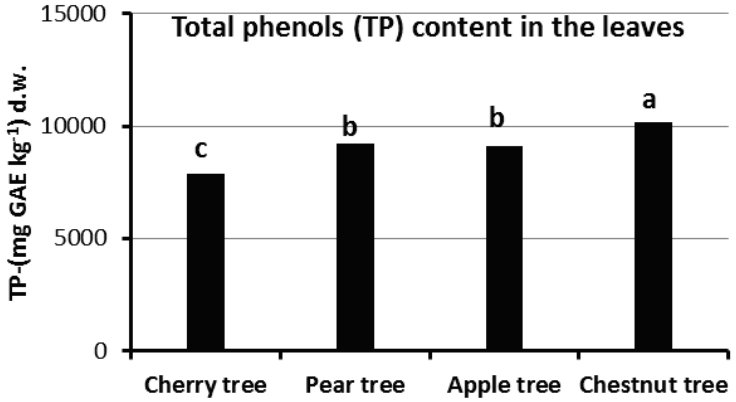

Figure 1. Content of total phenols in the leaves different fruit trees. Columns with the same letter do not differ significantly according to the Tukey's test (P=0.05).

Table 2

Flavonoid phenols (FP), Nonflavonoid phenols (NFP) and total flavanols (F-3-ols) content in the leaves from the tested tree species

	FP	NFP	F-3-ols
Tree leaves	(mg GAE/kg d.w.)	(mg GAE/kg d.w.)	(mg CE/kg d.w.)
Cherry tree	5577^{c}	2272^{b}	1116^{c}
pear tree	5978^{b}	3222^{a}	1282^{b}
apple tree	5902^{b}	3218^{a}	1294^{b}
Chestnut tree	6953^{a}	3204^{a}	1420^{a}

Columns with the same letter do not differ significantly according to the Tukey's test (P=0.05).

The ferric reducing antioxidant power (FRAP varies in wide ranges from 46.12 to 62.38 µmol FRAP/g d.w. (Figure 2), with the highest value for the chestnut tree leaves (62.38 µmol FRAP/g d.w.) and the lowest value for cherry tree leaves (46.12 µmol FRAP/g d.w.).

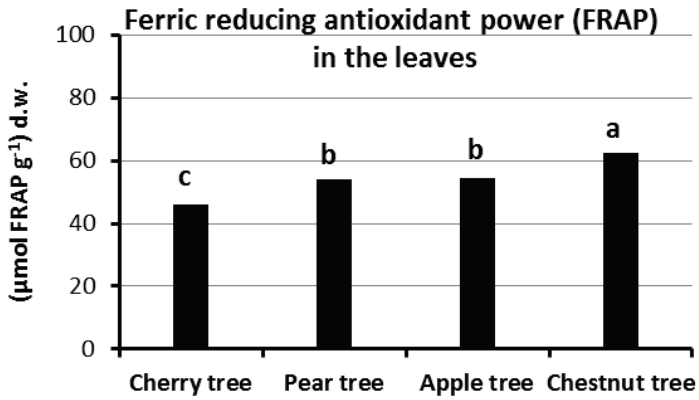

Figure 2. Antioxidant activity FRAP in the leaves different fruit trees. Columns with the same letter do not differ significantly according to the Tukey's test (P=0.05).

CONCLUSIONS

The leaves of the investigated four tree species, differ in their content of TP, NTP, FP and F-3-ols and ferric reducing antioxidant power (FRAP). From the tested species, the leaves of chestnut contain the highest amount of TP, F-3-ols and correspond to the highest antioxidant activity (FRAP).

The leaves from the fruit tree species under consideration are regarded as potent sources of biologically active phenol compounds for pharmaceutical purposes, and as natural pesticides.

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RELATIVE AND ECONOMIC EFFICIENCY OF LOAD OF FRUIT CARGO BY VARIOUS THINING METHODS

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Keywords: *Apple, economic efficiency, profitability, relative efficiency.*

ABSTRACT

The experimental plot is placed in the orchard "Codru-ST" Ltd. founded in 2004 year. The study subject of the experience was Golden Reinders apple variety grafted on M 9 rootstock. The distance of plantation is 3.5x 1.2 m. The research was conducted during the period of 2013 year. The tested agents was Pomonit, 0.4 l/ha; Geramid New, 1.5 l/ha; Metamitron, 3.5 l/ha; Dira Max LG, 2.5 l/ha, which was sprayed in different period. During the research, it was studied the studied the relative and economic efficiency of fruits production. It was established that the relative efficiency was recorded in manual thinning version - 13.9, and the highest level of profitability was achieved when treating with growth regulators Geramid New in dose of 1.5 l / ha, which was 146.1% of indicators shown.

INTRODUCTION

Fruit growing was and will continue to be, one of the main pillars of the national economy. In the years of prosperity, occupying 7-8% of the land surface, this branch provides up to 20% of profits from the sale of agricultural production, making considerable payments to the state budget of the Republic of Moldova (Babuc 2012; Cimpoieş 2012; Cimpoieş et al. 2013).

The economic crisis was reflected negatively on fruit growing. The average global harvest of fruits was reduced by 2.34 times and the average production per 1 ha - 2.38 times. Fruit growing, a branch with high level of profitability became unprofitable (Cimpoieş 2012).

To exit from this impasse was developed a strategic direction for the development of horticulture which consists of efficient operation of plantations with unspent potential and replacing it successively with new plantations with modern assortment, advanced technology, which provides early entry bearing, high fruit productivity and greater efficiency in their production (Babuc 2012; Balan et al. 2001; Cimpoieş et al. 2013; Peşteanu 2007).

Increasing the economic efficiency of production in agricultural depends heavily on strict compliance on economically regime and reducing unproductive expenditure. To solve these tasks in enterprises is necessary systematically analyzed all production costs, decrease the cost price of agricultural production and increasing labor productivity (Mladinoi 2013; Peşteanu 2007).

MATERIALS AND METHODS

The research was conducted in apple orchard enterprise „ Codru - ST" Ltd, founded in the autumn of 2004 with two years old trees type "knip-baum". During the 2013, it was studied the production and the amount of fruits per 1 cm^2 of trunk cross-sectional area, and the relative effectiveness of different methods of economic normalization load of fruit to Golden Reinders variety grafted on M9 rootstock. The planting distance was 3.25x1.20 m.

According with the growth regulators designed for chemical thinning of fruits, it was developed the following scheme of experiences:

1. Manual thinning (control);
2. Pomonit, 0.4 l/ha - spraying when 70% of petals fall;
3. Geramid New, 1.5 l/ha - spraying when 80% of petals fall +2-3 days;
4. Metamitron, 3.5 l/ha - spraying when the central fruit diameter is 10-15 mm;
5. Dira Max LG, 2.5 l/ha - spraying when the central fruit diameter is 10-15 mm.

The soil was maintained with grass on intervals between rows and herbicide field between trees on row with a width of 1.2 m. It was used the drip irrigation system.

The plots placement was made in blocks, each variant having three repetitions. Each repetition consisted of 7 trees. At the boundaries between the plots and the experimental repetitions was left per 1 untreated tree to avoid duplication of some control variants or repetitions on making the treatments.

The treatment of trees was made with portable watering tools on hours without wind, from morning, starting at the temperature of +16°C and finessing at the temperature of +25°C.

The recommended amount of solution per unit of surface preparation treat was 1000 l/ha. For a more positive grip of the solution with a leaf surface was added Silwet L77 from the ratio of 1 ml to 10 liters of water.

The production and quantity of fruits obtained from one tree was reported in 1 cm^2 of the cross-sectional area of the trunk, which was determined by the method of calculation.

The relative and economic efficiency of fruit production was calculated by keeping track of each variant, fruit quality, harvest, production costs and their profits and other expenses that were performed in the plantation.

RESULTS AND DISCUSSIONS

Lately, in the modern horticulture the fruit production and the amount of fruit produced from a tree relate to 1 cm^2 of trunk cross-sectional area.

The lowest production and the smallest quantity of fruits per 1 cm^2 of trunk cross-sectional area was registered in the variant treated with Pomonit 050 SL in dose of 0.4 l/ha being 0.62 kg/cm^2 or 3.58 fruits followed with the control variant with 0.66 kg/cm^2 or 3.90 fruits (fig. 1, 2). The variant treated with Dira Max LG in dose of 2.5 l/h registered medium values being respectively 0.70 kg/cm^2 or 4.14 fruits.

The highest values of productivity of a cm^2 of trunk cross-sectional area was registered in the variants treated with Metamitron in dose of 3,5 l/ha being 0,75 kg and when the treatment was made with Geramid New in dose of 1,5 l/ha being respectively 0,76 kg (fig. 1). The quantity of fruits per cm^2 of trunk cross-

sectional area in the above variants increased being respectively 4.43 and 4.75 pcs/cm² (fig. 2).

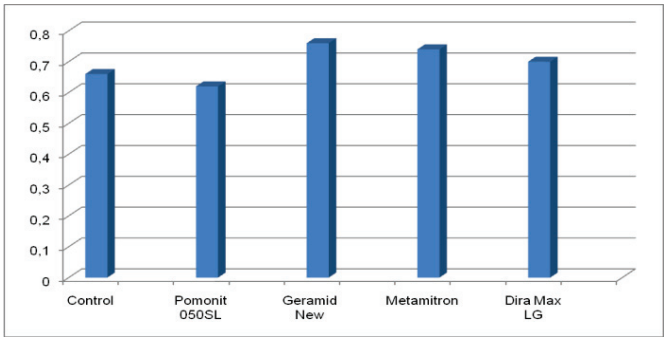

Figure 1. The productivity per cm^2 of trunk cross-sectional area on Golden Reinders variety based on fruit load normalization, kg/cm^2 SSTT

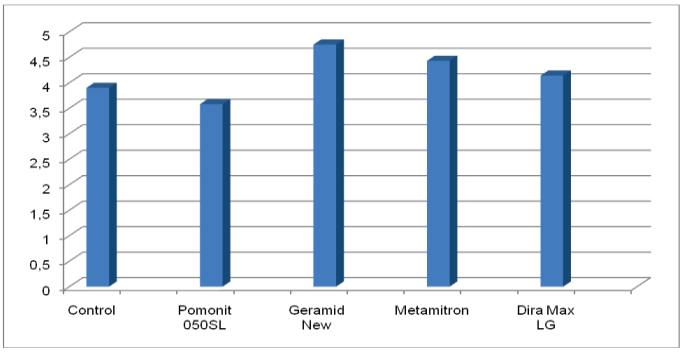

Figure 2. The quantity of fruits per cm^2 of trunk cross-sectional area on Golden Reinders variety based on the growth regulator used at fruit load normalization, pcs/cm^2

The conducted investigations prove that the highest production and the greatest amount of fruits per cm^2 of trunk cross-sectional area were registered on the variants treated with Geramid New in dose of 1,5 l/ha and Metamitron in dose of 3,5 l/ha.

For a fuller assessment of the relative effectiveness of each doses treatment and time of use of growth regulators settled indices diameter (R), production (P) and global (G), encompassing the diameter fruit and efficiency, which are two important criteria of fruit production and efficiency is purposeful chemical preparations used for fruit thinning.

As the share of fruits with the diameter less than 70 mm decreases, the diameter index increases, being in the variant treated with Geramid New in dose of 1.5 l/ha – 5.3, and in the variant treated with Metamitron in dose of 3.5 l/ha – 6.4. When the treatment was made with Dira Max LG in dose of 2.5 l/ha the diameter index was 10.1, with Pomonit 050 SL in dose of 0.4 l/ha the above index was 10.2

and in the variant where was made manual thinning it consisted 13.9 (table 1).

The highest value of the diameter was registered in the variant where it was reformed manual thinning. The production index (P) is the ratio between the harvests of fruits reported in the studied variant on the yield of fruits obtained in the control variant. To obtain high values of the above index, it is necessary that the production in the studied variants to be high too.

The conducted investigations prove that the highest production index was obtain in the variant treated with Geramid New in dose of 1.5 l/ha being 1.15 followed by the variant treated with Metamitron in dose of 3.5 l/ha – 1.09 and Dira Max LG in dose of 2.5 l/ha where the above index was 1.06

The lowest values of the production index were registered in the variant treated with Pomonit 050 SL in dose of 0.4 l/ha being 0.92, which was even lower than in the control variant where the mentioned index was 1.00.

Table 1

The relative efficiency of agro-technical measures targeted for standardization cargo apple fruit plantation of Golden Reinders variety

Variants	Fruits yield, kg/tree		Index		
	total	with ø < 70 mm	diameter, (R)	production, (P)	global, (G)
Control, manual thinning	17.71	1.27	13.9	1.00	13.9
Pomonit 050SL, 0.4 l/ha	16.30	1.59	10.25	0.92	9.3
Geramid New, 1.5 l/ha	20.35	3.84	5.3	1.15	6.1
Metamitron, 3.5 l/ha	19.38	3.04	6.4	1.09	7.0
Dira Max LG, 2.5 l/ha	18.77	1.85	10.1	1.06	10.7

The global index (G) is the product between the diameter production index and the production index. The lowest values of the global index were registered in the variant treated with Geramid New in dose of 1.5 l/ha being 6.1. The highest values of the global index were registered in the control variant with manual thinning was performed being 13.9. Followed, in descended order by the variant treated with Dira Max LG in dose of 2.5 l/ha – 10.7, Pomonit 050 SL in dose of 0.4 1 l/ha – 9.3 and the variant treated with Metamitron in dose of 3.5 l/ha – 7.0. The difference between the control variant and the one was where the thinning was performed with Dira Max LG in dose of 2.5 l/ha was insignificant.

Our studies prove that the highs values of the relative efficiency index (diameter, production and global index) were recorded in the variant treated with Dira Max LG in dose of 2.5 l/ha and in the control variant.

Initially, the main role of our investigation was to determine the optimal load normalization of fruit that would favor obtaining a high and constant quantity of fruits with lower investment. This allows better planning with optimal fruit buds for next year, which would maintain in the plantation a physiological balance between growth and fruiting.

Investigations conducted (table 2) demonstrate that the output value

depends on the quantity and quality of production and the sale price. The lowest profit was obtained in the variant which was treated with Pomonit 050 SL in dose of 4.4 l/ha being 178.7 thousands lei/ha. In the control variant, where was performed manual thinning the above index was 191.7 thousand lei/ha. Higher values than in the control variant was registered in the variant treated with the growth regulator Dira Max LG in dose of 2.5 l/ha being 202.3 thousands lei/ha and Metamitron in dose of 3.5 l/ha being respectively 204.2 thousands lei/ha. The highest profit was obtained from the variant treated with Geramid New in dose of 1.5 l/ha being 212.4 thousands lei/ha.

Table 2

The economic efficiency of production of fruit of Golden Reinders varieties based on the growth regulator used for standardization the load bearing

Variants	Profit from sales, k lei/ha	Investment for thinning a ha of orchard, k lei	Production cost, k lei/ha	Profit, k lei/ha	Level of profitablenessity, %
Control, manual thinning	191.7	2.5	86.0	105.7	122.9
Pomonit 050SL, 0.4 l/ha	178.7	0.13	82.4	96.3	116.8
Geramid New, 1.5 l/ha	212.4	1.00	86.3	126.1	146.1
Metamitron, 3.5 l/ha	204.2	1.34	86.0	118.2	137.4
Dira Max LG, 2.5 l/ha	202.3	1.67	85.9	116.4	135.5

When using different normalization methods to load were made additional investments for fruit thinning. The smelled investment was made in the variant treated with Pomonit 050 SL in dose of 0.4 l/ha being 0.13 thousand lei/ha. For manual thinning was necessary 20 person/day, which cost 2.5 thousand lei. Practically, the highest investment for thinning one hectare of orchard was made when the treatment was made with Dira Max LG in dose of 2.5 l/ha being 1.67 thousand lei/ha and when treating with Metamitron in dose of 3.5 l/ha being 1.34 thousand lei/ha.

Cost of production per unit of area differs from the amount of production and investment for thinning a hectare of orchard. The lowest cost of production was recorded in variant treated with Pomonit 050 SL in dose of 0.4 l/ha being 82.4 thousand lei/ha. In the rest of variants the cost of production was the same as in the control variant respectively 86.0 thousand lei/ha.

The profit shows how rational all the agro-technical measures were mad in the apple orchard. The profit in the control variant was 105.7 thousand lei/ha. A smaller profit than in the control variant was registered in the variant treated with Pomonit 050 SL in dose of 0.4 l/ha being 96.3 thousand lei/ha. In this variant and the profitability, level was lower being 116.8 %.

When the treatment was made with Dira Max LG in dose of 2.5 l/ha the

profit was 116.4 thousand lei/ha, while in the variant treated with Metamitron in dose of 3.5 l/ha, the above index was 118.2 thousand lei/ha. The highest profit was obtained in the variant treated with Geramid New in dose of 1.5 l/ha being 128.1 thousand lei/ha.

The level of profitablenessity depends on the profit and the cost of production. The lowest level of profitablenessity was registered in the variant treated with the growth regulator Pomonit 505 SL in dose of 0.4 l/ha being 116.8% followed by the control variant where the mentioned index was 122.9%. Higher values of the level of profitablenessity were registered in the variants treated with Dira Max LG in dose of 2.5 l/ha and the one treated with Metamitron in dose of 3.5 l/ha being respectively 135.5% and 137.4%.

The highs value of the level of profitablenessity was registered in the variant treated with the growth regulator Geramid New in dose of 1.5 l/ha being 146.1%. This is explained by the quantitative high production per unit of area.

CONCLUSION

The lowest production per cm^2 of trunk cross-sectional area was registered in the variant treated with the growth regulator Pomonit 050 SL in dose of 0.4 l/ha and the highest value in the variant treated with Geramid New in dose of 1.5 l/ha. The rest of variants registered medium values.

Technological measures focused on standardization of fruit load affected the relative efficiency of fruit production. Once the production of fruits increases and the quantity of fruits with the diameter less than 70 cm decreases, the diameter and the global index increases, but the production index decreases. The most rational relative efficiency was registered in the control variant being 13.9.

The growth regulator for standardization the load bearing influence on economic efficiency of fruit production. The low cost of production and high profits obtained by using growth regulators improved helped increase the level of profitablenessity on the Golden Reinders variety.

The lowest level of profitablenessity was obtained when we used the growth regulator Pomonit 050 SL in dose of 0.4 l/ha being 116.8% and the highest value when the treatment was made with Geramid New in dose of 1.5 l/ha where the mentioned index was 146.1 %.

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RESEARCH ON THE CHARACTERISTICS OF GROWTH AND PRODUCTIVITY OF SOME CORNICHON CUCUMBER CULTIVARS GROWN IN GREEN HOUSES

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ABSTRACT

Production-type cucumbers gherkins becomes a concern increasingly more present due to profit from this culture. Increased costs of production rise to the initiation of the growing cycle of increasingly early, which also represents some challenges for manufacturers, strictly observe: difficulties in seedling production and the actual culture because of high temperature and humidity differences in solar. In-extenso paper aims to establish relations between the peculiarities of growth and productivity fruits cucumber cornichon type produced in successive crop in greenhouses. Experience was used to achieve the next hybrid cucumber cornichon type: Kybria F1, RZ-828, RZ-829, RZ-830 (Rijk Zwaan manufacturer). Experience has been placed in a traditional solar tunnel. Solarium was placed in Peris area and was located on reddish brown soil, with moderate suitability for cultivation cucumbers type cornichon. Fruits necessary determinations were collected over the entire length of the plant, which have not been removed small fruits, in training. Morphological measurements were performed on samples of 15 fruits each, randomly separated from fruit harvested cucumbers. The length and diameter of the fruits - the quality criteria for cucumbers were determined by measuring with calipers. Average fruit weight was determined by weighing using a precision balance. From research conducted in this experience can highlight the following conclusions: Average fruit weight of cucumbers type cornichon gradually increases, compared to their length; Density fruit cucumber cornichon type depends exclusively on environmental conditions; Harvests show that the three new hybrids included in experience RZ-828, R-829 and R-830 have great potential production hovering over the values F1 hybrid cucumber Cornichon Kybria.

INTRODUCTION

Vegetables are fascinating products of nature that constantly give us surprises and new ways how to use them in enrichment of our lives, science and medicine.

Scientifically known as *Cucumis sativus*, cucumbers belong to the same family as zucchinis, watermelons, pumpkins, and other types of summer squash. The plant where cucumbers grow is a creeping vine that develops the cylindrical, edible fruits throughout the year. You will find different varieties of cucumber grown in different regions, and they are usually eaten fresh or pickled. Cucumbers

typically eaten fresh are calledslicing cucumbers. Gherkin cucumbers are specially produced to make pickles. These are much smaller in size than slicing cucumbers. Slicing cucumbers are available throughout the year, but they are at their best between May and July. Cucumbers originated in India almost 10,000 years ago, but are now cultivated in many different countries and continents. Recently, different varieties of cucumbers are traded on the international market and you will find them in abundance all year long.

The health benefits of cucumber are not widely known in many cultures. The taste of fresh cucumber is somewhat bland in comparison to other squashes, but it's thirst quenching, and the cooling quality of this squash is truly refreshing. Cucumbers often act as antioxidants when you consume them with barbecued and fried foods.(Ciofu 2004)

Production-type cucumbers gherkins becomes a concern increasingly more present due to profit from this culture

Increased costs of production rise to the initiation of the growing cycle of increasingly early, which also represents some challenges for manufacturers, strictly observe: difficulties in seedling production and the actual culture because of high temperature and humidity differences in solar.

In-extenso paper aims to establish relations between the peculiarities of growth and productivity fruits cucumber cornichon type produced in successive crop in greenhouses.

MATERIAL AND METHODS

Experience was used to achieve the next hybrid cucumber cornichon type: Kybria F1, RZ-828, RZ-829, RZ-830 (Rijk Zwaan manufacturer).

Experience has been placed in a traditional solar tunnel with a width of 5.40 m at the base. Solarium was placed in Peris area (about 25 km north of Bucharest) and was located on reddish brown soil, with moderate suitability for cultivation cucumbers type cornichon.

Basic fertilization was carried out in autumn by applying 1 t well fermented manure.

Cucumber seedlings were produced in April and then they were transplanted in May in solar. The planting distances cm was 80/50 which provides a density of 2.5 plants / m^2. It was determined that density as light conditions very good in the first part of the growing cycle favors both vegetative growth and fructification of cucumbers. Before planting were applied to 100 kg / ha NH_4NO_3. Cucumber fruit harvesting began in the first decade of June, and was conducted over two months. (Popescu and Atanasiu, 2000)

The solarium was not equipped with water spray in order to increase air humidity and maintain it within the construction, watering is performed on the gutters. The consequence of this situation was unfavorable for culture, influencing negatively the level of production (Horgos, 1999 and A. A. Kader, 2002).

To build the necessary experimental data volume and diversity have been conducted on the morpho-physiological observations of fruit cucumbers type cornichon.

Fruits necessary determinations were collected over the entire length of the plant, which have not been removed small fruits, in training.

Morphological measurements were performed on samples of 15 fruits each, randomly separated from fruit harvested cucumbers.

The length and diameter of the fruits - the quality criteria for cucumbers were determined by measuring with calipers.

Average fruit weight was determined by weighing using a precision balance.

RESULTS AND DISCUSSIONS

Morphological measurements are shown in Table. 1.

Table 1

Biometric measurements of some type cornichon cucumbers fruit in solar, summer-autumn cycle

Var.	Weight (g)			Medium Lenght (cm)	Medium Diametre (cm)
	Medium	Minimum	Maximum		
RZ-828	48.3	11.9	130.8	8.4	2.3
RZ-829	42.5	7.6	97.4	8.2	2.1
RZ-830	44.1	1.7	99.8	7.7	1.9
KYBRIA F_1	38.0	1.3	143.6	7.4	1.9

Cornichon cucumbers were harvested weights that ranged from 38g at Kybria F1 to 48.3g at RZ-828. The average length ranged from 7,4cm at Kybria to 8,4cm at RZ-828.

In terms of total production, were recorded production data of the first harvest.

Table 2

Total production. Type cornichon cucumbers in solarium

Experimental Variant	Production kg/plant	Production kg/m^2	Diference ±	Percent, %	Significant
RZ-828	6.70	20.09	+ 8.34	170.98	***
RZ-829	7.61	22.82	+ 11.07	194.21	***
RZ-830	5.51	16.53	+ 4.78	140.68	ns
Kybria F1	3.92	11.75	Ct	100.00	Ct

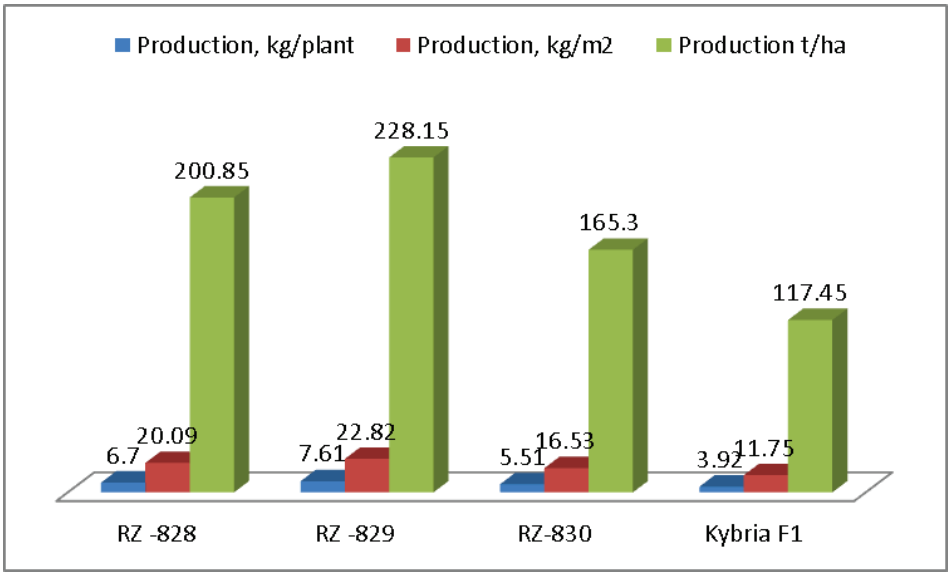
LD-5%=4.62 kg/m^2 LD1%=6.12 kg/m^2 LD1%=7.38 kg/m^2

The statistical interpretation of the results shows that yields RZ-828 and R-829 productions were statistically highly significant as compared to the control Kybria F1.

CONCLUSIONS

From research conducted in this experience can highlight the following conclusions:

- Average fruit weight of cucumbers type cornichon gradually increases, compared to their length;
- Density fruit cucumber cornichon type depends exclusively on environmental conditions;
- Harvests show that the three new hybrids included in experience RZ-828, R-829 and R-830 have great potential production hovering over the values F1 hybrid cucumber Cornichon Kybria.



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OLTENIA – THE LITTLE VITICULTURAL ROMANIA
Mention spéciale de l' Organisation Internationale de la Vigne et du Vin dans la catégorie "Monographies", 2016

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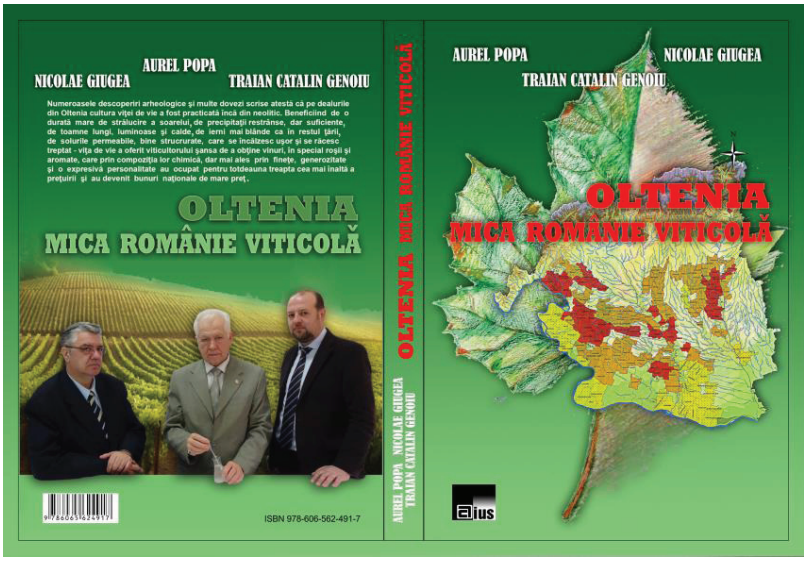
Oltenia, which is endowed with many hills, hillocks and sandy lands, a vast amphitheater spread towards the Danube, enjoying a sub-Mediterranean climate that extends forward and climbs till it reaches to the foothills, has become a brotherhood realm for the vegetal and animal representatives of several zones. Here, the cultivated vines shake hands with their feral ancestors (there are more than 40 genetic centers) while they also find associates in the surrounding trees, such as peaches, walnuts, chestnuts and almond, which are able to turn sterile into fertile, good and beautiful. Oltenia is neither deprived from the existence of large and fruitful hollow grounds, which are like huge reservoirs where the summer climate comes to be collected and preserved, a distinctive local circumstance which allows for autumns to stroll around long within winter, for winters to soften and for springs to come early.



Under the marvellous natural conditions which are effectively acting in Oltenia, for thousands of years the vine has been dripping into cups the finest nectar (at Bechet, a town situated near the point where the river Jiu flows into the Danube, on the occasion of some archaeological investigations, antique vine roots were found, together with some Roman coins that were circulating during the second half of the I-st century A. D.). Due to its multiple micro-climates and types of soils, but also due to the complete range of wines that it can provide (white, red, aromatic and wine distillates), while the same situation goes for table grapes and for raisins, Oltenia may be, thereby, considered as a real viticultural miniature of Romania. Through their respective generosity and finesse, wines have rendered famous many Oltenian sites. Among them, let us mention: Drăgăşani, Segarcea, Sâmbureşti, Oreviţa, Corcova, Golul Drincei, Halânga, Plaiul Vulcăneşti etc. Should we speak of "The Great Romania" or either of the actual Romania, the Oltenian viticulture has represented, and still does, about 15-20% of the whole country's viticultural practice (1905 – 35000 ha out of 230000 ha; 1939 - 46000 ha out of 270000 ha; 1989 -70000 ha out of 300000 ha; 2014 – 30000 ha out of 182000 ha). While crossing step by step the Oltenian areas and investigating their vocation towards a high quality viticultural practice, we have come to draw the conclusion that this old and beautiful province of our country might as well host the whole actual viticultural surface that exists in Romania (which is of 182000 ha).

Within the space of the European Union itself, should the question of kinds and sorts be risen, viticulture will end by constituting itself as an "unity within diversity", since each country ought to participate upon the market of grapes and wine with products mainly issued from its autochthonous varieties; therefore, after its adhesion to the European Union, Romania's viticultural identity should be built upon the vinifera variety concerning table grapes, raisins and wines that would have been obtained over a long time, under certain climate circumstances, having achieved high quality performances which would deserve to be acknowledged.

The acknowledgement of a viticultural area is difficult to obtain. For this, it takes time, the respective site's vocation, the variety’s inner structure, the plants and soil’s agricultural and technical peculiarities to be nursed, a specifically adapted wine-making technology, a permanent involvement concerning the wine's promotion. All these things reunited might only be achieved through solid knowledge, a lot of work and a really deep commitment for many generations of vine practitioners. Fortunately, in Oltenia there are a lot of viticultural areas which have been acknowledged; while others enjoy a more restrained recognition, few among them, though they have proven a truthful vocation for obtaining quality wines, have barely started to struggle for a well deserved acknowledgement.

Oltenia has preserved a lot more vestiges and testimonies about its ancient and continuous activity in the domain of viticulture than the Romanian provinces which are situated Southern and Eastern from the Carpathian Mountains, due to its central position within the Dacian state, to its more intense colonizing process accomplished by the Romans and to its better sheltered geographical position, that is to say being surrounded by the Danube, the Olt river and the Carpathians'curvature,which,all of them together, have protected it better from the incessant invasions that were turning upside down the territories of Moldavia and Valachia during the first thousand years A.D. It is, undoubtedly, interesting for us to mention that, before the appearance of phylloxera (1884), Oltenia was producing, in its Western hillocks'area, by then the most well-known

red wines of our country, as highly appreciated as the Cotnari white wine. But it is precisely the famous vineyards from Oreviţa, Drincea, Rogova etc., where those legendary red wines were produced, that were the first ones to fall under the scourge and to be affected by it in the gravest way, at such an extent that their exploitation had to be, ultimately,abandoned; the vineyards which, for such a long time, had enjoyed from an insuperable fame, had come to be transformed into some ill-at-ease pasture fields, where, hardly subsisting, had barely remained a few patch areas where only some directly producing hybrids could survive.

It is only during the final years of the XIX-th century that a muscled action was initiated, aiming to reconstitute the ancient vineyards, the ones mentioned above or the ones from Drăgăşani and Segarcea, due to the concern shown to this matter by a series of skillful and enthusiastic specialists, who sought to lay out the respective zone by outlining it into terraces and to plant, upon each of them, the most appropriate noble varieties (kinds), so that later they might be able to produce their wines of an exceptional quality which could claim to be most highly appreciated. Let us also remind the conclusions to which have reached, after vivid debates, the modern researchers; concerning the origin of the vine which had existed upon the South-Western territory of our country (the references of our enumeration are made suiting the Danube ‘shore). The G-mel Vitis sylvestris, that is to say the savage forestvine, the most ancient vine species ever known (which seems to have risen ever since the Tertiary Era) had spread, after the Ice Age, under the form of lianas, throughout the whole Eurasian territory, from the Atlantic Ocean to the Central Asia, thereby as well in our regions. In the forests that exist upon the territory of the ancient Dacia (scientifically established according to the inventory list dressed by Professor Dr. Emil Pop, member of the Romanian Academy, in 1931), this species could be spotted even nowadays, but the grapes produced by it are small and cannot be eaten. Yet, in Oltenia's geographical space (meaning in the area situated between Brezniţa-Vârciorova and the valley of the Cernariver, till the locality named after Hercules ‘Bathes and even further, within the forests made of trees from luxurious foliage species, even now we meet strong and numerous lianas of savage fruit-bearing vine, which does produce edible grapes.

Within the mixed forests (composed of: oak trees, aldertrees, mapletrees, hornbeamtrees, beechtrees, ashtrees, lime trees etc., all mingled together), and known in Romanian as: "shear", their leafy coronas are covered by the sprouts of this vine, the lianas of which are designated under various folklore denominations: "lăuruscă", "labruscă", "halângă", "aguridar" etc. Because they were fruit-bearing edible grapes, these vine lianas were paid attention to by the German botanists Engler and, afterhim, Victor Helin, who studied them (along the Danube and in the forests from Banat) and had reached to the conclusion that they had appeared in this region spontaneously, at the end of the XIX-th century. Consequently, these vines could not have sprung from the noble fructifera vine (Vitis vinifera-Linné) which originated from the Caucasus‘ region and from Asia Minor (where from, later, they must have been brought in our regions). Afterwards, at the beginning of the XX-th century, these same vine lianas were studied, in the forests from the area around the locality Băile Herculane (= Hercules'Bathes), by the German botanist Ferdinand Pax. This latter does argue against Engler and Helin. His thesis is that: though the formers might have considered them as being savage therefore spontaneous, the respective vine lianas (and this precisely because of bearing edible grapes as fruits!) were nothing else, in fact, but antique noble vines (Vitis

vinifera-Linné),either of local origins or imported in the old days,which,as time has passed, haddegenerated, that is to say had grown savage. Yet, ultimately (in the second tome of his work Grundzuje der Pflonzenverbreiting in den Karpaten, Leipzig, 1908) Pax comes to revise his previous statement and does admit that the perspective of Engler and Helin's thesis was the right one. Consequently, these lianas of savage but fruit - bearing vine (with edible grapes) do represent, simultaneously, an evolved form of the savage forest vine (Vitis sylvestris G-mel) and an intermediary form situated between the North American savage vine (Vitis labrusea) and the noble cultivated vine (Vitis vinifera-Linné). In scientific terms, we might compare them with the pre-historical savage fruit-bearing vines from Mingrelia and Georgia, with the lianas that had spread in the Balkans along the coasts of the Black Sea (Vitis prolingera known from Varna), with the antique vineyards from Tuscany (the ancient Etruria from Italy), mostly within the Maremma vineyard and with the savage vines that are to be met in France and are designated under the folklore nickname of "lambrusces".

In the beginning, these savage forest fruit-bearing vine lianas were protected only. Later (during the Neolithic Age) they came to be cultivated around the human inhabiting settlements, being physically sustained by trees (thereby, theywere, more or less but yet willfully, selected by the humans). At first, the grapes of these vines were used as food while being in their fresh state. Wine-making was discovered later, during the Bronze Age (II-nd and I-st millennia B.Chr.). Step by step, these vines got to be lifted up on tall pitchforks or upon the outside walls of the huts; lateron, they came to be laid upon purposely placed balustrades able to sustain them, within the gardens created around the inhabitations. All of these antique systems used to guide (orientate) the vine were continuously transmitted, till our own days and,thus,to us. This fact is visible in the Northern part of Oltenia, most of all in the area between Târgu-Jiu and Filiaşi,where we can find some diversified and stylish forms of this type of craftsmanship, which could be seen nowhere else in our country: arch - like bindings, trellises, guidance and suspension wires being installed even within verandas or balconies etc. For centuries long, these vines issued from savage lianas and scarcely chosen were the only ones. But later came to join them some kinds from the new and noble vines (Vitis vinifera - Linné), which were gradually brought in due to exchanges or voyages and which were, logically, cultivatedand orientated in the same ways as the old ones. But afterwards, when people had become a lot more concerned by wine-making than by consuming the fresh grapes as such, the need had risen to ensure for the grapes a more intense maturation process (that is to say a higher amount of naturally concentrated sugar). Or, this result could not be obtained under the circumstances of an upside orientation (vine could no more be left "alone" to grow freely, meaning to climb upon trees, tall pitchforks or houses etc.). This decision once taken, in Oltenia, the sunny slopes from the hillock area and the zone of Eolian sands from the South have suddenly become favourites for developing the unstained vine (not guided, not orientated), that is to say "crippled" (paralyzedindeed, for which the vine logs are planted much closer one to another and shorter cut, precisely till one palm of the hand above the earth, being also each left with no more than 3-5 seedlings, them too allowed each with not more than 2-3 fruit - bearing burgeons). In Oltenia, either in the hillock area or in the plain zone, thepeculiarities of cultivating vine during the Antiquity (like the chosen kinds or the vine - growth sustaining systems) are scientifically taxonomies

as belonging to the Thracian area, which also held the territory of the actual Bulgaria and Serbia, even extended at, in this province, Banat's Plain (either Romanian and Serbian). In the Oltenian vineyards from the sandy area, among the dominant kinds were a lot of the ones that were also common for the whole Thracian area, thereby for the actual respective countries: Braghina and Gâmza (with the Serbian denominations Bagrina and Skaderca), Roshioara, Semendra and Coada Vulpii (known in Bulgarian and Turkish as: Pamid, Parmac and Tilkicuirug). The kinds which had given (during the Antique times) the famous red wines from the "crippled" vineyards laying in the sub-Carpathian zones and on the Danube's upper terraces (that is to say from the West side of Oltenia)can also be found on the Danube's Southern side: Corbul and Berbecelul (in Bulgarian: Garan and Kokorko), Seina or Negru Moale, Gorganul Negru etc. The traditional varieties which have given, at Drăgăşani, the famous white wines are spread at the same extent: Tămâioasă (in Bulgarian: Tamianca) and Crâmpoşie (Cârlogancă).

About the old age and the Getic-Dacian origin of the Oltenian vines we have at hand a lot of proofs and scientific studies. Since 1874, in his work Originile viticulturii la români, the historian Bogdan Petriceicu Haşdeu had demonstrated that, in this province, viticulture was practiced even since the Antiquity and that it had preceded agriculture itself. Haşdeu also sustains that vines were cultivated in Oltenia since the times of the Agatharsians (some tribes of Thracian origin); during the VIII-th and VII-th centuries B.Chr.which is before the founding of the Greek colonies along the coasts of the Pontus Euxinus (that is to say the Black Sea). So, in Oltenia's sub-mountainous and hillock'areas,viticulture was practiced at least from the VIII-th century B.Chr. on. In its plain zone, we may consider that vine had started to be cultivated at almost the same time. This fact is attested by a testament, cut into a stone, that was found at the Roman castrum of Sucidava (nearby the locality of Izlaz). Through it, a Roman citizen did leave as legacy, to a local inhabitant, two acres of land estate and a house, under the condition that his tomb should be duly honored.

Concerning the "flying sands" areas from the valleys of the Danube and of the river Jiu,relatively recent archaeological explorations made at Dăbuleni (12 km from Bechet) have unveiled some silver Roman coins which bear the effigies of Emperors Vespasian (69-79 A.D.) respectively Domitian (81-96 A.D.). According to the rituals of that time, these coins were buried at the feet of some antique vine logs upon which, intime, sands have been laid by the winds. Again about the Oltenian vineyards, let us also mention a chronicle, issued in 1419, according to which are confirmed to the monasteries Vodiţa and Tismana their ancient real estate rights (probably granted during the previous century), involving some villages, mills, orchards, vineyards etc. situated in various locations within Oltenia.

Seized as an ensemble, the Oltenian viticulture does present itself under some traditional forms which are exceptionally pittoresque and which can as well be retrieved in the antique viticultural regions from Portugal, in Italy, in Greece and in the county of the Eastern Pyrenees from France. In all these locations, we can find, evennowadays, the antique systems used to orientate the vine, the ones that we have spoken above as surviving, and even in an astounding diversity, in the viticulture areas from Northern Oltenia.Here are the vines orientated upwards, that are planted within orchards and are climbing onto trees; here are the ones mounted upon tall pitchforks (2-2,5 m) arranged so that they could naturally form bowers; here are the ones hanging to the houses 'walls or verandas.

There are also some vines orientated through horizontal wires ("strings"), which may be either simple or with lateral ramifications made under the form of overhanging eaves. Vines may be also guided through ordinary trellises (with three wire strings each); let us not insist upon the diversity of the forms which rely upon arch like bendings or semi-bendings... At Runcu and at Dobriţa (Gorj) or at Bălăneşti, amidst the vine plantations which climb till the mountains'feet,arescattered wooden cellars, built up from oak tree beams and covered with "râpcă" (dried vine lianas),that, seen from far away, look like a "second village" and which do aggregate themselves into an unique sui generisensemble endowed with an outstanding asset of being pittoresque. The forms taken by such constructions are of an infinite variety while each of them gathers a whole "hodge-podge" made of all the instruments that had ever been thought of in viticulture or of the whole world's "traps": various tools, wine-making installations, vases to keep it in etc. These cellars are locked up with some primitive "padlocks" made of wood, bearing an ingenious as it could possibly be closing secret and which were created by the local craftsmen.

For these buildings vowed to viticulture, the beams and joists, as well as the wooden tools employed within these cellars are themselves joined in an archaic style and ornate with rich artistically carvings, which are genuine, diverse and extremely pittoresque; thus, they become a treasure for the Romanian ethnographics' museums. Once they had been sublimated by Brâncuşi, the gifted sculptor originating from Gorj's locality of Hobiţa, these forms of art have gained such a powerful fame that they have come to initiate the renewal of art throughout the world. Among the large number of viticultural instruments which have survived by preserving their genuine antique forms, let us mention especially: the Oltenian vine "spur-like" hedging knife and the simple (Dacian - type) hedging knife, which do constitute the evidence that sustains the viticultural practice's oldness in the West side of Oltenia. Upon the Getic Plateau's hills and hillocks are situated the viticultural regions and centers from the department of Mehedinţi, which do continue in the department of Dolj, then keep forming a line on the hill' slopes in the departments of Gorj and Vâlcea, this line prolonging itself by the ones from the department of Olt. The ending loops of this "chain" are the ones from the department of Argeş (where the Getic Plateau itself does end, at the Valley of the Dâmboviţa River). The Meridional Carpathian' summits are surrounded, in a crown-like shape, by this long girdle of viticultural regions and centers, the starting point of which are the hillocks laid around the city of Drobeta Turnu Severin. They lay upon the natural diadem of hills and hillocks developed towards the South and East of the mountains, on their sunniest slopes, within a changing-shape "belt", which is large from a few kilometers to dozens of them. Inside it, the vine sites may be either scattered or massively grouped as patches.

The vine realms of Halânga, Dealul Viilor, Şimian, Poroina laying upon various types of soils, mostly brown and reddish brown forest ones (which are distinctive for the Getic Plateau) have grounded their reputation upon the peculiar quality of their aromatic wines from Tămâioasă Românească or Sauvignon. Further towards East and South, on soils that are light, warm and rich in limestone, made of alluvial gravels, dolie, since ages ago, the famous viticulture centers of Oreviţa and Golul Drincei,with their red wines, which had indeed particularly impressed Ion Ionescu de la Brad, thus determining him to describe their outstanding assets in such a beautiful manner (Agricultura română în judetul Mehedinţi, 1868). In his

time, this sort was relying upon the kinds of Negru vârtos and Negru moale; nowadays, it is grounded upon the qualities of Cabernet Sauvignon, Pinot noir, Merlot or Fetească neagră, which, morerecently, were joined by the Syrach kind. Among the most valuable vine plantations, let us mention: Rogova, Vlădaia, Pădina, Punghina, Scorila, Fântânile Negre, Valea Anilor, Corlăţel, Vânju Mare, Oreviţa, Oprişor etc. In the department of Mehedinţi, the most extremely situated vineyard, that is to say in the Northern side of the hillock area, is the one of Brâncoveni-Corcova, well-known for its red and aromatic wines. The remarkable vineyard realms of Craiova lay on the hills from the Northern side of the department of Dolj. Three important centers are gathering them: around Craiova is the one of Banu Mărăcine (Plaiul Vulcăneştilor), with vineyards at: Şimnic, Coşoveni, Bucovăţ, Podari, Cârcea, Pieleşti, Robăneşti; another lies around Brădeşti (with the plantations from the hills nearby the rivers Jiu and Amaradia, at: Almăj, Filiaşi, Goeşti, Melineşti); the third is located around Brabova (with the vineyards from: Barboi, Breasta, Greceşti, Predeşti). The center from Oprişor (Mehedinţi) is continuated, through geographical proximity, by the viticultural center of Pleniţa, situated upon the hill' slopes from the central and Western sides of the department of Dolj. It does group the vineyards from: Cornu, Orodel, Palilula, Verbiţa.

Some other renowned viticultural plantations are to be found nearby the Danube, upon the hills of Cetate - Dolj. Since they lay on the Getic Plateau's predominant types of soils, all of these centers do own their respective reputations to the exquisite quality of their white wines but, above all others, to the paramount of their red wines from kinds like Cabernet Sauvignon, Pinot noir and Fetească neagră. In the department of Gorj, the vineyard realms from: Bălăneşti, Bârseşti, Bobu, Runcu,Scoarţa, planted within brown forrest soils as well as within argillaceous and clayey ones, are remarkable due to the exquisite finesse of their white and aromatic Sauvignon wines. Should we step further towards East, we would arrive to the great viticultural region of Drăgăşani,in the department of Vâlcea,the most extremely situated from the Northern side of Oltenia. During the Middle Ages, the vineyards owned as personal estates by the Bans of Craiova (as well as the ones owned by the valiant Buzescu brothers) were located in this county.

These massive plantations do cover the slopes of three ranks of hillocks, all of them being parallel to the river Olt, for a length of more than 60 km. They are climbing to altitudes which go beyond 500 m They are laid on brown and reddish brown forestsoils, among which some are averagely podzolized,rich in calcareous stone, with a deep stratum of alluvial gravels. The main vineyard realms which had always made the viticultural fame of this region are located at: Olt's Hill, Călina, Creţeni, Dobruşa, Guşoieni, Orleşti, Prundeni, Suteşti, Tetoiu and Verdea etc. They are particularly acknowledged for the exceptional quality of the aromatic wines given by the kind of Tămâioasă Românească from Drăgăşani and by the Sauvignon kind. The white Crâmpoşie wines and the red Pinot noir ones were also always outstanding. Among the most ancient in the Northern part of Oltenia, being as well the most extremely situated in this area, last but not least, lies the vineyard realm from Jiblea - Călimăneşti. Its altitude does reach to almost 600 m and it is sheltered from the upwards by the high Cozia hills, as it is placed on their Southern slope, which is rather abruptly inclined. The aromatic wines which are produced here (Muscat Ottonel, Sauvignon) are endowed with an exquisite finesse. Should we travel South from Drăgăşani, upon the hills which carry on standing along the river Olt, we would reach to the remarkable viticultural center named after Iancu

Jianu (in his time, this man was alike the local Romanian equivalent of the British Robin Hood). This realm's vineyard sites are: Arceşti, Bobiceşti, Cârlogani, Lungeşti, Strejeşti and its best products are the white aromatic wines of Tămâioasă Românească and of Sauvignon. Slightly Northern from Drăgăşani, on the left shore of the river Olt, of course in the department of Olt and in a hillock area too, there is the complex of Sâmbureşti, with the vineyard realms: Dejeşti, Dobroteasa, Trepteni, Vitomireşti. Here, famous wines are produced by the kind of Cabernet Sauvignon, but also by Pinot noir, Fetească neagră, Sauvignon and Chardonnay. Since this vineyard is planted within forest reddish brown soils (the hillocks named Bolindeţu and Bolovanu are famous since the old ages), some of the most acknowledged red wines from Romania are realized here. Should we keep going South, still following the left shore of the Olt river, we would reach to the viticultural center of Vultureşti, with its realm Verguleasa, where,again, red wines of a high quality are produced. In Oltenia's Southern side, upon rendzinical-calcareous soils, we can find the vineyard of Segarcea, with the realms of: Cerăt, Drănic, Lipovu and Valea Stanciului; some exquisite red wines are produced here,from the kinds of Pinot noir and Cabernet Sauvignon, as well as aromatic wines from the kinds of Tămâioasă roză and Tămâioasă românească;all of these wines had a lot of remarkable successes on the occasions of some highly regarded international wine contests. It is also our duty to mention, when talking about the type of sandy soils which can be found in this Southern part of Oltenia, that there was a (by now long since passed) time when, in some viticultural realms that have once existed at Bechet, Dăbuleni, Sadova, Tâmbureşti etc., the kind of Cabernet Sauvignon had firstly established its fame in Romania, due to the exquisite quality of its red wines. Oltenia is endowed with a lot of hills, hillocks and sandy areas. It is shaped alike a vast amphitheater turning its inside towards the Danube stream. Its climate is a sub-Mediterranean one, yet which is able to "step" over the land and to "climb" till the mountains ‘feet. Thereby, it offers to the vines which are cultivated here (they are existing, infact, in a parallel with their ancestors, that is to say with none other but Vitis sylvestris vinifera!) some unique pedo-climatic conditions, the existence of which is proven by the simultaneous presence, here, ofthe fig tree, of the almond tree and of the (edible) chestnut tree. A large palette of sorts that are suitable for obtaining high quality wines is cultivated and, as we have demonstrated above, they all are feeling here "home-like"; or, this fact is the ultimate evidence of the benefits provided by the sui generis Oltenian climate. As in many other places within Romania, in Oltenia may be produced wines which do own the finest nuances when it comes to the matter of flavors;these latters do fully illustrate the distinctiveness of the various kinds and do express, through their respective complexities and intensities, the deepest inner assets of each kind; the Oltenian wines'aroma can even stand as witnesses for the magnanime generosity (understood as an asset of the local climate), but as well for its equilibrium, since it presents no features at all that could indicate whatever toughness in the matters concerning its hydro-dynamical current phenomena.

We have (briefly) discussed of some arguments able to support the thesis that, ultimately, Oltenia is, indeed, a real viticultural miniature of the whole of our country, due to: the multitude of its micro-climates and the one of its soil types, as well as to the taxonomical completeness of the wine’ sorts that can be produced here (white, red, aromatic wines and wine distillations too), while the same types ‘integrality is also effective, indeed, in the cases of table grapes and sultanas.

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CONSIDERATIONS REGARDING ROMANIAN LEGISLATION OF A WINE IN THE COMMON MARKET CONTEXT

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ABSTRACT

Taking into account the importance of the wine legislation, by this endeavour we plan to do a review of the most important aspects related to existing regulations and their evolution in time, in terms of wine production related legislation. The highlight is the current common market, given the challenges encountered in this matter, in the integration process of Romania into the European Union. We make a brief but comprehensive incursion into history and we present wine and viticulture through the norms, rules and later through the laws that govern this vast area. The incursion in the field will start from the first regulations in history, but will also target comparatively the regulations in our country compared to other geographical areas established.

INTRODUCTION

We must necessarily begin this brief history with a terminology aspect- where does the "wine" denomination come from ? This name comes from ancient times , from the Sanskrit word" veno" which means love. The same linguistic root is also found in the word "Venus". About vineyard and wine were written many volumes since ancient times. Given the fact that the vineyard and the most popular product obtained from it, the wine, are elements inextricably linked to people's lives, naturally, at one point the society has created laws to regulate the legal situation.

The first legal regulations in history were found in Babylon, where they began to establish rules on wine trade. Rules in this matter began to appear especially in the Mediterranean basin area, especially among ancient civilizations. Egyptians and then later the Greeks and Romans also had rules about wine, its consumption or its production or marketing. The most famous rule comes from the Romans, where only men were allowed to drink wine, women being forbidden. They could even be killed for violating such rules. In France appeared the first more modern regulations, with the entry into the modern age of the wine in the XVIIth century.

Starting with this period, in the wine-producing countries in Europe production, marketing, consumption began to be regulated, but regulations on plantations were also proclaimed. In our country the legal regulations experienced a period of decline in communist times, when the exclusive owner of the vineyard

and wine production was the communist state at that time. Opportunities in the field started to reappear from 1989 when production, marketing and all other aspects related to wine were subjected to rigorous regulations. Currently, the Romanian legislation is in the process of alignment to the internationally existing one, the harmonization with rules imposed by the International Organisation of Vineyard and Wine, as well as with the European Union regulations being tried.

MATERIAL AND METHODS

The purpose of this document is a brief legislative analysis in the wine field and includes relevant legislation in this area. Also, the uniformity of law in our country with the European one is a priority of this study. The methods used in their analysis are comparative and logical-legal. Legal analysis of normative documents will be done especially in the common market and Romania's accession to the European Union.

RESULTS AND DISCUSSIONS

Framework law which governed the wine sector in our country in the period after 1989 was Law no.244/2002. It covers the areas of culture and establishes rules regarding vine planting material production and the establishment, maintenance and clearing of vineyards. Wine production is regulated with reference to wine capitalization and market mechanisms. A very important aspect is related to the establishment by law of organisms with significant role in the wine gear. It is therefore established the State Inspection for Wine Technical Control, National Office of Origin Denominations for Wines and Other Wine Products and the National Vineyard and Wine Office, establishing operating rules for each newly created institution.

It is also the first law in this area which establishes a series of sanctions regarding violations of the rules regarding the set up of vineyards, clearing of plantations, wine products counterfeiting and other. Along with Romania's integration into the European Union, it was necessary to harmonize national legislation with the European one. The Vineyard Register appeared.

The document that accomplishes this is the law no. 164 dated 24 June 2015 of Vineyard and Wine in the Common Wine Market Organisation System. In the current Romanian legislation, in this framework law - Law no. 164 / 2015- the wine is defined this way: *"Wine is a product obtained exclusively by whole or in part alcoholic fermentation of fresh grapes, whether or not pressed or grape must"* (Vineyard and wine law in the common organization system of the wine market no. 164/2015 published in the Official Gazette no. 472/ June 30, 2015).

This definition has already been in line with the existing one in EC Regulation 1493/1999 - the basic law of the field in the European Union that it virtually takes over. Intellectual property regulations are relevant in the current context of the common market. In Romania the area is covered by Law no. 84/1998 on trademarks and geographical indications, republished in the Official Gazette no. 337 dated 8 May 2014.

Geographical indications are intellectual property objects that serve to identify the origin of products, being guarantees of quality and value (Law no. 84/1998 on trademarks and geographical indications, republished in the Official Gazette no. 337 dated May 8, 2014). For increasingly better informed consumers, in the context of globalization and expanding outlets, such elements significantly

contribute to the market success of a wine, which is why it attaches great importance to all elements related to this issue. The tendency is one envisaged inclusively at the legislative level in the European Union, which tends to maximize its potential by promoting an agricultural policy based on quality which uses as a tool, among others, geographical indications. From this policy benefit both consumers who obtain products of constant quality that meet the increasingly high requirements, but also producers who obtain profits, having at their disposal an instrument of customer loyalty and also the region of origin, which in these conditions can more easily thrive economically. The brands in their turn are defined by the same law as "any sign capable of being represented graphically, such as words, including personal names, designs, letters, numerals, figurative elements, three-dimensional shapes and, in particular, the shape of the product or of their packaging, colors, color combinations, holograms, sound signals and any combination thereof, provided that such signs are capable of distinguishing products or services of one undertaking from those of other undertakings" (Law no. 84/1998 on trademarks and geographical indications, republished in the Official Gazette no. 337 dated May 8, 2014).

In the wine field, brands have a long tradition, consumer's choice being strongly influenced by that matters. In Romania and not only, the success of certain types of wine marketing is strongly influenced by the brand, which is why significant sums are invested and wine marks presentation is paid attention.

Recently, at European level, legislative changes occurred with the entry into force on 16 December 2015 of EU Directive 2015/2436 of the European Parliament and of the Council dated 16.12.2015, which entered into force on 13.01.2016, regarding the approximation of the laws of the Member States relating to trade marks and Amending Regulation (EC) No 207/2009 on the Community trade mark and Regulation (EC) no. 2868/1995 of the Implementing Regulation Commission (EC) no. 40/94 of the Council regarding the Community trade mark and repealing of the Regulation (EC) No. 2869/95 of the Commission on the fees payable to the Office for Harmonisation in the Internal Market (Trade Marks, designs and industrial models). Therefore, from the legislative point of view, changes should be carried out in relation to these new regulations, which first expressly establish harmonizing national legislation including setting deadlines.

The directive reminded, as well as the Regulation, are drafted simultaneously and contain identical provisions, in order to "reduce elements of divergence within the trade mark system in Europe as a whole, while maintaining national trademark protection as an attractive option for applicants".

In accordance with art. 54 of the Directive, until 14.01.2019, Romania will adopt "law documents and administrative documents necessary to comply with Articles 3 to 6, Articles 8-14, Articles 16, 17 and 18, Article 22-39, Article 41, Articles 43-50" of the Directive. These pieces of legislation contain legal norms of trade marks. Also until 14/01/2023 Romania has the obligation to adopt " law documents and administrative documents necessary to comply with the Article 45". This text contains rules on the procedure for termination of the rights conferred by the national trade mark registered and cancellation procedure of the national mark registered. The article highlights the differences between national legislation provisions and regulations of the Directive, so that the transposition of the Directive into national law fully corresponds to its objectives in the sense that "the acquisition and retention of the right to trademark in principle be subordinated, in all Member

States, to the same conditions". In the wine field, implications are obvious because future legislative changes will come as an extra protection for both producers and consumers in the context of the single common market.

CONCLUSIONS

The area where we have taken this approach was in ancient times an area as alive as possible and because of the many implications, its regulation was always needed. Since ancient times to the present there were increasingly more elaborate rules designed to cover all aspects of the wine sector. At present, the legislation in this area is one with a particular specific and became absolutely necessary for the smooth production and marketing of wine products and the effective exploitation of vineyards. Romanian legislation in this field is harmonized with the European one and currently a special emphasis is put on the rules on intellectual property rights and related rights. Regulations on the entry or cancellation of marks are particularly important where the wine trade experiences a significant development.

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