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SUMMARY

SUSTAINABLE PRODUCTS AND TECHNOLOGIES IN HORTICULTURE

HORTICULTURAL BIODIVERSITY AND GENETIC RESOURCES

PLANT PRODUCTION SYSTEMS

ORNAMENTAL PLANTS, DESIGN AND LANDSCAPE ARCHITECTURE

MISCELLANEOUS


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SUSTAINABLE PRODUCTS AND TECHNOLOGIES IN HORTICULTURE


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BEHAVIOUR OF DELTA CULTIVAR NECTARINES DURING THE VALORIZATION PROCESS ACCORDING TO THE FERTILIZATION OF THE CULTURE

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Abstract

The researchers performed at the Research and Development Institute for Processing and Marketing of the Horticultural Product-Bucharest. They had as object the study of some qualitative indicators (firmness, organoleptic appreciation, chemical composition, weight and qualitative losses) of Delta cultivar nectarines at harvest as well as their evolution during the valorisation process. The nectarines – Delta cultivar (an extra-early cultivar, created by the researchers from Research Station for Fruit Growing Constanta, in collaborate with Rutgers University, New Jersey – S.U.A.), provided from experimental plots of R. S. F. G. Constanta. They were fertilized in different manners, with organic or chemical fertilizers, applied on soil and/or foliar. The nectarines were stored in three variants: at the ambient temperature (26-28^{0}C), in cold conditions (T = 2-4°C) and cold + modified atmosphere conditions, for 5, 25 and 30 days, respectively. It was found that the quality of the nectarines and their storage capacity varies according to the fertilisation regime and the conditions in the storage environment, especially the temperature and the gaseous composition of the air. Among the fertilisation variants, the V4 variant (soil + foliar chemical fertilisation) induces the best quality and storage capacity. Foliar fertilisers ensure not only an input of macro-and micro elements but also other organic substances which stimulate the metabolism of chlorophyll assimilation, the energetic delivery and finally, the fruit quality. Of the three storage methods (ambient temperature, cold room and cold room + modified atmosphere), the best results were obtained within the third method, which recorded the smallest losses during storage.

Key words: *firmness, qualitative losses, storage capacity.*

INTRODUCTION

Due to a new and valuable sort which is adequate to ecological conditions, both the peach tree and the nectarine tree can ensure the consumption of fresh fruits for more than three month (Lamureanu et al., 2012). The studies show that the new nectarine cultivars obtain in the south-eastern of Romania have a good quality of the fruits, high and constant productivity of the trees and enriched the actual sortiment as for fresh consumption as for canneries (jam, nectar, stewed fruit) too (Margineanu et al., 2011).

Nectarines are extremely perishable, which raises serious problems concerning the maintaining of their quality during the valorization process, from the moment they are harvested until they reach the consumer.

The quality of the nectarines at harvest varies according to the technology which was applied to the culture, the climatic conditions, the cultivar and the maturity phase, while the evolution of this quality during storage depends on an ensemble of factors, beginning with the harvesting, the conditioning and the technological conditions in the storage environment (Gherghi et al., 1977) and especially on the temperature and the gaseous composition (Alexe et al., 2012). If the storage of the fruit is done while respecting adequate conditions (optimum storage temperatures or the specific modified atmosphere for a species or cultivar) the biochemical processes are inhibited, thus

maintaining the quality of the products (Alexe et al., 2010).
Nectarine cultivars display different particularities as far as their storage and valorisation for a longer period of time (Jampa and Carabulea, 2002).
The chemical composition of nectarines, which determines the level of the biochemical processes occurring during storage and thus the storage capacity, is highly influenced by the fertilisation regime. The doses in which the organic or mineral fertilisers are applied influence the chemical composition of the fruit, affecting the storage capacity as well (Salunke, 1974; Ion, 2004). The presence of several nutrients enhances, in a synergic manner, the effect of each of these nutrients, contributing to an adequate growth and development of the fruit (Ionita, 2012).
The aim of this paper is to study the effects of the fertilising regime on the physical and chemical particularities of the nectarines of the Delta cultivar as well as their evolution during storage, which is a very important stage in the valorisation process.

MATERIALS AND METHODS

The Delta cultivar was obtained at R.S.F.G. Constanta following the collaboration with Rutgers University, New Jersey, U.S.A and was patented in 1991. The tree is autofertile, of medium vigour (Figure 1), resistant to diseases and pests, precocious and productive (25-30 kg/tree), while the production, which is constant every year, is destined to be consumed as fresh (Braniste et al., 2007).

Figure 1. Nectarin of the the Delta cultivar

The fruits, having a spherical-elongated shape, are of medium size (90-100 grams), which is fairly good for an extra-early cultivar (the maturity phase occurs in the third decade of the month of June and the first decade of the month of July). The pulp is yellow, juicy, with a balanced, sour-sweet taste. The skin is smooth, the main colour being yellow, while the covering one is ruby-red on most of the surface (Figure 2).

Figure 2. Nectarines of the Delta cultivar

In the period 2007-2011 the threes were fertilised according to three variants, which were compared to the witness variant (V1), as follows:
- V2-organic fertilisation (with fermented manure);
- V3-chemical fertilisation of the soil (with NPK complex fertilisers, the ratio being of 15:15:15);
- V4-ground + foliar chemical fertilization (ground with NPK complex fertilizers 15:15:15 and foliar feeding with Murtonik 20:20:20 + micronutrients: Mn, Fe, Cu, Zn, B, in the form of chelation).

Immediately after harvesting the fruit were transported to the Research and Development Institute for Processing and Marketing of the Horticultural Product, where they were stored in 3 variants:
- ambient temperature (T = 26-28 ^{o}C, RH = 65-70%) in 1 kg packages-*keep warm*;
- refrigeration room (T = 2-4°C, RH = 83-87%), in packs of 1 kg covered with perforated polyethylene film-cold storage;
- refrigeration room (T = 2-4°C, RH = 92-96%), in 1 kg hermetic packages, so that the composition of the atmosphere inside has modified, by the reducing of the O_2 content and

the increasing the CO_2 content and also of air relative humidity - storage in modified atmosphere - MA.

The duration of the storage (days) varied according to the technological variant, being of 5 days for the warm storage, 25 days for the cold storage and 30 days for the AM storage.

Before entering the storage period and at its end the fruit were analysed in order to establish the firmness, the organoleptic characteristics and the biochemical features of the main components (dry soluble substance, soluble carbohydrates, titratable acidity). Moreover, the weight losses (quantitative) and those cause by alteration (qualitative) suffered by the fruit throughout the storage period were established.

The firmness was determined by means of an OFD mass penetrometer which measures in penetrometric units (1PU=0.1 mm) the depth that the conical needle (length=24 mm, base diameter = 4 mm) reaches within the pulp of the fruit.

The measurements were carried out on a number of 25 fruit/variant, each fruit being penetrated in 4 different points in the equatorial area.

The appreciation of the organoleptic quality was achieved by means of carrying out a sensorial testing of the fruit and the method was that of evaluating on a scale from 1 to 100. Tasting sheet were used comprising three appreciation criteria: aspect, texture, taste. Each of the three criteria holds a different weight within the general scoring, according to their importance. Thus, the "aspect" represents 15%, the "texture" 35% and the "taste" 50%. According to the scores there are five different quality classes as follows:

Grades (quality classes	Points
Very good	80 – 100
Good	60 – 79
Acceptable	40 – 59
Mediocre	20 – 39
Unsuitable	0 – 19

The methods for determining the biochemical components were the following: refractometry, using an ABBE refractometer to determine the soluble substance, the Bertrand titrimetric method for determination of the soluble carbohydrates, the titrimetric method for the determination of the titratable acidity.

During storage the thermo-hydric factors in the cold room were checked every day in order to ensure that the optimum conditions for maintaining the quality were respected. In addition, the capacity of maintaining the fruit's quality was evaluated, including the apparition and development of certain storage diseases.

RESULTS AND DISCUSSIONS

1. Firmness

The results presented in Table 1 reveal the fact that at harvest the firmness of the nectarines ranges from 68.79 PU at the V4 fertilising variant (chemical fertilisers applied on soil + foliar) to 93.57 PU at the V3 variant (chemical fertilisers applied on the soil), the average per cultivar being of 83.56 PU.

Table 1. The firmness of the nectarines of the Delta cultivar upon harvesting and after storage

Moment of evaluation	Variant				Average/ cultivar
	V1	V2	V3	V4	
At harvest	91.28	80.59	93.57	68.79	83.56
After warm storage	153.40	150.11	175.62	144.11	155.81
After cold storage	110.91	129.35	126.35	127.95	123.64
After AM storage	99.35	119.78	123.66	125.53	117.08

During warm storage for 5 days the firmness rapidly declines due to the alteration of the pectin substances and the cellular membranes, reaching values ranging from 144.11 PU at the V4 variant to 176.62 PU at the V3 variant, the average per cultivar being of 155.81 PU.

Cold storage slowed down the structural and cellular alteration of nectarines, after 25 days the average firmness being of 155.81 PU, meaning 110.91 PU at the V1 variant, 126.35 PU at the V3 variant, 127.95 PU at the V4 variant and 129.35 PU at the V2 variant.

The enriching of the atmosphere in carbon dioxide allowed for the nectarines to be stored for 30 days while maintaining the firmness at an average level of 117.08 PU, varying between 99.35 PU at the V1 variant and 125.53 PU at the V4 variant.

2. The organoleptic quality

At harvest, following the organoleptic test, the nectarines obtained a high score (89.95) due to their lovely aspect, their high degree of firmness and their pleasant and balanced taste, thus entering the "very good" fruit quality class (Table 2).

Table 2. The organoleptic appreciation of the nectarines of the Delta cultivar

Organoleptic appreciation-score + grade	Moment of evaluation			
	At harvest	After warm storage	After cold storage	After AM storage
Total	89.95	83.75	70.07	56.16
Aspect	13.80	13.20	12.50	11.25
Firmness	34.65	29.05	26.80	27.41
Taste	41.50	41.50	30.77	27.50
Qualifying	Very good	Very good	Good	Acceptable

After 5 days of warm storage the parameters of the organoleptic properties of the nectarines remained fairly reasonable, the score being of 83.75 points and the grade "very good". After 25 days of cold storage, the nectarines, though maintaining their pleasant aspect, lose their firmness and especially their taste, which explains why the total score relatively drops to 70.07 and the adequate grade is now "good". During AM storage the nectarines of the Delta cultivar lost their aspect, their firmness and especially their taste, the latter becoming bland and floury. Because of the very low score (56.16 points), the fruit received the grade "acceptable". In some cases the nectarines stored in AM conditions displayed physiological disorders, manifested through shiny, grey spots or the cracking of the skin (a rather scarce phenomenon present at nectarines stored in cold conditions as well). This demonstrates the fact that the period in which the fruit had the capacity to maintain their quality was surpassed, which means that the duration of the storage in the atmosphere enriched in carbon dioxide was too long.

3. Biochemical composition

The data presented in Table 3 show that the fertilising variant with organic fertilisers (V2) as well as the variant with chemical fertilisers applied on the soil + foliar (V4) have the largest input when it comes to enriching the fruit in dry soluble substance (11.10% and 11.24%, respectively) and soluble carbohydrates (8.57% and 8.32%, respectively). From this point of views, the V1 variant-witness occupies the last position, having, however, the highest content of malic acid (0.93%).

During storage the biochemical content of the nectarines modifies but at a different intensity according to the conditions in the storage place. The high temperature during storage favours the undergoing of biochemical processes within the fruit at a greater intensity, so that after 5 days of warm storage the content of dry soluble substance greatly increases (V1=12.39%, V2=12.73%, V3=11.53%, V4=12.19%, average=12.21%), while the soluble carbohydrates (V1=5.70%, V2=6.56%, V3=7.09), V4=6.81%, average =6.54%) and the malic acid (0.79%, 0.63%, 0.66% and 0.64%, respectively) decrease considerably in comparison to the other storage methods.

The lower temperature during cold storage leads to the slowing down of the rhythm of these biochemical processes, so that the dry soluble substance increases up to 11.50% within 25 days, while the content of soluble carbohydrates and titratable acidity decreases, reaching 7.76% and 0.71%, respectively – average value/cultivar.

Table 3. The main chemical components of the nectarines of the Delta cultivar

Biochemical indicator	Variant				
	V1	V2	V3	V4	Average/cultivar
At harvest:-soluble dry substance (^{0}R)	9.77	11.10	10.74	11.24	10.71
-soluble carbohydrates-%	6.95	8.57	8.16	8.32	8.00
-acidity (malic acid/100g)	0.93	0.68	0.71	0.68	0.75
Warm: -soluble dry substance (^{0}R)	12.39	12.73	11.53	12.19	12.21
-soluble carbohydrates-%	5.70	6.56	7.09	6.81	6.54
-acidity (malic acid /100g)	0.79	0.63	0.66	0.64	0.68
Cold: -soluble dry substance (^{0}R)	11.72	11.49	11.38	11.42	11.50
-soluble carbohydrates-%	6.67	8.25	8.01	8.11	7.76
-acidity (malic acid /100g)	0.88	0.66	0.69	0.62	0.71
AM: -soluble dry substance (^{0}R)	11.08	11.25	11.07	10.99	11.09
-soluble carbohydrates-%	6.51	8.08	7.96	7.81	7.59
-acidity (malic acid /100g)	0.87	0.67	0.67	0.62	0.71

The effect of the low temperature, that of slowing down the metabolism, adds up to that of the carbon dioxide, which has a larger concentration in the case of storage in a modified atmosphere. During this type of storage the content of dry soluble substance does not increase very much as compared to the initial moment (11.09%) and, at the same time, the content of soluble carbohydrates and titratable acidity insignificantly drops (7.59% and 0.71%, respectively).

4. Quantitative and qualitative losses

The losses recorded during warm storage (ambient temperature) for 5 days are presented in Table 4.

Table 4. Losses recorded during warm storage of the nectarines

Variant	Losses-%		
	total	weight	depreciation
V1	45.71	14.97	30.74
V2	36.89	13,32	23.57
V3	43.13	13.63	29.50
V4	31.79	14.36	17,43
Average per cultivar	**39.38**	**14.07**	**25.31**

It was noticed that the total losses are significant in all 4 variants of fertilisation and they are caused by weight losses and especially by depreciation. The following total losses were recorded: 45.71% at the V1 variant, 36.89% at the V2 variant, 43.13% at the V3 variant and 31.79% at the V4 variant. The average values of these indicators per cultivar are: 39.38% total losses, 14.07% weight losses and 25.31% alteration losses. The V4 variant recorded the smallest amount of losses, followed by the V2 variant.

The causes which determine the high percentages of losses by alteration are the late infections caused by the *Monilinia laxa* and the *M. fructigena* fungi, which occur before harvesting and the attacks of the *Rhizopus stolonifer* and *Botrytis cinerea*, which occur during harvesting and manipulation.

By using the cold storage method (Table 5) the developing of these fungi and moulds is slowed down, so that the total losses were greatly reduced at all fertilisation variants. The values were the following: 34.28% at the V1 variant, 10.17% at the V2 variant, 22.06% at the V3 variant and 5.67% at the V4 variant, the average per cultivar being of 18.04% total losses.

Table 5. Losses recorded during cold storage of the nectarines

Variant	Losses-%		
	total	weight	depreciation
V1	34.28	1.50	32.78
V2	10.17	1.30	8.87
V3	22.06	1.43	20.63
V4	5.67	1.33	4.34
Average per cultivar	**18.04**	**1.39**	**16.65**

It is obvious that, similar to warm storage, the V4 variant records the smallest losses (5.67%), followed by the V2 variant (10.17%).

Using the AM storage method led to a great decrease in both the weight and the depreciation losses, the values of the total losses per cultivar being of 6.46%, meaning 12.17% at the V1 variant, 6.47% at the V2 variant, 6.99% at the V3 variant and only 0.23% at the V4 variant.

Table 6. Losses recorded during AM storage of the nectarines

Variant	Losses-%		
	total	weight	depreciation
V1	12.17	0.31	11.86
V2	6.47	0.33	6.14
V3	6.99	0.31	6.68
V4	0.23	0.23	-
Average per cultivar	**6.46**	**0.29**	**6.17**

There were no depreciation losses at the V4 variant and the weight losses were very small (0.23%) in comparison to the other storage variants.

CONCLUSIONS

The different fertilization of the trees is reflected in the degree of firmness of the fruit at harvest, but not in their evolution during storage. The greatest firmness at harvest is recorded by the fruits which were chemically fertilized at soil + foliar (68.79 PU). The evolution of the firmness during storage is especially influenced by the storage conditions. Through warm storage the nectarines easily lose their firmness because of their rapid ripening. In the case of cold storage the intensity of the ripening process is decreased so that the fruit maintain their structural and textural firmness for a longer period of time (25 days). By enriching the atmosphere within the storage space in carbon dioxide the metabolic

processes become even slower and the firmness of the fruit is maintained for a longer period of time (30 days).

The organoleptic quality of the Delta cultivar nectarines is better appreciated (89.95 points) at harvest, the fruit having a yellow, juicy pulp, with a balanced, sour-sweet taste. During storage the quality decreases faster than it does at other studied cultivars (Cora), so that it is indicated that the valorization process be carried out faster because the storage capacity of this cultivar is lower.

The fertilization of the nectarine tree culture with the Murtonik foliar fertilizer (20:20:20 + microelements: Mn, Fe, Cu, Zn, B-chelation) resulted in the enriching of the fruit in dry soluble substance (11.24%) and soluble carbohydrates (8.32%). Moreover, the usage of organic fertilisers led to the obtaining of nectarines with a high content of these biochemical compounds (11.10% and 8.57%, respectively). During storage the content of dry soluble substance increased, while that of soluble carbohydrates and malic acid decreased, the intensity varying according to the temperature and the gaseous composition of the air in the storage place. The AM storage recorded the best results regarding the slowing down of the rhythm of the metabolic processes.

The quantitative and qualitative losses recorded during the storage of the nectarines are greatly influenced by the fertilising regime applied to the culture. In the case of supplementing the chemical fertilization of the soil with the Murtonik foliar fertiliser the weight losses and especially those caused by attacks from diseases were substantially smaller as compared to those recorded in the case of the control. From this point of view, good results were also obtained in the case of fertilising the culture with organic fertilizers, which contain minerals which enhance the quality of the fruit and their resistance to diseases during storage.

The maintaining of the nectarines′ quality during valorization is also influenced by the environmental conditions ensured during this process and especially by the temperature. Bu using the cold method the metabolic processes and the developing of fungi and moulds are greatly slowed down, so that the losses were significantly reduced at all variants of fertilization. The average reduction per cultivar was of 54.19% in the case of total losses, 90.12% in the case of quantitative losses and 34.21% in the case of depreciation losses. Using the AM storage method led to an important decrease in both weight losses (97.93%) as well as in depreciation losses (75.62%).

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RESEARCH REGARDING THE POSSIBILITIES OF STARTING AND CONTROLLING OF MLF IN RED WINES FROM CERNAVODA VITI-VINICOL CENTRE SITUATED IN MURFATLAR VINEYARD

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Abstract

The malolactic fermentation (MLF) is a biologically desacidification process of the wines especially red wines, made by lactic bacteria that convert malic acid (more aggressive for the taste buds) into lactic acid (pleasant taste buds impress) and CO_2. Between 2009-2011, were made studies reffering to the possibilities of starting and controlling of malolactic fermentation (MLF) in the red wines from Cernavoda Viti-Vinicol Centre, Murfatlar vineyard, as well as on the conditions of this biochemical process. The degradation of malic acid has three effects upon the wines: reduced acidity, microbial stabilisation and a some modification of the organoleptic properties. In the same time we noticed that through malolactic fermentation, the red wines winning in quality. The starting of MLF can be easy initiated, if for this are used wines in full MLF. For induce MLF is necessary an initial titre between $3x10^4$ till $5,0\ x10^4$ cells/mm^3. After inoculation the bacteria cells passed through an adaptation period because their functions were limited by the alcohol content and pH of the wine, and therefore in the medium remain a bacteria number of $1x10^4$ cells/mm^3. For MLF we can recommend some strains of lactic bacteria, isolated from vineyard microflora.

Key words: *malic acid; lactic acid; organoleptic properties, bacteria strain; inoculation.*

INTRODUCTION

In grapes, must and wine, malic acid there is in a big quantity like acid L (-)-malic. During grapes transformation proccess, malic acid and its salts reach in must (Cotea D.V. et al., 2005, 2009). Many researchers have studied the evolution of malic acid during maturation of grapes, alcoholic fermentation, malolactic fermentation and maturation of wines from vessel (Blouin J. et al., 2003). In the process of fermentation and wine storage period, the acidity decreases continuously through:

-the natural insolubilisation and precipitation of potassium hydrogen tartrate, under the influence of alcohol and low winter temperatures;

-through biological degradation of malic acid in must and wine by yeasts and malolactic bacteria (Târdea C., 2007). In the most cases malic acid from the wines is reduced by the biological way through MLF. Malolactic bacteria completely metabolize malic acid from the must and wine, with the formation of lactic acid and CO_2, according to the reaction: $HOOC\text{-}CH_2\text{-}CHOH$+malolactic bacteria -> $CH_3\text{-}CHOH\text{-}COOH + CO_2$. This proccess is important for the wines quality, having in view the effect upon the wines: reduced acidity, microbial stabilisation and an organoleptic properties modification (Baduca-Câmpeanu et al., 2008; Kontek A. et al., 1977). By this study are established the ways for starting and controlling of malolactic fermentation in the red wines from Cernavoda viti-vinicol Centre situated in Murfatlar vineyard.

MATERIALS AND METHODS

The researches were made in SC VINEX MURFATLAR SRL, a private Viti-Vinicol Company, situated in Cernavoda Viti-Vinicol Centre from Murfatlar vineyard, between 2009-2011, having in view:

- spontan starting of malolactic fermentation;
- using wine in full malolactic fermentation;
- using bacterial concentrate from spontaneous microflora;

- using selected bacteria from Leuconostoc oenos specie, for malolactic fermentation starting (Prahl C. et al.,1995).
The spontaneous starting of malolactic fermentation was followed in the vessels with 1000 and 10.000 liters capacity. For to obtain the wines with a big malolactic bacteria density, were used wines produced by carbonic maceration proccess.
Strains of malolactic bacteria used in researchs (10 strains) for inoculation, were selected in laboratories of SC VINEX MURFATLAR SRL by specialized personnel, from red wines with low pH and with the finished spontaneous malolactic fermentation. For lactic bacteria's study were used the techniques and the medium, indicated by Peynaud and Domerq (1959), and for their classification was used Bergey's Manual of Determinative Bacteriology-Ninth Edition (2004).
The bacterial concentrate was produced from Merlot wine in full malolactic fermentation, by the tangential microfiltration method.
The use of bacterial concentrate of spontaneous microflora is recommended for the starting and controlling of MLF in red wines.
The evolution of total number of lactic bacteria was made by counting on Thoma mount, and the number of propagation cells, by filter membrane.
The evolution of lactic bacteria in red wines of Cernavoda Viti-Vinicol Centre was put in evidence by chromatography on paper (the Kunkee method – 1968), and by the evolution of the total number of malolactic bacteria in wine.

RESULTS AND DISCUSSIONS

I. The spontaneous starting of malolactic fermentation in the SC VINEX MURFATLAR Cernavoda red wines, is depending of SO_2 quantity from the wines and of the tank size. In the red wines with pH-3,4 produced by maceration in big tank the degradation of malic acid is beginning early, without influence of free SO_2 doses.
In the red wines produced in small tank capacity (1000 liters) at 18^o temperature, the necessary time for malolactic fermentation starting is between 10-50 days, in this case being influenced of wine SO_2 free content.
The starting of malic acid degradation is produce when in the wine mass there is a bacteria density of $3x10^4 – 4.2x10^4$ cells/mm^3, degradation time for 1.4 g/l malic acid being between 7-8 days.
It has been found that the starting of the metabolisation of malic acid coincides with the moment of acquiring in the wine mass of a bacterial density of 4.2 x 10^4cells/mm^3 and at the end of the metabolisation of malic acid the bacterial density is $7.1x10^4$ cells/mm^3 (Figure 1).

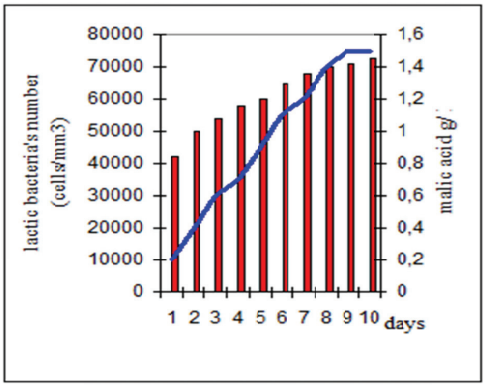

Figure 1. The speed of malic acid degradation and bacteria's number evolution

II. The research found that at the end of alcoholic fermentation in red wines obtained by carbonic maceration process was only half malic acid metabolized. When these wine storage conditions (temperature and SO_2) are adequate these wines completes its malolactic fermentation in 5 days. Blending these wines with other wines in which the malolactic fermentation is desired, is a good solution. The research has shown that if the wine-yeast quantity is higher, the metabolising time of malic acid decreases. Using a proportion of 10% wine-yeasts was achived in the wine inoculated a titre of $5.0x10^4$ cells/mm^3 of lactic bacteria (Figure 2).
From the figure 2, it can see that, after inoculation, malolactic bacteria went through a period of adjustment when their number decreased till $3.8x10^4$ cells/ mm^3 and then increased reaching $8.0x10^4$ cells/mm^3.
III. The using of concentrate bacterial from spontaneous microflora is another way for starting malolactic fermentation proccess.
This concentrate bacterial was obtained by tangential microflitration method from an unsulphitated but malolactic fermented young

wine of Merlot type, the characteristics of which are shown in table 1.

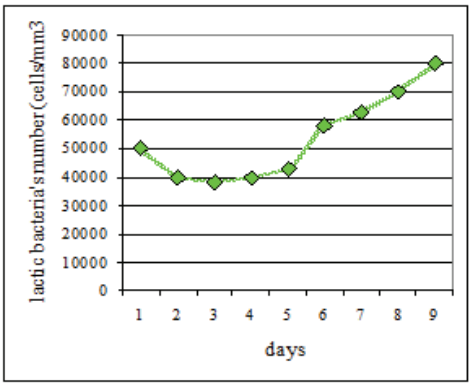

Figure 2. Lactic bacteria number evolution in the wines inoculated with 10% wine-yeasts in full MLF

Table 1. The phisico-chemical and microbiological characteristics of the malolactic fermented Merlot

Type of wine	Wine characteristics		
Merlot	Alcohol% vol		11.7
	Sugars g/l		5.4
	Tot. ac. g/l H2SO4		4.20
	Volatile acidity g/l CH3COOH		0.38
	SO2	total	28.2
		free	0.0
	pH		3.30
	Bacteria no./mm^3		$7.0x10^4$

From the table 1, we can show that at the end of metabolized period of malic acid, the bacterial density was $7,0x10^4$ cells/mm^3. In table 2, are shown the results of the microbiological tests, content of anthocyans and total polyphenols in the concentrate bacterial and in the filtrate obtained.

The lactic bacteria number from the concentrate bacterial was $2,1x10^6$ cells/mm^3, while the filtrate was sterile. The content of anthocyans and total polyphenols were greater values in the filtrate than in the concentrate bacterial.

Table 2. The microbiological and phisico-chemical characteristics of the concentrate bacterial and the filtrate obtained from Merlot wine

	Number of lactic bacteria /mm^3	Anthocianins mg/l	PFT g/l
Concentrate bacterial	$2.1x\ 10^6$	210.1	1850
Filtrate	0	320.0	1990

IV. In our researchs, we selected 10 strains of lactic bacteria from young red wines (Pinot noir, Merlot, Cabernet sauvignon, Feteasca neagra, Blawer). In the selection process were had in view criteria that they must have, namely: to possess the capability to increase at low pH, to grow in the presence of alcohol, to produce low amounts of volatile acids, do not degrade certain compounds in wine, as pentoze, glycerol, tartaric acid, etc. Of the 10 strains isolated by us were tested morphologically, physiologically and oenological point of view, it noticed that strains registered with code 1, 2, 5, 7, belonging to the species Leuconostoc oenos, the codes 3 and 6 the species Leuconostoc gracile, and the codes 4, 8 and 10, to Pediococcus cerevisiae species. For verification in production conditions were chosen strains 1, 2 and 5 of the species Leuconostoc oenos. In our experiments, the starting of malolactic fermentation took place when the amount of inoculum was $2.5x10^4$ cells/mm^3 on condition that at least 1.2×10^4 cells/mm can form colonies. After inoculation of lactic bacteria in the wine, the bacteria passed through an adaptation period because their function was limited by the alcohol content and pH of the wine. Three selected bacteria strains verified in wines, has realised the malic acid degradation in 5-7 days. Volatile acidity of the wines have had different growing-up, the smaller was in the sample inoculated with the strain code 2 (0.08 g/l CH_3COOH), and the biggest at the sample inoculated with strain code 1 (0.16 g/l CH_3COOH) (Table 3).

Table 3. The changes in the wine composition, inoculated with different bacteria strains after malolactic fermentation

The strain code	Free SO_2 mg/l	Acetaldehyde mg/l	Totale acidity g/l H_2SO_4	pH	Vol acidity g/l CH_3COOH	Increase of vol. acidity with:
Initial wine	12,2	16,1	4,00	3,60	0,34	-
Malolactic bacteria Code 1	10,5	12,6	3,42	3,67	0,50	0,16
Malolactic bacteria Code 2	10,5	15,8	3,20	3,59	0,42	0,08
Malolactic bacteria Code 5	11,1	29,9	3,30	3,70	3,45	0,11

To organoleptic analysis of the wines obtained, shown there are differences between samples: sample where MLF was carried out with bacteria strain under code 2, was balanced, harmonious, soft and velvety, compared with samples obtained with bacteria strains under code 1 and code 5 which were nice but not with the same harmony. Therefore bacteria under code 2, has been recommended for use in the production process in SC VINEX MURFATLAR SRL from Cernavoda Viti-Vinicol Centre.

CONCLUSIONS

In the red wines obtained by maceration process in tanks of big capacity, the starting of malolactic fermentation was spontaneous produced at the end of alcoholic fermentation. In the red wines produced in small tanks, the malolactic fermentation was later starting, due of SO_2 high-up level;

The quantity of inoculum used for initiation of MLF was $3x10^4 - 4{,}2x10^4$ cells/mm^3;

In production conditions the best results given the Leuconostoc oenos strain 2, which was recommended in production process.

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INFLUENCE OF BIOLOGICAL PRODUCTS USED IN FOLIAR FERTILIZATION ON THE NUMBER AND QUANTITY OF FRUIT REPORTED TO THE PLANT AND AREA OF CULTURE

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Abstract

Assortment of cucumbers has evolved rapidly and radically in recent years. The consequence of this development has resulted in increasing the number of hybrids Cornichon type as well as quality. Recently created F1 hybrids are totally gynoecious and presents type of parthenocarpic fruiting and also being very productive. It presents a high resistance to some cucumber specific diseases being recommended for both culture in field and protected culture in solarium. Biological products used in foliar fertilization, Cropmax, Bionat and Bioleafz are stimulating synthesis of phytohormones that regulate the process of maturation facilitating norming of cucumber fruit load, that is responsible for increasing the number of flowers and fruits. Fertilizations were made every 10 days, applying organic fertilizers according to appropriate technological practices to five hybrid type cucumbers gherkins, Kybria, Karaoke, Compomist, Trilogy and Promisa, pursuing the influence of products used in foliar fertilization on the number and amount of fruit reported to the plant and surface.

Key words: *Cucumis sativus L., fertilization, fruits, number, quantity.*

INTRODUCTION

The present research wants to demonstrate how pickling cucumber production may be influenced by hybrids and culture techniques (biofertilizer used for plant growing).

The vast majority of the pickling cucumber used in vegetable growing in south of Dambovita County is grown for pickling and fresh alimentation use (size 3 to 6 cm and 6 to 9 cm). To optimize yield and quality of commercial size fruits, most growers use biofertilizer production growing.

Main objectives of this experience are as follow:

-Determining the production potential of some new hybrids have been used in the culture, using biofertilizer for plant growing.

-Comparison of productivity of fruit obtained in comparative culture conducted in 2010.

MATERIALS AND METHODS

Conditions of experiment

This field experiments were conducted at the family farm in 200 square meters solarium tunnels, cultivated with five pickling cucumbers cultivars: Karaoke, Componist, Kybria, Trilogy and Promisa (Table 1).

Table 1. Experimental variations in solar with pickling cucumber type, Tartasesti 2010.

Variant	Cultivar	Origin	Comments
1	Trilogy	Netherland	Rijk Zwaan Hybrid
2	Promisa	Netherland	Rijk Zwaan Hybrid
3	Karaoke	Netherland	Rijk Zwaan Hybrid
4	Kybria	Netherland	Rijk Zwaan Hybrid
5	Componist	Netherland	Rijk Zwaan Hybrid

The soil pH was 8.06, and soil analyzed N-NH_4: 29,58, N-NO_3: 33,25, P-PO_4: 60,20, K: 145. The trials were monofactorial and set after the randomized block method using five cultivars, in tree variant and two replication (Ciulca, 2002, Saulescu, 1968).

Specific elements of technology: culture was established by planting seedling on 10/04/2010 with distance between rows of 70 cm and 30 cm between plants per row.

Plant spacing and row spacing were selected on the basis of current practices. The specific

works were pickling the cucumbers in solarium tunnels.
Experimental culture was harvested by hand, gradually, with registration repeating the production quality for each variant. Quantities harvested were pooled to establish production in accordance with experimental scale (variations).
The experimental design was the latin square blocks with three replications. Immediately after planting, foliar fertilizers (Cropmax, Bionat and Bioleaf) were applied and then soil fertilizer at a rate of 1 kg/ha (1:2:1/N-P-K) in a microirigation system.
Pickling cucumbers were harvested manually on period of 12.05.2010 (32 days after planting day) up to 12.08.2010 (3 months after day picking starting).
Fruits were harvested when about 30% of them have about 9-12 cm in long and sorted according to market standards.

RESULTS AND DISCUSSIONS

The fruit number increased because of the good conditions of growing.
With increased density of fruits on terminal part of plant the fruit weight per plant decreased and fruit weight per unit area increased.
This study results shows information that could help the farmers in Dambovita county.
Plants had good performance as a result of biofertilizer used.
Profitability of fresh pickling cucumbers its directly linked to hibryd used, selling price and period of selling. In this study we try to show the optimum growing element required to maximize the revenue.
Results of this study suggest that hibryd Kybria have the highest production of 6.76 kg/sq.m and 13.95 kg/sq.m for the first month of harvest and second one.

Table 2. Total production type cornichon cucumber in solarium, Tartasesti 2010, (the first month of harvest).

V	Cultivar	Fruits number/plant	Average weight (g)	Production per plant (kg)	Density culture	Total production (kg/sqm)	Difference from the control
1	Trilogy	10.41	97	1.01	4.76	4.81	-
2	Promisa	9.78	92	0.90	4.76	4.28	-0.53
3	Karaoke	15.64	85	1.33	4.76	6.33	+1.52
4	Kybria	16.13	88	1.42	4.76	6.76	+1.95
5	Componist	11.47	95	1.09	4.76	5.19	+0.38

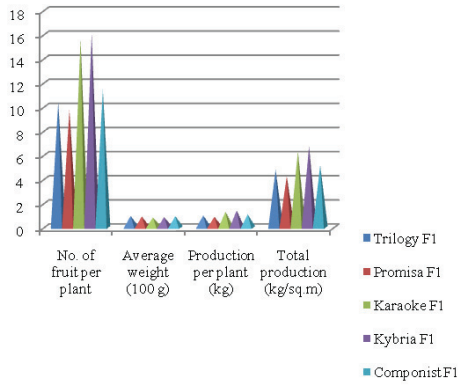

Figure 1. Total production type cornichon cucumber in solarium, Tartasesti 2010, (the first month of harvest).

Table 3. Total production type cornichon cucumber in solarium, Tartasesti 2010, (two month of harvest).

V.	Cultivar	Fruits number/plant	Average weight (g)	Production per plant (kg)	Density culture	Total production (kg/sq.m)	Difference from the control
1	Trilogy	17.04	97	1.65	4.76	7.85	-
2	Promisa	13.46	92	1.24	4.76	5.90	-1.95
3	Karaoke	25.20	85	2.14	4.76	10.19	+2.34
4	Kybria	33.24	88	2.93	4.76	13.95	+6.1
5	Componist	24.62	95	2.34	4.76	11.14	+3.29

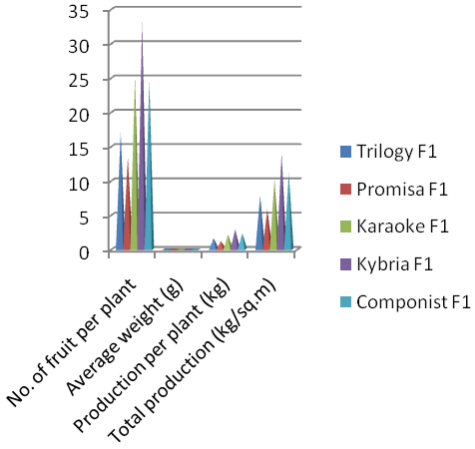

Figure 2. Total production type cornichon cucumber in solarium, Tartasesti 2010, (two month of harvest).

CONCLUSIONS

Regarding number of fruit per plant, hybrid Kybria are in top with average of 16.13 and 33.24.

For average weigh of fruit, the heaviest one are hybrid Trilogy with 97 g average and the smallest Karaoke with 85 g.

Production per plant: Kybria 1.42 kg (+0.45) and 2.93 kg (+1.28) for the first month of harvest and second one.

Regarding the production per sq.m hybrid Kybria had 6.76 kg/sq.m (+1.95) and 13.95 kg/sq.m (+6.10) for the first and second month of harvest.

Regarding productivity factor the highest from the four variants used was Kybria compare to Trilogy control.

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ORGANIC WEED CONTROL MEASURES APPLIED IN ORGANIC TOMATOES CULTURE

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Abstract

In vegetable cultures appears weeds which are perceived to be harmful to the culture. Weed infestation lowers its production through competition for soil resources and light, which can lead to underdevelopment of plant and / or inability to best use. Traditionally, removing weeds from crops is done by digging and hoeing. Usually, the crops still found some weed, with a low density which does not affect the production. In order to increase vegetable productivity different methods were used to eliminate weeds in crops. Among these biodynamic methods with sand or dry soil ash 1:9, the most effective methods are associations with chicken and tomatoes and heat weeding.

Key words: *chicken tomato associations, weeds, biological control, thermal weeding, signed false.*

INTRODUCTION

In the opinion of many scientists weeds are considered undesirable plant species encountered worked and cultivated soils crops, which causes some damage expressed by reduction in production and its quality (Bucur, 2011). Most weeds have medicinal value: plantain (*Plantago* sp.), *Capsella bursa-pastoris*. Beneficial weeds are dandelion (*Taraxacum officinale*), clover (*Trifolium* sp.) and other legumes (Balascuta, 1993). The use of herbicides is one of the most effective measures for weed control, but does not replace, nor exclude other maintenance of soil (Catana *et al.*, 2009). Control of weeds, pests and diseases must be achieved through preventive means, biological and mechanical. If it increases the proportion of cultivation crop rotation will succeed in reducing the degree of weeding, as a result of the large numbers of maintenance. In the same area, in addition to crop rotation is necessary rotation of herbicides with a different spectrum of combat (Catana *et al.*, 2009). Weed species diversity positively contributes to more complete use of vital space. The weeds trash are much more diverse and is embedded in the soil, are subject to successful humification processes compared to stubble cereals. Root systems of many weed species have a high capacity to extract from the arable layer and subarable layer inaccessible compounds for plant culture. Weeds contemporary influences soil formation process, providing the soil with certain quantities of items biofile (Bucur, 2011). The most important tillage to help unweed are: plowing, seedbed preparation, hoeing and weeding. Through a deep plowing will kill perennial weeds by cutting and burying them. Annual weed species and the perennial part will be destroyed by the most energetic mechanical work to destroy weeds-hoeing. To combat the perennial species are required 3-4 mechanical hoeing (Bucur, 2011). Based on the number and weight green weed was considered a weed pest threshold degree of weed number and gravity. Weeding was determined in dynamic, critical period of crop to weed, called the herbocritic stage (Bucur, 2011). In orchards are planted nettles (*Urtica dioica*), which several times a year mowing and leave the ground as mulch. They also planted grass and other plant species that many consider weeds (wild carrot (*Daucus carota*), wild spinach (*Chenopodium album*), yarrow (*Achillea millefolium*), dandelion (*Taraxacum officinale*)). Couch grass (*Triticum repens*) is a plant to be removed even

grasping a biological garden. It is also grown in rows in the orchard clover (*Trifolium* sp.) or clumps of alder (*Alnus incana*) for fixing atmospheric nitrogen in the soil (Catana et al, 2009). Weed density Shepherd's Purse (*Capsella bursa-pastoris*) and nettle (*Urtica dioica*) was lower in the treatments with compost. In vegetable crops can intentionally leave other plants than those of culture that will be health role. Among these against nematodes can successfully call marigold (*Calendula officinalis*) or marigold (*Tagetes* sp.) and snails are chased by the smell hyssop (*Hyssopus officinalis*) or thyme (*Thymus serpyllum*). To protect plants growing between the lines is planted garlic (*Allium sativum*), marigold (*Calendula officinalis*), *Tagetes* sp.. The cultivation of valuable medical plants as vetricea (*Tanacetum vulgare*), wormwood (*Artemisia absinthium*), comfrey (*Symphytum officinale*), nettle (*Urtica dioica*), garlic (*Allium sativum*), and horseradish (*Armoracia rusticana*) will consider most preparations composites good or as extracts, infusions and concoctions. The aim of this work was to analyze and test various ecological ways of preventing and combating weeds that can infest tomato crops in solar.

MATERIALS AND METHODS

Experimental field is located in southern Muntenia, Teleorman county and has been used for each variant 100m^2 in solar. The land was already converse in organic agriculture. Vegetables grown on land are tomato (*Lycopersicum esculentum*). Other materials: Cropmax, Champion 0.3% (copper hydroxide with 50% copper metal), decoction of Horsetail (*Equisetum arvense*), infusion of nettle (*Urtica dioica*), cylinder stove, burning appliances, ash resulting from home heating, put the minimum age of 7 days, black and white film for mulch.

Methods

Tomato crop in solar technology used in the experiments: the terrain was prepared by green manure fertilization founded in autumn, digging, leveling, remove weeds (10 days after seedbed preparation), planted seedling age was 60 days, planting culture was performed on 5 April 2009 after planting scheme 70 x 40 cm with a density 36-40000 culture plants / ha, flowering began April 20, 2009.Care works were drip irrigation and 2 hand- hoeing and for fertilization was used Cropmax at two weeks after planting.Preventive phytosanitary treatments were:-25 April 2009 product preventive treatment for hand Champion 0.3%-on May 5 was used horsetail decoction dilution of 1/10 against Septoria,infusion of nettle dilution of 1/10, from 10 to 10 days from 20 April 2009 until the abolition of culture to prevent diseases and pests throughout the growing season, nettle with role of fungicides and insecticides.

Trellising was made from planting and continued throughout the period until meat. Mulching was done in the first 10 days after planting for weed control sheet and maintains soil moisture. Child cut was performed at 10 days after planting, to reduce foliar apparatus. Defoliation was performed at 10 days after planting, the plant ventilation, preventing passage of soil manna plants. The cut of shoots has been made to 7 inflorescences, in order to speed up fructification and ripening existing fruit. Exploit stimulation was performed by placing near a beehive solarium, complete with artificial pollination induced by shaking the main wire to support plant every 15 days throughout the flowering. First harvest first collection was recorded June 10, 2009. Last harvest and dissolution culture were made on 15 September 2009, followed by dissolution culture and plant remains were transported to a composting platform.

False semantics was made after the preparation phase for sowing train, waiting 12 days, during which weeds have sprouted and grown destroyed then very rigid, as described by Fitiu, for the creation culture tomato in solar. Working variants were V1: tomato crop planting, V2: 14 days after planting, V3: 30 days after planting for field experience and witness field, where weeds were counted in sq. Thermal weeding was performed in cultured tomato in solar, after being established culture, the technology presented. Instead weeding thermal manual weeding was made. Working variants were V1: tomato crop planting, V2: 14 days after planting, V3: 30 days after planting for field experience and witness field, where weeds were counted in sq. Burning Flame was carried out to prepare the land for crop establishment. Experimental variants field work and the witness are as follows: V1 burning day, V2: 10 days to remove weeds by burning V3 at 20

days after removal of weeds by burning, Control, and will include weeds. Gas consumption for soil preparation flame burning weeds tomato crop establishment are: V1 in consumption of 15 liters of gas/1000 sqm, V2 at a rate of 20 liters of gas/1000 sqm, Control without gas consumption, and will include weeds raise counting. Type of existing weeds on land that was unprepared with thermal weeds. Working versions are V1: number monocotyledonous plants, V2: number dicotyledonous plants, monocotyledonous and dicotyledonous plants Control number. Weed control with ash: soil 1:9, it was made after he was setting the stage for crop cultivation without something on the land for at least 15 days. Were counted in a number of plant species 15 days after soil preparation and management of gray, with the following types of work: V1 couch grass crawler (*Agnopyrom repens*), V2 bindweed (*Convolvus arvensis*), V3 veronica (*Veronica* sp.) to control.

Association between tomato-chicken was done in a tomato crop as presented technology with the changes that not have been made hand weeding and was eliminated Cropmax fertilization and in solar were introduced in the 10 days after planting (15 April) 150 chickens aged 7 days, which were removed from culture at the beginning of ripening fruit (June 5). Weeds were counted at 20 days and at 40 days after placing puppies in culture. It has also been determined average amount of fruits per plant.

Mulching foil was made in tomato culture under given technology, in the first 10 days after planting. There were taken in consideration the following variants: V1 mulching with black foil, white foil mulching V2, V3 control without mulching. Were counted sprung weeds around plants that have been grown to 10 days after mulching were removed by weeding, and mulching at 20 days (actually 10 days from weeding). All experiments were performed in triplicate, and results presentation is average. Each variant of the experiment was conducted over an area of 100 sqm.

RESULTS AND DISCUSSIONS

Weed control in tomato crops by false semantics, on 1000 sqm, with predominant weeds Veronica (*Veronica* sp.), *Amaranthus retroflexus*, *Portulaca Oleraceea*.

Table 1. Weed control by false seeding at tomato culture

Variant		Weeds density / sqm	
		Experiment	**Control**
V1	At tomato transplanting	18±2	26±3
V2	At 14 days from transplanting	29±4	48±6
V3	At 14 days from transplanting	34±3	69±12

At 14 days after planting weeds in the field were 29 at experiment and 48 at control in the area. At 30 days after planting were observed 34 and 69 weeds experience in control field. After 30 days of culture planting control, in the experimental field consisted of 16 weed emergence, while control cultures were counted 43 weeds. Thermal weed is used as a means of weed control such *Atriplex*, on an area of 100 sqm. Weed control by thermal weed in tomato culture.

Table 2. Weed control by thermal weed in tomato culture

Variant		**Weeds density** / sqm	
		Experiment	**Control**
V1	At tomato transplanting	2±1	32±4
V2	At 14 days from transplanting	6±2	51±5
V3	At 30 days from transplanting	18±4	74±8

At the control planting culture in the experimental field there were 2 weeds, while zone of weed control were 32. At 14 days after planting is noted that the experimental culture have 6 weeds and the weed control were 51. At 30 days after planting, weeds were 18 in the experimental and the control 74. During the 30 days of experiment, the cultures appeared 16 weeds in the experimental field and the control 42 weeds have emerged. Results flame burning weeds, depending on when counting weeds following table:

Table 3. Removing weeds by burning with flame

Variant		**Weeds density / sqm**	
		Experiment	**Control**
V1	At removing the weed by thermal process	0	64±8
V2	At 14 days from transplanting	16±3	83±13
V3	At 30 days from transplanting	32±7	105±16

In V1, immediately after burning in field experience was not any weed, while in the control group were 64 weeds.

The variant V2 there were a few weeds because it's been a short period of cleaning by burning, the weed seeds germinate to light, so 16 plants were found in lot of experience, while the

control was 83 weeds. Increased to a period more weeds pop up on sqm. In variant V3 were found 32 plants in the experimental group, while the number of weed control increased to 105 plants.

Note that 20 days of treatment increased the number of weeds experience with 32 plants and the weed control number increased by 41 plants, the total number of weeds in group sqm were 3.28 times higher than experience. Gas consumption flame burning weeds in tomato crop, calculated at an area of 1000 square meters, according to Table. 4:

Table 4. Gas consumption flame burning weeds in tomato culture.

Variant	V1	V2	Control
	Gas consumption 15 liter	Gas consumption 20 liter	Gas consumption 0 liter
The quantity of weeds burn on sqm, % compare with control	91,7±3,1	83,2±2,4	100

After flame burning of weeds was observed that maximum efficiency was achieved at 15 liters gas consumption at 1000 mp.

The control was untreated weeds are in culture. Flame burning weeds in tomato crops, area 0.01 square meters at a density of 70 x 40 cm, depending on the type of weeds, weed correlated with the type existing in culture.

After thermal weeding there are determined the type of existing weeds on land unprepared. Such weeds were counted on a square before treatment, and at 30 days after treatment plants were counted according to the type found in them.

The results are shown below:

Table 5. Flame burning weeds, weed correlated with the type existing in culture

Variant	V1	V2	Control
Type of weeds	Mono cotyledon	Dicoty ledonous	Monocot yledon and Dicoty ledonous
Initial quantity of weeds, % compare with control	100	100	100
Weed quantity, %, distroyed by the treatament compared with control	78,2±5,8	86,9±3,7	0
The weeds after the treatment,% compare with control	21,8±5,8	13,1±3,7	100

Percentage of destruction was not 100%, due to the existence of perennial weeds in crop. Monocotyledonous weeds were destroyed in the 2-3 leaf stage, because at that time are sensitive to heat.

Note that the efficiency was higher in Dicotyledonous than Monocotyledon destruction. Combustion was achieved at temperature of 70-80^{o}C, so protein coagulates and weeds die.

Results of weed biodynamic methods, the ratio of 1:9 ash to dry soil are presented in the following table.

The results show that the percentage of all existing weed control cultures is reduced by 22% for creeping couch grass, bindweed and 28% to 16% for veronica. Reproduction is inhibited by the introduction of new weeds into the soil ash obtained by burning their seeds. This is repeated for 3-4 consecutive.

Table 6. Weed biodynamic methods, the ratio of 1:9 ash soil dry for at least 15 days

Variant		Results of weeds destroyed after treatment compared with control	Results,% plants find after treatment compare with control	Control
V1	Couch grass crawler	22±2,9	78±2,9	100
V2	Bindweed	28±4,3	72±4,3	100
V3	Veronica	16±6,1	84±6,1	100

Results weed control in tomato crop using chicken tomato combination, are shown in the following table:

Table 7. Chicken with tomato Association

Variant		Weed density/ mp	
		Experiment	Control
V1	At 20 days after chicken puppies introduced in culture	2±1	154±
V2	At 40 days after chicken puppies introduced in culture	3±2	316±
	Medium crop, kg/wire	3,2±0,5	1,9±0,3

At 20 days after placing puppies in culture is noted that the field experience are only 2 weeds while the crop weed control is 154. At 40 days after placing puppies in culture, experimental culture has three weeds, which was 314 compared with control weeds. Experiment 20 days, compared to the previous determination,

it appears that the culture has grown a weed test compared to 1620 weeds in the control group. Output gap was 1.3 kg wire tomato production increase for the experimental group. This can be explained by the fact that chickens ate weeds, then fertilized with a fertilizer culture rapidly mineralized (represented by their manure) and mobilized soil around plants. Land mulching helps remove weeds from the crop, as shown below:

Table 8. Mulching land and the number of weeds sprung

No	Var	Specification	No of weeds at mp	
			After 10 days after transplanting	After 20 days after transplanting
1	V1	Black foil	15±2	7±3
3	V2	White foil	21±5	9±3
4	V3	Control	83±18	129±26

Were counted sprung weeds around plants that have been grown to 10 days after mulching were removed by weeding, and mulching at 20 days (actually 10 days from weeding). Number of weeds at 20 days after planting is less than 10 days from planting because of weed seed near existing plants benefit from light to dawn. Moreover, foil prevent weed emergence, but heats the soil to a depth of 4-5 cm by 5-6^{o}C compared to the control. If it was white film number of weeds was higher, the higher number of weeds around plants as existing in foils rises but suffocate due to temperature. If it was black film, the number of weeds is lower. Since soil is well warmed by mulching with plastic white culture plants grow more quickly, reaching maturity earlier.

CONCLUSIONS

The most efficient mode to combat weeds is the association of tomatoes plants with chichen and with the use of thermal and mulching weeds.

A low effciency was found to ash/soil bio-dynamic methods.

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RESEARCHES ON THE INFLUENCE OF SOME BIOLOGICAL STIMULATORS TO THE SEED PRODUCTION OF FRENCH BEAN

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Abstract

The paper presents the results concerning a study on the influence of some biologically stimulators in a comparative crop in some dwarf French bean varieties used for seed production. The research works were carried out during the year 2012. Biological material under trial was represented by two dwarf Romanian varieties having green pods (Fantastica, Delicioasa de Pasarea) and one dwarf Romanian varieties having yellow pods (Margareta). Natural bioactive substances used in the experiments were: Cropmax 0.1% (four treatments on every 10-15 days), Kendal 0.2% (six treatments on every 7-10 days), Viva 0.4% (three treatments on every 15-20 days) and Benefit PZ 0.3% (on every seven days after pod setting). The variants were grown in an experimental field according to the method of subdivided plots with three replications. The observations performed concerning the phenology and morphological traits of the plants (plant pod number, pod length and weight of one thousand seeds) allowed an accurate characterization of the varieties under investigation as well an optimum recommendation for the growth regulators on the French bean crops. The processing of the production data of the seed crop was made according to the variance analysis. The influence of these treatments has been recorded both on the yield obtained and on the quality of the seed production. The results obtained show that the treatment applied with Cropmax and Kendal solution in a concentration of 0.1% and 0.2% increased the seed production by 35% and 30%. The paper presents data from the PhD thesis in the frame POSDRU/107/1.5/S/76888.

Key words: *biologically stimulators, dwarf french bean, seed production.*

INTRODUCTION

Having a high nutritional value, the pods of dwarf French bean are highly appreciated by the consumers and are consumed during the whole year, both fresh, at maturity of consumption and frozen or as tinned products (Ciofu et al., 2003; Popescu, 1996).

According to some researches the green pods of the French bean have a higher value in nutritional substances than the yellow ones. Due to the fact that one could obtain varieties having natural resistance against the main pathogens and on the other hand, research recent results confirm that it is possible to get seeds following ecological methods for the commercial crops, dwarf French bean is a species very suitable to be grown under ecological agriculture (Falticeanu, 2004).

That is why several varieties were created which are different by their vegetative period, pod kind, resistance to diseases and pests (Tigaieru, 2009; Munteanu, 1994).

Among the most efficient measures to increase and improve vegetable production one could enumerate the production and use of seeds of high biological and agrotechnical value. The achievements in the vegetable breeding and in the technology of production and conditioning of the seeds assured a high role of the seeds in the vegetable production, they having a strong influence over the level of the yield from quantitative and qualitative point of view. The yield ability of a variety, respectively of a vegetable seed is well defined by the agrotechnical conditions and its adaptation to the local environment. Vegetable seeds can be easily subjected to the degeneration when they are grown under less suitable environmental factors, an inferior agrotechnics or when it is not used for multiplication a biological material well selected. The true quality of the vegetable seeds is determined by the following traits: authenticity, germinative ability, absolute weight (weight of 1,000 grains), purity and health status (Voinea et al., 1971).

Maintainance of the genetic structure and prevention of the degeneration of the dwarf French bean varieties is achieved by the process of conservative selection during the seed production scheme. In the dwarf French bean the method of seed production is applied by individual selection with a single obtion (Draghici, 2006; Glaman et al., 2002; Szilagyi, 2002; Scurtu, 2001).

Among the modern methods of growing of seed vegetable crops aiming increase of seed production both quantitative and qualitative point of view one could count the use of phyto-regulators for growing, biological stimulators and bioactive substances recommended by many specialists (Darasteanu et al., 2005; Tofan, 2004).

Mode of action of the biostimulators in the plant and their influence upon the growing and development process of the plants were investigated by many researchers. Flower abortion could be prevented by the treatment with a mixture of citochinins and giberelins. Giberelin has a strong influence upon the flowering process and in general upon plant development. Fruit setting is linked by the mode how essential metabolites are distributed between the vegetative and generative tissues (Bernardis, 2006; Burzo et al., 1999).

On the world scale already exists a real industry of production of such chemical and biological stimulators due to efficiency of the synthetic hormonal substance upon the vegetable plants and on June 2011 The European Biostimulants Industry Consortium (EBIC) was set up (New AG International, 2012).

The main objective of these researches is a study of some vegetal biostimulators having an effect of increase upon quantity and quality of the seeds in dwarf French bean under the soil and weather conditions from the south of the country. This paper presents the seed yields obtained in an investigation in order to establish the most efficient ways of their increase.

MATERIALS AND METHODS

The research works were carried out during the year 2012 at UASVM Bucharest. The biological material investigated was studied under the open field according to the technology for seed crop in dwarf French bean recommended by the literature of speciality (Voican et al., 2006).

Two varieties of dwarf French bean with green pods-Fantastica and Delicioasa de Pasarea and one with yellow pods-Margareta were used. Among the biostimulators used in present for vegetable crops we chose four products having an effect upon vigour and resistance of the plants against diseases and pests: Cropmax, Kendal, Viva and Benefit PZ. The experiment had two factors: factor A-Biostimulators with five gradations (a_1-untreated; a_2-Cropmax 0,1%; a_3-Kendal 0,2%; a_4-Viva 0,4%; a_5-Benefit PZ 0,3%), factor B-Varieties having three gradations (b_1-Fantastica, b_2-Delicioasa de Pasarea, b_3-Margareta). By multiplication of these factors 15 experimental variants resulted. Check control was untreated with biostimulators.

The experiment was set up in a comparative culture placed in plots subdivided in three replications. The surface of a replication plot was of 9 sq.m.

For the location, field preparation and setting of the trial, general standards for the dwarf French bean seed crops were observed.

The trial followed an onion crop and the soil was prepared under the shape of furrow beds of 1.5 m width. The sowing scheme consisted in three rows on the furrow at 35 cm apart and 5 cm between seeds on the row. The herbicide Dual Gold 1 l/ha was applied preemergently and the herbicide Basagran 2 l/ha was applied postemergently. During the vegetative period four manual hoeings were made and humidity was assured by dripirrigation. To control disease and pests the following treatments were applied with Vondozeb 0.2% + Topsin 0.1%, Funguran 0.4%, Ridomil Gold 0.3%, Milbecknoch 0.075%, Confidor Energy 0.1%, Mospilan 0.022%. A distinct work for this seed crop was biological purification which consisted in removing of untypical plants considering traits for specifity of each cultivar. Purification works were made at the stage when plants had two cotyledons, during the flower stage and at the physiological maturity of the first pods.

Treatments were carried out with a sprayer and substances were weighted with a cylinder and an electronic scale. Biostimulators were applied in the morning as aqueous solutions using 200-

500 l water/ha according to the foliar surface of the plants such as:
-Cropmax – four foliar treatments at every 10-15 days interval;
- Kendal – six foliar treatments at every 7-10 days interval;
- Viva – three foliar treatments at every 15-20 days beginning with the stage of two-three leaves;
- Benefit PZ – three foliar treatments at every 7 days beginning with a completely formation of the first pods.
Both in size of the plots and in registering of the observations taken during the vegetative period and regarding the technique of data processing were observed provisions imposed by the experimental technique.
Phenological observations were taken registering important data regarding both growing and plant development during the period from sowing to physiological maturity of the seeds.
During the vegetative period biometrical determinations were made concerning plant height, pod width, pod length and number of pods per plant.
After pods harvest at the stage of seed physiological maturity was computed the number of seeds per plant as well seed weight per plant using an electronic balance. Production data were processed statistically by the method of variance analysis for polifactorial trials with the two factors placed in subdivided plots. Test of significance of the results was assured by the aid of F test for a global evaluation and with DL for evaluation of significance of every difference individually (Saulescu et al., 1967).

RESULTS AND DISCUSSIONS

The trait "number of seeds per plant" is important because it determines the productivity of the variety. It is directly correlated with the character "number of pods per plant".
By comparing the average seed yield of the three varieties taken as control yield, the highest yield was obtained at the variety Delicioasa de Pasarea (2.9 t/ha) and the lowerest at the variety Margareta (1.7 t/ha) and the yield difference were very significant (Table 1).

Table 1. Influence of the variety on seed production in dwarf French bean, 2012

Variety	Average yield (t/ha)	Relative yield (%)	Difference (t/ha)	Significance
Delicioasa de Pasarea	2.9	126.1	+0.6	xxx
Fantastica	2.4	104.3	+0.1	-
Average of varieties	2.3	100.0	-	
Margareta	1.7	73.9	-0.6	000

DL5%=0.25t/ha; DL1%=0.34t/ha; DL0.1%=0.46 t/ha

Computing average yield of seed obtained by treatment with the four biostimulators, irrespective of variety, only Cropmax product gave distinct significant gains of 2.7 t/ha by comparison with control untreated variant (Table 2).

Table 2. Influence of the treatments with biostimulators on seed production in dwarf French bean, 2012

Biostimulator	Average yield (t/ha)	Relative yield (%)	Difference (t/ha)	Significance
Cropmax 0.1%	2.7	135.0	+0.7	xx
Kendal 0.2%	2.6	130.0	+0.6	x
Benefit PZ 0.3%	2.2	110.0	+0.2	-
Viva 0.4%	2.1	105.0	+0.1	-
Control untreated	2.0	100.0	-	

DL5%=0.49 t/ha; DL1%=0.71 t/ha; DL0.1%=1.06 t/ha

Average yield of seeds for the variety Fantastica ranged between 2.0 t/ha (control V1) and 3.0 t/ha (variant treated with Cropmax 0.1%, V4).
For the variety Delicioasa de Pasarea the highest seed production was obtained also at the variant treated with Cropmax 0.1%, V5 (3.2 t/ha) by comparison with control variant V2 (2.6 t/ha).
The variety Margareta gave a seed production of 1.9 t/ha for the variant treated with Cropmax 0.1%, V6 by comparison with control variant V3 (1.5 t/ha) (Table 3).

Table 3. Interaction variety of dwarf French bean x biostimulators, 2012

Variety Biostimulator	Fantastica				Delicioasa de Pasarea				Margareta			
	T/ha	%	Diffe-rence	Signifi-cance	T/ha	%	Diffe-rence	Signifi-cance	T/ha	%	Diffe-rence	Signifi-cance
Cropmax 0.1%	3.0	150.0	+1.0	xx	3.2	123.1	+0.6	-	1.9	126.7	+0.4	-
Kendal 0.2%	2.9	145.0	+0.9	x	3.1	119.2	+0.5	-	1.8	120.0	+0.3	-
Benefit PZ 0.3%	2.2	110.0	+0.2	-	2.8	107.7	+0.2	-	1.7	113.3	+0.2	-
Viva 0.4%	2.1	105.0	+0.1	-	2.7	103.8	+0.1	-	1.6	106.7	+0.1	-
Control untreated	2.0	100.0	-		2.6	100.0	-		1.5	100.0	-	

DL5%=0.66 t/ha; DL1%=0.93 t/ha; DL0.1%=1.34 t/ha

CONCLUSIONS

Under the weather conditions of the year 2012 in the southern part of the country, treatments with biostimulators influenced seed yield in dwarf French bean by increasing the seed production in comparison with variants untreated.

The best results were obtained by treatments with Cropmax 0.1% (2.7 t/ha).

The highest seed yield was obtained at the variant treated with Cropmax 0.1% for the variety Delicioasa de Pasarea (3.2 t/ha), followed by the variant treated with Kendal 0.2% (3.1 t/ha) for the same variety.

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RESEARCHES CONCERNING THE RESISTANCE FROST OF THE TABLE GRAPE VARIETIES GROWN IN STEFANESTI-ARGES VINEYARD

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Abstract

In order to achieve this paper we have studied the freezing resistance and the effect of low temperatures over the viability of the winter shoots at certain grapevine varieties for the tablegrapes cultivated in the vineyard Stefanesti-Arges. The research concerned the varieties: Argessis, Golden of Stefanesti, Moldova, Augusta, Canner and clones: Muscat Adda 22 St., Perlette 10 St., grafted on Kober 5BB rootstock. The research took place in the period 2010-2012. As a result of the study, we have noticed the sensitivity of Perlette and Augusta varieties at the low temperatures of the winter. We have presented data concerning the determining procedure of the percentage of viable shoots.

Key words: *table grapes, fertility, productivity, resistance.*

INTRODUCTION

The experiment was conducted in 2010-2012, in the collection of INCDBH Stefanesti ampelographic - Arges. The study was made of grape varieties and clones obtained and cultivated vineyard table Stefanesti. Vineyard area is characterized by the following ecoclimatic elements Stefanesti: length of the growing season for grape-vines, on average 177-178 days; The annual average temperature 9.8-10.1ºC, global heat balance of vegetation period 3530ºC, 1350ºC useful heat balance; average temperatures of the warmest months (July, August 34,7ºC and 34,9ºC) insolation duration of vegetation period on average 1430 hours; real heliothermic index of 1.86 during the growing season. Therefore fits well studied varieties in demand environmental and showed good behavior even at lower temperatures.

The soil is loamy collection is located, the average supply of phosphorus, potassium and slightly carbonated, with a slightly acid pH (6.2 to 6.4). Rootstock used for grafting these varieties was Kober 5BB, planting distance between rows of 2.5 m and 1 m row between plants, resulting in a total of 4,000 vines / ha.

As regards the geographical location, the Stefanesti vineyard is located between 44°42′ and 44°55′ northern latitude, at the southern limit of the platform Candesti, in the contact zone with Campia Romana. The viticultural plantations are located at altitudes between 200 and 415m, the maximal altitudes being the Izvorani Hill (415m) and the Pietroasa Hill (325m).

MATERIALS AND METHODS

In the wine-growing practice on one hand and the grapevine varieties amelioration operations on the other hand, it has been observed that, the heredity of the characters and features of new varieties obtained by sexual hybridization are more obvious, as the genitors are genetically further and have distant origins. In the characters of the first variety prevails.

Following the manifestation and the degree of hereditary variability for one or more characters, in the wine-growing practice, the research analyzes a series of characters including: the growing force, the number of grapes on a grapevine, the production per grapevine, the sugar quantity, the acidity of the grape must, various maturation age, the resistance to diseases and pests, the resistance to drought and frost, etc.

In the present paper there have been tested four varieties of table grapes with different maturation ages under the aspect of their resistance to the low temperatures in the years 2010-2012.

Experimental scheme is situated in linear blocks with three variants 3 repetitions, each repetition with 12 stocks. Placing such experiences two-way 4x3 (varieties) and 2x3 (clones) for each experimental year (2010-2012) was the same, taking into study two factors, namely:

Factor A - Variety, which included graduations:

-a_1 Argessis;
-a_2 Auriu de Stefanesti;
-a_3 Moldova;
-a_4 Augusta;
-a_5 Perlette 10 St.
-a_6 Muscat Adda 22 St
-a_7 Canner

Factor B - loads of fruit with differentiated application of cutting bearing vineyards, which included graduations:

-b_1 load of 15 eyes per vine fruit, cutting the drill;
-b_2 load of 20 eyes per vine fruit, cutting the heart;
- of 25 eyes per vine fruit, cutting the string;

RESULTS AND DISCUSSIONS

Grape-vine buds lose their viability when the temperature falls below -20 in winter... 22ºC for wine varieties and below -18...-20°C at the table (Damian et al, 2004; Dumitriu I.C., 2008). The meteorological data have been extracted from the database of the Stefanesti Institute, collected during the interval 1991–2010 (Figure 1).

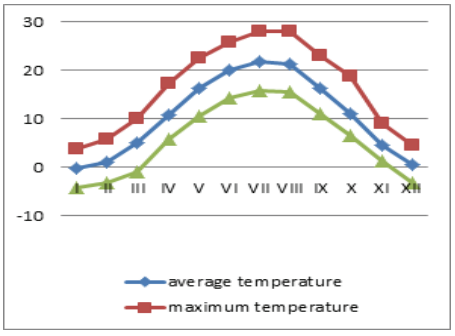

Figure 1. Average temperatures (ºC) 1991-2010

Grape vines can grow in the most common areas as one of the most affected by low temperatures below resistance. Damage caused by winter frosts can reduce production both quantitatively and qualitatively important economic effects for both growers and winemakers as, traders etc (Fennel A., 2004; Grecu V., 2010).

Parallelism exists between the annual cycle of temperature and annual biological cycle of the vine allowed for optimal thermal thresholds for main plant phenophases taken (Olteanu I., 2000).

In order to diminish the impact of climate change it is necessary to adapt the cultural practices to the evolution of climate over time (Bucur M. et al, 2012).

During winter quantities of starch accumulated in strings begin to decrease and the concentration of sugars begin to rise. These changes are associated with the development of frost grape-vine. Readiness of the vine vines for winter can be appreciated by determining carbohydrate accumulated in strings. Throughout the winter synthesize starch thus increasing the concentration of sugars in string, which is used as a barrier against injury caused by frost. Towards the end of winter there is a reverse conversion of carbohydrates so that will have high concentrations of starch and sugars decrease (Bennett J.S., 2002; Georgescu M et al., 1986; Matei P. et al., 2009).

Table 1. Report wood / marrow and starch concentration in the string, the varieties studied (average 2010-2012)

Varieties	Version	Report wood/marrow	Starch %
Argessis	V_1	0,27	4,3
	V_2	0,25	4,1
	V_3	0,24	4,0
Auriu de Stefanesti	V_1	0,25	5,2
	V_2	0,27	5,4
	V_3	0,23	5,8
Moldova	V_1	0,33	5,7
	V_2	0,30	6,1
	V_3	0,31	6,3
Augusta (control)	V_1	0,37	5,2
	V_2	0,38	5,4
	V_3	0,35	5,0

Dates on the ratio of the diameter of the wood/marrow and shows a correlation between the size of the report and frost resistance of the varieties studied. Thus the variety Moldova the report was on average 0.31, the variety Augusta of 0.37 while Argessis and Golden Stefanesti

varieties this ratio was 0.25, 0.27 respectively (Table 1). Hence the improved frost resistance of varieties Argessis and Golden Stefanesti irrespective of the applied pruning.

Table 2. Report wood / marrow and starch concentration in the string, the clones studied (average 2010-2012)

Clones	Version	Report wood/marrow	Starch %
Perlette 10 St.	V_1	0,34	5,1
	V_2	0,30	5,4
	V_3	0,28	5,6
Muscat Adda 22 St.	V_1	0,35	5,1
	V_2	0,31	5,3
	V_3	0,30	5,0
Canner (control)	V_1	0,35	4,8
	V_2	0,37	4,5
	V_3	0,30	4,6

The clone Muscat Adda 22 St. this report was from 0.31 to 0.35, the clone Perlette 10 St. from 0.28 to 0.34. At the same time the control (Canner apiren variety) this ratio was approximate values of the two clones from 0.30 to 0.37 (Table 2). This suggests that neither witness had chosen better behavior frost, so the two clones irrespective of the applied pruning showed almost the same values of the ratio wood/marrow.

To assess the degree of fertility of a variety of fertility coefficient calculated absolute and relative (CFA CFR), and productivity is to acquire plant and fruit shape keep it on the hub until full maturity (Dumitriu I.C., 2008).

Making grape-vine through several physiological phases represented by floral induction, differentiation and outside bud, inside the bud, inflorescence growth, flowering, pollination and fertilization, the first fruits and baking. All these steps must be carried out normally for a good production and quality depend on the percentage of shoots that appear on the block (Iuoras R. and Pop N., 2000). Fertility and productivity are qualities that characterize biological and technological agrobiological value variety and the grape-vine. Fertility and productivity are correlated with each other and directly affect grape production (Stoian I. and Namolosanu I., 2006).

Table 3. The fertility varieties and clones studied at INCDBH Ştefăneşti-Argeş (average 2010-2012)

Variety	TO	OV	TL	LF	NI	CFA	CFR
Argessis	21	14	14	6	9	1,50	0,64
Auriu de Stefanesti	25	17	17	13	19	1,46	1,11
Augusta	16	15	15	9	11	1,22	0,30
Moldova	28	17	17	8	8	1,00	0,47
Perlette 10 St.	17	9	9	1	1	1,00	0,11
Muscat Adda 22 St.	28	17	17	8	8	1,00	0,47
Canner	22	13	13	4	4	1,00	0,31

TO-total eye; OV-eye viable, TL-total shoots, LF-fertile tillers, NI-number of inflorescences, CFA-coefficient of absolute fertility, CFR-coefficient of relative fertility

The highest value CFA was recorded in variety Argessis (1.5) and the lowest in all varieties had suffered from frosts of 2012 (Table 4). The highest value CFR was recorded in variety Golden Stefanesti. (1.11) and lowest for clone Perlette 10 St. (0.11).

Table 4. The losses of buds at varieties studied (2012)

Variety	Version	% losses of buds
		2012
Argessis	V_1	35
	V_2	32
	V_3	30
Auriu de Stefanesti	V_1	30
	V_2	28
	V_3	25
Augusta	V_1	59
	V_2	60
	V_3	55
Moldova	V_1	35
	V_2	32
	V_3	30
Perlette 10 St.	V_1	55
	V_2	52
	V_3	50
Muscat Adda 22 St.	V_1	30
	V_2	35
	V_3	32
Canner	V_1	60
	V_2	62
	V_3	65

Between the lower threshold of spring and autumn leaf fall that occurs when normal conditions, length of the growing season ranges which ranges from 153-225 days in Romania. (Oltenu I., 2000). Losses buds were evident in varieties Augusta (55-60%) and Canner (62-65%), regardless of the type of cut applied (Table 4).

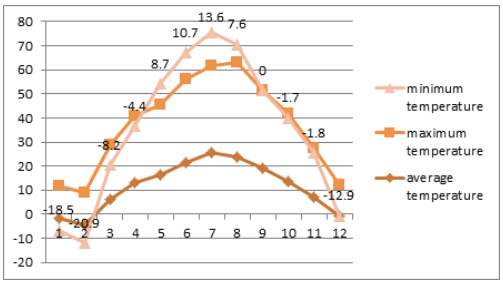

Figure 2. Value of the temperatures (ºC) 2012

Destructive temperatures, low temperature limits, the alternation and the duration of this low temperatures, produced important damages to grapevine in general and the table grape varieties in particular (Stroe M et all, 2009; Stroe M. and Bucur M., 2012).

The minimum temperatures in 2012 were significantly smaller in average years 1991-2010 (-20.9^{0}C in February) (Figure 2).

CONCLUSIONS

Dates on the ratio of the diameter of the wood/marrow and shows a correlation between the size of the report and frost resistance of the varieties studied. Hence the improved frost resistance of varieties Argessis and Golden Stefanesti irrespective of the applied pruning.

Argessis variety, showed the lowest resistance to frost it in hate -20.9ºC temperatures had a viability of 70% and variety Canner of 40%.

Most resistant variety of the studied work was Argessis with a viability of over 70%, so again showed resistance to frost.

Losses buds were evident in varieties Augusta (55-60%) and Canner (62-65%), regardless of the type of cut applied

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THE INFLUENCE OF TECHNOLOGICAL FACTORS ON THE PRODUCTION AND QUALITY OF THE PEPPER

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Abstract

The pepper, highly nutritious vegetable species is sensitive to alterations of the vegetation factors that may influence both commercial fruit quality and their content in carbohydrates, vitamin C and other biochemical components. Full paper shows the modifications and / or production dynamics and its quality in some cultivars of pepper in field crops from two dedicated areas: vegetable basin Silistraru (Braila) and Vidra (Berceni) Ilfov county, within some experiences regarding the allocated space for plants, their nutrition regimes and harvesting time. The researches were carried out within doctoral thesis in POSDRU/107/1.5/S/76888.

Key words: *Commercial quality, cultivars, field peppers, food quality.*

INTRODUCTION

Pepper is cultivated for its fruits, which have many uses in human nutrition, such fresh, and prepared or preserved (Stan et al., 2003).

Pepper fruits have a particular importance, considering the fact that you can eat fresh, as such, vitamins being fully utilized by the body (Ceausescu et al., 1984).

Pepper is considered a concentrate of vitamins easily assimilated by the human body. Among the vitamins, vitamin C comes first. From some studies conclude that mature pepper contains 4-6 times more vitamin C than lemon juice or orange juice (Ceausescu et al., 1984).

Pepper has twice as much vitamin C than lemon and twice as much vitamin A (630 IU) than butter (Dumitrescu et al., 1998).

Undertaken research purpose: to establish how, fruit maturity evolution technique at physiological maturity influence the commercial quality and food importance of pepper fruits grown in the field.

MATERIALS AND METHODS

To achieve this experience were studied variants shown in Table 1.

Table 1. Experimental variants. Peppers for fresh consumption, vegetable basins Silistraru Braila and Berceni Ilfov – 2012

Var.no.	Area of culture (A)	Var.no.	Time of harvest (maturity) (C)
1(mt1)	Silistraru Braila	Bianca F1 (b1)	Technical maturity (c1)
2			Physiological maturity (c2)
3		Atris F1 (b2)	Technical maturity (c1)
4			Physiological maturity (c2)
5		California Wonder F1 (b3)	Technical maturity (c1)
6			Physiological maturity (c2)
7(mt2)	Silistraru Braila	Bianca F1 (b1)	Technical maturity (c1)
8			Physiological maturity (c2)
9		Atris F1 (b2)	Technical maturity (c1)
10			Physiological maturity (c2)
11		California Wonder F1 (b3)	Technical maturity (c1)
12			Physiological maturity (c2)

Table 1 shows the type 2x3x2 trifactorial experience with 12 variants, with the following graduations.

Experimental factor A - Areal has two graduations: a1 - Silistraru vegetable basin Braila a2 - Ilfov Berceni vegetable basin Experimental factor B - Cultivar, has three graduations: b1 - Bianca F1 b2 - Atris F1 b3 - California Wonder F1

Experimental factor C - Time of harvest has two graduations: c1 - technical maturity of fruit c2 - physiological maturity of the fruit.

The biological material used in experience is composed of three cultivars.

Bianca F1, a pepper grown successfully in Romania, very early with good capacity fructification, large fruits white-yellow color.

Atris F1 early hybrid and highly productive, ripening from green to red. Long fruit with thick pulp is suitable for growing in the field and/or solarium. Good taste is juicy at technical maturity and also at its physiological.

California Wonder F1 hybrid with undetermined growth and long cycle of culture. Before maturity fruits have green color and at physiological maturity red color, the pericarp thick and juicy.

Specific technology applied to experience included the following groups of works and technical parameters (Atanasiu N., 2005).

Works in autumn - abolishing pre-culture, basic fertilization with superphosphate simple 3 kg per 100 m^2 (300 kg/ha) deep autumn plowing with incorporation of crop residues and superphosphate.

Foundation work, care and harvesting of crops:

Experience planting on 15 May 2012, by planting seedlings rarely without transplanters, produced in solarium with nutrient mixture layer placed on fresh manure aged 60 days to 70 cm between rows and 20 cm between plants in the row, providing density 71 400 plants/ha (Neata G., 2002).

Care of the most important works we mention integrated weed combat by herbicides combined with hoeing treatments to prevent/combat diseases and pests and crop specific area (Cristea S. and Neata G., 2004).

Fertilization was performed using soluble complex fertilizers Universol type, with higher content in nitrogen (blue Universol) until the first fruits and higher potassium content (Universol purple) during fructification (Neamtu G. et al.).

RESULTS AND DISCUSSIONS

Into experience were made observations and measurements, after which they were established the following results.

Table 2. The average weight of fruits (g). Silistraru Braila, Ilfov Berceni, 2012

Cultivar	Technical maturity		
	Grams of fruit	Differences	
Bianca F1	149,4	X	+
Atris F1	153,7	+	+
California Wonder F1	168,4	+	+
Bianca F1	141,2	-	X
Atris F1	136,2	-	-
California Wonder F1	149,5	-	-

The average fruit weight varied for analysis carried out from 153.7 g registered at the Atris F1 cultivars, up to the value of 168.4 g at California Wonder F1 witness against Bianca F1 149.4 g.

The differences are small and without statistical coverage.

Table 3. The dry matter content. Silistraru Braila, Berceni Ilfov, 2012

Cutivar	Technical maturity		Physiological maturity	
	Silistraru	Berceni	Silistraru	Berceni
Bianca F1	4.50%	4.35%	4.65%	4.47%
Atris F1	5.30%	5.15%	5.45%	5.32%
California Wonder F1	3.80%	3.65%	3.95%	3.77%

During the experiments and analyzes performed noted Atris F1 hybrid with a dry matter content of 5.45% at its physiological maturity in experimental conditions Silistraru, Braila. The dry matter content increases from technical maturity to physiological.

Table 4. The pericarp thickness. Silistraru Braila, Berceni Ilfov, 2012

Cutivar	Technical maturity		Physiological maturity	
	Silistraru	Berceni	Silistraru	Berceni
Bianca F1	4.86 mm	4.64 mm	5.15 mm	4.95 mm
Atris F1	4.54 mm	4.41 mm	4.65 mm	4.48 mm
California Wonder F1	7.15 mm	6.94 mm	7.30 mm	7.15 mm

During this research, the pericarp thickness ranged from 4.54 mm minimum value at Atris F1 (technical maturity, Silistraru) to 4.86 mm in case of Atris F1 cultivar (technical maturity, Silistraru) and 7.15 mm at cultivar California Wonder F1 (technical maturity, Silistraru) The differences were smaller when cultivars in Berceni, Ilfov because culture conditions.

Table 5. Vitamin C content. Silistraru Braila, Berceni Ilfov, 2012

Cutivar	Technical maturity		Physiological maturity	
	Silistraru, Braila County	Berceni, Ilfov County	Silistrar, Braila County	Berceni, Ilfov County
Bianca F1	131,90 mg/100 g s.p.	126,1 mg/100 g s.p.	139,12 mg/100 g s.p.	135,41 mg/100 g s.p.
Atris F1	152,44 mg/100 g s.p.	146,32 mg/100 g s.p.	156,28 mg/100 g s.p.	150,17 mg/100 g s.p.
California Wonder F1	118,40 mg/100 g s.p.	109,2 mg/100 g s.p.	125,60 mg/100 g s.p.	119,12 mg/100 g s.p.

Vitamin C content recorded the highest values in case of cultivar Atris F1 and lowest in case of cultivar California Wonder F1. Values increased from technical maturity to physiological maturity and are higher in cultivars from Silistraru Braila due to culture conditions and superior technology.

CONCLUSIONS

Based on the experimental results held the following conclusions can be drawn:

Among the cultivars used in experience stands in terms of average fruits weight with 168.4 g the hybrid California Wonder, which exceeds the average weight of fruits witness Bianca F1 (149.4 g).

The pericarp thickness increases from technical maturity to physiological all cases, and towards the witness Bianca F1 (5.15 mm, physiological maturity) in experimental conditions Silistraru, Braila County, the hybrid California Wonder F1 is distinguished with 7.30 mm (to physiological maturity).

Vitamin C content increases from technical maturity to physiological maturity and the highest values we meet at Atris F1 hybrid in experimental conditions in Silistraru, Braila.

In the experiments is remarkable growth indicators: solids content, vitamin C content and thickness of the pericarp cultivars when compared with cultivars Silistraru Braila in Berceni, Ilfov due to culture conditions and technology used.

Pericarp thickness and chemical composition ensures a balanced of fruit succulence and particularly flavor, it recommends the consumption of fresh and preserved condition.

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RESEARCH CONCERNING EFFECTS OF PERLITE SUBSTRATE ON TOMATO IN SOILLESS CULTURE

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Abstract

In Romania, soilless culture method in perlite substrate for tomato crop is still in early stages. Few farmers practice the culture on perlite substrate. Soilless cultures have many advantages such as increased yield, health and uniform product, conservation of water and land, better protects an efficient control of environmental pollution and reduce of workers for cultivation. The aim of this study was effects of perlite substrate on tomato yield and fruit quality in soilless cultivation. This study has done in the Hortiviticultural Systems Bioengineering Department, University of Agricultural Sciences and Veterinary Medicine-Bucharest. Tomato culture was founded on mattresses filled with perlite. Experimental variants were the type of size particle of perlite from mattress. The mattresses had provided a volume of 10 l perlite / plant. We used three types of grain of perlite of 2 mm, 4 mm and 5 mm. The best results were obtained when using perlite as substrate grain 4 mm.

Key words: *perlite substrate, tomatoes, size grain.*

INTRODUCTION

Supply the market with fresh vegetables is a priority with economic and social implication. Therefore, the researchers are permanently constrained to finding new modern growing technology, perfumed that to assure a high production (Abrar, 2011).

The most frequently unconventional systems are the systems of vegetables growing on Grodan and NFT systems.

Extending these culture systems have some drawbacks such as the rock wool culture system requires enormous quantities of this material, material subsequently back into circulation very difficult and NFT system involves rearranging production facilities by installing gutters, an operation that is very costly financially.

In view of the above, it is necessary to develop technologies that are not expensive, can be made with cheap materials and handy, but at the same time ensuring high productivity both quantitatively and qualitatively.

The culture of perlite substrate has two major advantages: it is very accessible from economically within the global trend as organic (Draghici et al., 2012).

In the global horticultural production, vegetable crops 'without soil' had begun already gain a leading position. These unconventional systems of culture are great interest both for researchers and for those who practice in order to achieve products for human consumption.

In Romania, expansion of these systems raises serious technical and economic issues, so it is necessary to establish culture technologies applicable, using local materials and equipment imported or to be accessible to a larger number of users (Atanasiu N., 2009).

Extending this systems create some problems referring to polluting because the Grodan is a substrate that is difficult to recycled.

Purpose of research in this study was to identify the best composition based on perlite substrate and recommend it to obtain early and total yields, quality and price of low cost.

Expanded perlite is a substrate of culture that completely replaces soil.

MATERIALS AND METHODS

The experiment was carried out in the vegetable sector in Bucharest, Faculty of Horticulture.

The biological material used was the hybrid tomato Gaheris.

Experience consisted of the following experiments presented in Table 1.

Table 1. Experimental variants

Variants	Substrate types	Growing
V1	Control	Growing on soil
V2	Perlite 2mm	Growing on mattresses
V3	50% Perlite of 2mm and 50% peat	Growing on mattresses
V4	Perlite 4mm	Growing on mattresses
V5	Perlite 4mm+peat	Growing on mattresses
V6	Perlite 5mm	Growing on mattresses
V7	Perlite 5mm+peat	Growing on mattresses

Culture was established in unheated solarium. Of each variant we use four mattresses of 1 m long for each where we had planted each three plants. In total, 24 mattresses were installed.
The distance between the mattresses was 90 cm and 35 cm between plants. Therefore, for each plant we had assured 10 l perlite substrate. Mattresses had contained 30 l of substrate. Plant density was 31,746 plants per ha.
Hydroponics mattresses were made of biodegradable polyethylene, triple laminated, composed of two layers, colored black inside and white outside. Mattresses have a length of 1 m and a width of 20 cm. The experiments were realized on some mattresses prototype created by SC Procema SRL, Romania.
The fertilizing recipe was modified with phenophase. In the first phenophase, immediate period after planting, for each plant we gave amount 50 ml of solution per *fertigation*-for 2 weeks.
Daily we had administrated a number of six watering.
I increased the amount of solution per plant as the plants increased in height, so had administrated between 100 ml and 200 ml depending on temperature and light.
Measurements and determinations made.
During the growing season were conducted observations and determinations so:
- increase in plant height;
- number of leaves;
- number of leaves until the first inflorescence;
- number of leaves between inflorescences;
- average distance between inflorescences;
- determine the number of inflorescences and flowers in blossom;
- percent of binding of fruit;
- early production;
- the quantity of fruit harvested per plant;
- the average fruit per harvest;
- the total production;

Fruit production was determined by weighing.
For each determination was made statistical analysis

RESULTS AND DISCUSSIONS

From the figure 1 we can see in dynamic the growing of plants on the experimental variants.

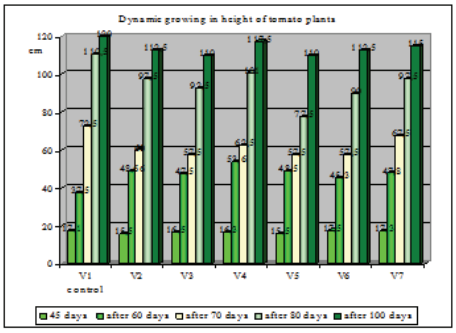

Figure 1. Dynamic growing in height of tomato plants

Total number of the flowers and fruits formed on inflorescences are presented in table 2.

Table 2. Total number of the flowers and fruits formed on inflorescences

Variants		Inflorescences					
		1st	2nd	3rd	4th	5th	6th
V1	No. Flowers	9	9	7	7	9	9
	No. fruits	5	5	4	4	3	3
V2	No. Flowers	9	9	9	9	11	14
	No. fruits	5	06.05	04.05	02.05	2	7
V3	No. Flowers	9	9	9	08.05	7	9
	No. fruits	6	3	5	05.05	02.05	4
V4	No. Flowers	8	9	9	7	7	7
	No. fruits	8	4	6	3	7	5
V5	No. Flowers	7	9	7	9	5	5
	No. fruits	7	0	4	3	4	1
V6	No. Flowers	11	7	5	6	6	5
	No. fruits	6	7	4	2	3	3
V7	No. Flowers	7	9	7	7	7	10
	No. fruits	5	6	4	1	0	5

In the table no 3 is noted that the highest percentage of binding occurs in variant no 4

with 70.21% as compared to Control, Variant no 1, were the percentage of binding was 48%.
A large percentage of fruit we had obtained at the V6 about 62.5% and 50.49% at the V3.
The variants 2, 5 and 7 we had registered a percentage below 50%.

Table 3. Total number of flower and fruits formatted on plant and percentage of binding

Variants	Total flowers formatted on plant	Total fruits formatted on plant	Percentage of binding
	no.	no.	%
V1 Control	50.0	24.0	48
V2 Perlit 2mm	61.0	27.mai	45.08
V3 Perlit 2mm+peat	51.5	26.0	50.49
V4 Perlit 4mm	47.0	33.0	70.21
V5 Perlit 4mm+peat	42.0	19.0	45.24
V6 Perlit 5mm	40.0	25.0	62.5
V7 Perlit 5mm+peat	47.0	21.0	44.68
Average	48.36	25.ian	51.85

At the first harvesting, are not existing differences between variants except the V2 where I remarked a positive significance statistic point and view (Table 4).

Table 4. Fruits mass at the first harvest

Variants	Fruits mass	Differences		Significance
	kg	Kg	%	
V1	0.40	0.00	100.0	Mt
V2	ian.17	0.78	295.09	*
V3	0.76	0.37	191.82	N
V4	0.47	0.07	118.24	N
V5	0.38	-0.02	95.97	N
V6	0.67	0.27	167.42	N
V7	0.86	0.46	215.60	N
Average	0.67	0.27	169.16	N

DL5%=0.520 DL1%=0.780 DL01%=1.250

At the first harvest, were collected from V1 four fruits with 100g in average fruit. Production obtained from this variant had the lowest referring to average mass (Table 5).
Most fruits were harvested from V2. Were harvested an average of 10 fruits per plant, with an average mass of 117 g on fruit. The largest fruits were harvested at 3 and 5 variants with 127 g average fruit. Of all the variants at the Variant 2 we harvested 10 fruits with weight of fruit of 117 g and at the V5 we harvested only 3 fruits per plant with an average of 127 g fruit.

Table 5. The number of fruit and average mass of fruit at the first harvesting

Variants	Number of fruits obtained on plant no.	Products on plants g/plant	Average mass of fruits g
V1	4	400.0	100.00
V2	10	1173.0	117.30
V3	6	762.5	127.08
V4	4	470.0	117.50
V5	3	381.5	127.17
V6	6	665.5	110.92
V7	7	857.0	122.43

In the table 6 are presented production, number of fruits and the average mass of fruit obtained on plant at the second and last harvested. We can remark that at the second harvest, the highest production had obtained at the V2 (1320.4 g/plant) and smallest production at the V6 (920.0 g/plant). In average the mass of fruit had varied between 117.5 g/fruit at V4 and 125.0 g/fruit at the V3 (the second harvest). At the last harvest were recorded 1322.40 g/plant at the control (V1). In addition, we can observe that at the last harvest the fruit mass was between 101.5 g/fruit at the V2 and 120.0 g/fruit at the V7.

Table 6. The production obtained at the second and the last harvested

Variants	The second harvest			Last harvest		
	Products on plants	No fruits	Average mass on fruit	Products on plants	No. fruits	Average mass on fruit
	g/plant	No.	g	g/plant	No.	g
V1	942.4	8	117.8	1322.4	12	110.2
V2	1320.0	11	120.0	659.75	06.mai	101.5
V3	1250.0	10	125.0	1150.0	10	115.0
V4	1645.0	14	117.5	1545.0	15	103.0
V5	1089.9	9	121.1	821.10	7	117.3
V6	920.0	8	115.0	1265.0	11	115.0
V7	964.0	8	120.5	720.00	6	120.0

The production obtained during a month was at 3.66 kg on the plant at V4 and 2.292 kg on the plant at V5 (Table 7).
The highest percentage was recorded at V7 and the lowest at V3, compared to the control, table 7.

Table 7. Total production on plant

Variants	Total on plant	Percent to control
	g/plant	%
V1	2662.80	100.00
V2	3152.75	118.40
V3	3162.50	118.77
V4	3660.00	137.45
V5	2292.50	86.09
V6	2850.50	107.05
V7	2541.00	95.43

CONCLUSIONS

On the plant were six inflorescences formatted in three months after planting on perlite substrate.

The number of fruit on inflorescences varied between 3 at the fifth and sixth cluster and five at the first and second clusters (V1 control).

The best results were obtained when using perlite as substrate grain 4 mm of 3.66 kg on the plant.

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INFLUENCE O THE PEST CONTROL METHODS OVER THE USEFUL ENTOMOFAUNA WITHIN THE VITICULTURAL ECOSYSTEM

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Abstract

The paper presents the influence of the differential methods to control pests and diseases of vines, respectively chemical control, biological and integrated, over the useful and harmful in a entomofauna vineyard ecosystem. Experimental data obtained showed that the abundance entomofauna (useful and harmful) presented higher values for biological control and integrated methods compared to chemical control method. Integrated control, especially chemical, caused a reduction of 4% and 17% in the number of the useful insects compared to the biological control method. The ratio between useful and harmful entomofauna recorded in May and June had an average of 1.1, with an upward trend in the use of biological control method and decreasing for integrated control, especially the chemical. Useful entomofauna recorded lower values than the harmful for all control methods used, which proves that useful pests are more sensitive than the harmful ones after application.

Key words: *methods of pest control, viticulture, useful entomofauna.*

INTRODUCTION

A full management of viticultural ecosystem can not be achieved without a reconsideration of the whole system based on a design that takes into account both ecological pest knowledge and their destructive potential and complex adoption of the most appropriate measures for the natural control of the harmful species (Coulon et Sentenac, 2001; Dejeu et al., 2005; Fregona, 2005). Parasites and predators of the existing natural background in each ecosystem wine is by far one of the most important natural biotic factors limiting the populations of the harmful pests (Perju *et al*., 1988). Some technological sequences used in vineyards, especially treatments of diseases and pests of vines, can influence in an obvious manner the diversity and numerical abundance of natural predators populations, with direct implications in maintaining the natural balance within the wines ecosystem.

Based on these considerations the paper aims to present the influence of differential methods of pests and diseases control in vines over the useful and harmful entomofauna existing in a vineyard ecosystem.

MATERIALS AND METHODS

Research has been carried out within a vineyard having planting distances: 2.0/1.0 m placed into terraced slope conditions arranged in terraces wide (width 17.2 m, 8 rows of vines). The biological material was represented by Merlot/SO4-4 variety.

They were experienced 3 differentiated method to control pests and diseases of the vines, namely:

-Chemical control based on the use of contact and systemic insecticides;

-Biological control based on the use of of copper, sulfur and bioinsecticides;

-Integrated control based on the use of less harmful insecticides, accepted internationally for the integrated pest management in vineyards to which were added biotechnical means and bioinsecticides.

To collect biological material that represents the useful and harmful entomofauna of the

vineyard, several methods were used depending on the targeted species, namely:
-Barber traps, which is the classical method for collecting mobile arthropods on the ground;
-Shaking technique that allows collecting useful and harmful entomofauna by shaking vegetative organs above an entomological net;
-Method of leaf samples, allowing an estimate of the entomophagous populations from the leaves.
Measurements were made at an interval of two weeks between May and June. After harvesting the samples samples were brought to the laboratory and analyzed the binocular loupe and microscope to identify the present species. Identified species were classified into taxonomic groups: orders, families and genus. The relative abundance and the number of species that encounter the the useful and the harmful entomofauna specific for the vineyard ecosystem was studied, the subject to the type of the treatment.
Based on the data we have got calculated the ratio between the two components of vine pests and predators respectively.

RESULTS AND DISCUSSIONS

Based on the role and the importance of predators into two vineyard ecosystem, a mapping of the vine pest for the three methods differentiated, on diseases and pest control in vineyards was concluded.
Arthropod fauna collected by means, during May-June in the experimental plots, amounted a total of 810 insects. out of these, 430 were harmful insects, representing 53.1% and 380 formed entomophagous population, representing 46.9% of the total. The reletio between the two populations was 1.13.
Function to the pest in the species vineyard, arthropods were divided into two groups: (i) harmful fauna (phytophagous pest that feed on different parts of plants and (ii) useful fauna (parasitoids and predators, whose regime is carnivorous diet).
Harmful species were included into 7 orders: Orthoptera, Thysanoptera, Heteroptera, Homoptera, Coleoptera, Lepidoptera and Diptera and 13 families: Catantopidae, Gryllidae, Thripidae, Miridae, Pentatomidae, Cicadellidae, Aphididae, Elateridae, Halticidae, Bruchidae, Curculionidae and Geometridae (for Diptera, suborder Brachycera).
Beneficials were separated into predators and parasites. Predators were included in 7 order: Aranea, Dermaptera, Heteroptera, Neuroptera, Hymenoptera, Coleoptera, and Diptera in 6 families. Parasites Hymenoptera belonge to two superfamilies, Chalcidoidea and Ichneumonoidea. Ants present in a large numbers were included into Formicoideal subfamily.
The taxonomic classification of the fauna collected specific to the vineyard ecosystem studied is presented in Table 1.

Table 1. Taxonomic classification of the fauna collected from the viticultural ecosystem studied

Harmful fauna	Useful fauna
1. Ord. ORTHOPTERA Fam. Catantopidae *Caliptamus italicus* L. Fam. Gryllidae *Grilus campestris* L. *Melanogryllus desertus* Pallas 2Ord. THYSANOPTERA Fam. Thripidae 3. Ord. HETEROPTERA Fam. Miridae *Lygus sp*. Fam. Pentatomidae 4. Ord. HOMOPTERA Fam. Cicadellidae Fam. Aphididae 5. Ord. COLEOPTERA Fam. Elateridae Fam. Halticidae Fam. Bruchidae Fam. Curculionidae 6. Ord. LEPIDOPTERA Fam. Geometridae 7. Ord. Diptera Subord. Brachycera	1. O. ARANEAE 2. O. DERMAPTERA Fam. Forficulidae *Forficula auricularia* L 3. HETEROPTERA Fam. Anthocoridae *Orius sp.* 4. NEUROPTERA Fam. Chrysopidae *Chrysoperla carnea Steph.* 5. O. HYMENOPTERA Suprafam. Chalcidoidea Suprafam. Ichneumonoidea Suprafam. Formicoidea 6. Ord. COLEOPTERA Fam. Coccinellidae *Coccinella 7-punctata* L. *Propylea 14-punctata* L. *Stethorus punctillum* Weise Fam. Staphilinidae 7. Ord. DIPTERA Fam. Tachinidae

The structure and relative abundance and number of species that form the harmful fauna population specific for the vineyard ecosystem studied, function of the types of management regarding the control of the agents on the entire collection period (May-June), is presented in Table 2.
The experimental data obtained, indicate a difference in the number of species collected of functions of the three types of pest management. Thus, it may be noted that the version where we used the biological control of

pest agents, that have been used substances based on Cu and S + bioinsecticides was collected the largest number of copies of harmful artopode (174 insects), followed by the version where were used the integrated control (less harmful chemicals + biotechnical means + bioinsecticides) (152 insects) and variant who underwent chemical control (104 insects).
This is the result of the less toxic effect of the products used for the biological control, and effect of more toxic chemicals used for chemical control. Integrated control place, the abundance of pests on an intermediate position.
In terms of the structure of pests, the situation is different on the three pest control methods.
In the version with chemical control, the highest level was occupied by the insects of the order Coleoptera (51.0%), followed by Homoptera (30.8%) and Orthoptera (11.5%). The remaining 6.73% counted Thisanoptera, Heteroptera, Lepidoptera and Diptera.
Whole, pests collected from the chemically treated, is below the threshold harmful to the vines. Noticeable is that Ciccadellidae family, wich require careful follow-up for future, given that in Europe there are several species of mycoplasmas carried by these vectors in vineyards (eg Scaphoideus titanus, Metcalfa pruinosa). Fortunately,these micoplasmas have not been identified so far in our country.
In the variant of biological control, there are two groups close to each other: Homoptera and Coleoptera occupy 44.3% and 30.5% in the structure of the pest, followed by Heteroptera and Orthoptera 12.1% and 9.2%.
In the version with integrated control, four groups of insects occupy close structural levels, as follows: Homoptera (38.8%), Coleoptera (22.4%), Orthoptera (20.4%) and Heteroptera (14.5%).

Table 2. Structure and relative and numeric abundance of the harmful insects subjects to the controlling method.

Toxonomy classification	Chemical control		Biological control		Integrated control	
	Nr ex.	%	Nr ex.	%	Nr ex.	%
1. Ord. ORTHOPTERA	12	11.5	16	9.2	31	20.4
2. Ord. THYSANOPTERA	1	1.0	3	1.7	0	0.00
3. Ord. HETEROPTERA	0	0.0	21	12.1	22	14.5
4. Ord. HOMOPTERA	32	30.8	77	44.3	59	38.8
5. Ord. COLEOPTERA	53	51.0	53	30.4	34	22.3
6. Ord. LEPIDOPTERA	2	1.9	1	0.6	3	2.0
7. Ord. DIPTERA	4	3.8	3	1.7	3	2.0
TOTAL	**104**	**100**	**174**	**100**	**152**	**100**

To be noted that all versions include Orthoptera group, represented by crickets and grasshoppers, whose presence is justified by the variety of spontaneous vegetation surrounding the vineyard ecosystem (Table 3).
Useful entomofauna specific for a vineyard ecosystem, where three types of pest were applied is presented both as structure and as number and relative abundance into the Table 4.
Analyzing the useful entomofauna collected from the vineyard ecosystem under the three methods of pest control, as in the case of the harmful fauna, we found the same trend: the largest number of beneficial being collected from biological control version (214 insects), followed by integrated control variant (102 insects), while fewer individuals were recorded in chemical control version (64 insects).

Table 3. Numerical distribution of the harmful entomofauna differentiated by the methods applied for pest control in vineyard

Toxonomy classification	**Chemical control**	**Biological control**	**Integrated control**
Ord. ORTHOPTERA	4	7	12
Ord. THYSANOPTERA	1	1	0
Ord. HETEROPTERA	0	10	9
Ord. HOMOPTERA	14	25	11
Ord. COLEOPTERA	17	20	15
Ord. LEPIDOPTERA	0	0	2
Ord. DIPTERA	0	2	0
TOTAL	**36**	**65**	**49**

Table 4. Structure and number and relative abundance of entomophagous population under different type of pest control

Toxonomy classification	**Chemical control**		**Biological control**		**Integrated control**	
	No.	%	No.	%	No.	%
1. Ord. ARANEA	18	28.1	34	15.9	33	32.3
2. Ord. DERMAPTERA	15	23.4	41	19.2	12	11.8
3. Ord. HETEROPTERA	0	0.0	6	2.8	2	2.0
4. Ord. NEUROPTERA	1	1.6	7	3.3	5	4.9
5. Ord. COLEOPTERA	7	10.9	37	17.3	16	15.7
6. Ord. DIPTERA	1	1.6	9	4.2	3	2.9
7. Ord. HYMENOPTERA	22	34.4	80	37.4	31	30.4
TOTAL	**64**	**100**	**214**	**100**	**102**	**100**

The beneficial insects were lower as number, but the number of species was higher. As a structure, the highest percentages were occupied by ants Hymenoptera group, 37.4% (biological control), 34.4% (chemical control) and 30.4% (integrated control). Ants, although they are not recognized as major predators in the agroecosystems, are big consumers of fresh dejections secreted by some insects, mainly aphids, and insect remains under decomposition.

A group of predators of a great importance in limiting the multiplication of pests are beetles of the family Coccinellidae, Coccinella and Stetorus genres. They have occupied the highest percentage in the alternative of biological control structure (17.3%), followed by integrated control option (15.7%) and then chemical variant (10.9%).

Noteworthy are the groups of Aranea (spiders predators) and Dermaptera (earwig), which achieved levels between 15.9-32.4% and 11.8-23.4%. Both groups of predators feed on small insects (aphids, mites) present on various vegetable substrates vines, respectively spontaneous vegetation. Earwig might produce damages in grapes at harvest time, but without the grapes ripened, they are regarded as predators of insects.

The structure and abundance of entomophagous in the experimental plots of the stationary were three types of pest management were applied, are shown in Table 5.

Table 5. Structure and abundance of the entomophagous into the stationary , subject to different pest control methods in vineyard

Toxonomy classification	Chemical control	Biological control	Integrated control
Ord. ARANEA	7	6	18
Ord. DERMAPTERA	6	8	2
Ord. COLEOPTERA	1	19	3
Ord. DIPTERA	0	1	0
Ord. HYMENOPTERA	4	31	18
TOTAL	**18**	**65**	**41**

Table 6. The ratio between the useful and harmful entomofauna (U / D) for the three methods of pest control in vineyard

Collection (no)	Date of collection	Chemical control	Biological control	Integrated control
		(U/D)		
1	25.05.	0.96	1.08	1.10
2	5.06.	0.84	1.48	1.03
3	19.06	0.46	1.55	0.95
4	29.06.	0.31	1.03	0.78

Based on the harmful and useful entomofauna collected from the wine ecosystems, a rotation between useful and harmful fauna was achieved for each collection date. The results are presented in the Table 6.

From Table 6 we can see that the ratio between the two components harmful pests and beneficial, followed an upward trend under the biological control and a decreasing if the variants of integrated and chemical particularly. As a general pole during spring and early summer this ratio has a value of 1.1, changes to one or other of the components occurring after the intervention with the control treatments: biological, chemical or integrated.

CONCLUSIONS

Entomofauna abundance of the useful and harmful insects presented higher values for the biological and integrated control methods, compared to the chemical control method.

Compared to the biological control, the most protective for the useful entomofauna, integrated control and especially chemical, caused a reduction of 4% and 17% in the number of useful insects.

The ratio between useful and harmful entomofauna recorded an average of 1.1, with

increasing trend for variants where was practiced the biological control going downward in the variant where chemical control was practiced.

Useful entomofauna was lower than the harmful for all 3 methods of control, which proves that beneficial insects are more sensible than the harmful insects, under phytosanitary treatments.

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EFFECTS OF THE DIFFERENT GRAPE ROOTSTOCKS ON BERRY SKIN B, CU, FE, MN AND ZN CONTENTS OF 'CSERSZEGI FŰSZERES' CULTIVAR

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Abstract

The selection of the most appropriate grape rootstock regarding the production purposes has a positive effect on quality of the grape, the must and the wine: it may produce higher vintage quantity and may increase the vintage quality. Field experiment was set up at the model farm of University of Debrecen on sand soil. 12 different grape rootstocks were compared ('Aramon x Riparia 143B M et de G', 'Vitis Berlandieri', 'Berlandieri x Riparia Szilágyi 157 Pécs', 'Berlandieri x Riparia S.O.4','Berlandieri x Riparia T5C Eger', 'Berlandieri x Riparia T.G. 5.A.5.','Berlandieri x Riparia T.8.B.','Berlandieri x Riparia T.K. 5.BB','Berlandieri x Riparia K.125AA','Riparia Sauvage', 'Riparia Selecta', 'Riparia Tomentosa'). 'Cserszegi fűszeres' scion was grafted into the above rootstocks. The aim of our research was to determine how the B, Cu, Fe, Mn and Zn contents of the berry skins change in case of the different grape rootstocks. In 2011 we obtained valuable differences in the boron, copper, iron, manganese and zinc concentrations of skins of 'Cserszegi fűszeres' grafted into different rootstocks. The concentrations of B, Cu, Fe, Mn and Zn changed between 18.0-32.0 mg kg^{-1}, between 1.27-4.77 mg kg^{-1}, between 11.5-45.0 mg kg^{-1}, between 3.78-14.0 mg kg^{-1}, and between 2.14-8.53 mg kg^{-1}, respectively. On the basis of our results the 'Riparia Sauvage' could be an advantageous rootstock, as the largest boron, iron and manganese concentrations were found in its skin. Advantageous rootstocks could be the 'Berlandieri x Riparia Szilágyi 157 Pécs' because of the largest measured copper content and the 'Vitis Berlandieri' due to the largest measured zinc content. These results support that the selection of the rootstocks influence the B, Cu, Fe, Mn and Zn contents of the grape berry.

Key words: *grape rootstock, berry skin, micro element, 'Cserszegi fűszeres'.*

INTRODUCTION

Grape rootstocks are present in the grape production since the devastation of the phylloxera. Because it is vital to be acquainted with characteristics of different rootstocks to choose the variety most appropriate to given circumstances, these characteristics were broadly inspected by many researchers. Choosing the ideal rootstock-scion cultivar combination at establishment of the vineyard has a determining effect for its whole lifetime. Crucial evaluative characteristics of rootstock cultivars are the following: soil requirement, mineral nutrition, resistant to loam- and salt content, affinity and vegetative cycle (Angeli et al., 1959). Most often utilised grape species in ennobling of rootstock cultivars are *'Vitis Riparia Scheel.'*, *'Vitis Rupestris Mich.'*, *'Vitis Berlandieri Plan.'* and *'Vitis vinifera L.'*. The first three varieties are of North-American origin. *'Vitis Riparia Scheel.'* comes from river valleys of the east coast, *'Vitis Rupestris Mich.'* origins from south-west part of the east coast, while *'Vitis Berlandieri Plan.'* can be find on rocky territories of Texas state. Distinctive characteristics of these species result from many thousand years' evolution (Kocsis, 2010). In ennobling of rootstock cultivars some other, mainly North-American grape species were also used (Galet, 1998). However, there are 19 listed rootstock varieties in the Hungarian National Variety Registry Catalogue, only a few is propagated for commercial use (Lőrincz and Zanathy, 2009). In some other countries possibilities of different rootstock-scion variety combinations corresponding to specific

territorial circumstances is more elaborated, spectrum of used rootstock varieties is broader.

The cultivated vine plant is called vine stock (Balogh, 1991). Vine stocks are propagated on vegetative way by cuttings or grafted cuttings (Prohászka, 2003). Parts differentiating from the cane in the soil form the rooting system, parts forming above ground give the trunk and shoot system of the stock (Kozma, 1993a). In case of propagation by grafts, the root system is formed by the rootstock cultivar (American grape species), and the shoot system growth up from the scion (*'Vitis vinifera L.'*) (Prohászka, 1982). Mineral nutrients are taken up by the root hairs from the soil. These nutrients get into the leaves and bunches through the root system, trunk, canes and shoots (Prohászka, 1982; Kozma, 1993a). Certain nutrients can also be taken up through the leaves in smaller quantities (Kozma, 1993a). Through the lifetime of the graft, scion and rootstock parts live together in mutual service. The rootstock takes up mineral nutrients dissolved in water, the scion fruits and feeds the rootstock with photosynthates (Kocsis, 2010).

Rootstock has direct and indirect effects on the scion (Striegler and Howel, 1991; Csikászné, 2008). Hegedűs and I'só (1965) demonstrated, that different scion cultivars show their best performance on different rootstocks, which differently affect nutrition of scions grafted on them (Lőrincz and Bényei, 1999). Mineral nutrition pattern characteristic for own rooted vine alter in case of grafts (Kozma, 1993b). Quantity and composition of nutrients going to the direction of the scion is predominantly determined by the selection ability/ characteristics of the root system (Kozma, 1993b).

Different rootstocks can be characterized by different root formation. Magnitude, vertical and horizontal extension of the root system is also an important factor of mineral take up (Vercesi, 1987). Certain rootstock cultivars form smaller (*'Berlandieri x Riparia TK5BB')* others form medium sized (*'Aramon x Rupestris G 1'*) root system. *'Riparia Portalis'* can be characterised by a deeper, while *'Berlandieri x Riparia S.O.4'* can be characterised by a shallow root system (Vanekova, 1995).

Effects of rootstocks do not confine for impinge on mineral take up but also on distribution of nutrients (Mannini et al. 1992). Withstanding that Kocsis (2010) could experimentally prove that scion cultivars show different results when grafted on various rootstocks concerning mineral take up, in field circumstances: effects of production site and ecological factors, affect the modifying power of rootstocks to a great extent, or even minimizes it (Csikászné, 2008).

Minerals taken up are predominantly located into the solid parts of the bunch: in the skin, seed and cellulose-pectinic cell walls of the flesh. The skin of the berry consists of the epiderma and some cell layers beneath (Ferenczi, 1966). Alkalinity of the of the berry regularly increase 2-3 times by the ripening; however only a more intensive relative increase is characteristic for the skin (Kállay, 1998). The most important microelements of the berries are B, Cu, Fe, Mn and Zn (Kállay, 1998). Most important role of iron is formation of chlorophyll (Prohászka, 1982). The least iron can be find in the seeds regarding the berries (Kozma, 1993a). Boron has crucial role in evolution of floral fertility, in amount and quality of the yield, but even a slight overdose of this element can have toxic effects (Bényei and Lőrincz, 1999; Oláh, 1979). Ruckenbauer (1987) found, that boron uptake of the vine is the biggest in the berries in case of 10 tons/ha yield. Experiments of Candolfi-Vasconcelos et al. (1997) state, that grafts are more effective in boron uptake than own rooted vines. Manganese is a mediator in the synthesis of carbohydrates and proteins, since it activates many enzymes (such as polyphenol-oxidase, ascorbic acid-oxidase). Zinc plays its most critical role in catalysing synthesis of tryptophan (Kozma, 1993a). Copper is one of the most important growth factors of the vine plant. One of its important roles is supporting of carbohydrate and protein synthesis (Kozma 1993a; Kállay, 2010).

Microelement content of the grape skin can also be interesting from the point of maceration technology at processing white aromatic grape cultivars, since by this way a certain amount of microelement of the skin dissolves into the must increasing its alkalinity (Kállay, 2010). Microelement content of the must further on

gets serious role through the fermentation process, because enzymatic activity of the yeast requires adequate amount and ratio of microelements (Erdőss, 1973). Further on, in the wine it is also significant from the point of formation of "minerality". This concept refers to the mineral content of the wine, also called "salinity". Both describe a special abundance in the taste complexity (Hajós, 2008).

The aim of our research was to determine how the B, Cu, Fe, Mn and Zn content of the berry skins changes in case of the different grape rootstocks. Data on mineral composition affected by different rootstocks are first year results of a longer, and more complex work.

MATERIALS AND METHODS

Grape variety collection of the University of Debrecen, Centre of Agricultural and Applied Economic Sciences was established in 2003 on immune sandy soil with 3m between row and 1m between vine spacing. 28 rootstock cultivars of the collection were trained to bald head system with one bended wire technology. In 2010 grafting of 'Cserszegi fűszeres' (also called 'Woodcutters' white') on 14 rootstocks out of the 28 was started with woody-green grafting in May, following with green grafting up to 20th of June. On vines grafted in place the scion was situated between 50-150 cm height. Scion was trained to single curtain training system (Figure 1.).

Figure 1. View from a grape variety collection of the University of Debrecen, Centre of Agricultural and Applied Economic Sciences

1st and 2nd tables show soil parameters of the experimental field in Pallag of 0-30 and 30-60 cm depth accordingly. To determine the fraction of soil B, Cu, Fe, Mn and Zn content, which could be utilized by the plant, analysis with NH_4-acetate + EDTA elution, elaborated by Lakanen and Erviö (1971) was used. Analysis of mineral composition of the elution was checked by Thermo Scientific iCAP 6300 Dual type inductively coupled plasma optical emission spectrometry (ICP- OES).

Table 1. Soluble (Lakanen and Erviö, 1971) B, Cu, Fe, Mn and Zn content of soil of Model Farm (mg kg-1)

Parameters	**Average (mg kg^{-1})**	
Sampling depth (cm)	0-30	30-60
B	0.63	0.60
Cu	9.95	7.02
Fe	239	213
Mn	329	382
Zn	6.93	4.65

Table 2. General parameters of soil of Model Farm

Parameters	**Average**	
Sampling depth (cm)	0-30	30-60
pH (KCl)	5.93	5.91
Soil texture	Sand	Sand
All water soluble salt (m/m)	0.005	0.006
$CaCO_3$ % (m/m)	0.5	0.5
Humic % (m/m)	1.12	1.08

In October of 2011 respectful amount of grape could be harvested of scions on 12 rootstock varieties. These are the following: *'Aramon x Riparia 143B M. et de G.', 'Vitis Berlandieri', 'Berlandieri x Riparia Szilágyi 157 Pécs', 'Berlandieri x Riparia S.O.4', 'Berlandieri x Riparia T5C Eger', 'Berlandieri x Riparia T.G. 5.A.5.', 'Berlandieri x Riparia T.8.B.', 'Berlandieri x Riparia T.K. 5.BB', 'Berlandieri x Riparia K.125AA', 'Riparia Sauvage', 'Riparia Selecta', 'Riparia Tomentosa'.*

The scion cultivar 'Cserszegi fűszeres' was ennobled by the crossing of 'Irsai Olivér' and 'Traminer' by Károly Bakonyi in Cserszegtomaj (Hungary). This middle ripe, white wine grape variety is commonly respected for its good wine quality and resistance to fungal diseases (Balogh, 1993; Bényei and Lőrincz, 1999). The point in selection of this cultivar for our study is to focus on its sensitivity to dry periods, and effects of rootstock cultivars on this feature.

Sample preparation and analyses were performed in laboratory of University of

Debrecen, Centre for Agricultural and Applied Economic Sciences, Institute of Food Sciences, Quality Assurance and Microbiology.

By the analysis 5 elements were checked (B, Cu, Fe, Mn and Zn) in three replications. The skin was separated and cleared in laboratory circumstances with laboratory tools (tweezers, flasks). Chemical maceration of the samples was carried out with the use of HNO_3 (wet and closed). Prepared samples were analysed by Thermo Scientific iCAP 6300 Dual type inductively coupled plasma optical emission spectrometry (ICP-OES).

Statistical evaluation of data was done by SPSS v. 14.0 (IBM Company). Correlation between parameters and factors was checked by One-Way ANOVA and Tukey-test. Probes were deemed significant below 5% P-value. Average, deviation and relative standard deviation (RSD%) were also calculated.

RESULTS AND DISCUSSIONS

Our inspection aimed to answer, how change different rootstocks affect B, Cu, Fe, Mn and Zn content of berry skin of 'Cserszegi fűszeres'. 3rd table presents berry skin analytical results of 'Cserszegi fűszeres' grafted on different rootstocks expressed on dry matter basis. Bolded values represent the highest, bolded and dented values represent the lowest concentration.

1. Results of boron concentration

Data clearly show, that the lowest difference was experienced in regard to the different rootstocks in case of boron. The relative standard deviation between the rootstocks was 22.3%, with a mean value of 22.7 mg kg^{-1}. The highest level was experienced at berry skin samples at *'Riparia Sauvage'*, while the lowest value was experienced at *'Berlandieri x Riparia S.O.4'*.

2. Results of copper concentration

Results show, that significant differences were detected between berry skin Cu contents of 'Cserszegi fűszeres' grafted on different rootstocks. The relative standard deviation between Cu content measured in the berry skins was 36.6%, with a mean value of 2.58 mg kg^{-1}. The highest Cu-level was experienced at 'Berlandieri x Riparia Sz 157 Pécs', while the lowest value was experienced at *'Berlandieri x Riparia T5C Eger'*.

3. Results of iron concentration

Significant differences were experienced in case of iron content of the berry skins of 'Cserszegi fűszeres' grafted on different rootstocks. The relative standard deviation of iron content measured in berry skin is 33.3%. The calculated mean value was 26.8 mg kg^{-1}. The highest iron concentration was measured at 'Cserszegi fűszeres' grafted on *'Riparia Sauvage'*, while the lowest was measured at *'Berlandieri x Riparia T5C Eger'*.

4. Results of manganese concentration

Significant differences were experienced in case of manganese concentration of the berry skins in case of the different rootstocks. The relative standard deviation of different rootstocks was 35.1%, with a calculated 9.54 mg kg^{-1} mean value. The highest manganese concentration was measured at skin samples of 'Cserszegi fűszeres' standing on *'Riparia Sauvage'*, the lowest value was measured at *'Berlandieri x Riparia Sz 157 Pécs'*.

5. Results of zinc concentration

Data show well, that the highest differences between rootstocks were experienced at zinc concentration In respect to this element, the relative standard deviation was 40.5%, and the calculated mean value was 4.42 mg kg^{-1}. The highest value was measured in case of *'Vitis Berlandieri'*, the lowest value was experienced at *'Berlandieri x Riparia Sz 157 Pécs'*.

Table 3. Element content of the berry skins of 'Cserszegi fűszeres' grafted on different rootstocks (n=3) (2011, Pallag)

ROOTSTOCKS	B (mg kg^{-1})	Cu (mg kg^{-1})	Fe (mg kg^{-1})	Mn (mg kg^{-1})	Zn (mg kg^{-1})
'AxR 143B M et de G'	31.9^{c}±0.4	1.93^{c}±0.03	16.8^{b}±0.2	8.07^{d}±0.09	3.66^{cd}±0.14
'V. BERLANDIERI'	20.2^{b}±0.6	2.64^{e}±0.05	30.7^{f}±0.6	13.1^{g}±0.1	**8.53^{h}±0.12**
'BxR SZ 157 Pécs'	18,4^{a}±0,2	**4.77^{h}±0.15**	23.2^{d}±0.7	***3.78^{a}±0.16***	***2.14^{a}±0.04***
'BxR S.O.4'	***18.0^{a}±0.3***	3.03^{f}±0.06	21.3^{c}±0.3	5.76^{b}±0.14	3.49^{c}±0.08
'BxR T5C Eger'	19.0^{ab}±0.6	***1.27^{a}±0.05***	***11.5^{a}±0.1***	7.47^{cd}±0.16	2.25^{a}±0.04
'BxR T.G. 5.A.5.'	22.0^{c}±1.1	2.16^{cd}±0.08	27.5^{e}±1.0	7.69^{cd}±0.49	4.31^{de}±0.29
'BxR T.8.B.'	26.4^{d}±1.0	3.09^{f}±0.08	30.3^{f}±0.3	12.0^{f}±0.4	4.57^{f}±0.10
'BxR T.K. 5.BB'	18.1^{a}±0.1	2.59^{e}±0.05	31.8^{f}±0.3	10.2^{e}±0.2	4.99^{f}±0.13
'BxR K.125 AA'	24.9^{d}±0.1	3.55^{g}±0.08	36.7^{g}±0.3	12.5^{fg}±0.4	4.63^{ef}±0.17
'R. SAUVAGE'	**32.0^{e}±0.2**	2.30^{d}±0.02	**45.0^{h}±0.9**	**14.0^{h}±0.1**	4.95^{f}±0.08
'R. SELECTA'	19.4^{ab}±0.3	1.59^{b}±0.02	24.3^{d}±0.6	12.9^{g}±0.5	6.51^{g}±0.22
'R. TOMENTOSA'	22.7^{c}±0,3	2.07^{c}±0.06	23.0^{d}±0.5	6.92^{c}±0.22	3.01^{b}±0.10

Different letters indicate significant differences between rootstocks regarding the element (P < 5%)

CONCLUSIONS

In this research work berry skin B-, Cu-, Fe-, Mn-, and Zn- concentration data have been processed.

Based on our examination it could be stated, that there are significant differences in mineral content of the berry skins of 'Cserszegi fűszeres' grafted on different rootstocks in regard to the listed elements. The highest relative standard deviation was experienced in the case of zinc, while the lowest relative standard deviation was shown in the case on boron. Differences between experienced concentrations can either be due to the genetic factor, thus to the different rootstocks, or to climatological factors of the vintage, that greatly affect mineral status of the vine (Szőke and Kiss, 1987; Csikászné, 2008). For evaluation of genetic and climatological (vintage) factors data of many years' experiment is to be collected.

Based on our results, it could supposed, that *'Riparia Sauvage'* could be an advantageous rootstock, since the highest values on B, Fe and Mn were measured in berry skin samples of 'Cserszegi fűszeres' grafted on this rootstock variety. From the point of the highest Cu concentration *'Berlandieri x Riparia Szilágyi 157 Pécs'*, while in respect to the Zn concentration *'Vitis Berlandieri'* could be highlighted.

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THE INFLUENCE OF DEVELOPMENT LEVEL OF VINES ON THE BIOMETRIC INDICES OF CARDINAL VARIETY

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Abstract

The grape quality is determined by the development of vines. Homogeneity of plant development depends on the quality of planting material and agrotechnics used. In our study on vineyards, the vines were classified in three groups - the small, medium and large vines. The vines within each group were studied weak, medium and strong shoots, setting a specific correlation.

Key words: *biometric indices, Cardinal variety, influence.*

INTRODUCTION

Viticulture is and will remain one of the basic branches of economy of the Republic of Moldova. Today the scientists are working to select the varieties and clones resistant to various adverse factors, high productivity and quality. Moldova has favorable conditions for growing grapes, but winters in recent years have lower minimum temperatures influencing productivity and quality. Therefore, recommended to protect the vines of table grapes' varieties and clones with soil even in the South of Moldova, especially varieties with early bud break, for example, the table grape variety Cardinal.

The grapes' resistance to frost and winter conditions is a multilateral particularities of the vines, because gradually formed long before installing the low temperatures. This complex of characteristics and agronomic measures are determining the longevity of vineyard plantation and the development level of vines. The vines of the Cardinal variety are characterized with average growth vigor. Level vine growth is determined mostly by the homogeneity and quality planting material.

The vigor of varieties is given with in a length and diameter of the shoots. In the experience, we studied both data diameter as well as length.

MATERIALS AND METHODS

The vineyards which we studied are located in Copceac village, Stefan Voda district, in a South-East part of Republic of Moldova, in 2011-2012 years.

The vines of vineyards were classified into three categories: small grow vigor, medium grow vigor and large grow vigor and the shoots were classified into the same three categories.

The observations and analyzes were performed according to current guidelines (Mănescu, Creola, ş.a., 1989; Perstniov, N, ş.a., 2000).

Results were processed by the method of correlation and regression analysis:

- small grow vigor vines (y_1, y_2, y_3, y_4), medium grow vigor vines (y_9, y_{10}, y_{11}, y_{12}), large grow vigor vines (y_{17}, y_{18}, y_{19}, y_{20}), general data (y_{25}, y_{26}, y_{27}, y_{28});
- small grow vigor shoots (y_1, y_9, y_{17}, y_{25}), medium grow vigor shoots (y_2, y_{10}, y_{18}, y_{26}), large grow vigor shoots (y_3, y_{11}, y_{19}, y_{27}), general data (y_4, y_{12}, y_{19}, y_{28}).

RESULTS AND DISCUSSIONS

Cardinal-is an early table grape variety. The grapes are large, cylindrical-conical shape. The berry density is different. The berries are very large, spherical or oval, red-violet, covered with obscure bloom. The peel is thick, but edible. The berries begin to ripening in late I-II decade of august. Productivity is high. The grapes have a high transportability.

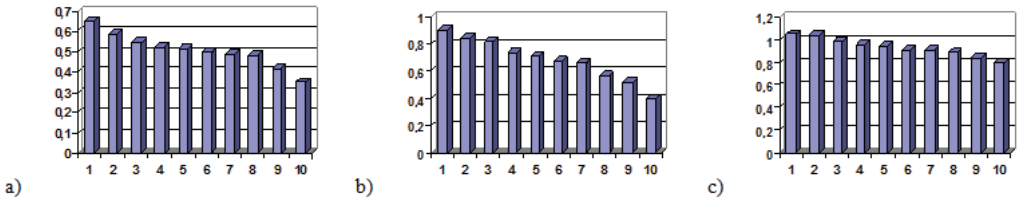


Figure 1. The diameter of internodes of shoots with small grow vigour
(a-small vigour shoots, b-medium vigour shoots, c-large vigour shoots)

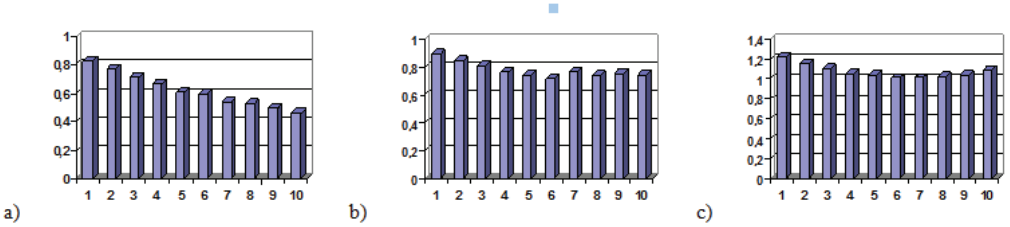


Figure 2. The diameter of internodes of shoots with medium grow vigour
(a-small vigour shoots, b-medium vigour shoots, c-large vigour shoots)

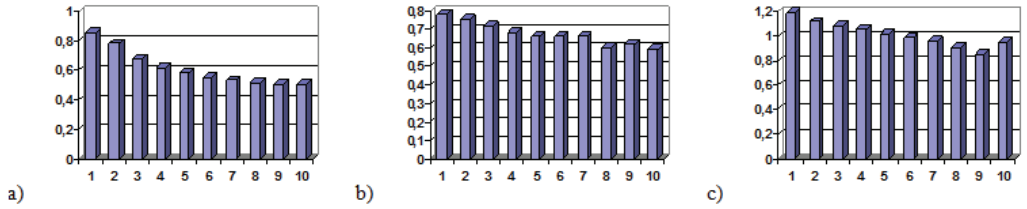


Figure 3. The diameter of internodes of shoots with large grow vigour
(a-small vigour shoots, b-medium vigour shoots, c-large vigour shoots)

The data from figure 1 showed that the diameters of internodes of small grow vigor was between 0,35 to 0,65 cm for small shoots, from 0,40 to 0,94 cm for medium shoots and from 0,79 to 1,05 cm.

The data from figure 2 showed that the diameters of internodes of medium grow vigour was between 0,46 to 0,83 cm for small shoots, from 0,74 to 0,89 cm for medium shoots and from 1,09 to 1,22 cm.

The data from figure 3 showed that the diameters of internodes of large grow vigor was between 0,51 to 0,85 cm for small shoots, from 0,59 to 0,78 cm for medium shoots and from 0,94 to 1,20cm.

The data from figure 4 showed that the length of internodes of small grow vigor was between 1,60 (1^{st} internodes) to 4,10 cm (8^{th} internodes) for small shoots, from 3,85 (1^{st} internodes) to 7,25 cm (4^{th} internodes) for medium shoots and from 2,63 (1^{st} internodes) to 7,90 cm (5^{th} internodes).

The data from figure 5 showed that the length of internodes of medium grow vigor was between 2,30 (1^{st} internodes) to 7,27 cm (5^{th} internodes) for small shoots, from 3,13 (1^{st} internodes) to 9,80 cm (8^{th} internodes) for medium shoots and from 3,84 (1^{st} internodes) to 11,74 cm (5^{th} internodes).

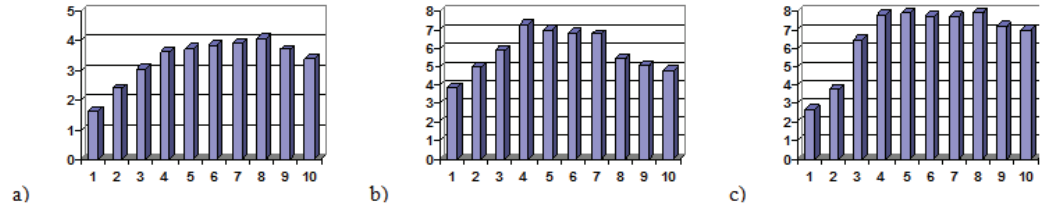


Figure 4. The length of internodes of shoots with small grow vigour (a-small vigour shoots, b-medium vigour shoots, c-large vigour shoots)

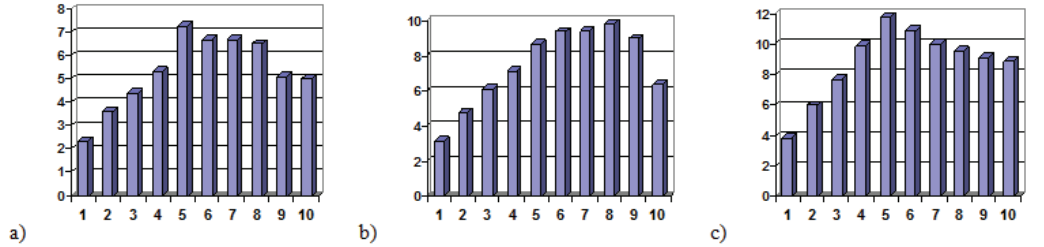


Figure 5. The length of internodes of shoots with medium grow vigour (a-small vigour shoots, b-medium vigour shoots, c-large vigour shoots)

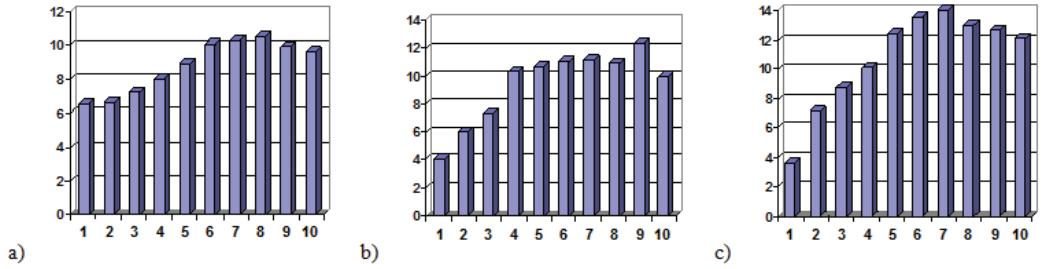


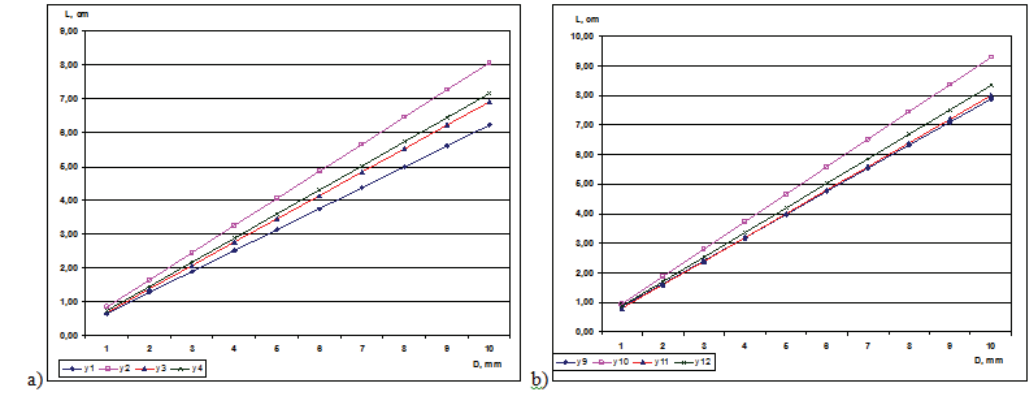
Figure 6. The length of internodes of shoots with large grow vigour (a-small vigour shoots, b-medium vigour shoots, c-large vigour shoots)

The data from figure 6 showed that the length of internodes of large grow vigor was between 6,53 (1st internodes) to 10,50 cm (8th internodes) for small shoots, from 4,10 (1st internodes) to 12,40 cm (9th internodes) for medium shoots and from 3,64 (1st internodes) to 14,00 cm (7th internodes).

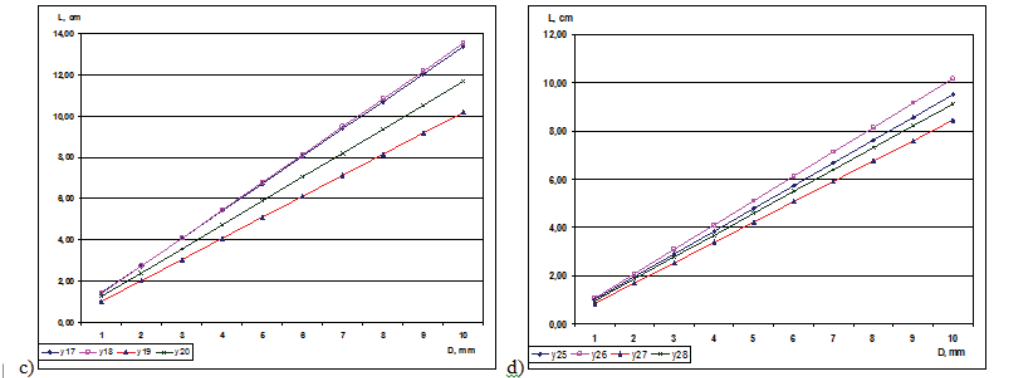
The data from figure 7 showed the correlation between the length and diameters of internodes for each group of shoots and grow vigor of vines. For small vines we obtained the next equation of regression y_4=0,02761+0,7134x, correlation coefficient r=0,46, coefficient of determination d_{yx}=0,2116 (figure 7a). For medium vines we obtained the next equation of regression y_{12}=0,03575+0,8317x, correlation coefficient r=0,28, coefficient of determination d_{yx}=0,0784 (figure 7b). For large vines we obtained the next equation of regression y_{20}=0,09795+1,1592x, correlation coefficient r=-0,08, coefficient of determination d_{yx}=0,0064 (figure 7c). For all vines (the general data), we obtained the next equation of regression y_{28}=0,05181+0,9067x, correlation coefficient r=0,21, coefficient of determination d_{yx}=0,0441 (figure 7d).

The general data of all vines for small vigor shoots showed the next equation of regression y_{25}=0,05324+0,9454x, correlation coefficient r=-0,07, coefficient of determination d_{yx}=0,0049 (figure 7d). For medium vigor shoots showed the next equation of regression y_{26}=0,04636+1,0117x, correlation coefficient r=-0,32, coefficient of determination

d_{yx}=0,1024 (figure 7d). For high vigor shoots showed the next equation of regression y_{27}=0,02148+0,8435x, correlation coefficient r=-0,37, coefficient of determination d_{yx}=0,1369 (figure 7d).



y_1=0,03853+0,6186x	r=-0,69+-0,26	d_{yx}=0,4761	y_9=0,06944+0,7819x	r=-0,68+-0,26	d_{yx}=0,4624
y_2=0,04423+0,8024x	r=-0,01+-0,35	d_{yx}=0,0001	y_{10}=0,02371+0,928x	r=-0,88+-0,17	d_{yx}=0,7744
y_3=0,01789+0,6913x	r=-0,69+-0,26	d_{yx}=0,4761	y_{11}=0,01651+0,7994x	r=-0,95+-0,11	d_{yx}=0,9025
y_4=0,02761+0,7134x	r=0,46+-0,17	d_{yx}=0,2116	y_{12}=0,03575+0,8317x	r=0,28+-0,18	d_{yx}=0,0784



y_{17}=0,10386+1,327x	r=-0,93+-0,13	d_{yx}=0,8649	y_{25}=0,05324+0,9454x	r=-0,07+-0,19	d_{yx}=0,0049
y_{18}=0,04482+1,3498x	r=-0,85+-0,19	d_{yx}=0,7225	y_{26}=0,04636+1,0117x	r=-0,32+-0,18	d_{yx}=0,1024
y_{19}=0,03991+1,0205x	r=-0,88+-0,17	d_{yx}=0,7744	y_{27}=0,02148+0,8435x	r=-0,37+-0,18	d_{yx}=0,1369
y_{20}=0,09795+1,1592x	r=-0,08+-0,19	d_{yx}=0,0064	y_{28}=0,05181+0,9067x	r=0,21+-0,1	d_{yx}=0,0441

Figure 7. Results of correlation and regression analysis between length and diameters of internodes of shoots

CONCLUSIONS

The correlation between the length and diameters of internodes for small, medium and large grow vigor of vines showed the insignificant weak correlation between these indicators. This is due to the biology of variety, quality of planting material and climatic conditions.

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RESEARCH REGARDING THE INFLUENCE OF THE HYBRID AND THE NUMBER OF STEMS ON THE FIELD PRODUCTION OF TOMATO PLANTS

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Abstract

The tomato crop started near Bucharest city, in a favourable area for vegetable growing, using 3 tomato crossbreeds, pruned with one and two stems in order to study their behaviour from the vegetative and fruit forming point of view. The biological material used for this particular experiment was 3 indeterminate, disease-resistant tomato hybrids, with fruits of roughly 150g, round and regular. The plants were pruned with two stems, the first one being the main and the second being formed from the first shoot located at the base of the plant. The crop was propped on trellis, with 5 clusters and mulched with agro textile material; the planting scheme was 100cm/40cm for variants pruned with two stems and 80cm/40 for variants pruned with one stem. The results showed that all studied hybrids had a satisfactory vegetative growth, proved by the height of the plants and their leaves, for both the main and the second stem. In what regards the formation of fruits, the plants with two stems provided a larger quantity. Thus, the number of fruits per plant was almost double for variants with two stems, the average fruit weight registered similar values for both treatments, but a considerably higher fruits yield was noted for Veneţia F1and Rhuen F1 hybrids.

Key words: *tomato, hybrids, two stems, yield.*

INTRODUCTION

Tomato cropping is possible in various systems due to the satisfactory results obtained when technological optimization is used. Tomato pruning with multiple stems is one of these improvements, which leads to cost reduction for the planting material, hence 20% less plants per hectare in comparison with one stem crops (Hoza, 2011). This pruning system is widely used in a protected environment, in extended cycle as far as our country is concerned, but it can also be practiced in farm field. Usually, tomato plants are pruned with one stem, however they can also be pruned with 2-3 stems for commercial crops and 4 stems for decorative purposes, in which case plants are propped variously. Research regarding the tomato plants cropped at varied densities, namely 60cm/40cm and 60cm/50cm respectively, pruned with 1,2 or 3 stems proved that a higher distance between plants on the row combined with 2 stems pruning, conducted to the highest total and marketable yield (Ara et all., 2007). Other experiments show that plants pruned with 2 stems and 6 fruits per cluster or 2 stems and no fruit pruning gave a significantly higher marketable and total yield; the 3 plants/m^2 density issued in a considerably higher marketable crop in comparison with the 2,5 or 2 plants/m^2 density and the results proved that the tomato yield and the fruit quality can be influenced by the number of stems and the plant density, while fruit pruning proved little effect on the aforementioned features (Maboko et al., 2011). Moreover, pruning tomato plants with 2 stems proves to have a significant positive influence on the crop quality and plant health (Kanyomeka and Shivute, 2005).

MATERIALS AND METHODS

The research was conducted near Bucharest city, in very favourable climatic conditions for tomato crops. The experiment was outlined in two straps, with two exponents (Table 1):
-Exponent A, represented by hybrids, with 3 graduations
-Exponent B, represented by the number of stems, with 2 graduations
The planting was made in simple rows at 80cm/40cm for variants pruned with one stem and a leading density of 3.1 pl/m^2 and

100cm/40cm for variants pruned with two stems and a leading density of 2,5 pl/m^2, with transplanted seedling. The crop was subjected to specific maintenance work, the field was mulched with agrotextile material, with 5 clusters and plants were propped by metallic trellis on1,8 m height. At variants pruned with two stems, the second stem was formed from the first shoot located at the base of the plant which was V propped on band. During the vegetation period, data was collected regarding the growth of the plants, flower formation, fruit binding, resulted yield and fruit size.

Table 1. The scheme of the experiment

A Exponent	B Exponent	
Veneţia F_1	V_1 (Mt) - Veneţia F1, one stem	V_2 – Veneţia F1, two stems
Fournaise F_1	V_3 – Rhuen F1, one stem	V_4 – Rhuen F1, two stems
Ruen F_1	V_5 – Fournaise F1, one stem	V_6 – Fournaise, F1 two stems

RESULTS AND DISCUSSIONS

Tomato pruning with two stems represents an alternative for growers in what regards the reduction of plants on the cropping field without the fruits yield being affected. From research it is clear that from the vegetative growth point of view, there were no significant differences between the variant pruned with one stem and the other pruned with two stems, as long as the appropriate and regular agro-technological procedures were conducted equally (Table 2 and 3).

Table 2. The height of the main stem

Variant	V_1 (Mt) Veneţia F1 one stem	V_2 Veneţia F1 two stems	V_3 Rhuen F1 one stem	V_4 Rhuen F1 two stems	V_5 Fournaise F1, one stem	V_6 Fournaise F1 two stems
H (cm)	102.5	100.3	95.7	82.8	101.6	81.3

Table 3. The height of the shoot stem

Variant	V_2 Veneţia F1 two stems	V_4 Rhuen F1 two stems	V_6 Fournaise F1 two stems
H (cm)	99.0	93.1	87.7

In what regards the distance between clusters, it was observed that differences of some centimeters between the variant pruned with one stems and the ones pruned with two stems did not affect the fructification process.

The Veneţia F1 hybrid registered the highest regularity, the differences noted being under 1,5 cm (Table 4 and 5).

Table 4. The synthesis of results regarding the average distance between clusters on main

Variant	Average distance between clusters			
	1 - 2	2 - 3	3 - 4	4 - 5
V_1 (Mt) – Veneţia F1 one stem	13.5	13.9	15.2	15.5
V_2 - Veneţia F2 two stems	14.1	13.3	15.1	13.9
V_3 - Rhuen F1 one stem	7.4	9.4	10.4	10.1
V_4 – Rhuen F1 two stems	11.1	13.6	15.1	17.4
V_5 – Fournaise F1 one stem	12.8	12.5	16.6	15.4
V_6 – Fournaise F1 two stems	8.4	11.0	14.2	8.6

Table 5. The synthesis of results regarding the average distance on the second stem

Variant	Average distance between clusters			
	1 - 2	2 - 3	3 - 4	4 - 5
V_2 - Veneţia F1 two stems	14.4	13.5	14.8	13.8
V_4 – Rhuen F1 two stems	11.7	14.0	14.7	16.9
V_6 – Fournaise F1 two stems	9.6	11.4	12.6	9.4

The process of fruit forming was developed in optimal conditions, for both one stem and two stems plants. Thus, it was noted that Veneţia F1 hybrid fructified on clusters similarly for both cases. However, on the second stem, on clusters 1 and 2, the number of fruits was slightly higher probably due to the optimization of environmental conditions. For other hybrids, the differences observed were smaller. The total number of fruits on the main stem was contiguous for studied hybrids, but Veneţia F1 and Rhuen F1 produced 2-3 more fruits when they were pruned with two stems (Table 6). The second stem showed a high regularity of fruits formation on each cluster and the total number of fruits was conformable with the one on the main stem (Table 7).

Table 6. The synthesis of results regarding the average number of fruits formed on the main stem

Variant	Average number of fruits formed on cluster					Total number of fruits
	1	2	3	4	5	
V_1 (Mt) – Veneţia F1 one stem	3.3	3.4	4.8	5.2	5.2	21.9
V_2 - Veneţia F1 two stems	5.3	5.4	4.8	4.8	4.9	25.2
V_3 - Rhuen F1 one stem	4.2	3.6	4.9	4.6	4.5	21.8
V_4 – Rhuen F1 two stems	4.2	3.7	4.7	5.3	5.6	23.5
V_5 – Fournaise F1 one stem	4.7	4.4	4.7	5.1	5.1	24.0
V_6 – Fournaise F1 two stems	4.5	5.0	4.1	5.2	5.0	23.8

Table 7. The synthesis of results regarding the average number of fruits formed on the second stem

Variant	Average number of fruits formed on cluster					Total number of fruits
	1	2	3	4	5	
V_2 - Veneţia F1 two stems	4.9	4.8	4.6	4.4	3.9	22.6
V_4 – Rhuen F1 two stems	3.9	3.6	4.1	4.9	4.7	21.2
V_6 – Fournaise F1 two stems	4.3	4.7	3.8	4.7	4.3	21.8

Integrating the number of fruits formed on stems, it was ascertained that the second stem produced lower figures, namely 2-3 less fruit than the main stem, but overall, the total number of fruits obtained was almost double for variants pruned with two stems.

Table 8. The synthesis of results regarding the average number of fruits formed on plant

Variant	Average number of fruits		Total number of fruits
	Main stem	Second stem	
V_1 (Mt) – Veneţia F1 one stem	21.9	-	21.9
V_2 - Veneţia F1 two stems	25.2	22.6	47.8
V_3 – Rhuen F1 one stem	21.8	-	21,.8
V_4 – Rhuen F1 two stems	23.5	21.2	44.7
V_5 – Fournaise F1 one stem	24.0	-	24.0
V_6 - Fournaise F1 two stems	23.8	21.8	45.6

The number of fruits was compassed between 21,8 and 25,2 on main stem and 21,2 and 22,6 on shoot stem.

In what regards the average weight of fruits, there were no significant differences between fruits obtained on the main stem and the ones from the second stem. However, it was observed that fruits formed on the shoot stem were slightly smaller than the ones from the main stem (Table 9).

Pruning plants with two stems brings a roughly yield doubling on plant level (Table 10). This proves to be a great advantage because considering other features studied, such as the number of fruits and their size, it is very contiguous for both stems. The highest tomato yield was obtained on Veneţia F1 hybrid pruned with two stems, 5,2 kg/pl, followed by Fournaise F1 with 4,9 kg/pl and Rhuen F1 with 4,7 kg/pl.

Table 9. The synthesis of results regarding the average weight of fruits

Variant	Average weight of fruits on main stem (g)	Average weight of fruits on second stem (g)	Average weight of fruits on plant (g)
V_1 (Mt) – Veneţia F1 one stem	113.9	-	113.9
V_2 –Veneţia F1 two stems	109.1	108.4	108.8
V_3 – Rhuen F1 one stem	120.5	-	120.5
V_4 - Rhuen F1 two stems	106.2	103.9	105.0
V_5 – Fournaise F1 one stem	112.4	-	112.4
V_6 -Fournaise F1 two stems	107.7	105.3	106.5

Statistically analysing the fruit quantity on plants pruned with one and two stems, it was ascertained that those pruned with two stems provided a higher yield per plant and per farming area (Table 10).

Table 10. Statistic interpretation of results regarding the influence of the number of stems on tomato yield

Variant	Yield							
	kg/pl	%	Gap	Meaning	kg/m²	%	Gap	Meaning
V_1 (Mt) – Veneţia F1 one stem	2.5	100	-	Mt	7.8	100	-	Mt
V_2 –Veneţia F1 two stems	5.2	208	2.7	xxx	13.0	166.6	5.2	xxx
V_3 – Rhuen F1 one stem	2.6	104	-	NS	8.0	102.6	-	NS
V_4 – Rhuen F1 two stems	4.7	188	2.1	xxx	11.8	151.3	3.8	xxx
V_5 – Fournaise F1 one stem	2.7	108	-	NS	8.3	106.4	-	NS
V_6 - Fournaise two stems	4.9	196	2.2	xxx	12.2	156.4	3.9	xxx

DL 5% = 0,3 kg/pl; DL 1% = 0,44 kg/pl; DL 0,1% = 0,63 kg/pl
DL 5% = 1,18 kg/sqm; DL 1% = 1,69 kg/sqm; DL 0,1% =2,44 kg/sqm

CONCLUSIONS

The research conducted on tomato plants pruned with one and two stems can be followed by the next conclusions:

The number of seedlings used to start the crop was reduced with 20% by increasing the distance between rows up to 100 cm;

The quantity of fruits per plant significantly grew on variants pruned with two stems, F1 Veneţia F1 hybrid even reaching roughly twice as many fruits for that particular treatment;

The yield per farming area increased due to higher yield per plant, even though the number of plants was reduced by 20%;

The size of the obtained fruits was appropriate for the hybrids used;

The number of fruits and their size was slightly smaller on the second stem for all studied hybrids;

Plants proved a highly satisfactory vegetative growth, which lead to a similar fruit binding.

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TYPE OF TRELLISING AND FOLIAR FERTILIZATION INFLUENCE ON YIELD AND QUALITY FOR NEW VARIETIES OF GHERKINS (*CUCUMIS SATIVUS* L.) WITH PARTHENOCARPIC FRUITING

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Abstract

This study was conducted during 2009-2010 in southern Dâmbovita County, in order to determine the impact of foliar fertilization on the production and its quality on five hybrids of cucumber gherkins: Promisa, Trilogy, Karaoke, Kybria and Componist and were obtained results with significant differences. Hybrids were planted in the same soil type and bearing the same climatic conditions, differences occurred in the production were attributed to variants studied. Immediately after establishment of experimental culture, fertilization were made every 10 days with application of bio-fertilizer as appropriate technological practices, also were performed observations and measurements on the production and quality of the varieties analyzed.

Key words: *Cucumis sativus L., fertilization, production, quality, gherkins.*

INTRODUCTION

In traditional agriculture losses of elements used in fertilization are important, especially in the N: P: K case, representing an important economic problem (Guerrero, 1998). Fractionation of fertilization and application in critical phases is recommended by most researchers (Cadahia, 2000; Guzmán, 2004; Pizarro, 1987). Foliar fertilization creates a positive impact on production in most varieties and hybrids (Solorzano, 2001).

Researches regarding the technology of cultivation gherkins cucumbers were conducted during 2009-2011 in the Tartasesti, Dâmbovita County, in the family-owned farm. Taking into account the pedoclimatic conditions of the south area of the country and climate conditions, the applied technology present a special importance for obtaining high productions and high quality. Foliar fertilization represents a rare piece of technology applied in the Lunguletu-Brezoaele vegetable basin area (which includes Tartasesti), solar crops of vegetables being established in small areas, the most important are field crops of vegetable, maintained on the traditional principles of agriculture.

Have been attempted combining two elements of technology, leading and trellising mode of the plant with foliar fertilization regime, the approach together of the two elements of technology in a area where protected vegetable crops have a low share will lay the foundation for future investment in the area (Petrescu, 1992; Popescu V and Atanasiu N., 2001)

Following research it was observed that the driving of the plant and foliar fertilization led to positive results on the production and quality of gherkins cucumbers, results that support the necessity of introducing in the technology of gherkins culture new elements that will come as a completion of higher genetic potential of new hybrids being subject of this study. The main purpose of this research represents the introduction of new elements of technology in parallel with the discovery of better hybrids adapted to the climatic conditions of the area.

Therefore, research will highlight the following aspect:

- obtaining high yields as a result of foliar fertilization and of the plant leading type on trellises;
- correlation between growing phased and total production under the influence of technology elements;
- productivity of analyzed hybrids.

MATERIALS AND METHODS

For biological material selection were taken into account first of all the necessity of using high temperature resistant varieties (the South area of the country and growing in protected areas) and very productive. For this were identified five RZhybrids (Kybria, Karaoke, Compomist, Trilogy si Promisa). The experience was polyfactorial one where experimental factors have been the following:

- Factor A – Hybrid:

A_1 – Kybria;
A_2 – Karaoke;
A_3 – Compomist;
A_4 – Trilogy;
A_2 –Promisa.

- Factor B – Leading mode:

B_1 – The plants were led up to a maximum height of 2.5 m. The first 30 cm were maintained without fruit, next 50 cm one fruit on each side sprig preserving all the fruits of main stalk nodes, and from ˜ 80 cm has not been intervened on the fructification.

B_2 – The first 50 cm were maintained without fruit, then for the next 50 cm were kept one fruit on side sprig and all the fruit on the main stem and from 100 cm height were kept absolutely all the fruit, as illustrated.

- Factor C – Foliar fertilization:

C_1 – CROPMAX: biological product according E.U.
C_2 – BIONAT PLUS: product approved by permit no. 391/16.03.2007.
C_2 – BIOLEAFZ: is a liquid plants stimulant.

RESULTS AND DISCUSSIONS

During 2009-2011 the results of plants growth concerning the stem growing height, number of sprigs of orders I and II, number of leafs, number of female flowers and number of related fruits appeared, showed some differences, thus demonstrating the influence of experimental factors on production and its quality.

As a result, at some variants the hight of plants was different and the number of fruits was influenced by the leading mode of the stem and applied foliar fertilizer. The differences were more pronounced at the beginning of vegetation, first floor of 30 cm and 50 cm high which has not have retained fruit having a obvious influence.

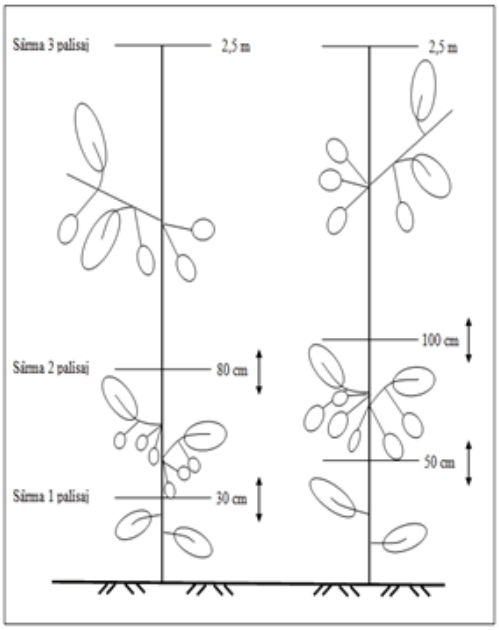

Figure 1. Trellising schemes used in research

Foliar nutrient solutions applied at the same stage of development of the plant, regardless of hybrid, had a positive influence on the vegetative growth for variant B_2 (50/100/250), plants having a strictly vegetative growth period until they reached the 50 cm height (compared with plants where it was applied variant B_1-30/80/250).

In 2009, concerning increase in height of plants, it was found that the variant B_2-50/100/250 had higher results compared to B_1-30/80/250.

In 2010, the trends were similar, hybrid reaching 234 cm led by the same scheme and foliar fertilized with the same solution.

Maximum height reached in 2010 is detained also by Compomist hybrid, but led to the scheme B_1-30/80/250 and foliar fertilized with CROPMAX.

CONCLUSIONS

Plants grown after B_1-30/80/250 leading mode showed less vegetative growth than plants grown after B_2-50/100/250 leading mode.

Compomist F1 hybrid reaches value of 239 cm in height in 2009, led by B_2-50/100/250 scheme and fertilized with BIONAT. In 2010 the results were similar.

Promisa F1 with the scheme B_1-30/80/250 determined a total of 41 fruits representing the maximum number and Trilogy F1 determined 19 number of fruits with the scheme B_2-50/100/250 in the year 2009.

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Table 1. Records of growing and developping of plants, Tartasesti, 2009

No.	VARIANT			Plant height (cm)	No. of tillers		No. of leafs	No. of flowers	No. of related fruits
	HYBRID	LEADING	FERTILIZATION		Tipe. I	Tipe. II			
1	A_1 - Kybria								
2	A_2 - Karaoke			228	17	24	64	31	25
3	A_3 -	B_1		215	12	19	69	29	27
4	Compomist	(30/80/250)		232	14	20	65	38	31
5	A_4 - Trilogy			226	12	23	72	42	37
	A_5 - Promisa		C_1	224	11	29	73	46	40
6	A_1 - Kybria		CROPMAX	230	10	17	68	32	28
7	A_2 - Karaoke			238	9	19	70	34	25
8	A_3 -	B_2		232	12	22	61	31	24
9	Compomist	(50/100/250)		225	10	14	74	42	38
10	A_4 - Trilogy			229	8	19	77	40	34
	A_5 - Promisa								
11	A_1 - Kybria								
12	A_2 - Karaoke			228	12	22	61	39	32
13	A_3 -	B_1		236	9	17	67	35	29
14	Compomist	(30/80/250)		210	13	21	64	38	35
15	A_4 - Trilogy			224	15	23	76	39	30
	A_5 - Promisa		C_2	257	12	19	68	38	36
16	A_1 - Kybria		BIONAT	224	9	24	69	33	27
17	A_2 - Karaoke			236	11	19	66	31	29
18	A_3 -	B_2		239	7	23	63	29	25
19	Compomist	(50/100/250)		218	12	20	69	40	29
20	A_4 - Trilogy			224	10	19	67	43	35
	A_5 - Promisa								
21	A_1 - Kybria								
22	A_2 - Karaoke			208	14	28	62	42	40
23	A_3 -	B_1		222	10	30	69	29	24
24	Compomist	(30/80/250)		235	16	25	70	36	32
25	A_4 - Trilogy			238	12	20	74	31	29
	A_5 - Promisa		C_3	227	11	26	69	44	41
26	A_1 - Kybria		BIOLEAFZ	216	12	18	64	41	38
27	A_2 - Karaoke			221	8	14	72	34	29
28	A_3 -	B_2		219	11	21	71	28	21
29	Compomist	(50/100/250)		233	11	22	68	36	19
30	A_4 - Trilogy			230	9	19	66	33	28
	A_5 - Promisa								

Table 2. Records of growing and developping of plants, Tartasesti, 2010.

Nr.	VARIANT			Plant height (cm)	No. of tillers		No. of leafs	No. of flowers	No. of related fruits
	HYBRID	LEADING	FERTILIZATION		Tipe. I	Tipe. II			
1	A_1 - Kybria								
2	A_2 - Karaoke			223	10	21	61	29	26
3	A_3 -	B_1		219	13	22	64	30	26
4	Compomist	(30/80/250)		238	15	18	67	36	28
5	A_4 - Trilogy			237	12	21	74	46	41
	A_5 - Promisa		C_1	225	16	27	70	43	39
6	A_1 - Kybria		CROPMAX	236	11	19	66	34	27
7	A_2 - Karaoke			223	9	18	68	33	28
8	A_3 -	B_2		211	11	24	64	29	26
9	Compomist	(50/100/250)		235	12	17	77	47	39
10	A_4 - Trilogy			228	10	21	79	44	33
	A_5 - Promisa								
11	A_1 - Kybria								
12	A_2 - Karaoke			229	11	24	60	38	31
13	A_3 -	B_1		234	16	21	66	36	32
14	Compomist	(30/80/250)		218	12	17	67	33	25
15	A_4 - Trilogy			220	10	22	72	40	38
	A_5 - Promisa		C_2	217	11	24	69	39	36
16	A_1 - Kybria		BIONAT	226	10	22	65	28	26
17	A_2 - Karaoke			232	10	21	64	35	31
18	A_3 -	B_2		234	8	24	60	31	24
19	Compomist	(50/100/250)		221	11	18	58	41	30
20	A_4 - Trilogy			209	9	21	65	38	33
	A_5 - Promisa								
21	A_1 - Kybria								
22	A_2 - Karaoke			223	12	31	68	40	27
23	A_3 -	B_1		225	11	27	71	31	25
24	Compomist	(30/80/250)		231	15	24	66	35	31
25	A_4 - Trilogy			214	11	22	72	32	28
	A_5 - Promisa		C_3	229	16	25	68	42	36
26	A_1 - Kybria		BIOLEAFZ	227	9	20	62	40	33
27	A_2 - Karaoke			224	12	17	63	32	32
28	A_3 -	B_2		233	10	19	73	26	25
29	Compomist	(50/100/250)		230	13	23	71	38	24
30	A_4 - Trilogy			229	8	17	70	39	32
	A_5 - Promisa								

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EFFECT OF FOLIAR FERTILIZATION ON THE CHEMICAL COMPOSITION OF FIVE GHERKINS FRUIT HYBRIDS *(CUCUMIS SATIVUS* L.) GYNOECIOUS TYPE AND PARTHENOCARPIC FRUCTIFICATION

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Abstract

Large number of gherkins type cucumbers varieties and hybrids emerging as a result of increasing demands from pretentious consumers related to quality aspects such as shape, color, firmness, appearance and capacity of storage, have led in time to change culture technology, foliar fertilization having a key role to achieve these goals, without knowing in detail the long-term influence on the chemical composition of the fruits used or human consumption. Therefore, this study comes to support clarification of these issues. As a result of data obtained concerning chemical composition of the fruits of five cucumber gherkins hybrids: Promisa, Trilogy, Karaoke, Kybria and Componist and interpreted in the USAMVB it was concluded that it differs depending on fruit size and age at which they were collected. Soil pH, fertilizer pH which is applied to leaf and the degree of hydration of the fruits has a direct influence on the chemical composition.

Key words: *Cucumis sativus L., fertilization, fruits, number, quantity.*

INTRODUCTION

Chemical composition represents an important factor with direct influence on fruits quality of gherkins cucumber. Information concerning the amount of different chemicals can be obtained from the analysis of dry matter and organic acid titration. Concentrations of these organic compounds in fruits are different depending on the cultivar and strongly influenced by their land reserve, which can be found in the form of ions, being picked up by plants (Rivis, 2004). In order to obtain conclusive results is very important to know the exact amounts of substances ($N\text{-}NH_4$, $N\text{-}NO_3$, P, K) in the soil and their concentrations in the solutions used to foliar fertilization.

In one plant exist at one point all common fructification elements: flowers, small, medium and large fruit, located to a distance less or greater than the radicular system having a significant influence on the chemical composition of gherkins cucumber fruits. Results follow in the first place nitrates and nitrites route from the moment of foliar fertilization through fruit until using them in close correlation with their quantities in the soil. According to studies on the pollution of horticultural products where there is a balanced diet, approximately 75-80% of nitrate derived from vegetables, nearly 15-20% from water and somewhere in the 5-7% from meat and milk. Their accumulation in different organs of the plant depends on the speciesWith 1349 samples to *Cucumis sativus L.* and its varieties originating in China, India and Turkey, The U.S. National Plant germplasm is the largest in the world.

MATERIALS AND METHODS

To accomplish this work were studied five different variants (for five hybrids *Promisa, Trilogy, Karaoke, Kybria and Componist)* on which foliar fertilization was performed with Cropmax product. The pH of the culture substrate (soil in which was embedded well fermented manure) was 7.4 for Trilogy and

Componist variants, 7.5 for Kybria variant and 7.6 for Karaoke and Promisa variants. Experimental field was conducted in a large solar farm, the culture being founded in the summer of 2010 from seedlings personally obtained. After soil analysis were obtained results which gives to the soil good fertility, N-NH4 content range between 18,25-51,30 ppm, N-NO3-136,7-356,2 ppm, P-28,4-42,1 and K-178,2-223,5 ppm.
During the experiment of the summer of 2010 soil samples were taken for each variant and fruit samples for each category according to size (3-6 cm, 6-9 cm, 9-12 cm).

RESULTS AND DISCUSSIONS

This study followed the route up to the fruits level of nitrogen compounds based on monofactorial research conducted. Samples collected were analyzed in the Laboratory of Biotechnologies of USAMVB and after obtaining the results we could notice that in most cases they did not exceed permissible levels of quality standards.

Table 1. Experimental results concerning nitrogen content of gherkins fruit.

Cultivar	N soil, ppm	N fruits (3-6 cm), ppm	N fruits (6-9 cm), ppm	N fruits (9-12 cm), ppm
Trilogy F1	161.45	144.4	152	120
Karaoke F1	266.60	285	76	95
Promisa F1	226.85	456	114	105
Componist F1	281.09	114	323	95
Kybria F1	386.78	76	95	114

Nitrogen content ranged between ranged from 76.00 to 323.00 ppm values in fruits and only in one case it exceeded the permissible limit of 400.00 ppm (Promisa hybrid sample of small fruit 3-6 cm, where the value of was 456 ppm). By considering the following aspects: vegetation period was equal for all studied hybrids, irrigation was performed using a uniform system of drip irrigation and foliar fertilization was achieved with the same product, we believe that small differences between the results obtained cannot be made only on account of hybrid, is being in close correlation with fruit size. Maximum permitted limit for nitrogen and its compounds in fruits gherkins is 400 ppm.

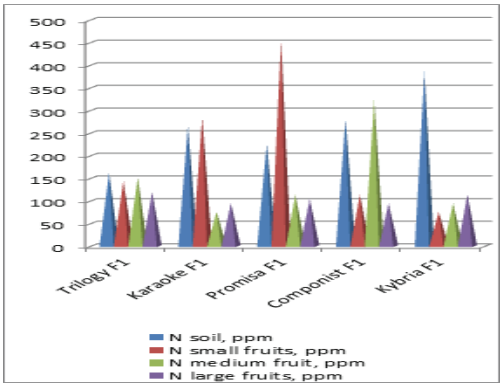

Figure 1. Experimental results representation concerning nitrogen content of gherkins fruit.

After analyzing the results we can distinguish as follows: for hybrid Promised starting from a concentration of 226.85 ppm nitrogen in the soil can be seen a sharp increase in its concentration to small fruit stage 3-6 cm with a value of 456.00 ppm, then decreased to a level of 105 ppm for large fruit stage 9-12 cm. This threshold which has exceeded the permissible limit by 56 ppm not constituted a risk to human health; the fruits of this size are only collected for laboratory analysis. According to analyzes of fruits, in the case of Phosphorus the values ranged from 179.92 to 193.76 ppm for different fruit sizes of Componist hybrid, observing a slight decrease in concentration as the fruit increases in size.

Table 2. Experimental results concerning phosphorus content of gherkins fruit.

Cultivar	P soil, ppm	P fruits (3-6 cm), ppm	P fruits (6-9 cm), ppm	P fruits (9-12 cm), ppm
Trilogy F1	28.4	373.68	553.6	420.1
Karaoke F1	32.5	664.32	664.32	512.08
Promisa F1	34.1	809.64	588.2	511.3
Componist F1	42.1	193.76	186.84	179.92
Kybria F1	40.2	276.52	560.52	449.8

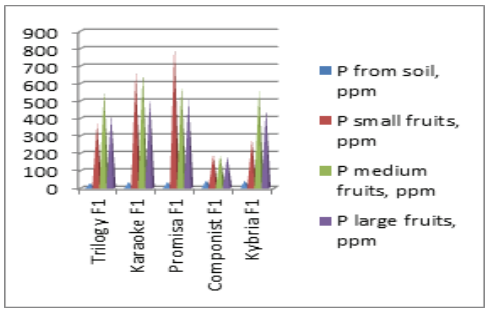

Figure 2. Experimental results representation concerning phosphorus content of gherkins fruit

Table 3. Experimental results concerning potassium content of gherkins fruits.

Cultivar	K soil, ppm	K fruits (3-6 cm), ppm	K fruits (6-9 cm), ppm	K fruits (9-12 cm), ppm
Trilogy F1	185.2	2840	2620	2560
Karaoke F1	223.5	3080	2740	2570
Promisa F1	215.8	2840	2620	2490
Componist F1	178.2	2840	2980	2540
Kybria F1	180.2	3340	2620	2700

For Karaoke and Promisa hybrids can be observed sudden decline of P values from 664.32 and 809.64 ppm for 3-6 cm fruits to P values of 512.08 or 511.3 ppm for 9-12 cm fruits. Trilogy and Kybria presents one maximum concentration peak for 6-9 cm fruits, with values of 553.60 ppm and 560.52 ppm respectively, after which it decreased to 420.1 and 449.80 ppm for 9-12 cm fruits.

For potassium, as can be seen from the figure 3, the differences are not significant, the concentrations of all the studied variants being in the range of 2620 ppm to 3080 ppm, with a slight peak concentration of 3340 ppm for Kybria hybrid with 3-6 cm fruits.

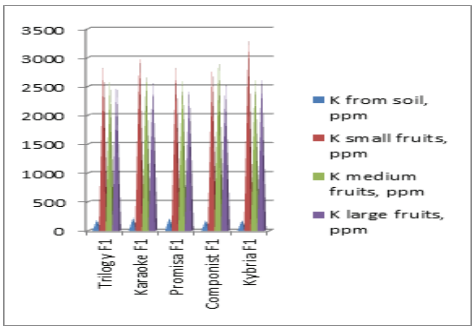

Figure 3. Experimental results regarding concerning potassium content of gherkins fruits.

CONCLUSIONS

In most cases N content was within normal limits. In the case of Promisa hybrid version (fruit 3-6 cm) was found a high value of N concentration that exceeding by 56 ppm the normal concentration. Growing season, irrigation and the product used for foliar fertilization had no influence on the N amount in the fruits level, variations are due to the studied hybrid and are based on its ability to synthesize nitrogen compounds. Phosphorus concentration varies depending on the size of the fruit and the hybrid used. Potassium analysis showed significant differences.

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EFFECT OF FOLIAR FERTILIZER ON GROWTH AND YIELD OF SEVEN POTATO CULTIVARS (*SOLANUM TUBEROSOM* L.)

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Abstract

An experiment was conducted out during 2009 to study the effect of spraying numbers (0, 2 and4) of Alaska foliar fertilizer (N:12, P_2O_5:12, K_2O:36, Fe:0.05%, Cu:0.005%, Mn:0.03% , Zn:0.01% , B: 0.02% , Mo:0.003%) on growth and yield of 7 potato cvs. (Draga, Aladin, Elpaso, Kurado, Diseree, Provento and Red Brown). Factorial experiment included 21 treatments arranged in Random Complete Bloke Design (RCBD) with 4 replications. Results showed that foliar fertilizer had a significant effect on plant height, tuber weight and total yield. Potato cvs. differ in all studied parameters. High yields were obtained from Red Brown, Provento and Draga cvs. Interactions had a significant effect on the most studied parameters.

Key words: *foliar fertilize , potatoes cultivars.*

INTRODUCTION

Potato (*Solanum tuberosum* L.) is the most important tuber crop, and it is the fourth world crop after wheat, rice and maize. Moreover, potato is an important vegetable and a good source of antioxidants (Chen *et al*., 2007). Although potato is quite adaptable to planting conditions, it has, as every culture, certain requirements for ecological conditions. Stability of a varieties features and preserving quality in different conditions has great importance; total and graded yield and quality factors are affected by cultivars and location (Tomasiewicz *et al*., 2003; Haase *et al*., 2005). Both yield and quality of potato are affected by cultivar, environmental conditions and cultural practices. In trial with Burren, Arnova and Aladin cv., Burren was a superior in yield, but Arnova was super in tuber mean weight (Kadum, 2011).

Fertilizer application has important effects on the quality and yield of potato (Westermann, 2005). Uptake of fertilizer nutrients (NPK) by potato per unit area and time is high because of the rapid rate of early growth and tuber bulking. Foliar fertilization has potential for an important role in potato production.

Nitrogen supply plays an important role in the balance between vegetative and reproductive growth for potato (Alva, 2004). Many previous studies have shown that N applications can increase total and/or marketable tuber yield (Kara, 2002; Zebarth *et al*., 2004; Zelalem *et al.*, 2009). It is suggested that late application of N in foliar sprays can be benefit to potato crop with a long growing season and reduce environmental losses of N.

Phosphor application significantly increased plant height, marketable tuber yield and marketable tuber number (Zelalem *et al*., 2009). One of the major problems in the use of phosphate fertilizer is the fixation of applied phosphate by the soil. Foliar P application resulted in higher tuber yield (Ekelof, 2007). Application of K increases plant height and crop vigour. It increases both the rate and duration of tuber bulking. Its application assists in the translocation of carbohydrates from leaves to tubers. Potassium increases the size but not the total number of tubers (Trehan *et al*., 2001). Foliar application of K increased potato tuber yield. The increasing of foliar K fertilizer rates (2.5%) was associated with the highest yield (Habib *et al.,* 2011). Foliar application of micronutrients has been one of the approaches to achieve an improvement the nutritional status, yield of potato end to optimize use of chemical fertilizers (Khalifa *et al*., 2003). Potato plants foliar treated with Unigreen (containing macro and micronutrients) 2.5 g/l and Solu Potash (50% K_2O) 3.0 g/l gave higher total yield and higher number of marketable tubers per plant

and total number of tubers per plant (Abdul Rasool *et al*., 2010).

The present investigation aimed to study the response of 7 Potato cultivars to the number of foliar fertilizer sprays.

MATERIALS AND METHODS

A field experiment was carried out on a farm 15 km south of Hilla, during 2009 to study the effect of spraying numbers (0, 2 and 4) of Alaska foliar fertilizer (N:12, P_2O_5: 12, K_2O: 36, Fe: 0.05%, Cu: 0.005%, Mn: 0.03%, Zn: 0.01%, B: 0.02%, Mo: 0.003%) on 7 potato varieties (Draga, Aladin, Elpaso, Kurado, Diseree, Provento, and Red Brown) obtained from Nahar Alawrad Company. Factorial experiment included 21 treatments arrangement in Random Complete Bloke Design (RCBD) with 4 replications.

Potato seed Tubers were sown on 6 Feb. at 25 cm apart in the rows. Each plot consisted of 3 rows, each of five meters in length and 70 cm wide. The plot area was 10.5 m. DAP fertilizer was added at the rate of 200 kg/ha dressing 10 cm bellow the tubers. The first foliar spray was made after 40 days, in which plants were blossoming and were at the early tuber set stage. The other foliar sprays were made at weakly intervals. Plant length (cm), number of shoots was determined at 90 days after planting. At harvesting (21 May), fresh tuber yield were recorded in terms of number of tubers per plant and tuber weight as well as total yield.

The obtained data were subjected to the analysis of variance procedure and treatment means were compared to the L.S.D. test according to Steel and Torrie, 1980.

RESULTS AND DISCUSSIONS

Data presented in (Table 1) showed that, length of potato plants were significantly increased as a result of plant spraying with Alaska fertilizer compared with the control treatment. In addition, there were no significant differences between 2 or 4 foliar times of sprays. The increases in plant height may be due to the role of such macro and micro nutrients in the physiological process and cell division and elongation which indirectly affect tissue formation and consequently vegetative growth of plant. These results are in good accordance with those obtained by (Khalifa *et al.,* 2003; Abdul Rasool *et al*., 2010; Kadum, 2011).

The varieties had a significant effect in plant height. It appeared that it was related to type of various varieties, (Tafi *et al.,* 2010). The interaction had a significant effect also.

Table 1. Effect of Varieties and Foliar High-K Fertilizer Number on Plant Height (cm)

Average var.	4 time spray	2 time spray	control	Var.
64.3	68	66	59	Draga
56.3	63	56	50	Aladin
65.7	67	68	62	Elpaso
55.7	62	59	46	Kurado
62.7	69	68	51	Diseree
65.0	69	72	54	Provento
56.3	61	59	49	Red Brown
-	65.6	64	53	Average of spray

L.S.D. 0.05 var. = 3.1 fertilizer = 2.03 interactions = 5.37

Results in (Table 2) showed that foliar fertilizer had no significant effect on stem numbers. Potato varieties had a significant effect on stem numbers, and Elpaso had the largest than other cultivars, it gave 4.6 stem which reached significant only with Aladin that gave 4.0 cm. In fact the stem numbers are formed after planting and before adding foliar fertilizer and cannot affect by it. It can be mentioned that the stem number in different cultivars is as one of the internal and compatible characteristics affected by the plant environmental condition (Henricksen and Molgaard, 2005).

Table 2. Effect of Varieties and Foliar High-K Fertilizer Number on Stem Numbers

Average var.	4 time spray	2 time spray	control	Var.
4.27	4.2	4.4	4.2	Draga
4.00	4.2	4.1	3.7	Aladin
4.60	4.7	4.7	4.4	Elpaso
4.27	4.3	4.1	4.4	Kurado
4.17	4.4	4.2	3.9	Diseree
4.30	4.3	4.6	4.0	Provento
4.17	4.2	3.9	4.1	Red Brown
-	4.3	4.3	4.1	Average of spray

Foliar fertilizer caused an increase in tuber weight as compared with control (Table 3). Four times of foliar fertilizer had no significant effect on this parameter as compared with two

times. It may be attributed to the increase in vegetative growth by fertilizer and in the role of potassium in translocation of produced photosynthetic assimilates and its accumulation in storage organs (Habib *et al.,* 2011). Haeder *et al*., (1973) indicated that with adequate K nutrition two thirds of the labeled photosynthesis product passed within one day into the tubers when after flowering intensive growth of tubers set in. With insufficient K supply only half of the photosynthesis product was translocated to the tubers during the same period Draga and Aladin varieties were superior in this parameter as compared to other varieties. It may be a variety characters. The interactions had a significant effect and Draga+ 4 time sprayed was significant as compared with all interactions.

Table 3. Effect of Varieties and Foliar High-K Fertilizer Number on Tuber Weight (gm)

Average var.	4 time spray	2 time spray	control	Var.
71.2	76.8	71.9	65.0	Draga
63.6	63.4	63.4	64.0	Aladin
59.0	59.0	60.6	57.5	Elpaso
57.0	58.2	56.0	56.6	Kurado
57.3	56.5	58.9	56.6	Diseree
57.8	56.8	57.2	59.6	Provento
60.1	62.9	59.9	57.5	Red Brown
-	62.0	61.1	59.6	Average of spray

Foliar fertilizer caused a significant effect on yield as compared with the control (Table 4). It could be concluded that increasing productivity of potato plants as a result of foliar fertilizer, may be due to increased in weight and numbers of tuber/plant which in turn increased the total tubers yield (ton/h.). This effect might be due to that potassium plays an important role in the transport of assimilates and nutrients (Allison *et al*., 2001) as well as the enhanced effect of other materials contents of the fertilizer. These findings were supported by previous investigators such as (Habib *et al*., 2011; El-Sirafy *et al.,* 2008). The interactions had a significant effect and Draga+4 time sprayed gave the highest, which differed significantly as compared with Aladin and Elpaso interaction. These results agreed with (Kadum, 2011).

Table 4. Effect of Varieties and Foliar High-K Fertilizer Number on Tuber Yield (ton/h)

Average var.	4 time spray	2time spray	control	Var.
27.999	29.553	30.045	21.398	Draga
21.873	23.693	25.094	16.894	Aladin
20.602	21.737	22.022	18.049	Elpaso
23.403	26.265	24.640	19.304	Kurado
23.829	25.975	27.297	18.357	Diseree
23.480	25.595	24.525	20.320	Provento
24.116	26.9654	27.666	17.718	Red Brown
-	25.683	25.899	18.959	Average of spray

L.S.D. 0.05 var. = 2.543 fertilizer = 1.665 interactions = 4.403

CONCLUSIONS

Potato cultivars differ in growth and yield because of the differences in inheritance and the ecological conditions. Experiments could be made to select the best cultivar to the local conditions. This study was done to evaluate seven cultivars with foliar fertilizer at south region of Babylon. it could be concluded that potato plants foliar with fertilizer contain high potash, caused an improve in growth and tubers yield per unit area, and it can also recommend that planting Red Brown, Provento and Draga varieties in south region of Babylon Governorate.

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PEACH CROP PROTECTION IN SUSTAINABLE AGRICULTURE CONDITIONS IN SMALL AND MEDIUM FARMS

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Abstract

Scientific work aims to promote disease management systems of fruit trees stone group (peach), using chemical treatment methods with low impact on the environment and human health, which contribute to increase crop quality and quantity. Research has been conducted on peach species cultivated in Research and Development Station for Fruit Tree Growing-Baneasa, Bucharest, in the climatic conditions of the year 2012. Stigmina carpophila was the pathogen for which measures have been taken for its prevention and control. Treatments against pathogen were applied at warning, depending on the biological reserve of the vegetation period and the climate evolution in that year. Among the five fungicides used, the best results were obtained with the products Score 250 EC and Systhane C PU.

Key words: *peach orchard, disease control, ARM software.*

INTRODUCTION

Prunus persica L. culture has a high economic value on national as well as on international level. Production and fruits marketing is the goal of an intense modern trade. Annually, the trees suffer from attacks of various pathogens causing crop diseases which develop dependent to the climate conditions of the year and to the cultivated variety (Ivascu, 2002; Delian, 2006). Long term use of pesticides in pomiculture and ignoring its side effects, have had negative consequences towards the environment (Hoza et al., 2000; Burzo et al., 2005). Nowdays, the more severe requirements regarding the environment protection and health orchards led to the development of ecological selective methods (Toncea, 2001) specifically for the crops pest control (Jinga et al., 2008). The treatments applied during the vegetation period determine the improvement of the yield′s quality and quantity (Delian et al., 2012).

MATERIALS AND METHODS

The evaluation of several plant protection products efficacy against the main studied pathogens for the peach culture was developed during several visits at the Research and Development Station for Fruit Tree Growing-Baneasa. There were taken biological samples (plants with pathogen attack symptoms) from this orchard and there were isolated the main pathogen agents. The isolated pathogens were used in laboratory experiments for testing these new plant protection products proposed in the technology. After the laboratory trials, there were also performed field treatments, during the spring season, in the vegetation period, with fungicides, followed by establishing the efficacy of the tested products. In the *Prunus persica* L. orchard there were carried out treatments in order to prevent and control the attack of the main fruit′s pathogens. The attack rate was calculated with the formulas RA%= F*I/100, F%-frequency of the attacked organs, I – intensity of the organ′ attack. The tested peach variety was Victoria, which is a sensitive one. During the laboratory trials was tested the biological action of the following products: Dithane M45, Bravo Folicur Solo 250EW, Score 250 EC and Systhane C PU. It was used a method based on the inclusion of the tested fungicide into the PDA medium, in 5 different concentrations. The medium was poured in

Petri dishes, the pathogenic fungi were placed on the medium, and it was observed the growth of the colonies compared to control fungi, growth on medium without fungicide (Baicu et al., 1996; Severin et al., 2001). For each fungicide concentration was calculated the inhibition percent of the mycelium growth (Alexandri, 1982; Geamanu, 2006).

The field trials of the fungicides selected after the laboratory tests were made in the 2012 spring season. There were used the following variants:

V1 = untreated control
V2 = Dithane M45 0.2% concentration
V3 = Bravo 500 SC 0.15% concentration
V4 = Folicur Solo 250 EW 0.1% conc
V5 = Systhane C PU 0.1% concentration
V6 = Score 250 EC 0.02% concentration

Weather conditions during application:

Table 1. 1st treatment 04-04-2012

Temperature of air	19.2°C
Relative humidity	54%
Wind speed	0.8
Wind direction	N
Cloud cover (%)	0
Rainfall with 1 week before of spraying	0.4 mm
Rainfall with 2 weeks after spraying	0 mm
First rainfall after spraying and its amount	15-05-2012

Table 2. 2nd treatment 06-05-2012

Temperature of air	13.9°C
Relative humidity	72%
Wind speed	0.5
Wind direction	NE
Cloud cover (%)	0
Rainfall with 1 week before of spraying	0.4 mm
Rainfall with 2 weeks after spraying	3.4 mm
First rainfall after spraying and its amount	19-05-2012

Table 3. 3rd treatment 09-06-2012

Temperature of air	19.6°C
Relative humidity	64%
Wind speed	0.7
Wind direction	N
Cloud cover (%)	0
Rainfall with 1 week before of spraying	0 mm
Rainfall with 2 weeks after spraying	0 mm
First rainfall after spraying and its amount	24-06-2012

There were applied 3 treatments on the 4th April, 6th May and 9th June, in accordance with the meteorological conditions, and the observations took place 8 days after each treatment, taking into account the frequency (PESING) and the intensity (PESSEV) of the attack. The observations targeted the *Stigmina carpophila* pathogen which produces the shot hole disease (Figure 1).

The treatments were carried out using the SOLO atomizer pump (Figure 2).

Studies regarding the experimental models of the proposed technology took place in an 8 years *Prunus persica* L. orchard, at Research and Development Station for Fruit Tree Growing-Baneasa, in order to establish the rate of infectious load from this area.

It was used the classical testing method which consist in 6 variants in 4 replications with 5 trees per each variant in random disposal.

Figure 1. Shot hole and fruit stain produced by Stigmina carpophila

Figure 2. Treatments in vegetation period

RESULTS AND DISCUSSIONS

The biological action of some fungicides on the development of *Stigmina carpophila* fungus colonies on leaves and fruits is presented in Table 4.

Table 4. Biological action of some fungicides on the development of fungus colonies Stigmina carpophila

Product	Colony diameter (mm) at conc.%					Inhibition percent at conc.%				
	0,2	0,1	0,05	0,025	0,015	0,2	0,1	0,05	0,025	0,015
Dithane M 45	0	7	10	16	20	98,6	70,0	65,0	37,1	11,5
Bravo 500 SC	0	8	20	25	41	100	80,5	70,5	20,0	14,8
Folicur Solo 250 EW	0	0	8	10,5	15	100	91,4	88,6	75,0	50,1
Systhane CPU	0	0	8	19	31	100	100	78,5	58,6	42,5
Score 250 EC	0	0	0	0	0	100	100	100	87,1	51,5
Control	70 mm									

Based on the data presented in Table 4 were selected the products and their optimal concentration which will further be used during the field trials in order to control the fungus *Stigmina carpophila*.

The products with very good biological action were: Folicur Solo 250 EW in 0.1% concentration, Systhane C PU in 0.05% concentration, Score 250 EC in 0.02% concentration, Bravo 500 SC in 0.2% concentration, Dithane M 45 in 0.2% concentration.

During the experiments there were taking into account the 100% fungi inhibition in accordance with the various factors acting towards plants.

The results obtained in field during the vegetation period are presented in Tables 5 and 6.

Table 5. The frequency and intensity of the Stigmina carpophila attack

Treatment product name		PESINC %	PESSEV %	PESINC %	PESSEV %	PESINC %	PESSEV %
		04.04.2012		09.05.2012		12.06.2012	
Variant 1	R 1	27.0	12.0	39.0	12.0	52.0	16.0
	R 2	19.0	10.0	27.0	16.0	43.0	20.0
	R 3	28.0	9.0	34.0	14.0	48.0	23.0
	R 4	31.0	12.0	31.0	16.0	51.0	20.0
	Average	26.3	10.8	32.8	14.5	48.5	19.8
Variant 2	R 1	16.0	6.0	20.0	11.0	21.0	13.0
	R 2	12.0	4.0	18.0	12.0	31.0	21.0
	R 3	17.0	5.0	15.0	6.0	24.0	14.0
	R 4	14.0	4.0	21.0	10.0	28.0	12.0
	Average	14.8	4.8	18.5	9.8	26.0	15.0
Variant 3	R 1	17.0	5.0	17.0	15.0	20.0	9.0

	R 2	11.0	4.0	15.0	7.0	22.0	10.0
	R 3	16.0	4.0	16.0	5.0	17.0	8.0
	R 4	9.0	5.0	12.0	8.0	21.0	10.0
	Average	13.3	4.5	15.0	8.8	20.0	9.3
Variant 4	R 1	10.0	3.0	16.0	7.0	17.0	6.0
	R 2	12.0	5.0	10.0	4.0	19.0	7.0
	R 3	9.0	4.0	12.0	6.0	21.0	8.0
	R 4	11.0	6.0	14.0	3.0	14.0	7.0
	Average	10.5	4.5	13.0	5.0	17.8	7.0
Treatment product name		PESINC %	PESSEV %	PESINC %	PESSEV %	PESINC %	PESSEV %
		04.04.2012		09.05.2012		12.06.2012	
Variant 5	R 1	14.0	7.0	11.0	4.0	11.0	7.0
	R 2	12.0	4.0	12.0	6.0	16.0	5.0
	R 3	16.0	4.0	14.0	5.0	14.0	8.0
	R 4	10.0	5.0	13.0	6.0	16.0	4.0
	Average	13.0	5.0	12.5	5.3	14.3	6.0
Variant 6	R 1	10.0	5.0	7.0	5.0	11.0	6.0
	R 2	12.0	4.0	10.0	4.0	12.0	5.0
	R 3	9.0	4.0	12.0	3.0	9.0	4.0
	R 4	8.0	3.0	11.0	3.0	10.0	3.0
	Average	9.8	4.0	10.0	3.8	10.5	4.5

Table 6. Processing of data from the three treatments applied in the vegetation period

Variant	Treatment Product Name	PESINC %	PESSEV %	PESINC %	PESSEV %	PESINC %	PESSEV %
		04.04.2012		09.05.2012		12.06.2012	
1	Variant 1	26.3 a	10.8 b	32.8 a	14.5 a	48.5 a	19.8 a
2	Variant 2	14.8 b	4.8 b	18.5 b	9.8 b	26.0 b	15.0 b
3	Variant 3	13.3 b	4.5 b	15.0 bc	8.8 b	20.0 c	9.3 c
4	Variant 4	10.5 b	4.5 b	13.0 c	5.0 bc	17.8 c	7.0 cd
5	Variant 5	13.0 b	5.0 b	12.5 c	5.3 bc	14.3 cd	6.0 cd
6	Variant 6	9.8 b	4.0 b	10.0 c	3.8 c	10.5 d	4.5 d
LSD (P=.05)		4.56	1.59	4.32	3.57	4.85	3.41
Standard Deviation		3.02	1.05	2.87	2.37	3.22	2.27
CV		20.74	18.88	16.91	30.27	14.09	22.1
Bartlett's X2		6.773	3.184	5.618	8.991	4.713	10.298
P (Bartlett's X2)		0.238	0.672	0.345	0.109	0.452	0.067
Replicate F		1.270	2.050	1.114	1.166	0.462	1.136
Replicate Prob (F)		0.3204	0.1501	0.3746	0.3555	0.7131	0.3662
Treatment F		15.787	23.460	33.049	11.431	71.803	27.351
Treatment Prob (F)		0.0001	0.0001	0.0001	0.0001	0.0001	0.0001

*Means followed by same letter do not significantly differ (P=0.05, Student-Newman-Keuls)
Mean comparisons performed only when AOV Treatment P (F) is significant at mean comparison OSL.

The data processed using ARM 8 software (ARM is a recognized and respected standard throughout the plant production, used by thousands of researchers around the world), concludes, that after the first treatment (April 4) all 5 fungicides showed significant effects (b) in fungus control. After the 2nd treatment (May 9) the results are significant (b) in variants 2 and 3 and significant distinct (bc) in variants 4 and 5 and very significant in variant 6. The results obtained after the 3rd treatment (June 12) are from distinct significant in variants 3 and 5 up to very significant in variant 6.

It results that the following contact fungicides Bravo 500 SC and Dithane M 45 (V2 and V3) have a good efficacy, and the systemic ones (V3-V6) present a high efficacy. The best results were obtained with V6, the fungicide Score 250 EC.

CONCLUSIONS

During the laboratory trials there were selected the products with the best biological activity

against the development of the studied fungi. The products with the highest biological activity against the development of fungus colonies of *Stigmina carpophila* were: Folicur Solo 250 EW in 0.1% concentration, Systhane C PU in 0.05% concentration, Score 250 EC in 0.02% concentration, Bravo 500 SC in 0.2% concentration, Dithane M 45 in 0.2% concentration. Laboratory results enable the selection of fungicides showing high inhibition percentage in order to establish a treatment chart for the vegetation period, regarding the control of the major diseases specific to the peach.

The phytosanitary treatments will be made at warning, according to the evolution of environmental conditions and pathogenic organisms, pursuant to the proposed technology.

It results that the following contact fungicides Bravo 500 SC and Dithane M 45 (V2 and V3) have a good efficacy, and the systemic ones (V3-V6) present a high efficacy. The best results were obtained with V6, the fungicide Score 250 EC.

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THE VITICULTURE AND WINEMAKING OF REPUBLIC OF MOLDOVA - PAST, PRESENT AND FUTURE

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Abstract

Viticulture and winemaking in Moldova has an important role in the national economy. These branches have an important share in the GDP. At this stage of viticulture and winemaking activity is regulated by Law of Vine and Wine (57/10.03.2006), government resolution on the approval of the restoration and development of viticulture and winemaking for the period 2002-2020 (1313/07.10.2002) and other regulations. In the period until 2006 the branch has a rapid growth, and stagnation occurred as a result of the embargo imposed by Russia. At present, the vineyard area is about 100 000 ha.

Key words: *Republic of Moldova, viticulture, winemaking industry.*

INTRODUCTION

Viticulture and winemaking in Moldova are the main sectors of agriculture. The favorable climatic conditions of Moldova, provide an opportunity to successfully cultivate grapes. The main activity of the villagers is cultivation of table grapes and grapes for processing. For many years' viticulture and winemaking was subjected to many tests under the influence of various factors-political, economic, social, etc.
At this stage of viticulture and winemaking activity is regulated by Law of Vine and Wine (57/10.03.2006), government resolution on the approval of the restoration and development of viticulture and winemaking for the period 2002-2020 (1313/07.10.2002) and other regulations.
The aim of our research was to study the dynamics of development and the state of viticulture and winemaking at this stage and the level of their development in according to the program.

MATERIALS AND METHODS

In our study, about the situation of viticulture and winemaking, we used the data of the National Statistical Department and the Ministry of Agriculture and Food Industry of Republic of Moldova. Also we used normative and legislative acts of the parliament and government of Moldova, the specialized literature.

RESULTS AND DISCUSSIONS

The state of viticulture and winemaking at this stage is characterized by the following data.
The data from figure 1 showed that from 1991 to 2011, the total area of vineyards has decreased significantly from 176 thousand ha to 102 thousand ha, and the area of productive vineyards decreased from 148 thousand hectares to 92 thousand hectares.
In the period from 2002 to 2006 the area of vineyards has been stable, about 108-110 thousand hectares. This is due to GD 1313/2002 on the restoration of viticulture and winemaking for the period 2002-2020. After 2006, the vineyard's area decreased, this situation was associated with the embargo for wine from Russia, the largest market for products.

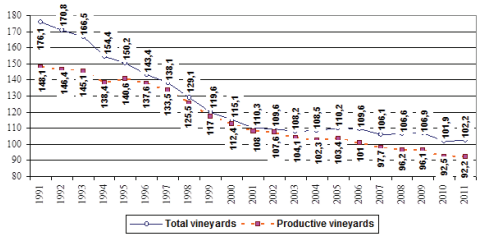

Figure 1. Dynamics of the total and productive area of vineyards in the Republic of Moldova during 1991-2011 years, thousand ha (Nicolaescu et al., 2010; Corobca et al., 2012)

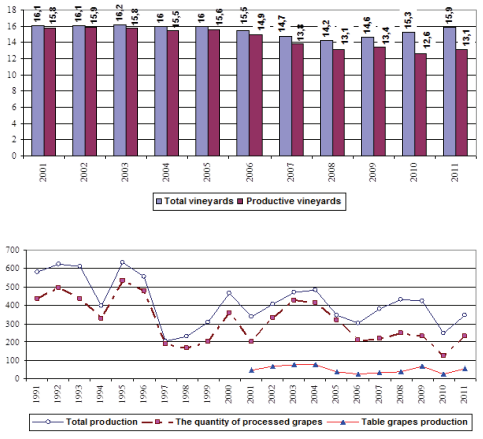

Figure 2. Dynamics of the total, processed and grapes production in the Republic of Moldova during 1991-2011 years, thousand t. (Nicolaescu et al., 2010; Corobca et al., 2012)

The data from figure 2 showed that from 2001 to 2011, the total area of table grapes vineyards has been stable, about 15-16 thousand hectares. After that, from 2006 to 2009, the vineyard's area decreased, this situation was associated with the embargo for wine from Russia, the largest market for products. In recent years, the situation has improved.

The data from figure 3 showed that from 1991 to 2011, the production has decreased significantly from about 600 thousand tones (total production in 1991) to 350 thousand ha (the same indices in 2011). The similar situation observed for the quantity of processed grapes in this period, but the table grapes production in the period from 2001 to 2011 years has between about 30 thousand tones (in 2006) and about 77 thousand tones (in 2004). The production decrease was due to the decrease of the area of vineyards and the nonhomogeneous weather conditions. The weather conditions influenced the production per hectares (next figures).

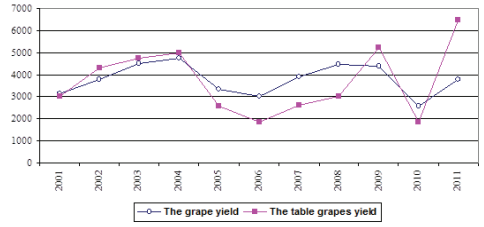

Figure 3. Dynamics of the grape yield in the Republic of Moldova during 2001-2011 years, kg/ha. (Nicolaescu et al., 2010; Corobca et al., 2012)

The data from figure 4 showed that the yield was nonhomogeneous. They was to influenced by the nonhomogeneous weather conditions.

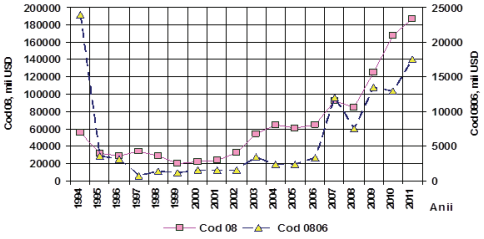

Figure 4. Dynamics of the grapes export from the Republic of Moldova during 1994-2011 years, thousand USD. (Nicolaescu et al., 2010)

The source of information:
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http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:282:0001:0912:RO:PDF

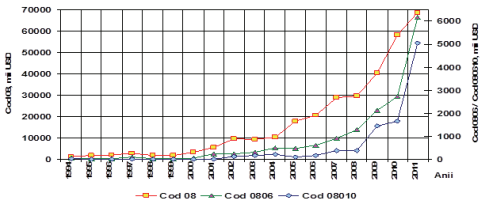

Figure 5. Dynamics of the grapes import in the Republic of Moldova during 1994-2011 years, thousand USD. (Nicolaescu et al., 2010)

The source of information:
http://comtrade.un.org
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:282:0001:0912:RO:PDF

Analyzing the dynamics of the total value of export of fruits (code 08) and fresh and dried grapes (code 0806), according to UN database, we can say with certainty that until 1999 these indices were in a continuous decline and since 2000 there has been a considerable increase in export value (fig. 5). Minimum export of total fruits (code 08), was in 1999 and constituted 20.1 million USD and the maximum value of exports was in 2011 and amounted to 187 million USD. Minimum export of fresh and dried grapes (code 0806), were in 1997 and constituted 0.7 million USD and the maximum value of exports was in 1994 about 24 million USD. Export value in 2011 was 17.6 million USD, or 25.1 times more than the year 1997 and 1.4 times less than in 1994. Also in 2011, the export value of grapes (code 0806), in export value of fruit structure (code 08) was 9.39% (Figure 5).

The dynamics of import value (Figure 6) compared to the exports in the period 1994-1999 was relatively stable and in 2000 there is also a considerable increase. In 2011, the imports of fruit in general (code 08) was about 68.4 million dollars, or 57 times more than the year 1994. The trade balance was positive-118.6 million USD for export.

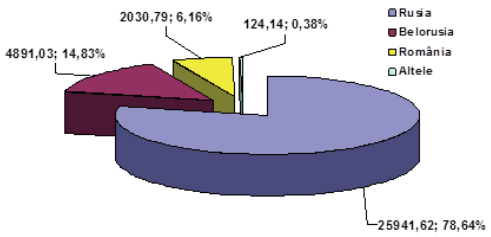

Figure 6. The structure of export of table grapes from the Republic of Moldova in 2011, tones,%. (Nicolaescu et al., 2010)

The source of information:
http://comtrade.un.org;
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:282:0001:0912:RO:PDF

The grapes import value (code 0806) in 2011 was 6.2 million USD or 155 times more than in 1994. In the structure of grape fruit import value has returned 9.1%. The trade balance was positive this 11.4 million USD for export. Fresh grapes (code 080610) registered import value of 5.0 million USD or 166.7 times more than the year 1994. However, the import value of fresh grapes in the total structure of the grapes (code 0806) was 80.62%, 18.38% for raisins. Trade balance in terms of fresh grapes in 2011 was positive by 12.6 million USD for export.

In the structure of exports of table grapes (code 0806) in 2011, the share of 78.64% or 25,941.62 tons refers to Russia, which is followed by Belarus with 14.83% or 4891.03 tons and Romania with 6 16% or 2030.79 tons (Figure 7).

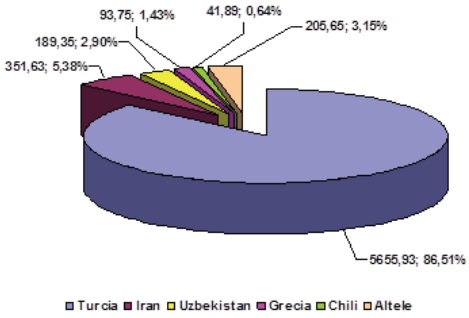

Figure 7. The structure of import of table grapes in the Republic of Moldova in 2011, tones,%. (Nicolaescu et al., 2010)

The source of information:
http://comtrade.un.org;
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:282:0001:0912:RO:PDF

In the structure of imports of table grapes (code 0806) in 2011, the share of 86.51% or 5655.93 tons is refers Turkey, which is followed by Iran-by 5.38% or 351.63 tons, Uzbekistan-with 2.90% or 189.35, Greece-by 1.43% or 93.75 tonnes and Chile-0.64% or 41.89 tons (Figure 8).

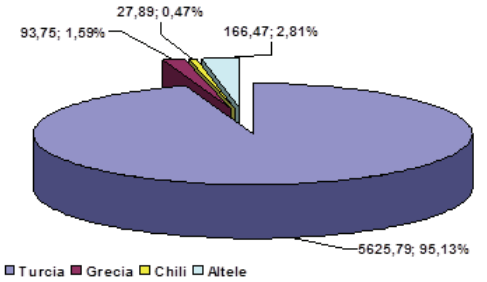

Figure 8. The structure of import of fresh table grapes in the Republic of Moldova in 2011, tones,%. (Nicolaescu et al., 2010)

The source of information:
http://comtrade.un.org;
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:282:0001:0912:RO:PDF

In the structure of imports of fresh grapes (code 080610), in 2011, the share of 95.13% or 5655.93 tons is refers to Turkey, which is followed by Greece-by 1.59% or 93.75 tonnes and Chile-0.47% or 27.89 tons (Figure 9).

Wine branch is a branch of Agro-Industrial Complex that provides people with fresh and processed production: juices, jams and various types of wines. The food's importance, economic importance, it has the advantage that in comparison with others. According to scientific research of medicine, annual consumption calculation time a person is 40-50 kg grapes per year and approx. 40-50 it coming.

Grape production in calculating per capita in the period 2006-2009, varies between 130 kg (2006) and 192 kg (2009) and of the mass: 8.16 kg (2006) and 29.24 kg (2009).

Based on the data presented in Table 1, we find that the production of table grapes in Moldova in calculating per capita in 2006 is 18.13% of normal consumption, increasing to 64.99% in 2009 compared to the norm of consumption.

The results obtained show that local producers can not cover domestic consumption of fresh grapes. However, we find that the production of wine in Moldova in computing per capita in 2006 is 26.90% of normal consumption, falling by 16.51% in 2009 compared to the norm of consumption.

Table 1. The dynamics of production of grapes and wine production in Moldova in calculating the per capita (Nicolaescu et al., 2010)

Indices	***2006***	***2007***	***2008***	***2009***
1. Grape production in the calculation per capita, kg	*130*	*167*	*178*	*192*
-in% in comparison with last year	x	128,46	106,59	107,87
-in% in comparison with scientific annual consumption	288,89	371,11	395,56	426,67
2. The table grape production in the calculation per capita, kg	*8,16*	*10,55*	*11,68*	*29,24*
-in% in comparison with last year	x	129,27	110,77	250,37
-in% in comparison with scientific annual consumption	18,13	23,43	25,96	64,99
3. Wine production in the calculation per capita, l	*12,10*	*9,58*	*9,57*	*7,43*
-in% in comparison with last year	x	79,16	99,85	77,65
-in% in comparison with scientific annual consumption	26,90	21,29	21,26	16,51

Analyzing coverage of consumer standard table grapes (Table 1.) We can say that Moldova is unable to produce the required amount of grapes according to the norm of consumption.

At present in force 'Program restoration and development of viticulture and winemaking in the years 2002-2020', which was approved to restore the complex in the branches of viticulture and winemaking by the Governmental Decision no. 1313 / 07.10.2002 (Monitorul oficial 142 / 17.10.2002, art. 1448).

Given the current state of the industry, production capacity and level of business development of enterprises at that time, were projected production following wines:

Table 2. Indicative data on volumes of production of wine products and their value (in comparable prices of 2000) in the 2002-2020 years

Type of wines	Unit of measure	Years												
		2000				2010			2015			2020		
		Quantity	Price, MDL/unit	Sum		Quantity	Sum		Quantity	Sum		Quantity	Sum	
					mil. MDL	mil. Euro		mil. MDL	mil. Euro		mil. MDL	mil. Euro	mil. MDL	mil. Euro
Bottled wines	1000 hl	750	896	672	50,27	1000	896	67,02	1100	986	73,76	1500	1.344	100,53
Wines in bulk, sparkling wine	1000 hl	850	320	272	20,35	900	288	21,54	1000	320	23,94	1500	480	35,91
Total:		16		944	70,61	19	1184	88,57	21	1.306	97,69	30	1824	136,44
Sparkling wine	1000 bottles	5,5	10	55	4,11	8,5	85	6,36	10	100	7,48	12	120	8,98
	1000 hl	41,3	1333	55	4,11	63,8	85	6,36	75	100	7,48	90	120	8,98
Divin (cognac)	1000 hl	41,6	4000	166	12,42	40	160	11,97	50	200	14,96	60	240	17,95
Brendy	1000 hl	95,5	1660	153	11,44	100	160	11,97	120	192	14,36	140	224	16,76
Production value-total (million MDL)				1318	98,59		1589	118,86		1798	134,50		2408	180,12
in% in comparison with 2000				100			121			136			183	

The level of achievement of planned objectives will be revealed in later chapters. To obtain that quantity of wine products necessary to process the following quantities of grapes and wines.

Table 3. Indicative data on volumes of grape processing and use directions of wine obtained in the 2002-2020 years

Indices	Unit of measure	Years				
		1990 (for reference)	2000 (real data)	2010	2015	2020
Grape processing	1000 tones	770	360	360	430	600
Production of raw wines	1000 hl	5.200	2.400	2.400	2.800	3.900
including						
----for wines	1000 hl	4.200	1.870	1.500	1.700	2.600
----for sparkling	1000 hl	500	470	500	500	500
----for divinuri (cognac)	1000 hl	300	30	300	400	500
----for grape iuice	1000 hl	200	30	100	200	300

Considering the pedoclimatic potential of Moldova in terms of the culture of the vine, and the objectives set for achieving certain amounts of wines, the area of vineyards of the commodity producing grapes at the end of that period should be approx. 100 000 hectares, of which the productive-approx. 80 000 hectares. The area of vineyards per wine regions should be distributed as follows: South wine region (Cahul)-48 000 hectares, the wine region of Centre-48 000 hectares and wine region North (Balti)-4 000 hectares.

Table 4. Indicative data on the development of viticulture in the commodity producing grapes from 2002-2020

Years	Annual average				Total area, thousand ha		Necessary quantity of planting material, million pcs
	Total area, thousand ha	Productive area, thousand ha	Total production, thousand tones	Yield, kg/ha	designed deforestation	planting area	
2002-2005	99,6	95,2	434,2	4.560	22,5	9,2	32,2
including 2005*	94,2	85,5	393,0	4.600	6,0	4,5	15,75
2006-2010	91,2	71,7	374,4	5.220	35,0	30,0	105,0
including 2010*	89,2	64,2	379,0	5.900	8,0	7,0	24,5
2011-2015	92,2	64,4	419,6	6.520	30,0	35,0	122,5
including 2015*	94,2	66,2	460,0	6.950	6,0	7,0	24,5
2016-2020	98,0	75,0	570,8	7.610	20,0	25,8	90,3
including 2020*	100,0	80,0	640,0	8.000	4,0	5,0	17,5

Also it requires the existence of vineyards to produce wines with designation of origin, given the unique climatic conditions favourable for vines. The area of these plantations should be approx. 5000 hectares.

The level of program implementation can easily see from Figure 9, but the establishment of vineyards in the years 2008-2009 was performed at a lower level compared to planned programme. This, in our opinion, is due to stress growers as a result of the embargo imposed by the Russian Federation.

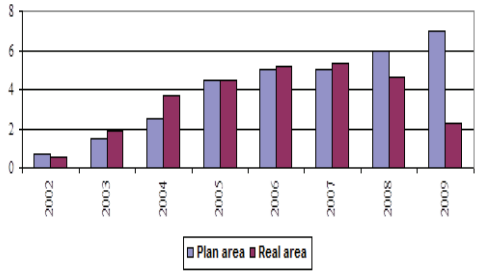

Figure 9. The dynamics of vineyard

During the years, the global production of grapes and quantity processed by the processing enterprises varies very widely. This is due largely to climatic conditions that are created in the geographical territory of the Republic of Moldova.

The decisive and destructive climatic factors which influencing the successful development of viticulture and their intensify in recent years this is the winter frosts, late spring frosts, hail in the early stages of growth, prolonged summer droughts (flowering and berry growth), autumn rains (berry maturation) and early autumn frosts.

CONCLUSIONS

During the years, the total area of vineyards, the global production of grapes and quantity processed by the processing enterprises varies very widely. This is due largely to climatic conditions that are created in the geographical territory of the Republic of Moldova.

The decisive and destructive climatic factors which influencing the successful development of viticulture and their intensify in recent years this is the winter frosts, late spring frosts, hail in the early stages of growth, prolonged summer droughts, autumn rains and early autumn frosts.

To improve the efficiency of viticulture and wine-making is necessary to raise the level of technology of vineyards, perform the intended purpose of the program development, and to develop new markets for grapes and wines.

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THE INFLUENCE OF FERTILIZATION LEVELS AND DRIP IRRIGATION NORMS ON THE APPLE HARVEST IN SOUTH-EASTERN ROMANIAN CONDITIONS

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Abstract

Making a modern fruit growing cannot be conceived without providing a corresponding hydric regime that fruit species need. Even in areas with abundant precipitation should be taken into account that they are unevenly distributed throughout the growing season and that there are critical moments in which trees need to consume water. Low humidity and lack of water can harm large harvest this year or next year to the fruit formation. Taking into account this aspect, in the present study, we wanted to put out the effects of application of modern methods of water located on the behaviour of apple fruit valuable in terms of the south-eastern Romania, where are encountered optimal culture conditions and find the best recommendations for production. The content of this paper is based on research, observations, experiments, extensive research of issues prioritized and data processing including the whole range of issues, starting from the foundation of the application irrigation necessity. As a result, the entire work is based almost exclusively on research findings on the effect of irrigation and fertilization level on apple at Moara Domneasca farm conditions.Factor A-variety: Generos and Florina. Factor B-irrigation norms: non irrigated witness; drop 2 litres / hour; drop 4 litres / hour. FactorC-fertilization levels: 2,5 kilo Megasol or 5 kilo Megasol.The irrigation level resulted in production increases and bonuses obtained as very significant statistically for the two levels of irrigation applied. The highest yields were recorded in variants where rules were applied 4 l / h, with production increases of 40.1%, and increases the harvest of 5.52 t / ha.

Key words: *drip irrigation, fertilization, harvest, water norms, varieties.*

INTRODUCTION

Making a modern fruit growing cannot be conceived without providing a hydric system that corresponds to the needs of the fruit species. Even in areas with heavy rainfall should be noted that these are distributed unevenly throughout the growing season and that there are critical moments in which trees need to consume water (Rzekanowski C., Rolbiecki S., 2000). Low humidity and lack of water can harm large crop of fruit in the current year or of the fruit formation in the next year (Cohen D., 1993).

Currently, irrigation is necessary to be understood, according to the principles of integrated fruit crops as a highly effective tool for regulating the activity of vegetative and productive trees (Botu I., Botu M., 2003). It is known that a mild water stress has the effect of picking the fruit bud differentiation phenomenon. Also, reducing excessive watering result a decrease of the vegetative growth exaggerated of the shoots and directing the assimilated towards the fruits (Atkinson D., 1977).

Even in areas where there is 600-700 mm annual rainfall, water scarcity is need to be cover from July through September, or sometime in the spring, in March-April, before and during flowering and autumn, in October during intensive growth roots. Over time, water saving problem has become increasingly important higher with global climate change, rising among other issues also that of the reduction and rationalization of water use for irrigation (Popescu M., Godeanu I.,1989).

Bearing this in mind, the present study, we aimed to emphasize the effects of localized application of modern methods of water, over the behavior of two valuable apple varieties, in the south-eastern Romania conditions, where are encountered optimal conditions of culture.

The research objective is to observe what is the impact of localized irrigation application on fruitfulness and establishing recommendations

for production of localized irrigation on apple application in the in the south-eastern Romania conditions

MATERIALS AND METHODS

The entire work is based on the results of personal research on the effect of apple irrigation in Moara Domneasca Farm conditions.
Researches to develop this work were conducted in 2008-2011 period. Relief locality is included in the Romanian Plain, Vlasiei Plain subdivision, in the transition from steppe to forest area. The general relief is flat with numerous small bumps and depressions, called dales, of different shapes and sizes. Groundwater is at different depths from 6 m to 10 m, depending on the terrain. In 2008, the accumulated rainfall was 378 mm, in 2009 was 559,4 mm, in 2010 was 494,8 mm and in 2011 was 288 mm. All values are below the 50-year annual average of 548.0 mm.
The soil type at the Moara Domneasca Farm is reddish brown (preluvosoil), softness subtype.
To achieve the objectives, it was imposed an organization of some tri factorial type experiences with the following experimental factors:
Factor A-variety: Generos and Florina.
Factor B-irrigation norms: non irrigated witness; drop 2 litres / hour; drop 4 litres / hour.
Factor C-fertilization levels: 2,5 kilo Megasol or 5 kilo Megasol.
Drip irrigation was started from March 20, administering it daily, for 4 hours. In periods where there were registered rainfalls, the irrigation was discontinued. In general, the number of watering recommended is 2-5.
Fertilization consisted of **Megasol** product administration, which is a soluble fertilizer designed specifically for use in advanced irrigation systems, especially through the drip, and foliar and basic fertilization. On fruit trees were applied 5 splashes using the doses mentioned above.

RESULTS AND DISCUSSIONS

The influence of the variety on the production of apples

Table 1. The Influence of the variety on the production of apples, average of 2008-2011

Variety	Prod. t/ha	%	Dif. t/ha	Signif.
Generous	16,53	100,1	0,02	-
Florina	16,49	99,9	-0,02	-
Average	16,51	100	-	Mt

Dl 5% = 0,244 t / ha Dl 1% = 0,563 t / ha Dl 0,1% = 1,791 t / ha

To analyze the influence of the variety on production, we have established as term of comparison-stander-by the average production of the two analyzed varieties, 16,51 t/ha.
The Generous variety achieved a production of 16,53 t/ha, at a non-significant difference (0,02 t/ha) compared to the stander-by.
Florina variety enrolled with a production of 16,49 t/ha, at a non-significant difference compared to the stander-by, but negative.
We can say that the varieties have a similar genetic potential production (Table 1)

The influence of the drip irrigation levels on the production of apples

Table 2. The Influence of the drip irrigation levels on the production of apples, average of 2008-2011

Irrigation norm	Prod. t/ha	%	Diff. t/ha	Signif.
Non-irrigated	13,75	100	-	Mt
2 l/h	16,51	120,1	2,76	***
4 l/h	19,27	140,1	5,52	***

DL 5% = 0,140 t/ha DL 1% = 0,203 t/ha DL 0,1% = 0,305 t/ha

As shown in Table 2., the irrigation level determined increases of the yields obtained and increases statistically confirmed as highly significant for the two levels of irrigation applied.
Compared to the control (irrigated) production standards achieved at 2 l/h were 20,1% higher, which means an increase of 2,76 t/ha, very significant.
An increase of 5,52 t/ha was recorded also at the irrigated variant with 4 l/h, which means an additional crop of 40,1%.

The influence of the level of fertilization on the production of apples

Table 3. The Influence of the level of fertilization on the production of apples, average of 2008-2011

Fertilizer Dose	Prod. t/ha	%	Diff. t/ha	Signif.
Unfertilized	14,82	100	-	Mt
2,5 kg /ha	16,52	111,5	1,70	***
5,0 kg /ha	18,18	122,7	3,36	***

DL 5% = 0,074 t/ha DL 1% = 0,101 t/ha DL 0,1% = 0,135 t/ha

To make an analysis of the data presented in Table 3. was considered as a stander-by production obtained on a unfertilized variant, 14,82 t/ha. In comparison with this, the recorded production on a dose of 2,5 kg/ha Megasol, 16,52 t/ha was higher by 1,70 t/ha, which is a very significant production increase. The dose of 5 kg/ha resulted in a production of 18,18 t/ha, with 22,7% over the stander-by production, meaning an increase of 3,36 t/ha, a very significantly increase. In conclusion, the fertilization causes very significant production increases for all levels of fertilizer applied.

Table 4. The Influence of fertilization levels on production of apples for the same level of irrigation, average of 2008-2011

Irrigated norm	Non-irrigated			2 l/h			4 l/h		
Fertilizer dose	Prod. t/ha	Dif. t/ha	Signif.	Prod. t/ha	Dif. t/ha	Signif.	Prod. t/ha	Dif. t/ha	Signif.
Non-fertilizer	12,84	-	Mt	14,89	-	Mt	16,74	-	Mt
2,5 kg/ha	13,81	0,97	***	16,53	1,64	***	19,23	2,49	***
5,0 kg/ha	14,59	1,75	***	18,12	3,23	***	21,84	5,10	***

The influence of fertilization levels on production of apples for the same level of irrigation

As noted previously, fertilization brings very significant production increases at all graduations used but irrigation application makes these increases higher than those obtained only after fertilization (Table 4). On non-irrigated variant, the production increase was 0,97 t/ha at a dose of 2,5 kg/ha and 1,75 t/ha at a dose of 5 kg/ha Megasol. With the water irrigation administration, benefits increased to 1,64 t/ha, respectively, 3,23 t/ha. Norms of 4 l/h caused increases of production of 2,49 t/ha, the fertilized variant with 2,5 kg/ha and 5,10 t/ha, the fertilized variant with 5 kg/ha. All registered harvest ups were very significant.

Table 5. The Influence of irrigation levels on the production of apples for the same level of fertilization, average of 2008-2011

Fertilized Dose	**Non-fertilized**			**2,5 kg/ha Megasol**			**5,0 kg/ha Megasol**		
Irrigated norm	**Prod. t/ha**	**Dif. t/ha**	**Signif.**	**Prod. t/ha**	**Dif. t/ha**	**Signif.**	**Prod. t/ha**	**Dif. t/ha**	**Signif.**
Non-irrigated	12,84	-	Mt	13,81	-	Mt	14,59	-	Mt
2 l/h	14,89	2,05	***	16,53	2,72	***	18,12	3,53	***
4 l/h	16,74	3,90	***	19,23	5,42	***	21,84	7,25	***

The Influence of irrigation levels on the production of apples for the same level of fertilization

The level of irrigation, on fertilization background brings very significant yield increases (Table 5). The highest yields from unfertilized variants were obtained from irrigation norms of 4 l/ h, 16,74 t/ha with a production increase of 3,90 t/ha. Production increases amounted to 5,42 t/ha, where were applied 2,5 kg/ha Megasol and were irrigated with and 4 l/h. The highest yields and hence the largest yield increases were obtained in irrigated variant with 4 l/h and fertilized with 5 kg/ha Megasol, 21,84 t/ha, an increase of 7,25 t/ha.

The Influence of the variety on the production of apples for the same level of fertilization

The data presented in Table 6., shows that Generous variety recorded high yields towards Florina variety, but yield differences are insignificant. The biggest difference of production was obtained from unfertilized variant, 0,28 t/ha. Florina variety gets higher production but only at the variant fertilized with 5 kg/ha, where production exceeds the

Generous variety with 0,19 t/ha, increase that was statistically uninsured.

Table 6. The Influence of the variety on the production of apples for the same level of fertilization), average of 2008-2011

Fertilizer dose	Non-fertilized			2,5 kg /ha			5,0 kg/ha		
Variety	Prod. t/ha	Dif. t/ha	Signif.	Prod. t/ha	Dif. t/ha	Signif.	Prod. t/ha	Dif. t/ha	Signif.
Generous	14,96	-	Mt	16,54	-	Mt	18,08	-	Mt
Florina	14,68	-0,28	0	16,51	-0,03	-	18,27	0,19	-

DL 5% = 0, 247 t/ha DL 1% = 0,523 t/ha DL 0,1% = 1,536 t/ha

The influence of the fertilization level on the production of apples for the same variety and the same level of irrigation

Table 7. The Influence of the fertilization level on the production of apples for the same variety and the same level of irrigation, average of 2008-2011

Variety	Generous						Florina					
Factor BxC	Non-irrigated		2 l/h		4 l/h		Non-irrigated		2 l/h		4 l/h	
	Prod. t/ha	Dif.	Prod. t/ha	Dif.	Prod. t/ha	Dif.	Prod t/ha	Dif.	Prod. t/ha	Dif.	Prod. t/ha	Dif.
Non-fertilized	12,95	-	15,10	-	16,83	-	12,73	-	14,67	-	16,65	-
2,5 kg/ha	13,73	0,78***	16,57	1,47***	19,32	2,49***	13,89	1,16***	16,49	1,82***	19,14	2,49***
5,0 kg/ha	14,37	1,42***	18,11	3,01***	21,77	4,94***	14,80	2,07***	18,12	3,45***	21,90	5,25***

DL 5% = 0,182 t/ha DL 1% = 0,247 t/ha DL 0,1% = 0,331 t/ha

Analyzing the data in Table 7. and shows that the two varieties have similar production value but the biggest production increases were achieved at Florina variety. On irrigated variants were made between 12,73 and 21,90 productions t/ha. Production increases were statistically confirmed and were in the range of 0,78 to 5,25 t/ha, all being very significant. Generous variety was enrolled with the lowest production on non-irrigated, 12,95 t/ha and the highest in irrigated variety with 4 l/h and fertilized with 5 kg/ha Megasol, 21,77 t/ha, variant were the production growth achieved was 4,94 t/ha. Florina variety recorded the highest harvest at the same variant 21,90 t/ha and an increase of 5,25 t/ha. Irrigation combined with fertilization determines the increase of the production increases compared to variants where he acted only one factor.

The influence of irrigation level on the production of apples for the same variety and the same level of fertilization

Analyzing the data in Table 8. it observed that the application of irrigation causes very significant production increases at all variants studied. At a watering of 2 l/h, increases the crop increases were recorded as receiving concomitant irrigation and Megasol. To 2,5 kg/ha fertilizer, increases were 2,84 t/ha, the variety Generous and 2,60 t/ha, at Florina variety. At 5 kg/ha Megasol, increases were of 3,74 t/ha and 3,32 t/ha. Increasing the water quantity, administered at 4 l/ha resulted in a significant increase of production increases obtained. Thus, at the dose of 2,5 kg/ha Megasol was recorded an increase of 5,59 t/ha, at the Generous variety and 5,25 t/ha at Florina variety. Dose of 5 kg/ha resulted in increases of the production of 7,40 t/ha at the Generous variety and 7,10 t/ha, at Florina variety.

The Influence of variety on the production of apples for the same level of irrigation and fertilization

Comparing the data in Table 9. it is noted that between the varieties analyzed there are no differences of production statistically assured, which suggests a capacity approximately equal. The only variable that was a significant difference in the non-irrigated and fertilized was with 5 kg/ha Megasol (0,43 t/ha). Overall the production of Florina variety was lower than those of the Generous variety.

Table 8. The Influence of irrigation level on the production of apples for the same variety and the same level of fertilization, average of 2008-2011

Variety	Generous						Florina					
Factor CxB	Non-fertilized		2,5 kg/ha		5,0 kg /ha		Non-fertilized		2,5 kg /ha		5,0 kg /ha	
	Prod. t/ha	Dif.	Prod. t/ha	Dif.	Prod. t/ha	Dif.	Prod. t/ha	Dif.	Prod. t/ha	Dif.	Prod. t/ha	Dif.
Non-irrigated	12,95	-	13,73	-	14,37	-	12,73	-	13,89	-	14,80	-
2 l/h	15,10	2,15***	16,57	2,84***	18,11	3,74***	14,67	1,94***	16,49	2,60***	18,12	3,32***
4 l/h	16,83	3,88***	19,32	5,59***	21,77	7,40***	16,65	3,92***	19,14	5,25***	21,90	7,10***

DL 5% = 0,247 t/ha DL 1% = 0,350 t/ha DL 0,1% = 0,504 t/ha

Table 9. The Influence of variety on the production of apples for the same level of irrigation and fertilization, average of 2008-2011

Irrigation level	Fertilization level	Generous	Florina	Dif. t/ha	Signif.
Non-irrigated	Unfertilized	12,95	12,73	-0,22	-
	2,5 kg/ha	13,73	13,89	0,16	-
	5,0 kg/ha	14,37	14,80	0,43	*
2 l/h	Unfertilized	15,10	14,67	-0,43	0
	2,5 kg/ha	16,57	16,49	-0,08	-
	5,0 kg/ha	18,11	18,12	0,01	-
4 /h	Unfertilized	16,83	16,65	-0,18	-
	2,5 kg/ha	19,32	19,14	-0,18	-
	5,0 kg/ha	21,77	21,90	0,13	-

DL 5% = 0,311 t/ha DL 1% = 0,545 t/ha DL 0,1% = 1,263 t/ha

The variants fertilized with 5 kg/ha, regardless of irrigation level, Florina variety exceeded the production Generous variety, showing a greater capacity for recovery of the fertilizer, but insignificant.

CONCLUSIONS

Influence on the production of apple variety, average of the years 2008-2011. On average over the three years of experimentation, the Generous variety showed a higher yield potential than Florina variety, but yield differences between them are significant

Influence of drip irrigation level on apple production, average of the years 2008-2011

Irrigation level resulted in increases of the production obtained and increases as highly significant statistically assured for the two levels of irrigation applied. The highest yields were recorded in variants where were applied norms of 4 l/h, increases production of 40,1%, and increases of crops of 5,52 t/ha. **Influence of fertilization level on the production of apple, average of the years 2008-2011.**

Level of fertilization causes very significant production increases for all levels of fertilizer applied. The highest yields were achieved at doses of 5 kg/ha Megasol (18,18 t/ha), with increases of 22,7% (3,36 t/ha).

Influence of fertilization on the production of apples to the same level of irrigation, average of the years 2008-2011.

Fertilization brings very significant production increases at all graduations used but irrigation application makes these increases to be superior to those obtained only after fertilization. The highest yields were obtained at fertilization with a dose of 5 kg/ha, regardless of the norms of irrigation applied with a maximum increase irrigated with 4 l/h (5,10 t/ha).

Influence of irrigation level on the production of apples for the same level of fertilization, average of the years 2008-2011.

Irrigation resulted in very significant production increases regardless of fertilization, yields based on the value of 2,05 t/ha and reaching at a value of 7,25 t/ha. The highest yields and hence the largest yield increases were obtained in irrigated variant with 4 l/h and fertilized with 5 kg/ha Megasol, 21,84 t/ha, and an increase of 7,25 t/ha.

Influence of variety on the production of apples for the same level of fertilization, average of the years 2008-2011.

The only difference between the two varieties production was recorded in the unfertilized variant, where the Generous exceeded the production of Florina variety by 0,28 t/ha, which is a significant difference statistically assured being insignificant. Fertilizer administration has reduced the distance between productions, reaching at the dose of 5 kg/ha, Florina variety exceeds the production at the Generous variety, but the differences are insignificant.

Influence of fertilization level on the production of apples for the same variety and level of irrigation, average of the years 2008-2011.

Under the same conditions of fertilization and irrigation, the reaction was different varieties. Thus, Generous variety obtained yield increases in the range of 0,78 t/ha, at doses of 2,5 kg/ha to 1,16 t/ha obtained by Florina variety, up to 4,94 t/ha, achieved growth in a dose of 5 kg/ha towards 5,25 t/ha obtained by Florina variety. This variety has used more effectively the fertilization effect. All registered production increases at all graduations used, were very significant.

Influence of irrigation level on the production of apples for the same variety and level of fertilization, average of the years 2008-2011.

Applying irrigation causes very significant production increases at all variants studied.

Thus, Generous variety obtained yield increases in the range of 2,15 t/ha, the norms of 2 l/h compared to 1,94 t/ha obtained by Florina variety, up to 7,40 t/ha, increase made at norm of 4,94 t/ha, increase achieved at a dose of 4 l/h, compared to 7,10 t/ha,obtained at Florina variety. Generous variety exploited more efficiently the effect of irrigation.

All registered production increases at all graduations used were very significant. **Influence of variety on the production of apples for the same level of irrigation and fertilization, average of the years 2008-2011.**

There are no differences of production statistically assured between the varieties analyzed, which suggests a production capacity approximately equal. Overall the yields of Florina variety were lower than the Generous variety. The largest differences in production were of 0,43 t/ha and the lowest, of 0,01 t/ha.

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THE INFLUENCE OF THE DRIP IRRIGATION ON THE PHYSICAL AND CHEMICAL APPLE CHARACTERISTICS

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Abstract

The premise of scientific and technical experiments was to evaluate the behaviour during the winter storage of the 2 cultivars of apples (Generos and Florina) introduced into experimental and comparison with other cultivars. The drip irrigation was started from March 20, administering daily for 4 hours. Recommended watering periods, depending on the weather of the year are:5-15 of March; 1-15 of May (after the fruit tying); 15-25 of July; 10-15 of September; 1-15 of November, the supply. The needed water norms are between 300 and 700 m^3/ha.

Key words: *chemical, irrigation, organoleptic, physical, storage.*

INTRODUCTION

Influence of drip irrigation on production quality is the effect on the nutritional and food value of fruits (Atkinson D., 1977; Gherghi et. al., 1972). Nutritional and food value of the fruits represents the purpose for growing fruit trees, fruit bushes and strawberries as supplements of vitamins, sugars, minerals, acids and energy (calories) needed for proper body growth and development (Botu, 2003). In addition, the fruits also contain magnesium, manganese, copper, zinc and iron, as well as the important minerals in the diet (Gherghi A., 1983)

Apples in controlled storage conditions can prolong the storage period of 3-9 months without losing its qualities. Storage and consumption during the same organoleptic characteristics depend on the terms offered and the particular cultivar. It is known that during storage, the apples suffer structural-textural changes that are produced slower or faster depending on the characteristics of cultivars and storage conditions (Gherghi A et. all., 2001). When apples with great firmness at harvest are stored in controlled atmosphere storage, they can use the same value until the next harvest of early cultivars (Gherghi A., 1989).

MATERIALS AND METHODS

To establish the ability to maintain quality fresh apples were taken 5 homologated cultivars, of which Generos and Florina disease-resistant and Jonathan, Golden Delicious and Idared, with widespread in the current assortment in our country. Fruits were kept after harvesting a period of about 50-60 days, depending on cultivar, in the storage spaces of the resort, from where they were then taken for experiments and refrigerated in storage conditions (t=0...+4°C, RH = 90-95%) over a period of 110 days in cold storage of Belciugatele Didactic Station, located inside the Moara Domneasca Farm.

After removal from storage were made determinations regarding the following:

- the quantitative and qualitative losses recorded by the fruit during storage;
- modifying fruit firmness (penetrometer determined) during storage;
- evolution of the main chemical components of the apples during storage;
- organoleptic assessment (appearance, firmness, taste) of fruit after storage.

The premise of the scientific and technical experiments was to assess behavior during winter storage of the 2 cultivars of apples introduced in the experimentation and comparison with other cultivars. Existence of

optimal flow experience across storage-keeping with reference to standardized packaging units, space conditioning, refrigeration thermostatic cell, organoleptic testing laboratory, equipment and devices for measurements and analyzes provided made it possible to achieve this goal.

The experiments were conducted in 5 different comparative variants based on the mentioned cultivars, with 3 repetitions per variant. During storage it has been made the daily examination of the thermal-hydric factors in the refrigeration room, for ensuring that optimal conditions to maintain quality (temperature 0 ... 4^0C and RH 90 .. 95%). Also we proceeded to assess the ability to maintain fruit quality by findings the appearance changes occurred regarding dehydration, the appearance and evolution of different storage disease. Taking into account the high degree of maturity of the fruit during storage and quality changes occurring during storage it was estimated that during cold storage the limit is 110 days. After removing apples from the storage space the determinations were performed on the table and impairment losses (spoilage) and fruit firmness, biochemical analysis of the main components and organoleptic testing at this stage. Determination of mass loss and spoilage during storage products was done by weighing samples of fruit resulted, respectively the fruit impaired (spoiled) during storage, compared with the initial amount deposited, the results being expressed as a percentage.

Fruit firmness was made manual with a penetrometer piston type Effe-gi 1 mm, on a total of 25 fruits per variant, each fruit was penetrated at 4 points in the equatorial zone after removing the epidermis in those points.

Tests for the main chemical components (dry substance, total sugar, titratable acidity and ascorbic acid) were performed by standard laboratory methods as follows:

- dry substance was determined by refractometry method using ABB table refractometer with results expressed in%:
- total sugar by Berthrand method with results expressed in %;
- acidity by titrimetric method with results expressed in % of malic acid;
- vitamin C (ascorbic acid) by spectrophotometer method, using UV-VIS Specol spectrophotometer and expression in mg/100g.

To assess organoleptic tasting were performed using the tasting sheets that contain a number of three assessment criteria (appearance, texture, taste). Notation (appreciation) was performed using 100 points scale. Each of the three assessment criteria has different weight in general notation, depending on their importance. Thus 'the aspect' represents 15%, 'texture' 35% and taste 50%. Depending on the score achieved 5 quality classes, according to Table 1.

Table 1. Classification of fruit after scoring

Rating (quality category)	Score
very good	80-100
good	60- 79
acceptable	40-59
mediocre	20-39
inappropriate	0-19

RESULTS AND DISCUSSIONS

Influence of drip irrigation on quantitative and qualitative losses

The results of the quantitative and qualitative losses recorded by the fruit during storage at the experimental variants are presented in Table 2.

Table 2. Losses while preserving apples

Var	Cultivar	Losses (%)			Remarks on damaged fruits
		Total	Weight	Damage	
V1	Jonathan	19.28	7.41	11.87	3.54 % gray rottenness 8.33% internal collapse
V2	Golden Delicious	24.20	8.62	15.58	gray rottenness
V3	Idared	17.55	5.17	12.38	gray rottenness
V4	Florina	14.66	5.88	9.08	4.26 % gray rottenness 4.82% heart rot
V5	Generos	5.94	5.94	-	-
	AVERAGE	16.33	6.60	9.78	

The data presented shows that total losses during storage are between 5.94-24.20% (depending on cultivar), with an average of 16.33%. Weight loss varies between 5.17-8.62% with an average of 6.6% and by spoiling from 0-15.58% with an average 9.8%.

The lowest total losses (5.94%) are recorded on Generos cultivar (Figure 1).

Figure 1. The aspect of apples from Generos cultivar after storage

This variant shows reduced mass loss and recorded spoiling due to disease attack. The total losses are recorded by Golden Delicious cultivar (24.20%) that both weight loss and spoiling is the highest (Figure 2)

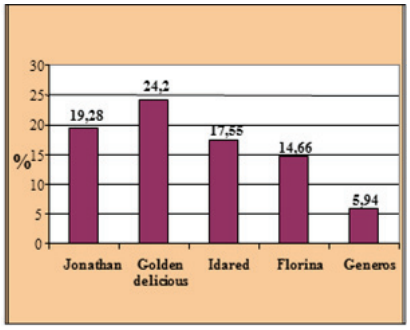

Figure 2. The total losses recorded at studied varieties

Influence of drip irrigation on fruit firmness

Results regarding the fruits firmness (penetrometer determined) during storage are presented in Table 3

Table 3. Firmness of apples during storage and after storage

Variant	Penetration value (kgf/cm²)			
	Cultivar	On insertion	After keeping	Reduction %
V1	Jonathan	3.93	3.73	5.09
V2	Golden	4.82	3.53	26.76
V3	Idared	4.08	3.93	3.68
V4	Florina	3.71	3.23	12.94
V5	Generos	4.10	3.86	5.85
Average	-	4.13	3.66	10.86

During cold storage the cultivars studied showed a different degree of pulp consistency, varying between 3.71 kgf/cm² (V4) and 4.82 kgf/cm² (V2).

Average value of the 5 variants was 4.13 kgf/cm², surpassed by the Golden Delicious cultivar (4.82 kgf/cm²).

During storage, the fruit firmness decreased in all variants in different ratios, ranging from 3.93 kgf/cm² on an average of 3.66 kgf/cm², value with 7.4% less than the original.

Fruits which remained firmed are related to: V3 (Idared), V1 (Jonathan) and V5 (Generos) on which firmness decreased from 3.68-5.85%. Firmness showed the largest decrease in variant V2 (Golden Delicious) were registered drastically firmness decreased from 37.15%, respectively to 26.76%.

Influence of drip irrigation on chemical and physical characteristics to apples

Results on the evolution of the main chemical components during storage are presented in table 4.

Table 4. Principal chemical components of apples during and after storage

Cultivar	Dry Soluble Substance (%)		Titratable acidity (%) (malic acid)		Total carbohydrates (%)		Ascorbic acid (mg/100g)	
	initial	final	initial	final	initial	final	initial	final
Jonathan	13.4	13.5	0.50	0.42	11.26	10.29	9.45	7.66
Golden	11.8	12.2	0.39	0.32	9.90	9.00	9.18	7.35
Idared	11.8	13.0	0.60	0.53	9.60	8.59	6.70	5.41
Florina	12.8	13.1	0.59	0.41	10.66	9.88	9.65	7.68
Generos	13.3	13.9	0.65	0.56	11.05	10.47	9.06	7.22
Average	12.62	13.14	0.55	0.45	10.50	9.65	8.81	7.06
Differences (%)		+5.20		-17.0		-8.70		-16.4

Initial dry substance content at the experimental variants was between 11.8 and 13.4%, with an average of 12.62%, Jonathan cultivar and Generos cultivar with the highest values and the lowest at the Golden Delicious and Idared cultivar. During cold storage the content of dry substance increased in all variants reaching on average of 13.14%. The average increase recorded was 5.20%. The initial acidity of the fruit (expressed in malic acid /100g) ranged from 0.39-0.65%, with an average of 0.55%. The lowest acidity was recorded by Golden Delicious cultivar and highest by Generos and Idared cultivars.

During cold storage fruit acidity decreased in all variants on average with 17.0%.

Total carbohydrate content initially ranged between 9.60% and 11.26% depending on the variant, with an average of 10.50%. The lowest values were seen in Idared cultivar and the highest at Jonathan cultivar. During cold storage, the carbohydrate content decreased by average of 8.7%. Initial content of ascorbic acid (vitamin C) ranged from 6.70-9.65 mg/100g depending on the variant, with an average of 8.81 mg/100g. Fruits with high content of ascorbic acid belong to the Florina and Jonathan cultivars. During cold storage, the ascorbic acid content decreased in all cases, with an average of 16.4%. The results of the measurements regarding the weight average, structural-texture firmness and the form index of apples are shown in table 5.

Table 5. Physical features of apples

No. crt.	Variant	Cultivar	Average weight (g)	Firmness (kgf/cm²)	Form index
1	V1	Jonathan	171.05	3.47	0.84
2	V2	Generos	207.37	4.85	0.84
3	V3	Idared	209.20	4.48	0.83
4	V4	Florina	179.58	6.24	0.92
5	V5	Golden delicious	149.16	4.47	0.94
Overall average			183.27	4.70	0.87

Influence of drip irrigation on organoleptic

Organoleptic test results from Apple (appearance, firmness, taste) after storage are presented in Table 6

In terms of appearance it was found that the Generos cultivar has obtained the highest score (15.0) of all experimental variants while Golden Delicious had the lowest score from experience. From the point of view of apple appearance all variants showed a high score from 12.00–15.00 points depending on the variant, with an overall average of 13.46 points.

Regarding firmness, the apples obtained from 27.00-34.00 points depending on the variant, with an overall average of 31.40 points. Top-rated variants were Idared and Florina, the lowest being Jonathan cultivar.

Meanwhile Jonathan and Golden got the lowest score (12.0).

Regarding taste, the apples obtained from 42.86-48.57 points depending on the variant, with an average of 45.14 points.

Table 6. Organoleptic assessment of apples after storage

Cultivar	Rating cultivar taste - (points)				Grade	Place
	Aspect	Firm-ness	Taste	The average amounts		
Jonathan	12.86	27.00	44.29	84.15	Very good	5
Generos	15.00	32.00	48.57	95.57	Very good	1
Idared	13.71	34.00	44.29	92.00	Very good	3
Florina	13.71	34.00	45.71	93.42	Very good	2
Golden delicious	12.00	30.00	42.86	84.86	Very good	4
Overall average	13.46	31.4	45.14	90.00		

The highest score for taste assessing was obtained by Generos. At the opposite side it was Golden Delicious cultivar with the lowest score of assessment.

The total score in apples taste assessing was 84.15-95.57 points depending on variant and rated 'very good', with an overall average of 90.00 points. On the first place it stands Generos. Latest seats were occupied in order by Golden Delicious and Jonathan.

CONCLUSIONS

Conclusions on losses

Among the cultivars tested best behaved was Generos, which ranked first a total loss of 5.94% without losses through spoilage. Golden Delicious presented the worst results, with 24.20% total losses of which 15.58% through spoilage.

Conclusions on fruit firmness

Compared to the initial firmness of 3.71-4.82 kgf / cm ² depending on the cultivar, apples after storage showed firmness values of 3.23-3.93 kgf / cm ² depending on the cultivar.

The apples firmness dropped during cold storage levels in average with 7-10%, with a range between 3.68-26.76% depending on the cultivar. Between cultivars were observed in this order Idared, Jonathan and Generos with fruit firmness reduction between 3.68-5.85%. On the last place between cultivars was located Golden Delicious whose firmness decreased by 26.76%.

Conclusions on changes in chemical constituents

The main chemical components (soluble dry substance, titratable acidity, total sugars and ascorbic acid) during storage of apples undergo some changes regarding the increase or the decrease of their recorded content during the storage in refrigerated space. In that period of 110 days, the soluble solids substance content increased by 5.20% and the titratable acidity, total sugars and ascorbic acid were reduced by 17.0%, 8.70% and 16.40%

From the analysis resulted it is showed that among all variants, a balanced content of these components is found at the variants V1-Jonathan cultivar.

Conclusions on fruit size and shape index

Apples of the late maturing apple cultivars studied, differs in fruit size, structural-textural firmness and form index. The average weight of the fruit ranges from 149.16-209.20 g (depending on variant), with an overall average of 183.27 g. The fruits over 200g/pcs presented the Generos and Idared cultivars.

Firmness of apples varies between 3.47 and 6.24 kgf / cm ^{2} (depending on variant) with an overall average of 4.70 kgf / cm ^{2}. The highest value was determined from Florina cultivar, and the lowest, from the Jonathan cultivar. The form index of apples had an overall average of 0.87 with a range from 0.83-0.94, depending on the variant.

Conclusions on some organoleptic characteristics

In terms of apple's appearance, all variants showed a high score of 12-15 points, with an overall average of 13.46 points. Generos cultivar obtained the maximum possible score of 15 points, while Golden Delicious cultivar had the lowest score. In terms of firmness, the apples obtained from 27.00 to 34.00 points with an overall average of 31.40 points. Idared and Florina cultivars were best rated and Jonathan cultivar received the fewest points. Regarding the taste, the apples obtained from 42.86-48.57 points, with an average of 45.14 points. The highest score on taste assessing was obtained by the Generos cultivar. On the opposite side was the Golden delicious cultivar with the lowest score.

The total score at the apples assessing taste was 84.15-95.57 points and was rated 'very good', with an overall average of 90.00 points. The first place was located by the Generos cultivar. The last place was taken in order by the Golden Delicious and Jonathan cultivars.

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RESEARCH ON FACTORS AFFECTING RASPBERRY PLANT GROWTH

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Abstract

The paper presents the results and observations made in Moldova in the period 2002-2010 on the factors that influence plant growth and development phenological phases of 29 introduced raspberry variety. It was established as the beginning of flowering until early fruit maturation medium passes in 27-47 days. After assessing the extent of fruiting plant varieties revealed the Pathfinder, Hybrid Bulgarian, Lloyd George, Rubin Bulgarian, The Latham. The average weight of the raspberry fruits is a criterion for assessing their quality and which highlighted these varieties Hybrid Bulgarian, Rubin, September, Delbard Magnific, Lazarevscaia. Study after winter hardiness of raspberry variety introduced revealed the most resistant to Pathfinder, June, Cayuga, Solnisco, Lazarevscaia, Balsam. Varieties that showed an increased resistance to drought are Stolicinaia, Malling Promise, Lloyd George. Among disease-resistant varieties (Bean and Septoria) have revealed Kuthbert, Indian Summer, Hybrid Bulgarian, St. Walfried, The Latham

Key words: *raspberry, phonological phases, weight of berries, plants resistance, Republic of Moldova.*

INTRODUCTION

Hydrological regime is one of the factors limiting raspberries crop. Raspberry shoots during the growth and fruits ripening period, especially needs a large amount of moisture. Insufficient or excess of water during this period not only adversely affects the fruits and shoots at the moment, but also largely determine their viability, harvest of next year (Kazacov and Kicina, 1980).

All varieties of raspberry strength are closely related to temperature regime during the growing season determine the plant status during the resting state. So now, plant growth in the summer, in wet conditions and high temperatures leads to branching stems and prevents wood cooking at ramifications arising prematurely, which freezes in winter. Most varieties not withstand temperatures below minus 25°C (Belîh et al,, 2004; Kondratenco and Nadtocii, 2002).

Deep raspberry plantations thrive fungal diseases, bacterial, viral, especially bean, Septoria, rust, bacterial cancer. Land too acidic and rich in nitrogen, bean grows more quickly, especially in dense bushes (Hoza, 2005; Bogdanova, 2011).

MATERIALS AND METHODS

Studies on the impact of growing conditions and plant development, deployment phenological development stages of raspberry varieties introduced and the influence of climate on crop of fruits quality. The research was conducted in the experimental field of the Institute of Horticulture as recognized and approved methods for studying small fruits. The plantation was established in 2000 on land without irrigation after planting distance of 2.5x0.5 m

The study included 29 introduced varieties of raspberry: Barnauliscaia, Rubin, Delbard Magnific, Stolicinaia, Kirjaci, Pathfinder, President, Kuthbert, Indian Summer, Hybrid Bulgarian, June, Marfilk, Kobfuller, Cayga, Malling Promise, Solnishco, Lazarevscaia, Balsam, Brigantine, Meteor, Red Wadenswil, Lloyd George, Bulgarian Rubin, Paul Camerzid, September, St. Taylor, Walfried, Latham, Malling Jewel. Varieties were assessed by the degree of fructification with note 1 (low fructification) up to grade 5 (high fructification), the degree of resistance to bean, Septoria, frost and drought were rated at 0 (unaffected) and Note 5 (strongly affected).

RESULTS AND DISCUSSIONS

Raspberry is a very demanding crop in soil moisture due to shallow the root system. In the absence of rainfall during critical periods of plant development (growth period of shoots and fruit formation) and to avoid adverse effects on raspberry fruit crop requires irrigation plantation. Still made on rainfall data from the period of observation during the years 2002-2010 are included in Table 1.

Table 1. Rainfall during the research period (mm)

Months	2002	2003	2004	2005	2006	2007	2008	2009	2010
III	58.7	12.4	31.0	14.8	89.1	33.7	35.6	70.8	29.0
IV	30.6	34.9	28.0	49.5	36.6	36.5	43.2	2.7	45.1
V	10.4	20.6	75.0	75.8	97.1	19.0	42.6	33.3	69.2
VI	60.1	21.6	11.0	104.8	81.6	23,7	62.8	39.0	85.0
VII	133.4	17.4	10.0	17.6	53.0	3.6	50.2	67.2	67.2
VIII	80.6	27.4	25.6	150.9	67.7	33.8	30.8	32.6	53.0
IX	47.1	52.7	69.6	4.9	57.8	24.8	77.7	21.7	46.7
X	84.2	62.1	33.4	11.0	13.6	71.0	16.0	29.6	68.9
IV-IX	446.4	236.7	374.6	429.3	491.5	246.1	358.9	297.4	464.1
year	618.0	376.4	651.9	660.3	560	474.4	460.5	455.1	735.2

According to Table 1 analysis of data on rainfall amount shows that the minimum annual precipitation that has accumulated in 2003 year was 376.4 mm, and the largest amount was collected in 2005 year in the amount of 660.3 mm, although rainfall during the year and the vegetation period were uniformly distributed, including during critical periods of growth and development of the raspberry plant. The highest of monthly precipitation fell in August, 2005 in the amount of 150.9 mm, in July 2002 year to 133.4 mm, in June 2001 year to 129.5 mm.

The smallest amount of monthly precipitation fell in July 2007 to 3.6 mm, in September 2005 to 4.9 mm in August 2001 to 5.4 mm. Air temperature and soil moisture are important on development and deployment of raspberry phenological phases. Temperature during the observation period is presented in Table 2.

Table 2. Air temperature during research, (0C)

Months	2002	2003	2004	2005	2006	2007	2008	2009	2010
III	7.2	1.0	5.4	2.3	2.6	7.1	7.2	3.2	3.4
IV	10.4	8.5	10.8	10.5	10.9	10.6	11.0	12.2	11.0
V	17.9	11.5	14.8	16.5	15.6	18.9	15.5	16.4	16.8
VI	20.1	1.2	19.3	18.6	19.7	23.6	20.9	21.1	21.0
VII	24.3	21.6	21.7	27.7	22.1	25.8	22.3	23.9	23.1
VIII	21.3	22.6	21.1	21.8	22.2	23.9	23.8	23.0	24.9
IX	16.6	15.6	15.9	18.3	17.1	16.7	15.5	18.7	16.1
X	9.5	9.2	11.4	17.2	12.1	11.3	12.5	11.6	7.5
III-X	17.2	15.7	16.43	18.66	17.1	18.69	17.36	18.13	17.20
year	11.0	9.0	10.29	11.43	10.2	11.5	11.4	11.3	10.62

The 2003 year was marked by the lowest average of temperatures during the growing season aier, which reached only the value of 15.71°C, compared to the highest values of 18.69 º C, set in 2007.

It also showed the lowest average annual temperature of only 9°C in 2003, compared with the highest temperature of 11.5°C, recorded in 2007.

Air temperature during 2007 for June, July and August with corresponding values of +23.6, 25.8, 23.9°C, which was the highest for the entire period of observations. Especially in summer air temperature ranged between +17.9 and +27.7 values and C. Phases phenological development of raspberry plants depends on the variety and other factors, but in particular on climatic conditions of the year, Table 3.

According to phenological observations (Tables 1, 2, 3), and meteorological data recorded in 2003 year, fell the least amount of annual rainfall-376.4 mm was recorded and the lowest average annual temperature +9°C, and in vegetation period + 15.71 º C, which led to the late burgeoning of raspberry plant at April 21 during the researches.

Air average temperature higher than usual, recorded in February by + 4.9 º C and +7.2 º C in March of 2002 year contributed to the early budding of raspberry plant from March 20.

Phenological phases carrying the raspberry plants, during research

Table 3. Phenological phases carrying the raspberry plants, during research

Phenological phases	2002	2003	2004	2005	2006	2007	2008	2009	2010	mean
beginning of vegetation	20.03	21.04	25.03	10.04	09.04	29.03	05.04	24.03	03.04	
Duration between phases	44	28	51	39	42	43	30	46	45	46
flowering	02.05	18.05	13.05	19.05	21.05.	10.05	04.05	08.05	18.05	
Duration between phases	43	31	34	27	30	36	47	35	35	33
Fruit maturation	14.06	19.06	15.06	14.06	19.06	15.06	20.06	12.06	22.06	

Raspberry plants flowering usually begins in early May, although some delays may occur up in the second half of May, depending on the amount of assets accumulated temperature needed to start the phenological phases. Length of time between phenological stages of budding and flowering varies between 28-51 days. Since the beginning of flowering until early fruit maturation medium passes in a period of 27 to 47 days.

Figure 1. Flowering period of raspberry fruits

Period, which lasts from the beginning of vegetation, to fruit maturation, varies between 59-87 days. Raspberry fruit ripening usually begins in the second-the third decade of June, with some deviations depending on the temperatures set in this period.

Raspberry reacts negatively to lack of moisture during fruit formation and growth, which can lead to fruit weight reduction, fruit quantity and quality.

Table 4. Development indices and the degree of resistance raspberry plant, years 2002-2006

Variety	Degree of fructification, note	Average fruit weight grade,g	degree of Bean damage, note,	Degree of septoria damage, note	Degree of frost damage, note	Degree of drought damage, note
1.Barnauliscaia	2	2.0	2	1	2	3
2.Rubin	3	3.2	5	3	2	4
3.Delbard Magnific	3	2.9	3	3	1	5
4.Stolichnaia	4	2.5	4	3	1	0
5.Chirjaci	4	2.0	4	3	1	4
6.Paphinder	5	1.6	2	3	0	2
7.President	1	2.5	2	2	1	-
8.Kuthbert	1	1.6	0	0	4	3
9.Indian Summer	3	1.6	0	0	2	2
10.Hybrid Bulgarian	5	3.5	0	0	1	3
11.June	1	1.3	1	1	0	4
12.Marfilk	1	2.0	2	2	2	-
13.Kobfuller	4	2.4	-	-	1	2
14.Cayga	3	2.5	1	1	0	-
15.Malling Promise	4	2.1	3	2	2	0
16.Solnishco	3	2.2	1	1	0	4
17.Lazarevscaia	4	2.7	4	4	0	1
18.Balsam	3	2.3	1	2	0	1
19.Brigantine	3	1.9	2	2	1	2
20.Meteor	1	1.6	2	2	1	4
21.Red Wadenswil	4	1.6	1	1	2	1
22. Lloyd George	5	2.7	2	3	1	0
23.Rubin Bulgarian	5	2.5	3	2	2	4
24.Paul Camerzid	2	2.4	-	-	2	3
25.September	4	3.2	4	4	1	5
26.St. Walfried	4	1.7	0	0	2	1
27.Taylor	1	2.0	2	2	3	1
28.The Latham	5	2.1	0	1	1	1
29.Malling Jewel	2	2.2	3	2	2	3
Variation limits	1-5	1.3-3.5	0-5	0-4	0-4	0-5

Raspberry varieties capacity to adapt to the new conditions of growth and development of plants is different, and lack of rainfall can affect the quantity and quality of the harvest, reduce fruit weight, if necessary measures are not related to irrigation. As a result of research conducted on plant development, degree of fruiting, fruit weight, degree of damage by disease, frost and drought were assessed raspberry varieties on irrigated land, and the data obtained are presented in Table 4.

Appreciation fruiting varieties studied by the ability to highlight varieties allowed Pathfinder, hybrid Bulgarian, Lloyd George, Rubin Bulgarian, Latham, who showed top marks in the grade 5 on level fruition.

The average weight of the fruits of raspberry is a criterion for assessing the quality varieties. The results obtained on fruit size allowed to highlight the following varieties of fruits largest: Hybrid Bulgarian-3.5 g, Rubin, September-3.2 g, Delbard Magnific-2.9 g, Lazarevscaia – 2.7 g. Small fruit varieties from 1.3 to 1.6 g were: June, Meteor, Pathfinder, Red Wadenswil, Indian Summer, Kuthbert, St. Walfred.

Figure 2. Maturation period of raspberry fruits, variety Delbard Magnific

Research on winter hardiness of raspberry variety introduced, included in the study and appreciation revealed the 0 score of the toughest as: Pathfinder, June, Cayuga, Solnishco, Lazarevscaia, Balsam. Varieties showed an increased resistance to drought are Stolicinaia, Malling Promise, Lloyd George. Among disease-resistant varieties (bean and Septoria) were highlighted: Kuthbert, Indian Summer, Hybrid Bulgarian, St. Walfried, The Latham.

CONCLUSIONS

As a result of scientific research conducted on developing varieties introduced raspberry established that:

Budding is usually between 20.03-10.04, although there are some variations until 21.04.

Early flowering begins average over 28-51 days. Early flowering usually occurs in early May at 02.05.

Early fruit ripening occurs on average at 27-47 days after the beginning of flowering.

Maturation begins usually in the second-the third decade of June from 12 till 20.06. depending on the year.

After assessing the extent of fruiting plant varieties revealed the Pathfinder, Hybrid Bulgarian, Lloyd George, Rubin Bulgarian, The Latham.

The average weight of the fruits of raspberry is a criterion for assessing their quality and which highlighted the following varieties as Hybrid Bulgarian-3.5 g, Rubin, September-3.2 g, Delbard Magnific-2.9 g, Lazarevscaia-2 7 g.

Study regarding the raspberry varieties introduced after winter hardiness revealed the most resistant as: Pathfinder, June, Cayuga, Solnishco, Lazarevscaia, Balsam. http://agriculturefor life.usamv.ro:9080/UserArticle#

Varieties which showed a high resistance to drought are Stolicinaia, Malling Promise, Lloyd George.

The disease-resistant varieties (bean and Septoria) have revealed Kuthbert, Indian Summer, Hybrid Bulgarian, St. Walfried, The Latham.

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PHENOLOGY RESEARCH ON BLACKBERRY DEVELOPMENT IN REPUBLIC OF MOLDOVA

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Abstract

The paper presents research results and observations made on the development of phenological stages and plant development of blackberry varieties Darrow, Smoothstem, Thornfree studied during the years 2010-2012 in the Republic of Moldova. It was established that during the period between budding and flowering was 31-46 days and fruit ripening begins at 55 -64 days from the beginning of flowering. The varieties studied during fruit maturation until early vegetation ranges from 88 to 114 days. The average length of blackberry shoots ranged from 1.18 to 3.29 m and the average number on bush was 8-11. pcs. The average mass of blackberry fruit settled in the amount of 2.9 to 4.9 g. Bush fruit number ranged from 224 pcs. to 483 pcs.

Key words: *blackberry, varieties, phenophases, fruit mass.*

INTRODUCTION

Small fruits have and continued to have an important role in the national economy and in creating a cleaner environment and beneficial as everyday living. Blackberry bush culture have a great importance because of taste qualities, herbal capacities, being rich in content of tannins, flavones, organic acids, vitamin C, pectic substances etc. (Cociu, Oprea, 1989; Chira, 2000).The Importance of blackberry bush is subject to a number of advantages over other fruit crops. One of these advantages is that blackberry bush easily and quickly multiply. He enters and gives early bearing crops rather large. The yields are obtained from plants of blackberry in the 3-4 - third year after planting. Because blackberry bush blooms later, the flowers not affect by spring frosts (Mladin, 1992). Blackberry bush, early varieties, blooms during the last decade of May and the first days of June to late varieties. Flowering duration is 5-8 days. While most varieties are autogamous, cross pollination ensures maximum yields and high quality. Fruit maturation occurs gradually, and the during of ripening is related to the particular variety, which varies from 20 to 25 days for early varieties and from 50 to 80 days for late varieties. Usually, the first fruits of blackberry, which matures on bush are the largest (Cociu, Oprea, 1989; Babuc, 2012).

MATERIALS AND METHODS

The research has been conducted on demonstration experimental field of Small fruits laboratory in the Technological-Experimental Station 'Codru' of IP ISPHTA. As research objects was included 3 varieties of blackberry: Darrow, Smoothstem, Thornfree. Blackberry plantation was established in 2007 year after planting distance of 3.0 x 1.5 m, number of plants of each variety in the each iteration was 20. Scientific study was performed according to field and laboratory methods under accepted and approved program for small fruits (Cociu, Oprea, 1989; Miciurinsc, 1973).

RESULTS AND DISCUSSIONS

Swelling buds, that usually occurs in March, with some variation from year to year, the sum of active temperatures reach 60-80°C for blackberry varieties (from a biological threshold +5°C). Blackberry varieties budding begins when, the sum of active temperatures varies from 80 to 150°C (Balan, Cimpoieş, Barbăroşie, 2002). In the first half of 2012 year

observations were made on phenological development phases of blackberry varieties. Evidence of harm caused by low winter temperatures was conducted in spring, during the accelerated growth of plants. The impairment of blackberry plants by low winter temperatures was established as a result of observations and appreciated as middle with the note 3.The climate conditions on Republic of Moldova are quite complicated. Insufficient rainfall during the year and especially during the growing season but besides all these, there are also unevenly distributed, especially during critical periods of plant development, and when the air temperatures are too high. Data accumulated rainfall amount and temperature established during the vegetation period are included in Table 1.

Table 1. Climatic conditions during the vegetation period of research

Month	2010		2011		2012		Year average	
	Rainfall (mm)	Air temp (ºC)	Rainfall (mm)	Air temp (ºC)	Rainfall (mm)	Air temp (ºC)	Rainfall (mm)	Air temp (ºC)
IV	45.1	11.0	57.6	9.9	16.4	13.2	39.7	11.4
V	69.2	16.8	56.4	16.4	65.3	19.2	63.6	17.5
VI	85.0	21.0	161.3	20.1	20,2	23.3	88.83	21.5
VII	67.2	23.1	15.5	23.0	36.03	26.0	57.03	24.03
VIII	53.0	24.9	16.1	21.1	27.4	22.4	32.2	22.8
IX	46.7	16.1	8.2	19.1	38.9	19.2	31.3	18.1
X	68.9	7.5	36.4	9.5	46.9	12.9	50.7	10.0
Sum (mm) Average (ºC) IV-X	435.1	17.2	351.5	17.01	303.5	19.46	363.4	17.9

The data included in Table 1 allow us to state that during the growing season of 2012 year was the lowest amount accumulated rainfall amounting to 303 mm and the average temperature of air was the highest of 19.46°C. The highest amount of rainfall in the amount of 435 mm accumulated during the growing season of 2010 year, and the average temperature comparatively low reached 17.2°C. Research conducted according to methods field and laboratory work allowed registration data covering the period of vegetation phenological phases blackberry varieties that have been exposed in Table 2. The vegetation blackberry plant occurs in early spring, at the end of March and beginning of April when on temperatures 2-4 º C begin the roots to rise and adventitious buds activate the root of the neck (Mladin Gh., Mladin P., 1992).

From making observations on plant development in terms of new development and conduct phenological phases of blackberry varieties has been established as a satisfactory general condition of the plants, the plants showed good development of the leaf and phenological phases were conducted in normal as characteristic peculiarities of varieties and climatic conditions during the research. In the first half of the year were aimed plant disease resistance blackberry variety, the result of which has been established that all studied varieties are resistant to mildew.

As shown in Table 2, the earliest variety of blackberry that first begins vegetation Darrow, then later start in vegetation Thornfree and Smoothstem varieties. According to observations made in the conditions of 2012 year blackberry plant growth and phenological phases were conducted with 6-10 days earlier than in 2011 year and 7 to 16 days earlier than in 2010 year.

Blackberry plants budding took place in the period from 08.04 until 12.04. The earliest blooming the variety Darrow, followed by variety Smoothstem with 10-12 days later, and the variety Thornfree blooms with 15 to 18 days later than the variety Darrow. Duration of budding and flowering periods of blackberry plant varies from 31 to 46 days.

Blackberry varieties flowering takes place relatively late, when temperatures of aier are stable positive. The time difference between the time of flowering of early varieties and late varieties was 20 days (Mladin Gh., Mladin P., 1992).

According to observations made, besides the characteristic features of blackberry varieties studied, flowering phenological phase depends mainly on climatic conditions laid down in the corresponding period phenological stage of development. Blackberry varieties start flowering took place at 10.05. up to 01.06. and lasted from 28.05 until 21.06. The duration of flowering plants blackberry varieties included in the study ranged from 16 to 23 days.

Blackberry fruit maturation takes place in the last days of June to the first decade of September. During fruit ripening at different blackberry varieties is almost three months, which is very important to provide fresh fruits (Hapova S., 2003).

The results obtained allowed to establish that blackberry fruit ripening took place over 55-64 days from the beginning of flowering (Figure 1). The varieties studied during the early vegetation until fruit maturation period ranged between 88 and 114 days. Early maturing varieties of blackberry took place at 21.06. up to 28.07. and lasted from 29.07 until 09.09. During the period of ripening blackberry plant on varieties included in the study ranged from 30 to 46 days (Figure 2).

As a result of measurements made at varieties of blackberry plants studied were obtained data on capacity development and fruiting blackberry plants that have been included in Table 3.

The variety Darrow is from the group cumanica and is an early variety, very productive, with the ability to suckers, has erect stems, but with a drawback, are endowed with sharp thorns and bend the tip, which creates inconvenience to harvest fruit.

According to the data in Table 3 was established that the average length of strains on the blackberry variety Darrow reached values ranging from 1.15 m in 2011 year until 1.21 m on 2012 year.

The variety Smoothstem average length of the strains corresponding ranged between 1.58 m and 2.13 m. The variety Thornfree reached the highest values, the average length of the strains was corresponding 3.03 m and 3.55 m, data from the emerge as the most vigorous variety.

Table 2. Phenological stages of plant development in blackberry varieties

The variety, years	Beginning of budding	Phenophases period	Flowering			Phenophases period	Fruits maturation				
			beginning	end	duration		beginning	in mass	end	duration	Duration formation
Darrow											
2010	15.04	**32**	17.05	02.06	**16**	**56**	12.07	05.08	19.08	**37**	**93**
2011	10.04	**34**	19.05	06.06	**17**	**59**	17.07	30.07	16.08	**30**	**89**
2012	08.04	**32**	10.05	28.05	**18**	**57**	21.06	05.07	29.07	**39**	**96**
Smoothstem											
2010	21.04	**34**	22.05	09.06	**18**	**62**	23.07	18.08	08.09	**46**	**88**
2011	20.04	**33**	23.05	08.06	**16**	**59**	21.07	15.08	05.09	**45**	**114**
2012	10.04	**42**	22.05	12.06	**21**	**61**	15.07	08.08	28.08	**44**	**105**
Thornfree											
2010	28.04	**31**	29.05	21.06	**23**	**60**	28.07	19.08	09.09	**43**	**103**
2011	26.04	**36**	01.06	18.06	**17**	**55**	26.07	17.08	07.09	**42**	**97**
2012	12.04	**46**	28.05	19.06	**22**	**64**	21.07	17.08	02.09	**42**	**104**

The average length of stems varied between 1.18 and 3.29 m, and the limit of changes deviated from 1.15 to 3.55 m.

Average number of strains of the blackberry bush varieties has varied on years from 8 shoots on the variety Smoothstem and up to 11 pcs. on the variety Darrow. The average mass of blackberry fruit ranged from 2.9 g to 4.9 g Darrow variety to variety Thornfree. Limit of variation from the average mass of blackberry fruit ranged from 2.7 to 5.1 g The average values of fruits on the blackberry bushes ranged from 224 pcs. on the variety Smoothstem up to 483 pcs. on the variety Thornfree. Limit of variation deviated between 195-540 fruits/bush.

Figure 1. Flowering period and blackberry fruit growth

Figure 2. Maturation period of blackberry fruits, variety Darrow

Table 3. Plants development and fructification capacity of blackberry varieties

The variety	Presence of thorns	Average length of stems, m	Number of stems m/bush, pcs.	Average weight of a fruit (g)	Number of fruits/bush, piece.
Darrow 2011 2012	thorns branches	1.15 1.21	**9** **11**	2.7 3.1	216 355
Mean		**1.18**	**10**	**2.9**	**286**
Smoothstem 2011 2012	branches without thorns	1.58 2.13	**8** **8**	3.9 4.2	195 252
Mean		**1.86**	**8**	**4.1**	**224**
Thornfree 2011 2012	branches without thorns	3.03 3.55	**9** **9**	4.7 5.1	426 540
Mean		**3.29**	**9**	**4.9**	**483**
Limit of variation		**1.15-3.55**	**8-11**	**2.7-5.1**	**195-540**

The variety Smoothstem average length of the strains corresponding ranged between 1.58 m and 2.13 m. The variety Thornfree reached the highest values, the average length of the strains was corresponding 3.03 m and 3.55 m, data from the emerge as the most vigorous variety. The average length of stems varied between 1.18 and 3.29 m, and the limit of changes deviated from 1.15 to 3.55 m.

Average number of strains of the blackberry bush varieties has varied on years from 8 shoots on the variety Smoothstem and up to 11 pcs. on the variety Darrow.mass of blackberry fruit ranged from 2.9 g on variety Darrow to 4.9 g on variety Thornfree. Limit of variation from the average mass of blackberry fruit ranged from 2.7 to 5.1 g. The average values of fruits on the blackberry bush ranged from 224 pcs. the variety Smoothstem up to 483 pcs. the variety Thornfree limit of variation deviated between 195-540 fruits / bush.

CONCLUSIONS

As a result of research carried out at the discretion Darrow blackberry varieties, Smoothstem, Thornfree included in the study - found that:

The period between budding and flowering varies between 31-46 days flowering period from 16 to 23 days.

Fruit maturation takes place between 55-64 days from the beginning of flowering.

During the ripening of blackberry fruit is between 88 to 114 days.

The average length of blackberry stems settled in variety Darrow 1.18 m, 1.86 m in variety and variety Smoothstem Thornfree 3.29 m

Average number of strains of the blackberry bush was 8 pcs. on the variety Smoothstem, 9 pcs. on the variety Thornfree, and 10 pcs. on the variety Darrow.

The average weight of blackberry fruits, settled in the amount of 2.9 g on variety Darrow, on

the variety Smoothstem 4.1 g, and 4.9 g on variety Thornfree.

Number of fruits on bush ranged from 224 pcs. on the variety Smoothstem, 286 pcs. on the variety Darrow and 483 pcs. on the variety Thornfree.

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COMPARATIVE STUDY REGARDING THE INFLUENCE OF BIOSTIMULATORS ON THE QUALITATIVE AND QUANTITATIVE POTENTIAL OF CABERNET SAUVIGNON

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Abstract

The popularity, the qualitative parameters and the impressive variability proved by the Cabernet Sauvignon variety, offers new ways of approach to the practice of winery and to scientific research. This paper presents a comparative study regarding the influence of some biostimulators on the production and quality potential of the Cabernet Sauvignon variety, in the ecological, pedological and climatic conditions recorded in Urlati wine center, from Dealu Mare vineyard. The experiment proved the application of 3 treatments with these bio-stimulators (Tecnophyt PK, Tecamin BRIX, Tecnokel amino CAB 2), during grape phonological growth, as follows: at the binding of the grapes (berry) 1-2 mm, when the grapes had a diameter of 4-6 mm and when the grapes had 6-8 mm. Observations and detailed determinations regarding the agro-biological and technological behavior were performed in the same time, but the production was especially evaluated in terms of physical-chemical parameters of the grapes, in order to obtain some quality wines, with particular notes. All the obtained results in terms of production, quantity and quality are leading to the idea that the used biostimulator substances had a positive influence, with the remark that for a 5.8% production increase, the quality parameters (sugar, acidity, polyphenols) are situated in the same limits, even higher sometimes, fully justifying their use.

Key words: *biostimulators, ecological factors, phenological, vineyard, variety.*

INTRODUCTION

Cabernet Sauvignon variety owns at present time in our country, the largest cultivated surface with varieties designed to obtain quality red wines, and although they are more cultivated in many wine centers (74), positioned in the hilly Carpathians of Muntenia and Oltenia, the South of Moldavia and Dobrogea as well as in some wine centers in the west of the country, found its second home in Dealu Mare vineyard.

Although adapted to the climate here, Cabernet Sauvignon presents an impressing variability of the phenolic characters in the plantations, various biotypes being detected here, differenced as follows: according to the type of flowers, the length of the inflorescence, the degree of ramification of the inflorescence, the binding percentage of the grapes, the shaking percentage of the already formed flower (42,8%) as well as the undevelopment of the grapes, which in some years, leave a mark on the production.

Starting from this consideration, in the present paper has been analyzed the influence and the effect of foliar application of some biofertilizers, in different stages regarding the growth of the grapes, on the enhancement of the productive and technological potential (Antonacci and Perniola, 2012) of this variety, in the wine year 2011-2012.

The interpretation of the results obtained after this experiment were analyzed under the aspect of production quality parameter definition (production per vine, sugar, acidity), (Pârcalabu, 2010).

MATERIALS AND METHODS

The reasearch was made in the wine center Urlati, which is located in the Dealu Mare vineyard where Cabernet Sauvignon variety was conducted on a semi-high, mixed pruning system, Guyot on a semi-stem pruning system, with a load of 30 buds/vine, at a planting distance of 1,0/2,5 m (Figure 1).

Figure 1. Cabernet Sauvignon variety in the experimental field-wine center Urlati, 2012

Bio-stimulators used (Table 1) have a large action specter including bio-stimulating effects, growing and auxinic regulators, not being toxic for humans, bees, fish, non-cumulative and biodegradable.

Table 1. Phenological study of vine during biofertilizers treatment application

Principal growth stage 7: Development of fruits (BBCH MODIFIED PHENOLOGICAL SCALE FOR COST ACTION FA1003)		
Phenological stage 71: Fruit set: young fruits begin to swell, remains of flower lost (1-2 mm)	Phenological stage 73: Berries groat-sized, bunches begin to hang (4 mm in diameter)	Phenological stage 75: Berries pea-sized, bunches hang (7 mm in diameter)
I treatment **Tecnophyt PK 3 l/ha** Small-berry grape only formats 13.06.2012 	II treatment **Tecamin BRIX 2 l/ha** Grapes with berries 4-6 mm in diameter 30.06.2012 	III treatment **Tecamin BRIX 2 l/ha & Tecnokel amino CAB 2 l/ha** Grapes with berries 6-8 mm in diameter 14.07.2012 

Foliar treatments have been applied according to the experimental protocol, which prefigured applying them in different phenophases of grape growing, as follows: at binding 1-2 mm, when the grapes were 4-6 mm diameter and when the grapes were 6-8 mm diameter (Table 2). During growing period were taken observations on the whole phonological specter, and at the harvesting moment, on a medium sample of 10 grapevines, there were made the following determinations: fertility coefficients (absolute and relative), productivity indexes (absolute and relative – g/sprout), grape number per vine, average weight of a grape, average weight of 100 grapes, production in kilograms/vine, sugar (g/l), acidity (g/l of tartric acid), anthocyanins mg/l, polyphenolic total index, and so on. In order to provide information regarding the quality of the production obtained, it was quantified the term of grape production quality (Pârcalabu, 2010) which was expressed throughout three components: production per vine in kg/vine; sugar concentration of the must g/l; must concentration in total acidity g/l. Dimensioning the grape production quality is made for each variety eventhough in the same wine area are cultivated white wine varieties as well as red wine varieties.

A possibility to obtain quality characteristics independent from the variety is to divide each quality component (P-production, Z-sugar

content, A-acidity content) to the optimal values of each variety P_{opt}, Z_{opt}, $A_{opt.}$ Optimal values in Dealu Mare vineyard – Valea Calugareasca are the multi-annual averages of these values (Pârcalabu, 2010), as follows: sugar – 210 g/l, acidity-4,4 g/l of tartric acid, production – 2,62 kg/vine. Therefore they are defined: Production quality coefficient: c_p defined by the ecuation: $c_p = P/P_{opt}$; Quality coefficient in sugar must content: c_z defined by the ecuation: $c_z = Z/Z_{opt}$; Quality coefficient in must total acidity content c_a defined by the ecuation: $c_a = A/A_{opt}$. Quality vector has in this case, the component $c = (c_p, c_z, c_a)$. The best quality is considered when, on each component quality coefficient exist and has the value close to 1. This being the ideal case, c = (1, 1, 1) or if they are expressed in percentages then this quality will become c = (100%, 100%100%).
In this case the values of quality coefficients are sub-unitary or supra-unitary, we can conclude that, qualitatively speaking, the culture is not at optimal parameters.

Table 2. Applied products features

Experimental values	**Small-berry grape only formats 13.06.2012**	**Grapes with berries 4-6 mm in diameter 30.06.2012**	**Grapes with berries 6-8 mm in diameter 14.07.2012**
Cabarnet Sauvignon (fertilized)	**Tecnophyt PK 3 l/ha** (Potassium phosphate) Total Phosphorus P_2O_5 30% w/w, Total PotassiumK_2O 20% w/w, pH 4; Activation of natural defending mechanisms of the plants, control and prevention of phytopatogenous mushrooms (*Plasmospara viticola*). Inducind phytoalexines synthesis Represents an asimilable and concentrated Potassium and Phosphorus source	**Tecamin BRIX 2 l/ha** Potassium (K_2O) 18% w/w, Boron (B), 0,2% w/w Sea weed extract, rich in auxines and giberelines 10% w/w It enhances the color of the fruits and the sugar content Determines the growth of fruits dimension	**Tecamin BRIX 2 l/ha** & **Tecnokel amino CAB 2 l/ha** Calcium oxide (CaO) 10% w/w Boron (B) 0,2% w/w L-Aminoacides 6% w/w EDTA (Ethylenediamine tetracetic acid) Increases fruit firmness and post-harvesting quality Increases breaking resistance Control over physiological disfunctions associated with the lack of Calcium
Cabarnet Sauvignon (control)	-	-	-

Optimal values in Dealu Mare vineyard, Valea Călugărească are: sugar: 210 g/l, 4.4 g/l tartric acid and production 2,62 kg/vine

To evaluate more easily how quality performant a variety acts inside an area or after applying a technology, it can be introduced the relative quality coefficient (relative to the optimal values), defined by the three components: Relative quality coefficient in production: c_p defined by the ecuation $c_{pr} = /P_{opt} = c_p\text{-}1$; Relative quality coefficient in grape must sugar content: : c_z defined by the ecuation: $c_{zr} = /Z_{opt} = c_z\text{-}1$; Relative quality coefficient in total acidity grape must content: c_a defined by the ecuation: $c_{ar} = / A_{opt} = c_a\text{-}1$.
Quality vector has, in this case the component $c_r = (c_{pr}, c_{zr}, c_{ar})$ (Table 3). Appreciating the quality potential of a variety in accordance to the relative quality coefficient is made taking into consideration the fact that the variety has a greater adaptability area as the relative quality coefficient values recorded are closer to zero.

Table 3. Quality components of grape production analysis

Vectors that define quality parameter			
$c_p = P/P_{opt}$ *	$c = (c_p, c_z, c_a)$	$c_{pr} = /P_{opt} = c_p\text{-}1$	$c_r = (c_{pr}, c_{zr}, c_{ar})$
$c_z = Z/Z_{opt}$ *		$c_{zr} = /Z_{opt} = c_z\text{-}1$	
$c_a = A/A_{opt}$ *		$c_{ar} = /A_{opt} = c_a\text{-}1$	

RESULTS AND DISCUSSIONS

Because of the fact that to both of the experimental variants was applied the same agrotechnics (pruning type, pruning system, load of buds per vine, planting distances, and so on), it is observed that there weren′t significant differences regarding the elements that define the fertility of a variety (c.f.a, c.f.r, number of grapes per vine) values obtained for both of the variants being very close (Table 4).

Productivity level was appreciated with the help of the productivity indexes (absolute and relative) that gives informations about the grape quantity on a fertile sprout, and from this point, it is observed that, the fertilized variant obtains higher values (173 g/sprout), in comparation with the control variant (165 g/sprout) because the values of a grape′s average weight know the same differences.

The differences more or less significant showed as a result of applying the biofertilizers, in the grape growing phenophase, practically insuring a better growth of the grapes, gradually in the three applying stages (13.06.2012, 30.06.2012, 14.07.2012), as well as a higher grape weight. At the harvesting moment, Cabernet Sauvignon after the three treatments obtains grapes with a higher average weight (92 g), compared to the control variant, difference that is observed in the average weight of 100 grapes. Regarding the production that was obtained and its quality, higher accumulations of sugar are showed at the fertilized variant (219 g/l), comparing to the control with values of only 202 g/l.

Production per vine, also shows such differences, and a plus of 5,8% in case of bio-stimulators treatment was made, can be observed. Surprisingly, comparing the average values of the anthocyans accumulations and the total polyphenol index, it is underlined the fact that, at the control variant these values are superior, comparing to the fertilized variant.

It can be concluded partially that, applying bio-fertilizers to avoid massive flower shaking and a good grape binding and growing, brings a plus of quality production through grape growth, enhances the sugar content and doesn′t enhance grape color (at least in the chosen variants Tecnophyt PK 3 l/ha, Tecamin BRIX 2 l/ha, Tecnokel amino CaB 2 l/ha and for vine, especially).

Table 4. Cuantification of the biofertilizers effects on the productive and technological potential of Cabernet Sauvignon variety in the conditions of Urlati vineyard

Experimental variants and specification	**Absolute fertility coefficient**	**Relative fertility coefficient**	**Absolute productivity index (g/sprout)**	**Relative productivity index (g/sprout)**
Cabernet Sauvignon **(fertilized)**	1,78	1,38	173,0	132,48
Cabernet Sauvignon **(control)**	1,89	1,36	165,0	118,4
Experimental variants and specification	**No. of grapes/vine**	**Average weight of a grape (g)**	**Weight of 100 grapes**	**Production (kg /vine)**
Cabernet Sauvignon **(fertilized)**	25	92	96,5	2,210
Cabernet Sauvignon **(control)**	24	87	92,3	2,088
Experimental variants and specification	**Sugar (g/l)**	**Acidity (g/l tartric)**	**Anthocyans (mg/l)**	**Total polyphenolic index**
Cabernet Sauvignon **(fertilized)**	219	4,46	1187,6	
Cabernet Sauvignon **(control)**	202	4,98	1466,7	447,44

Evaluating the parameters that define production quality of Cabernet Sauvignon in accordance to the results obtained after the experiment was realised through dividing each quality component (production, sugar, acidity) at optimal values of each variety, (optimal values or productive potential of the variety are considered average multi-annual values of the closest area, Valea Călugărească (Table 5).

It is observed that, applying some biofertilizers in different growing stages of the grapes, these parameters record values close to 1 (1,042 – for

sugar accumulated in grapes and 1,01 for must acidity) which shows the fact that, the variety reached at the moment of full maturation a technological potential close to the optimal (variety potential). For the production parameter, the value obtained of 0,84 or 84,35% shows that from this point of view, the variety was situated under the optimal parameter.

Appreciating the qualitative potential of the variety in conformity with the relative quality coefficient values underline that, under accumulated sugar quantity and reached acidity, the biostimulators variant records values close to zero, which shows a very good adaptability of the variety and the chosen research variant, based on favorable ecopedoclimatic conditions in which the experiment took place. For the control variant, it is observed that the sugar parameter records values close to 1 (0,96 or 96,19%), underlining the fact that, the variety has reached at the full maturity moment a technological potential very close to optimal (variety potential). For the other two parameters, the production per vine and the grape must acidity, the values recorded are even too low (0,79), even too high (1,13), showing the fact that, from this point of view the variety situated under its potential. For appreciating the qualitative variety potential compared to the relative quality coefficient it is underlined the same tendancy – under the sugar accumulation the control variant records values close to zero (0,04), hierarchically followed by the values recorded by the acidity and the production/vine, with lower values, but not that low so that the differences could be statistically insured.

Table 5. Cuantification of the effects of biofertilizers on quality parameters of Cabernet Sauvignon variety in the conditions of Urlati vineyard

Experimental variants	**Vectors that define quality parameters**			
Cabernet Sauvignon **(fertilized)**	c_p=P/P_{opt} * 0,84	c = (c_p, c_z, c_a) 0,84, **1,042, 1,01** 84,35%, 104,2%, 101,1%	c_{pr} = /P_{opt}= c_p -*1* 0,16	c_r= (*c_{pr}, c_{zr}, c_{ar}*) 0,16,**0,042**, **0,013**
	c_z =Z/Z_{opt}* **1,042**		c_{zr} = /Z_{opt}= c_z -*1* **0,042**	
	c_a=A/A_{opt}* **1,01**		c_{ar} = /A_{opt}= c_a -*1* **0,013**	
Cabernet Sauvignon **(control)**	c_p=P/P_{opt} 0,79	c = (c_p, c_z, c_a) 0,79, **96,19, 1,13** 79,69%, **96,19%,** 113,18%	c_{pr} = /P_{opt}= c_p -*1* 0,20	c_r= (*c_{pr}, c_{zr}, c_{ar}*) 0,20,**0,04**, **0,13**
	c_z =Z/Z_{opt} **0,96**		c_{zr} = /Z_{opt}= c_z -*1* **0,04**	
	c_a=A/A_{opt} 1,13		c_{ar} = /A_{opt}= c_a -*1* **0,13**	

CONCLUSIONS

The results obtained under the aspect of quantity and quality lead to the idea that the biostimulating substances used had a positive influence on Cabernet Sauvignon, observing that at a production rate of 5,8%, parameters that define quality (sugar, acidity, polyphenols) are situated at the same limits, sometimes even higher, justifying their use. Regarding production quality it is underlined the fertilized variant, the deviation from the optimal production being minor – 84,35% and for the accumulated sugar and the grape must acidity the values obtained are closer to 1 showing the fact that the variety reached at the moment of full maturity a technological potential close to the optimal one (variety potential). For the control variant it is observed that the sugar parameter records values close to 1 (0,96 or 96,19%), and for production and acidity the values recorded are even too low (0,79 or 79,69%,) or even too high (1,13 or 113,18%), situating the variety under its optimal potential, but not that far to have and influence on the quality of the wine.

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TECHNICAL ASPECTS CONCERNING THE QUALITY PRESERVATION IN FRESH AND DEHYDRATION OF APRICOTS

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Abstract

The researches carried on in ICDIMPH-Horting had in view to emphasize the influence of the variety and post-harvest temperature on quality preservation in fresh and dehydration of apricots from internal production. In this way, three varieties of apricots (Royal, Mari de Cenad, Cea mai buna de Ungaria), coming from the same orchard and being simultaneously harvested, were kept in different conditions (environmental temperature, refrigeration and cold storage) for testing the capacity of quality preservation of fresh fruits. At the same time,the apricots have been tested during dehydration process, the researches being focused on conduct, quality and output of the product. Taking into consideration losses level and the evolution of firmness and some chemical components, resulted that in environmental conditions Royal variety gave better results, Cea mai buna de Ungaria emphasized its good behaviour in refrigerated rooms and Mari de Cenad kept better quality than the others in cold conditions. Concerning dehydration, the results stated that the variety and maturity stage influence the output and duration of the process. The variety Mari de Cenad registered the highest drying ratio and the shortest time for dehydration process.

Key words: *apricots, storage, dehydration, quality preservation.*

INTRODUCTION

The apricots are very appreciated on local and international markets. Growing conditions are also very good in our country, every yard from the south part of the country having some trees with savory sweet fruits. In Romania are many local valuable varieties, but foreign varieties are also grown with good results in specific conditions from different areas.

Differing from other countries that consider apricots exports (fresh, dehydrated or processed) a good income resource, our apricot production is in present time only an internal and seasonal resource. Romanian fresh apricots can be found on the market only 1-2 months during main harvesting period, the imported lots covering the market demand in the rest of the year. And the presentation on the market is poor in comparison with the imported fruits.

This old deficiency is still present despite EC Regulation 851/2000 and Romanian Standard SR 3178/2003 containing precised rules regarding the packaging and presentation for selling.

In order to assure the preservation of the quality and to prolong the trading time of horticultural products, actual postharvest technologies are based on cold chain used from the producer to the consumer.

The storage optimum temperature recommended by Cantwell M., 2002 and Hardenburg and colab. 1986 is -0,5...0ºC and 90-95% relative humidity. The authors do not recommend controlled atmosphere for fresh apricots. Jamba A. and Carabulea B.,2002 are considering that the proper temperature for cold storage of apricots is 0...+0,5ºC and 7...+10ºC for refrigeration purpose. They admit CA with 3% O2 si 5% CO2 for extension of cold storage life of apricots.

In order to find out the behavior of the apricots from internal production in different storage conditions (ambiental temperature, refrigerated and cold storage), specific comparative researches have been done in ICDIMPH-Horting institute using three varieties from the actual range of cultivars.

The dehydration of fruit and vegetables has many advantages, among which can be:

- all over the year consuming, especially during the fruits and vegetable absence, ensuring the human body needs with vitamins, minerals and other components

which sustain the immune system and its balance;
- using, whatever the time of the year, of the food recipes based on vegetables and fruits, by the rehydration of industrial dried products, both in restaurants and in pizzerias, bakeries and candied fruits;
- the dried fruits and vegetables with a rich content in vitamins and minerals, besides their important role in the diet, helps to prevent cardiovascular and digestive tract diseases;
- the dried foods have high nutrient content in low volume and weight, about 5-7 times less compared to the fresh ones, presenting a significant advantage in storage and transport.

MATERIALS AND METHODS

The organization of experimental variants have been done on the basis of variety and storage conditions and that is presented in table 1.

Table 1. Organization of apricot experiments

Variant	Variety	Storage conditions
V1	Royal	Environmental (20-22°)
V2	- idem -	Refrigeration (10-12°)
V3	- idem -	Cold storage (3-5°)
V4	Mari de Cenad	Environmental (20-22°)
V5	- idem -	Refrigeration (10-12°)
V6	- idem -	Cold storage (3-5°)
V7	Cea mai buna de Ungaria	Environmental (20-22°)
V8	- idem -	Refrigeration (10-12°)
V9	- idem -	Cold storage (3-5°)

Preparation of apricot experiments is illustrated in the figure 1.

Figure 1. Apricot experiments during preparation

Apricots belonging to three varieties (Royal, Mari de Cenad and Cea mai buna de Ungaria) were stored in different thermal conditions (environmental temperature, refrigeration and cold conditions). The evolution of losses (by weight and decay), structural firmness and some chemical fruit compounds during storage have been determined.

The experiments was developed in 2012, on the dehydration plant existing in the pilot station of ICDIMP-Horting Bucharest.

The dehydration plant used (fig. 2) is consist of vegetables and fruit dryer (70-300 kg / batch capacity), using hot air as drying agent. The installation program allows measurement and automatic/manual programming (Figure 3) of working parameters: temperature, humidity, air speed, driving valve and it is provided with an interface for connection to PC for data acquisition.

Drying temperature was 65-70^{0}C, held in this area for 12 hours. During the dehydration process was followed the evaluation of the combined effects of various drying parameters, such as drying temperature, speed and direction of the stream of air movement.

Figure 2. Dryer

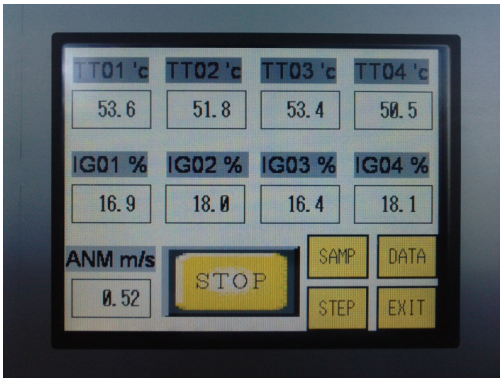

Figure 3. Programmer

RESULTS AND DISCUSSIONS

The level of weight and decay losses during storage of apricots are presented in the table 2 and the fruit firmness evolution in the table 3.

The results followed from the data presented in the table 2 show that in ambiental conditions the apricot can be kept maximum 5 days with 32,22% total average losses. The fruits from Royal variety presented 26,27% total losses, less than others. The highest level of losses was registered at Mari de Cenad with 41,53% total losses. Many of these fruits had wrinkled, spotted and bruised appearance.

In refrigerated conditions the apricots have been stores 15 days with 16,54-20,59% weight losses (according to variety) and 4,44-37,77% decay losses (according to variety). The total losses ranged from 23,41 to 58,36 (according to variety) with an average of 38,69%. The most resistant in refrigerated storage was Cea mai buna de Ungaria variety with minimum decay and medium weight losses.

In cold storage conditions the apricots have been stores 20 days with 10,64-17,67% weight losses (according to variety) and without any decay losses. For all that, the varieties presented some differences. The Royal variety fruits presented some discolorations (darker zones of the skin) and maturation process. And Cea mai buna de Ungaria variety presented also a visible maturation process and slight wrinkled skin of some fruits. But for Mari de Cenad apricots the cold storage had a good effect on the maintaining the quality. It reduced the postmaturation process and was favourable in keeping the fruit appearance and health.

Table 2. Losses during storage of apricots (%)

Variety	Environmental losses (%)			Refrigeration losses (%)			Cold storage losses (%)		
	weight	decay	total	weight	decay	total	weight	decay	total
Royal	18,12	8,15	26,27	16,54	17,78	34,32	10,64	0	10,64
Mari de Cenad	20,03	21,50	41,53	20,59	37,77	58,36	17,67	0	17,67
C.m.b.de Ungaria	18,62	10,25	28,87	18,97	4,44	23,41	11,51	0	11,51
Average	**18,92**	**13,30**	**32,22**	**18,70**	**19,99**	**38,69**	**13,27**	**0**	**13,27**
Storage period	5 days			15 days			20 days		

Table 3. Evolution of apricot firmness during storage

Var. no.	Variety	Storage temperature (°C)	Storage period (days)	Pulp firmness (PU) *	Difference (%)
	Royal	initial	-	119,30	-
V1	-idem-	20-22°	5	148,90	+24,8
V2	-idem-	10-12°	15	145,95	+22,3
V3	-idem-	3-5°	20	149,35	+25,2
	Mari de Cenad	initial	-	96,75	-

V4	-idem-	20-22°	5	169,15	+74,8
V5	-idem-	10-12°	15	162,65	+68,1
V6	-idem-	3-5°	20	98,05	+1,3
	C.m.b. de Ungaria	initial	-	103,13	-
V7	-idem-	20-22°	5	150,55	+46,0
V8	-idem-	10-12°	15	125,25	+21,4
V9	-idem-	3-5°	20	143,85	+39,5

**penetrometric unit (PU) = 0,1mm*

The data from table 3 show that initially firmness of the apricots is 96,75-119,30 PU (according to the variety), the maturity degree of different varieties being closed enough. In all experimental variants stored fruits presented a decreasing of fruit pulp firmness with 1,3-74,8% from the initial value.

In environmental conditions Royal apricots had a constant evolution of fruit firmness that decreased with 22,3-25,2% from the initial value (according to the storage conditions and storage period). In such conditions the Royal apricots kept better its quality in comparison with the competitors Mari de Cenad and Cea mai buna de Ungaria that registered a decreasing of 74,8% respectively 46% of the initial firmness.

The Mari de Cenad apricots presented extreme firmness values according to the storage conditions having a great liability face to the temperature level. This variety was placed on the latest places concerning storage resistance to environmental and refrigerated conditions with 68,1-74,8% firmness decreasing, but occupied first place with only 1,3% decreasing in cool conditions.

Cea mai buna de Ungaria variety had a different firmness evolution, being adapted to refrigeration. This variety registered during refrigerated storage the lowest pulp firmness decreasing (21,4%). However at lower temperature, specific to the cold storage, the fruits of this variety are wasting 39,5% from the initial firmness, the apricot quality being thus affected in a way.

The initial content and evolution of some chemical compounds during storage are presented in the table 4. The data show that the initial content of fruits is as follows: 16,4-17,4% soluble solids, 0,91-1,01% acidity and 9,27-10,37% total sugars (according to the variety).

Table 4. Initial level and evolution of some chemical compounds of apricots during storage

Var. no.	**Variety**	**Storage temperature (°C)**	**Soluble solids (%)**	**Acidity (%)**	**Total sugars (%)**
	Royal	initial	17,4	0,91	10,37
V1	- idem -	20 - 22°	17,3	1,00	11,02
V2	- idem -	10 - 12°	17,4	1,20	11,84
V3	- idem -	3 - 5°	16,8	1,23	10,07
	Mari de Cenad	initial	17,2	0,87	9,88
V4	- idem -	20 - 22°	17,6	1,21	10,33
V5	- idem -	10 - 12°	16,2	1,40	9,43
V6	- idem -	3 - 5°	17,3	1,72	10,98
	C.M.B.U.	initial	16,4	1,01	9,27
V7	- idem -	20 - 22°	16,6	1,15	9,89
V8	- idem -	10 - 12°	16,7	1,25	10,19
V9	- idem -	3 - 5°	14,3	1,52	7,44

The Royal fruis presented the highest soluble solids and sugar content and Cea mai buna de Ungaria the highest acidity.

The evolution of these compounds differs from a variant to another. Soluble solids content presented after storage figures very close to initial ones. Some lower values have been determined for Mari de Cenad stored in refrigeration conditions and Royal and Cea mai buna de Ungaria stored in cold rooms.

The postharvest fruit acidity presented generally a increasing tendency for all varieties and in all storage conditions. The growth is reduced in case of ambiental storage condition, moderate in refrigerated conditions and higher in cold storage conditions

Total sugar content has an increasing tendency for all apricots stored in environmental conditions and for Royal and Cea mai buna de Ungaria varieties kept in refrigerated rooms. In cold conditions the same Royal and Cea mai buna de Ungaria varieties presented however a decreasing of sugar content in the fruits, opposing to Mari de Cenad that registered higher sugar content and a good storage result.

Appearance of the apricots after 5 storage days in environmental conditions is presented in the figure 4, after 15 days in refrigerated conditions in the figure 5 and after 20 days in cold conditions in the figure 6.

Figure 4. Appearance of apricots after 5 storage days in environmental conditions

Figure 5. Appearance of apricots after 15 storage days in refrigerated rooms

Figure 6. Appearance of apricots after 20 storage days in cold rooms

The variation of air humidity inside the place for dehydration-analyzing the graph (Figure 7), can be notice that at the beginning of the process the humidity was 76-80% in the four measuring points of the place.

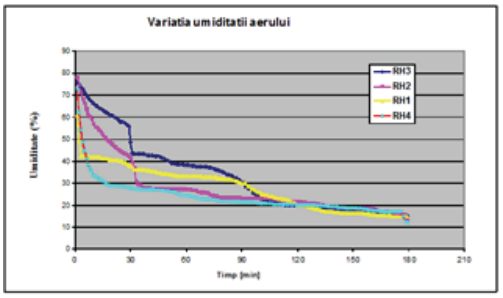

Figure 7. The variation of humidity inside the place for dehydration in the first 3 hours

During the first 30 minutes occurs a sudden decrease of humidity to a value of 35 – 40%. Over the next two hours the humidity decrease is achieved more slowly, reaching values of 20-30%. In the period between 120 and 180 minutes after starting the process can be seen a stabilization of the humidity values between 12-16% with a tendency to form a tray at the value of 14%, which indicates a uniformity of the air humidity inside the place for dehydration.

The temperature variation-analyzing the graph (Figure 8) can be seen that the start temperature was 30-33°C, ambient temperature respectively. The first hour of operation reveals a faster growth temperature values of 50-60°C. Over the next 120 minutes occurs a slow increase of temperature, stabilizing its values around 70-73°C, after 180 minutes from the process starting.

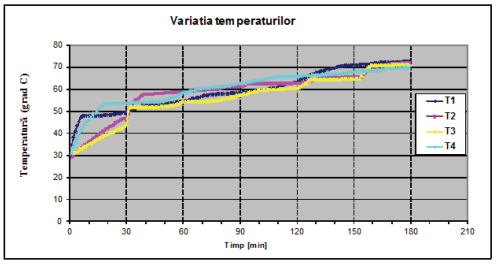

Figure 8. The variation of temperature inside the place for dehydration in the first 3 hours

CONCLUSIONS

Storage temperature is the main factor that determines the duration of apricot quality preservation. In this way the apricots have been kept maximum 5 days in ambiental temperature with 32,2% total average losses, 15 days in refrigerated rooms with 38,7% total average losses and 20 days in cold storage with 13,3% total average losses. Optimum duration is however 3 days in ambiental temperature, 10 days in refrigeration and 15 days in cold conditions.

Apricot varieties had different behaviour in similar storage conditions. If Royal apricots had better results in ambiental temperature, Cea mai buna de Ungaria gave better results in refrigerated storage and Mari de Cenad kept better quality than others in cold conditions.

Firmness is a good indicator of fruit quality and its evolution during storage allowed a good evaluation of quality preservation in different storage conditions. Fruit firmness decreased with about 25% in all storage conditions. The

variety Mari de Cenad presented the largest variation of fruit firmness that decreased with 74,8% in ambiental conditions and only with 1,2% in cold conditions.

The evolution of some chemical compounds (soluble solids, acidity and total sugar) can be an important indicator of the capacity of quality maintain in variable storage condition and of the maturity stage of apricots. The chemical evolution differs from a variety to another. Mari de Cenad presented an increase of soluble solids and sugar content of the fruits in cold store conditions and a decreasing tendency in refrigerated rooms in opposition with other varieties. At the same time fruit acidity of this variety stored in cold conditions increased with 100% compared with only 35-54% registered by other varieties in similar conditions.

Stating experiences results in dehydration allow the following conclusions:

- After 180 minutes inside the place for dehydration the temperature and humidity were stabilized, in whole its volume;
- For the same keeping period of 12 hours under the same conditions of temperature, humidity and air drying speed, were obtained different values of the final humidity of the fruits, which indicates that the texture, thickness and epidermis influenced the dehydration process.

In 80% proportion the dehydrated products existing in the Romanian market come from imports. Due to current conditions and the absence of the performing technologies is required the modernization and optimization of the specific dehydration technologies, which can ensure the obtaining of competitive local products (apricots, apples, plums etc.), competitive for both internal market and for export.

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KINEMATICS AND OPERATION PROCESS OF THE COMPLEX AGGREGATE USED TO PREPARE THE GERMINATIVE BED IN VEGETABLE FARMING

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Abstract

Preparing the germination bed represents an essential work for growing and developing plants in vegetable farming. The machinery used can have a positive or negative influence on improving or degrading the soil's physio-mechanic characteristics and on the quality of the work, therefore choosing them requires a lot of attention. These aspects are a results of studying the kinematics and work process of the complex aggregate that is used during this stage.

Key words: *soil, germinative bed preparation, complex aggregate, kinematics, work process.*

INTRODUCTION

Modeling the soil consists of a set of activities performed with the purpose of improve the soil's physical, chemical and biological properties. During these activities the soil is overturned, aerated, mixed, crumbled, leveled, pressed and modeled. Soil activities can be basic activities and germinative bed preparation activities.

During the germinative bed preparation, the soil is aerated up to the seeding or planting depth, in order for the soil to provide the required pedoclimatic conditions for the plants to develop, during the seeding and sprouting stages.

The complex aggregates are machines that are used for preparing the germinative bed.

The working organs that are shaped like blades with variable size are mounted on parallel bars called blade-bearing bars. These bars are given an oscillating motion from the tractor's power outlet. They move on a plane perpendicular to the machinery's movement direction. The mechanism powering the bars transforms the rotation movement into translational-oscillator movement.

MATERIALS AND METHODS

This piece of work will determine and study the trajectory of the $F(x_F,y_F,z_F)$ point, the top of the lateral blade on the studied complex aggregate's blade-bearing bar.

The mechanism powering the blade-bearing bar is presented in figure 1.*a*. This case presents a crank-rod mechanism featuring a crankshaft. The running element is the AB crank, while the led element is represented by the BC bar. The blade-bearing bar executes the translational-oscillator movement (Caproiu St., 1982, Naghiu L., 2003, Pásztor J and Bratucu Gh., 2008, Sztachó-Pekáry I. et al., 2007). The chosen frame of reference, xGz, is a mobile system which moves at a constant speed reported to a stationary system, according to figure 1.*b*.

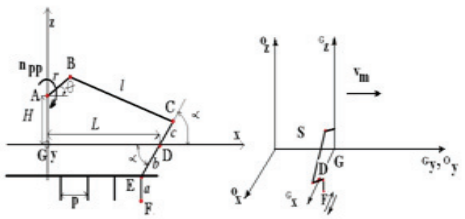

Figure 1. 1. a - Kinematics of a point from the complex aggregate blade-bearing bar, the running mechanism; b - mobile and stationary reference

The $F(x_F,y_F,z_F)$ point's coordinates are determined using the coordinates of points A,

B, C, D and E (Pásztor J and Bratucu Gh., 2008).

$A(x_A, y_A, z_A)$ point's coordinates:

$$A(x_A, y_A, z_A)\begin{cases} x_A = 0 \\ y_A = 0 \\ z_A = H \end{cases} \quad (1)$$

$B(x_B, y_B, z_B)$ point's coordinates:

$$B(x_B, y_B, z_B)\begin{cases} x_B = x_A + r \cdot \cos\theta \\ y_B = 0 \\ z_B = z_A + r \cdot \sin\theta \end{cases}, \quad (2)$$

where: r is the length of the AB element, in m; ϑ – the rotation angle of the AB element, in *rad* (fig, 1.*a.)*

The ϑ angle is the variable parameter:

$$\theta = \varpi \cdot t = 2\pi \cdot n \cdot t \ [rad]. \quad (3)$$

where: ω is the power outlet's angular speed, in *rad/s*; n – the power outlet's speed, in rot/s.

Point $C(x_C, y_C, z_C)$ is located at the intersection of two circles, one with the origin in point B, having the BC radius, and the other with the origin in point D, with the radius DC. By resolving the system formed by the circles' equation, the C point's coordinates reported to the mobile reference are obtained.

$$\begin{cases} (x_B - x)^2 + (z_B - z)^2 - l^2 = 0 \\ (x_D - x)^2 + (z_D - z)^2 - c^2 = 0 \end{cases} \quad (4)$$

$D(x_D, y_D, z_D)$ point's coordinates are considered to be known are the following:

$$D(x_D, y_D, z_D)\begin{cases} x_D = L \\ y_D = 0 \\ z_D = 0 \end{cases}. \quad (5)$$

Using the relations (5), the equation system (4) is modified as follows:

$$\begin{cases} z = \pm\sqrt{c^2 - (L - x)^2} \\ a_1 \cdot x^2 + b_1 \cdot x + c_1 = 0 \end{cases}, \quad (6)$$

Where a_1, b_1, c_1 are the computable coefficients from the actual construction data:

$$\begin{aligned} a_1 &= z_B^2 + (L - x_B)^2, \\ b_1 &= m \cdot (L - x_B) - 2z_B^2 \cdot L, \\ c_1 &= \frac{m^2}{4} + z_B^2 \cdot L^2 - z_B^2 \cdot c^2, \\ m &= x_B^2 + z_B^2 + c^2 - L^2 - l^2 \end{aligned} \quad (7)$$

where: H is the height difference between the blade-bearing bar and the power outlet, in m; l – length of the BC element, in m, according to figure 1.*a.* From the solutions obtained using the system (6) the versions corresponding to geometric restrictions are chosen.

The $tg\alpha$ expression is determined using the $C(x_C, y_C, z_C)$ point's coordinates, which is necessary for describing the trajectory of points $E(x_E, y_E, z_E)$ şi $F(x_F, y_F, z_F)$:

$$tg\alpha = \frac{z_C}{x_C - L}$$

$$E(x_E, y_E, z_E)\begin{cases} x_E = L - b \cdot \cos\alpha \\ y_E = 0 \\ z_E = -b \cdot \sin\alpha \end{cases},$$

$$F(x_F, y_F, z_F)\begin{cases} x_F = x_E \\ y_F = 0 \\ z_F = z_E - a \end{cases} \quad (8)$$

where: b is the length of the DE element, in m; a - the blade's length, in m, *figure 1.a.*

RESULTS AND DISCUSSIONS

The xGz reference is considered mobile and has a translational movement at a constant speed, v_m, reported to the xOz reference (fig, 1. *b)*.

The parametric equations reported to the xOy reference are obtained by resolving the following operations:

$$^{O}[P_F] = [T]\,^{G}[P_F], \tag{9}$$

where: P_F represent the coordinates of point F; T – transformation matrix (Naghiu, L., 2003). The transformed equations will be:

$$\begin{bmatrix} ^{o}x_F \\ ^{o}y_F \\ ^{o}z_F \\ 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & S \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \cdot \begin{bmatrix} ^{G}x_F \\ ^{G}y_F \\ ^{G}z_F \\ 1 \end{bmatrix}, \tag{10}$$

Where S is the distance covered by the complex aggregate following the movement's direction. The distance covered by the complex aggregate is time dependent and is calculated using the relation:

$$S = v_m \cdot t\,. \tag{11}$$

Parametric equations of the absolute movement of point $F(x_F, y_F, z_F)$ are obtained by making the corresponding replacements:

$$\begin{cases} ^{o}x_F = x_F \\ ^{o}y_C = 0 + v_m \cdot t\,. \\ ^{o}z_C = z_F \end{cases} \tag{12}$$

The trajectory of the blade's top (Vlad C. and all., 2012) is determined by using the $F(x_F, y_F, z_F)$ point's parametric equations. By drawing the trajectory followed by the complex aggregate's working organ several aspects can be determined: studying soil modelling at different speeds of the complex aggregate, the theoretical study of the aggregate's behavior and also the theoretical study of the blades' working process.

The equations for joined blades and blades mounted on the other bars can be determined by using the parametric equations of the absolute movement (12). During calculations, the following will be taken into consideration: step between the blades, p;phase shift between time crankpin, φ_n;the distance between the blade-bearing bars, d.

These trajectories are shown in figure 2, based on the parametric equations of point $F(x_F, y_F, z_F)$ (Vlad C. and all., 2012).

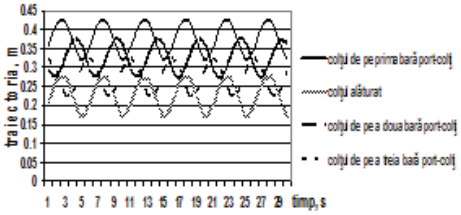

Figure 2. Blades' tips oscillation on a horizontal plane

By analyzing the aggregate's operation, the blade-bearing bar's oscillation on a plane perpendicular to the movement direct can be observed. This can be verified by using the parametric equations of point $F(x_F, y_F, z_F)$. The fact that the blade-bearing bars follow an oscillatory movement on plane xOz can be observed in figure 3.

Parametric equations $xF=f(r, n, H, l, c, L, b, \varphi_n)$ and $zF=f(r, n, H, l, c, L, b, \varphi_n)$ can also be used to represent the trajectories on the xOz vertical plane, according to figure 3.

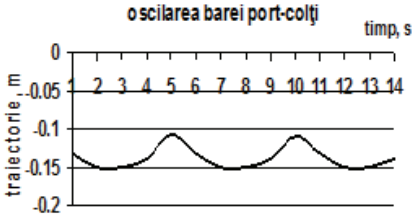

Figure 3. The blade bar's oscillatory movement.

During operation, the blades follow the bar's movement, receiving the alternation translational movement perpendicular to the forward movement in the xOz plane, according to figure 4.

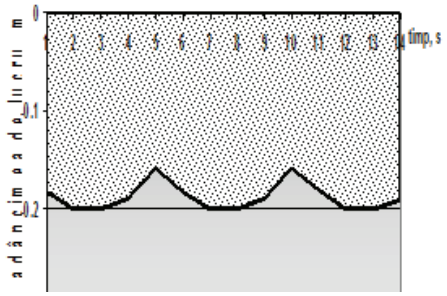

Figure 4. The operation process executed by the blade in vertical plane

By analyzing the blades' operation mode, it is observed that there are unprocessed sections in the soil caused by the vertical oscillation. A second and a third blade bar are required to be mounted on the complex aggregate in order to eliminate this inconvenience.

The parametric equations are useful for studying the joint operation process of the blades on a vertical plane, perpendicular to the forward movement, like pictured in figure 5.

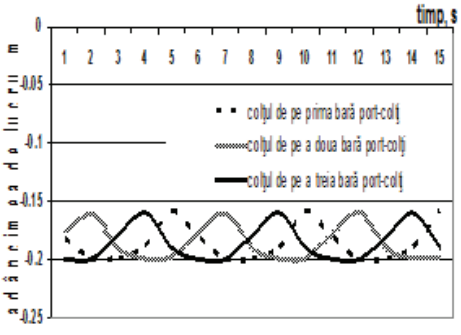

Figure 5. The blades' operation process on vertical

By analyzing the the trajectory of the complex aggregate's blades' tips, it is observed that the soil is being processed energetic and uniform up to the set working depth if three operating organs mounted on paralel blade bars and working in phase shift are being used.

CONCLUSIONS

Parametric equations $xF=f(r, n, H, l, c, L, b, \varphi_n)$ and $zF=f(r, n, H, l, c, L, b, \varphi_n)$ describe sinusoid trajectories of the complex aggregate's blades on vertical and horizontal plane.

By analyzing the work process of the operating organs on the complex aggregate, it can be observed that the agricultural machinery provides the soil crumbling and a good mixture of soil layers up to the set working depth, if fitted with two or three blade bars.

Parametric equations $xF=f(r, n, H, l, c, L, b, \varphi_n)$ and $zF=f(r, n, H, l, c, L, b, \varphi_n)$ offer the possibility to study the complex aggregate's optimization.

The parametric equations represent mathematical models for studying the complex aggregate's dynamics and energetics.

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RESULTS CONCERNING THE EFFECT OF FOLIAR FERTILIZERS AND GROWTH PROMOTERS TREATMENTS ON PRODUCTION AND QUALITY OF TOMATO FRUITS

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Abstract

The work presents results obtained in protected culture of tomatoes under different treatments with foliar fertilizers (Folimax, Agriphyte) and ecological growth promoter P& R. It was taken in experience hybrid Balkan F1 and variety Ghittia. The foliar fertilizers and growth promoters treatments has good influence on production and quality of tomato fruits. If the best at production was the hybrid Balkan F_1, the variety Ghittia was the best at quality. The biggest production was obtained by the hybrid Balkan F1 treated with Agriphyte (69.626 t/ha) and the smallest one it was the variety Ghittia untreated – control (48.865 t/ha). The biggest content of vitamin C was registered at Ghittia variety in the case of P& R treatment (21.52 mg/100g and the biggest content of lycopene was registered at hybrid Balkan F_1 for Agriphyte treatment (69.39 ppm). The content of soluble carbohydrates was almost constant and has slightly varied at around 4.8%.

Key words: *Agriphyte, Folimax, P&R, quality, production.*

INTRODUCTION

Because of the big request for consumption, tomatoes are the most cultivated vegetable species on protected crops from Romania.
The benefits of this culture system are: possibility to obtain of sorts of vegetables according to the request of the market; earliness; good prices; possibility to obtain tomatoes almost all year; big productions/ha (Voican and Lacatus, 2002).
For obtaining good productions with maximum economic efficiency it needs to practice some technologies in which stimulating of growth and development of plants, fertilization and pest control are the most important works.
In the production technologies can be used different fertilizers, growth promoters and foliar fertilizers.
Researches on use of fertilizers in protected crops shows that use of foliar fertilizers has very good effects in vegetable crops in all growth and development phases (Davidescu and Davidescu, 2000; Lacatus, et al., 2005).
Foliar fertilization is very used in vegetable protected crops and it has some advantages like: use of reduced concentration of mineral elements, easier application simultaneously with pesticides and rapid correction of nutritional deficiency (Voican and Lacatus, 2002).
Between foliar fertilizers, the literature mentions foliar fertilizers type F (231; 141; 411), the product Cropmax (Ciofu, et al., 2004), liquid foliar fertilizer Folimax (Lacatus, 2006).
The growth promoters are used for the regulation of the processes of growth and development of plants especially when the microclimate conditions are not favorable.
Many authors recommended that the treatments must be applied when the flowers are completely opened with a solution of Tomatoset, Tomafix, Duraset, or Tomato-stim.
The paper presents partial results regarding the influence of the treatments with growth promoters and foliar fertilizers on growth, development and production of tomatoes for protected crops.

MATERIALS AND METHODS

The main objective of the research has been determining the optimal variant of stimulation and foliar fertilization of tomatoes in protected crops in order to obtain early production of

good quality fruits. Experience has been carried out in 2012 in Poiana, Ialomita county in high tunnel of 1000 m^2.
The experiment has been carried out in random blocks in three repetitions and experimental variants consist of three products: two foliar fertilizers and one growth promoter, which were compared with the control (Table 1).

Table 1. Experimental variants – variety Ghittia /hybrid Balkan-2012

Variants/ treatments	Specification
V1 Control (untreated)	-
V2 Folimax-0.3%	Foliar fertilizer with microelements; ensure steady growth, disease resistance, increase the number of fruits and production.
V3 Agriphyte-0.3%	Foliar fertilizer with 33% phosphorus, and 28% potassium; secondary has systemic fungicide properties.
V4 P& R-0.5%	Organic product with role of protection and recovery of the plants from damage caused by extreme temperatures or diseases; help to a better use of the nutrients in different types of soils; increase the assimilation of some nutrients (Fe, Zn, Mn, B, Cu); may be used together with protective agents for plants (herbicides, insecticides, fungicides).

Biological material has been represented by variety Ghittia and hybrid Balkan F_1.
Ghittia: late tomatoes indefinite, the plants are vigorous, fruits are round flattened with 4-6 seeds lodge, uniform, of 250-300g weight and 4-5 fruit in a cluster, fruits are resistant to cracking, with good firmness. Recommended for cultivation in plastic tunnels and field.
Balkan: early tomatoes, semi-determined growth. The fruits are rounded, uniform, of 100-120g weight, 6 fruit in a cluster. Recommended for cultivation in plastic tunnels and field.
The technology used in the experiences was selected from the literature for tomatoes (Ciofu et al., 2004).
Under climatic conditions of the year 2012, the culture has been established by planting of seedling on 25 of the April. The seedling was by 53 days old, 20-22 cm height, 4-5 mm thickness of stem, 5-6 leaves and it has first inflorescence. The density used was 36.000 plants/ha. Care work consisted in watering, hoeing, weeding, removing of early shoots whenever is necessary, sustaining plants on strings, wire tapping for stimulation of pollination, pest and diseases control. It has been applied fertilization with different fertilizers (Folimax, Agriphyte) and growth promoter (P& R), depending on experimental variants, at two weeks and one month from planting.
Harvesting was done from the second decade of the July, by variants.
During the experimentation period has been carried out observations, measurements and determinations, which were used specific working methods namely:
Phenological determinations: sowing date, date of emerging, date of planting, date of flowering and date of harvest.
Production potential was determined by recording the number of fruits/plant, average mass of fruits and by calculation of the average production/plant and ha, for each variant studied. The fruits were harvested by quality classes according to the average weight of fruits as follows:
-extra-greater than 80 g;
-I-60-80 g;
-II-40-60 g;
-understas-less than 40 g.
The results were interpreted statistically by analysis of variance-Student test (Ardelean, et al., 2007).
Laboratory analysis at tomato fruits:
-biochemical analysis: vitamin C content (mg/100 fresh product), soluble carbohydrates (%), acidity (%), lycopene (ppm). Were harvested fruit samples for biochemical analysis of three different harvests and results are average of these samples.

RESULTS AND DISCUSSIONS

From the analysis of the results it can be observed that, regardless of treatment, the productions were superior to the untreated control (Table 2, Figure 1 and 2). Regardless of the variety the greatest production was obtained when applying foliar fertilization with Agriphyte (66.957 t/ha for Ghittia variety, respectively Balkan F_1 hybrid 69.626 t/ha). The largest share of total production was at quality I. It can also notice a higher share of quality extra in the case of Ghittia variety for Agriphyte treatment (40%).

Table 2. The production obtained at tomato experiment and the distribution on qualities Poiana, Ialomita county, 2012

HYBRID / VARIETY	VARIANT	QUALITY										TOTAL t/ha
		EXTRA		I		II		TOTAL STAS		UNDERSTAS		
		t/ha	%	t/ha	%	t/ha	%	t/ha	%	t/ha	%	
GHITTIA	Control	18.000	37	19.965	41	9.000	18	46.965	96	1.900	4	48.865
	Folimax	23.900	37	27.900	43	9.850	15	61.650	96	2.560	4	64.210
	Agriphyte	26.900	40	27.400	41	10.500	16	64.800	97	2.157	3	66.957
	P& R	22.350	38	23.920	41	10.100	17	56.370	95	2.650	5	59.020
BALKAN F_1	Control	18.570	34	18.471	34	16.005	29	53.046	96	1.955	4	55.001
	Folimax	21.924	33	25.932	39	15.920	24	63.776	96	2.600	4	66.376
	Agriphyte	23.410	34	26.920	39	17.015	24	67.345	97	2.281	3	69.626
	P& R	20.499	32	22.943	36	17.284	27	60.726	96	2.775	4	63.501

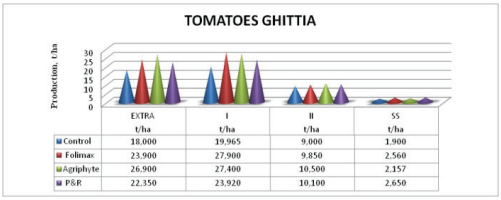

Figure 1. The production obtained at Ghittia variety and the distribution of it on qualities

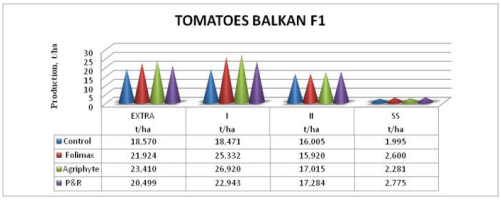

Figure 2. The production obtained at hybrid Balkan F1 and the distribution of it on qualities

Taking into account the influence of variety/ hybrid on the production of tomato (Table 3) it can be seen that the hybrid Balkan F_1 has made a significantly distinct difference production (3.863 t/ ha) than Ghittia variety.

Table 3. The influence of variety on tomatoes production

Variant (variety/hybrid)	Average production, (t/ha)	%	Differences (t/ha)	Signi-ficance
A1 Ghittia	59.763	100	-	
A2 Balkan F_1	63.626	106	3.863	**
DL 5% 1.5423				
DL 1% 3.57957				
DL 0.1% 11.33411				

The influence of treatment on tomatoes production can be observed in table 4. As shown in this table all variants treated with foliar fertilizers (Folimax, Agriphyte) and /or growth promoter P&R exceed untreated control with very significant differences.

Table 4. The influence of treatment of tomatoes production

Treatment	Average production (t/ha)	%	Differences (t/ha)	Signi-ficance
b1Control	51.933	100	-	
b2 Folimax	65.293	126	13.360	***
b3 Agriphyte	68.292	131	16.359	***
b4 P& R	61.261	118	9.328	***
DL 5% 1.884312				
DL 1% 2.644951				
DL 0.1% 3.734048				

Regarding the influence of foliar fertilizer treatments and growth promoter on each variety (Table 5) it can be noted that the yield differences obtained from untreated control are very significant.

Table 5. The influence of treatments on each variety production

Variant (treatment)	Average production (t/ha)	%	Differences (t/ha)	Signi-ficance
a1b1 (Control)	48.865	100	-	
a1b2	64.210	131	15.345	***
a1b3	66.957	137	18.092	***
a1b4	59.020	121	10.155	***
a2b1 (Control)	55.001	100	-	
a2b2	66.376	121	11.375	***
a2b3	69.626	127	14.625	***
a2b4	63.501	115	8.500	***
DL 5% 2.6648189				
DL 1% 3.7405256				
DL 0.1% 5.280742				

If it is taking into account both factors (variety and treatment) it can be noted that the variant treated with Agriphyte had the most consistent behavior regardless of the variety under study, being superior to other types of treatment (Table 6, Figure 3 and 4). The largest increases of production was realized by Balkan F_1 hybrid treated with Agriphyte (69.626 t/ha).

Figure 3. Fruits of hybrid Balkan F1

Figure 4. Fruits of variety Ghittia

Table 6. The influence of variety and treatment on tomatoes production

Variant (treatment)	Average production (t/ha)	%	Differences (t/ha)	Signi-ficance	Variant (treatment)	Average production (t/ha)	%	Differences (t/ha)	Signi-ficance
a1b1 (Control)	48.865	100	-		a1b3 (Control)	66.957	100	-	
a2b1	55.001	113	6.136	**	a2b1	55.001	82	-11.956	000
a2b2	66.376	136	17.511	***	a2b2	66.376	99	-0.581	
a2b3	69.626	142	20.761	***	a2b3	69.626	104	2.669	*
a2b4	63.501	130	14.636	***	a2b4	63.501	95	-3.456	0
a1b2 (Control)	64.210	100	-		a1b4 (Control)	59.020	100	-	
a2b1	55.001	86	-9.209	000	a2b1	55.001	93	-4.019	0
a2b2	66.376	103	2.166		a2b2	66.376	112	7.356	**
a2b3	69.626	108	5.416	**	a2b3	69.626	118	10.606	***
a2b4	63.501	99	-0.709		a2b4	63.501	108	4.481	**
DL 5% 2.6107467					DL 5% 2.6107467				
DL 1% 4.1067505					DL 1% 4.1067505				
DL 0.1% 7.7606017					DL 0.1% 7.7606017				

As shown in figures 5 and 6 the vitamin C and lycopene content of tomato fruits are bigger for treated variants than control regardless of variety.

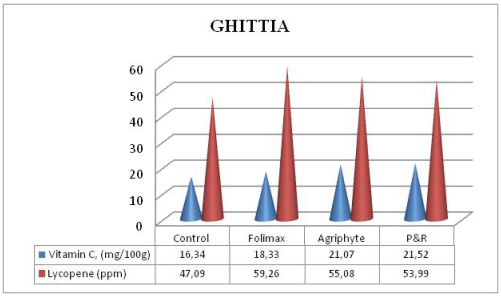

Figure 5. Vitamin C and lycopene content in variety Ghittia

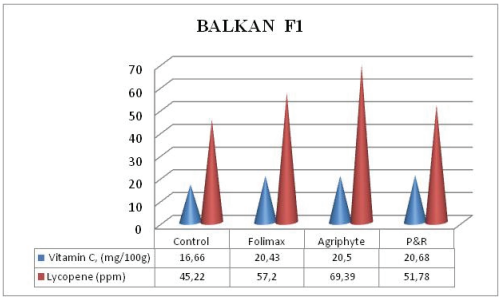

Figure 6. Vitamin C and lycopene content in hybrid Balkan F1

Regarding the carbohydrates content it can be observed that it does not vary much by treatment. The acidity of tomato fruits varies quite widely depending on the treatment and variety (Figure 7 and 8).

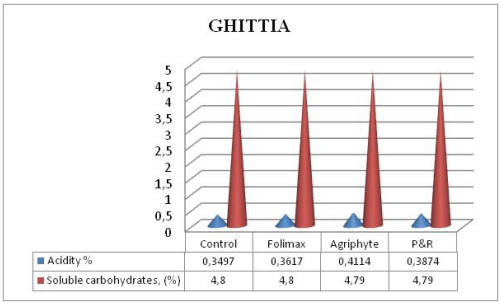

Figure 7. Soluble carbohydrates and acidity content in variety Ghittia

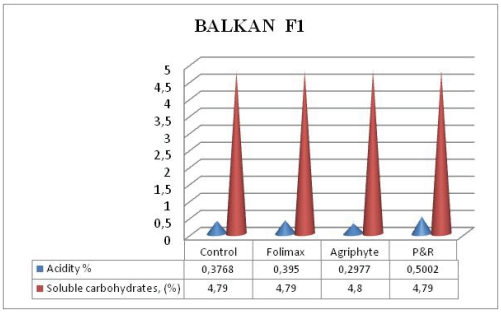

Figure 8. Soluble carbohydrates and acidity content hybrid Balkan F1

CONCLUSIONS

Growth promoter and foliar fertilizer treatments had a positive influence on the level of production and quality of tomato fruits grown in high tunnel, Poiana county Ialomita 2012.

Highest yield was obtained at Agriphyte treatment for both varieties Ghittia and Balkan F_1 (66.957 t/ha, respectively 69.626 t/ha).

Regarding the distribution of fruits on the quality classes, Ghittia shows in variant treated with Agriphyte, the biggest share of

extra fruit quality class (40% of total production).

Production results were interpreted statistically. The differences between Balkan F_1 and Ghittia is distinctly significant and between control and treated variants were very significant.

Vitamin C and lycopene contents varied positively according to the treatment.

The highest content of vitamin C was recorded in variety Ghittia treated with growth promoter P& R (21.52%) and the highest lycopene content was at Balkan F_1 hybrid treated with Agriphyte (69.39 ppm).

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RESULTS CONCERNING THE EFFECT OF FOLIAR FERTILIZERS AND GROWTH PROMOTERS TREATMENTS ON PRODUCTION AND QUALITY OF LETTUCE CULTIVATED IN PLASTIC TUNNELS

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Abstract

The work presents results obtained in protected crops of lettuce under different treatments with growth promoter P& R and foliar fertilizers Agriphyte and Folimax, which are cultivated in high tunnels in southern area of Romania. It were taken in experience three varieties of lettuce: May King, Great Lakes 118 and Lollo Rossa. These treatments shows positive influence on the production and quality of lettuce. Reffer to production the best variant was in the case of the variety May King which was treated with foliar fertilizer Agriphyte (175 g/ head, 28 t/ha). At the other two varieties the best results was obtained at variants treated with foliar fertilizer Folimax. The laboratory analyses shows that the nitrate content of leaves was clearly under the maximum admissible level (2000-3000 ppm) and depends by variety and variant. The content of vitamin C was positively influenced by the treatments, especially by the ecological growth promoter P& R.

Key words: *Agriphyte, Folimax, P&R, quality, production.*

INTRODUCTION

The lettuce is cultivated regularly at early in spring and in autumn late like successive cultures. This system of culture assure the needs of vegetables in these periods of the year, creates the possibility to use more intensive the constructions and assure more benefits to producers. Short vegetation period and reduced height of plants recommended lettuce like a very good associated culture (Ciofu et al., 2004).

The advantages of this system of culture are the following: possibility of obtaining of very early and early productions, possibility of obtaining good harvest long time during the year, good quality of the products, obtaining of big production/ha, avoiding of apparition of weather accidents.

Lettuce is cultivated for its heads, which are consumed mostly fresh like salads.

In recent times because of orientation of the population to a nutrition regime more close to nature, lettuce has begun one of the mostly consumed vegetable (Ciofu et al., 2004, Indrea and Apahidean, 1997). It has nutritional importance because of the high content of vitamins, mineral salts and nutritive substances as following: 100 g of lettuce contains 43 mg Ca, 32 mg P, 0.3 mg Fe, 350 mg K, 15 mg vitamin E, 4.2 mg vitamin A, 0.07 mg vitamin B_1, 0.08 mg vitamin B_2, 0.5 mg vitamin PP. It contains also in this quantity of leaves 0.1% sugar, 1.4% proteins, 0.5% cellulose. Lettuce is a good vegetable for remineralization, cleanser sedative, emollient. Its energetic value is of 16 calories. Lettuce juice has very good properties because of the high content in magnesium and iron. This species was cultivated long time ago. Egiptians, Greeks and Romans cultivate lettuce on large surfaces and appreciated this culture like a very valuable vegetable. In present, lettuce is spread on all continents, on large areas, especially in the countries from Western Europe, in USA and Japan. In the US, for example, this culture occupies over 100,000 ha and the consumption/inhabitant reached 10 kg/year. In our country, lettuce is grown both in pure culture and in the system of associated and successive culture, in all counties and especially around big cities and industrial centers, occupying 14,000-15,000 ha annually. Different authors recommended for prolongation of preservation of lettuce a big number of products. Relatively recent was discovered many regulators of growth and

fruiting with a large application in vegetables crops. They are natural or synthetic hormonal substances which influence the processes of growth and development of plants (Indrea et al., 2007). The authors shows that is possible to apply these products in combination with foliar fertilizers.
These foliar fertilizers are used on large scale in vegetable protected crops because of some advantages like: reduced concentration of mineral elements and quickly correction of nutrition deficiencies (Voican and Lacatus, 2002).

MATERIALS AND METHODS

The main objective of research was to determine the optimal variant of stimulation and foliar fertilization of the lettuce in protected crops for obtaining early and high quality production.
The experience was held in 2012 in village Poiana, Ialomita county, in high tunnels on a surface of 720 m^2.
The installation of trial was done in subdivided parcels, in three repetitions.

The experimental variants consist of three products used: two foliar fertilizers and one natural stimulator, which are compared with a untreated control (Table 1).
The technology used in the experiences was selected from the literature for lettuce (Ciofu et al., 2004).
Under climatic conditions of the year 2012, the culture has been established by planting of seedling on 15th of October. The seedling was by 28 days old and 5-6 leaves.

Figure 1. View with variety Great Lakes 118

Table 1. Experimental variants – 2012

Biological material	Treatments	Specification
May King Great Lakes 118 Lollo Rossa	V1 Control (untreated)	-
	V2 Folimax-0.3%	Foliar fertilizer with microelements; ensure steady growth, disease resistance, increase the number of fruits and production.
	V3 Agriphyte-0.3%	Foliar fertilizer with 33% phosphorus and 28% potassium; secondary has systemic fungicide properties.
	V4 P&R-0.5%	Organic product with role of protection and recovery of the plants from damage caused by extreme temperatures or diseases; help to a better use of the nutrients in different types of soils; increase the assimilation of some nutrients (Fe, Zn, Mn, B, Cu); may be used together with protective agents for plants (herbicides, insecticides, fungicides).

Biological material has been represented by two varieties: May King, Great Lakes 118 and Lollo Rossa, recommended for protected and open field crops. (Table 2, Figure 1).
The density used was 160,000 plants/ha.

Table 2. Description of the lettuce varieties from trial

Biological material	Characterization
May King	Early variety, for protected and open field crops, for autumn and spring, with compact medium head, blade present corrugating; resistant to flowering.
Great Lakes 118	Mid – early variety, for protected and open field crops; with head by round to oval shape, with curled leaves, crisp and of iceberg type.
Lollo Rossa	Forms a distinct compact rosette of blood violet fan -shaped leaves with a non-hearting pale green base. The leaves have a crisp, semi-succulent, hardy texture

At two weeks from planting it was applied treatments with growth promoter (P&R) and foliar fertilizers (Folimax and Agriphyte) in accordance with experimental variants.
Harvesting was done from the first half of December, by variants.
During the experimentation period has been carried out observations, measurements and determinations, which were used specific working methods namely:
Phenological determinations: sowing date, date of emerging, date of planting and date of harvest.
Production potential was determined by registering of the mass of each head/ rosette harvested by variants.
The results were interpreted statistically by analysis of variance - Student test (Ardelean et al., 2007).
Laboratory analysis at lettuce:
- agrochemical analysis: $N\text{-}NO_3^-$ and $N\text{-}NO_2^-$ content, $P\text{-}PO_4^{3-}$ content, K^+ content.
- biochemical analysis: vitamin C content (mg/100 fresh product), soluble carbohydrates (%), acidity (%), chlorophyll (mg/100 fresh product). Were harvested lettuce samples for laboratory analysis of three different harvests and results are average of these samples.

RESULTS AND DISCUSSIONS

From the analysis results can be observed that the average weight of the head of the May King lettuce ranged from 158 g (untreated control) to 175 g (Agriphyte). At variety Great Lakes 118 the average weight of the head ranged between 152 g (untreated control) to 168 g (Folimax). At Lollo Rossa the average weight of the rosette varied between 140 g (untreated control) to 157 g (Folimax) (Table 3, Figure 2).

Table 3. The influence of growth promoter and foliar fertilizers treatments on the production of lettuce-2012

Variety	Variant	Average weight of the head/ rosette, kg/pl.	Production t/ha
May King	Control	0.158	25.28
	Folimax	0.170	27.20
	Agriphyte	0.175	28.00
	P& R	0.163	26.08
Great Lakes	Control	0.152	24.32
	Folimax	0.168	26.88
	Agriphyte	0.166	26.56
	P& R	0.160	25.60
Lollo Rossa	Control	0.140	22.40
	Folimax	0.157	25.12
	Agriphyte	0.150	24.00
	P& R	0.146	23.36

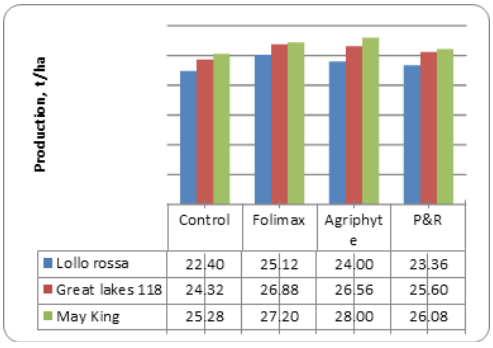

Figure 2. Production at lettuce experiences, 2012

Concerning the production of lettuce May King it was between 25.280 t/ha (control) and 28.000 t/ha (Agriphyte). It can be observed that the applied treatments favored average weight of the heads and the production. At Great Lakes 118 variety, on first place it was the variant treated with foliar fertilizers Folimax (26.880 t/ ha) compare to the control (24.320 t/ ha). At Lollo Rossa variety, on first place it was the variant treated with foliar fertilizers Folimax (25.120 t/ ha) compare to the control (22.400 t/ ha). If we take into account the influence of variety on the lettuce production (Table 4), it can be observed that both varieties Great Lakes 118 and May King have made a significantly distinct difference of production (2.120 t/ ha, respectively 2.920 t/ha) compare to Lollo Rossa .

Table 4. The influence of the variety on the lettuce production

Variety	Average poduction (t/ha)	%	Differences t/ha	Signi-fication
a1 Lollo Rossa	23.720	100	-	
a2Great Lakes 118	25.840	109	2.120	**
a3 May King	26.640	112	2.920	**
DL 5% 0.50609				
DL 1% 1.17459				
DL 0.1% 3.71916				

The influence of the treatment on the lettuce production it can be seen in the table 5. As it show in this table the variants treated with foliar fertilizers (Folimax, Agriphyte) exceeded the control with significantly distinct difference.

Table 5. The influence of the treatment on the lettuce production

Treatment	Average production (t/ha)	%	Differences t/ha	Signi-fication
b1Control	24.000	100	-	
b2 Folimax	26.400	110	2.400	**
b3 Agriphyte	26.187	109	2.187	**
b4 P& R	25.013	104	1.013	

If we take into account the influence of the treatments on the production at the same variety, it can be noticed different behavior of the three varities of lettuce. If varieties Lollo Rossa and Great Lakes 118 made the biggest differences for Folimax treatment, variety May King give best results at Agriphyte treatment (Table 6, Figure 3 and 4).

Figure 3. View with variety May King

Figure 4. View with variety Lollo rossa

Table 6. The influence of the treatment on the lettuce production from the same variety

Treatment	Average production (t/ha)	%	Differences t/ha	Signi-fication
a1b1 (Control)	22.400	100	-	
a1b2	25.120	112	2.720	**
a1b3	24.000	107	1.600	
a1b4	23.360	104	0.960	
a2b1 (Control)	24.320	100	-	
a2b2	26.880	111	2.560	**
a2b3	26.560	109	2.240	*
a2b4	25.600	105	1.280	
a3b1 (Control)	25.280	100		
a3b2	27.200	108	1.920	*
a3b3	28.000	111	2.720	**
a3b4	26.080	103	0.800	
DL 5% 1,77129				
DL 1% 2,48631				
DL 0.1% 3,51008				

If we take into account the both factors, variety and treatment, it can be seen that the variants treated with Agriphyte behaved consistently achieving highest differences to any control when is associated with variety May King (Table 7).

Table 7. The influence of variety and treatments on the lettuce production

Variant	Average production (t/ha)	%	Differences t/ha	Signi-fication	Variant	Average production (t/ha)	%	Differences t/ha	Signi-fication
a1b1	22.400	100	-		a1b3	24.000	100	-	
a2b1	24.320	109	1.920	*	a2b1	24.320	101	0.320	
a2b2	26.880	120	4.480	***	a2b2	26.880	112	2.880	**
a2b3	26.560	119	4.160	***	a2b3	26.560	111	2.560	**
a2b4	25.600	114	3.200	**	a2b4	25.600	107	1.600	*
a1b2	25.120	100	-		a1b4	23.360	100	-	
a2b1	24.320	97	-0.800		a2b1	24.320	104	0.960	
a2b2	26.880	107	1.760	*	a2b2	26.880	115	3.520	**
a2b3	26.560	106	1.440		a2b3	26.560	114	3.200	**
a2b4	25.600	102	0.480		a2b4	25.600	110	2.240	*
a1b1	22.400	100	-		a1b3	24.000	100	-	
a3b1	25.280	113	2.880	**	a3b1	25.280	105	1.280	
a3b2	27.200	121	4.800	***	a3b2	27.200	113	3.200	**
a3b3	28.000	125	5.600	***	a3b3	28.000	117	4.000	***
a3b4	26.080	116	3.680	***	a3b4	26.080	109	2.080	*
a1b2	25.120	100	-		a1b4	23.360	100	-	
a3b1	25.280	101	0.160		a3b1	25.280	108	1.920	*
a3b2	27.200	108	2.080	*	a3b2	27.200	116	3.840	***
a3b3	28.000	111	2.880	**	a3b3	28.000	120	4.640	***
a3b4	26.080	104	0.960		a3b4	26.080	112	2.720	**
DL 5% 1.58555						DL 5% 1.58555			
DL1% 2.30163						DL1% 2.30163			
DL0.1% 3.58707						DL 0.1% 3.58707			

If we take a look on the results of laboratory analysis we can see that none of the variants is poluted with nitrates/nitrites (Table 8).
The nitrates content is well below the maximum level (2000-3000 ppm). The highest nitrate level was recorded at Great Lakes 118 at variant treated with Agriphyte (345.45 ppm). The highest content of phosphorus was found at variant Great Lakes 118 treated with growth promoter P& R (166.38 ppm). The highest content of potassium was found at variant May King treated with Folimax (4020 ppm).

Table 8. Results of laboratory analysis at lettuce

Variety	Treatment	Content						
		$N\text{-}NO_3^-$	$P\text{-}PO_43\text{-}$	K+	Acidity %	Soluble carbohydrates	Vitamin C, mg/100g	Chlorophyll mg/100g
Lollo Rossa	Control	185.10	132.65	3000.00	0.19	2.09	4.28	60.51
	Folimax	186.10	126.91	3046.67	0.21	2.11	4.28	63.88
	Agriphyte	279.14	139.47	3083.33	0.21	2.11	4.25	60.02
	P& R	301.31	138.11	3060.00	0.21	2.27	4.27	59.27
Great Lakes 118	Control	190.41	144.19	3800.00	0.10	2.23	2.63	73.56
	Folimax	194.17	132.66	3903.33	0.13	2.18	2.60	76.27
	Agriphyte	345.45	124.97	3700.00	0.15	2.25	2.60	71.57
	P& R	335.27	166.38	3628.67	0.15	2.25	2.65	72.75
May King	Control	152.09	136.63	3593.33	0.15	2.13	2.98	66.89
	Folimax	179.38	124.31	4020.00	0.18	2.14	3.19	69.20
	Agriphyte	188.52	120.43	3820.00	0.18	2.09	3.32	66.98
	P& R	214.17	114.96	3466.67	0.19	2.12	3.30	65.68

The highest content of soluble carbohydrates was found at variant Lollo Rossa treated with P& R (2.27%). The biggest content of vitamin C was recorded at variant Lollo Rossa treated with Folimax (4.28%). The highest content of chlorophyll was found at variant Great Lakes 118 treated with Folimax (73.56%).

CONCLUSIONS

The highest average weight of the head/ rosette and the highest production was achieved by the variant May King treated with Agriphyte (175.0 g, 28.0 t/ha).

Foliar fertilizers Folimax and Agriphyte achieved the highest average productions on the experience of lettuce (26.400 t/ha respectively 26.187 t/ha).

The experimental results were verified statistically and differences from control was at least significantly.

None of these treatments had pollution effect with nitrates/ nitrites on the final product.

Foliar fertilizer Folimax favored the accumulation of chlorophyll in all varieties and the accumulation of potassium in Great Lakes 118 and May King varieties.

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A PRELIMINARY SURVEY OF THE OCCURRENCE OF APPLE PROLIFERATION IN THE NORTH OF ROMANIA

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Abstract

Apple proliferation (AP), caused by the 'Candidatus Phytoplama mali' ('Ca. P. Mali'), is considered one of the most important disease affecting apple. While different reports showed its largely spread in some European countries, very limited information about the occurrence of AP in Romanian apple orchards are available. To start to secure this missing data, a preliminary survey was perform in two apple orchards located in Bistrita area from Romania. Watching typical AP symptoms (witches' brooms, foliar reddening, dwarf fruits), twenty samples from symptomatic trees, belonging to three cultivars (Generos, Florina and Aura), were collected in autumn 2012. Serological DAS-ELISA using Bioreba monoclonal antibody, and nested-PCR using primer sets to detect AP group, were performed. ELISA results indicated that 17 out of 20 samples collected were positive, while nested-PCR revealed that all 20 samples were infected. Because plenty of trees showed similar symptoms like those sampled, this preliminary survey suggests a high incidence of AP in the two orchards. An extended study on surrounding areas of Bistrita, and then on regional and national level is necessary to provide relevant data about the AP occurrence in Romanian apple orchards and, subsequently, to recommend control measures, if will be needed.

Key words: *apple proliferation, DAS-ELISA, nested-PCR, apple orchards, survey.*

INTRODUCTION

Apple proliferation (AP) is considered one of the most important diseases that occur in almost all European countries, where apple is grown (Seemüller et al., 2011). Most of the apple cultivars are known to be susceptible to this disease. The causal agent of this disease is '*Candidatus* Phytoplama mali' ('*Ca.* P. Mali'), which belongs to the 16SrX phylogenetic group (Seemüller and Schneider, 2004). The first report of AP was made in Northern Italy (Rui et al., 1950). Apple proliferation can be transmitted by grafting and infected plant materials, but is not seed transmissible (Seidl and Komarkova, 1974).

Within the orchards, the most important natural spread of *'Ca.* P. Mali' is made by insects vectors. Two *Cacopsylla* species, *C. picta* (Jarausch et al., 2003; Malagnini et. al., 2010) and *C. melanoneura* (Tedeschi et al., 2002; Chireceanu and Fatu, 2012) were reported as '*Ca.* P. mali' vectors. The pathogen is transmitted by both species in a persistent manner. Also, *Fieberiella florii* (Stal) was reported as vector of '*Ca.* P. mali' in Germany (Krczal, et al., 1988), and in Italy (Tedeschi and Alma, 2006).

The main symptoms of AP disease are foliar reddening, witches' brooms, enlarged stipules and small sized fruits with poor taste (Nemeth, 1986). At this time, there are a lot of possibility for detection of AP, from indexing on woody indicators and using electron microscopy (Seemüller, 1976), to serological methods (ELISA) using monoclonal antibodies (Loi et al, 2002), hybridization and molecular tests, using direct/nested-PCR and RFLP (Kison et al., 1994), or real-time PCR (Baric and Dalla-Via, 2004). Regarding the serological detection of AP group, Ploaie (2006) has showed that there is no serological difference between Apple proliferation, Pear decline and European stone fruit yellows.

The existence of AP in different orchards from Romania, based on symptomatology, was observed since 1958 (Pop, 1962; Pop et al., 1965, 1967). Along 15 years, Gheorghiu (1985) had studied the etiology, symptomatology, epidemiology and transmission of AP on two apple cvs., Jonathan and Red Delicious. During 1967-1973, Gheorghiu (1985) provided data on

AP monitoring performed in Romanian apple orchards, based on morphological symptoms. In the last thirty years there is a lack of information about AP incidence in Romanian apple orchards.

To date, there are no studies about the occurrence of AP in apple orchards from Romania based on serological and/or molecular tests. To start to secure these missing data, a preliminary survey was carried out in 2012, in two apple orchards located in Bistrita area, Romania, using serological and molecular assays.

MATERIALS AND METHODS

'Florina' cv., known to be one of the highly susceptible to AP (Loi et al. 1995) and another two Romanian cultivars, named 'Generos' and 'Aura', were the subject of this study. Twenty samples of symptomatic apple trees were collected in autumn 2012 from the three cultivars. Sampling was based on typical AP symptoms: witches' brooms, foliar reddening in late summer, enlarged stipules and dwarf of fruits (Figure 1).

Figure 1. Symptom of Apple proliferation disease: dwarf sized fruits (down) compared with healthy fruits (top) – original.

Photo 1. Symptom of Apple proliferation disease: dwarf sized fruits (down) compared with healthy fruits (top) – original.

Serological diagnoses were performed by Double Antibody Sandwich-Enzyme Linked Immunosorbent Assay (DAS-ELISA) – (Clark and Adams, 1977), using a monoclonal antibody (Loi et. al., 2002) raised against AP phytoplasmas group, according to the manufacturer's instructions (Bioreba, Switzerland). Absorbance values were measured at 405 nm after 30 and 60 minutes, using a TECAN plate reader. Samples were considered positive if their absorbance values were more than twice those of negative control. Positive and negative controls were provided in AP kit (Bioreba), and used both in serological and molecular assay.

For molecular detection, total DNA was purified by using DNeasy Plant Mini Kit and the protocol recommended by manufacturer (Qiagen, Germany). DNA was extracted from leaf veins and phloem, which were prior grind to a fine powder under liquid nitrogen. Aliquots of DNA were then used in nested-PCR. A first round of amplification was made by using an universal primers pair P1/P7 (Deng and Hiruki 1991).

RESULTS AND DISCUSSIONS

Seventeen samples out of twenty reacted positively by DAS-ELISA, using monoclonal antibody provided by Bioreba, which specifically recognize AP (Table 1).

Nested-PCR, performed in parallel with serological detection, allowed us to detect 16SrX phytoplasmas group. All samples tested by nested-PCR reacted positively, both in the first and the second PCR round.

Consequently, "infected status" of all the 20 trees showing typical AP symptoms analyzed in the present work was confirmed in nested-PCR. However, three samples were found negative in DAS-ELISA. There is possible that the three isolates were not recognized by monoclonal antibody.

Table 1. Results of serological and molecular tests

Cultivar	Isolate code	DAS-ELISA	Nested-PCR	Status
Generos	G1	+	+	*infected*
	G2	+	+	*infected*
	G3	+	+	*infected*
	G4	+	+	*infected*
	G5	+	+	*infected*
	G6	+	+	*infected*
	G7	+	+	*infected*
	G8	+	+	*infected*

Florina	F1	-	+	*infected*
	F2	-	+	*infected*
	F3	+	+	*infected*
	F4	+	+	*infected*
	F5	+	+	*infected*
	F6	+	+	*infected*
	F7	+	+	*infected*
	F8	+	+	*infected*
Aura	A1	+	+	*infected*
	A2	+	+	*infected*
	A3	+	+	*infected*
	A4	-	+	*infected*
AP positive control		+	+	
AP negative control		-	-	

Because plenty of trees showed similar symptoms like those sampled, this preliminary survey suggests a high incidence of AP in the two orchards. An extended survey on surrounding areas of Bistrita, and then at regional and national level, focused not only on symptomatic trees, but also on asymptomatic, is necessary to provide relevant data about the AP occurrences in Romanian apple orchards. Subsequently, overall data will allow to establish control measures, knowing that this disease is included in the list of quarantine.

This work can be considered a first step in evaluation of incidence of AP in apple orchards from Romania, by using not only visual monitoring, but also serological and molecular assays.

CONCLUSIONS

The finding of AP in all twenty apple trees tested corroborated with plenty of symptomatic trees indicates a potential for a high prevalence of AP within and around the surveyed orchards.

These results request an additional and exhaustive study at regional and national level. Subsequently, appropriate measures to reduce the impact could be recommended, if will be needed.

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SOME FRUIT CHARACTERISTICS OF MEDLAR (*MESPILUS GERMANICA* L.) GENOTYPES GROWN IN ORDU, TURKEY

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Abstract

Medlar is grown mostly as scattered trees within or around hazelnut orchards in the Black Sea Region of Turkey. The harvested fruits are used for family consumption or sold in local markets. This research was carried out to determine certain morphological and chemical attributes of 39 medlar genotypes grown in Ordu region in 2012. There was large variation among the genotypes that the average fruit weight, fruit length and fruit width were between 6.32 and 36.42 g, 21.8 and 40.1 mm and 20.6 and 42.7 mm while width and length of calyx basin ranged from 8.3 to 23.3 mm and from 3.8 to 11.8 mm, respectively. Soluble dry matter, titreable acid contents and pH varied between 2.3 and 11.9 g/l, 8 and 18%, and 3.62 and 4.90, respectively. Based on especially fruit size and weight, the clone #3 was selected as a promising genotype.

Key words: *Medlar, Mespilus germanica L., pomology, selection.*

INTRODUCTION

Medlar (*Mespilus germanica* L.) is a genus in the Rosaceae family which has many fruit species. Medlar is deciduous and grows naturally as large shrubs or small trees in Southwest Asia and also in Southeast Europe, mostly in the coast of Black Sea in Turkey for 3000 years. The fruits of medlar have brown and sometimes reddish colour and they are 1.5-3 cm in diameter, the small ones have a weight of 10-80 g (Browicz, 1972; Bignami, 2000; Ayaz et al., 2008). The medlar fruit is widely consumed in Turkey. In Northeast Anatolia (Turkey) both wild and cultivated forms are grown, and their fruit is used in different ways. In October, the hard fruit is harvested from the medlar trees and stored in cold, dark and ventilated places. However, a substantial part of the crop at different stages of maturity is left on the trees and harvested later after fruit softening has started. The fruit is often consumed or sold in the local markets and stores.Cultivars of Mespilus germanica that are grown for their fruit include; hollandia, nottingham and russian, dutch (also known as giant or monstrous), royal, breda giant and large russian (Bignami, 2000). There are very few kinds of fruit in other types.This study was conducted in order to determine the fruit characteristics of genotypes grown in natural habitat of Ordu province.

MATERIALS AND METHODS

Plant material

The fruits of 39 different genotypes were taken into consideration among hundreds of genotypes grown in the district of Ulubey, Ordu. The fruits were harvested from the trees before softening and 15 fruits from each genotype were left for softening at 22 ± 2 ^{0}C.

The measurements of fruit length, fruit diameter, width and length of calyx basin were determined with digital calipers; fruit and seed weight were determined with 0.01 g sensitive precision scales by taking the average of the 15 fruits.

In soft fruits, the rate of total soluble dry matter was determined as percentage with hand refractometer. The rate of titreable acid content was determined as percentage considering the amount of total base consumed as malic acid, after the titration with 1N NaOH. The pH of fruit juice was also determined.

The data obtained from the fruits of the 39 genotypes were tested using variance analysis with the statistical packages of minitab (MINITAB Inc.). The differences were compared with Duncan method with using 0.05 *F* value ($P \leq 0.05$).

RESULTS AND DISCUSSIONS

Fruit characteristics of the 39 genotypes that were evaluated in the field observations are given in Table 1. According to the results, the genotype 3 has the highest value for fruit weight (36.42 g) and it is followed by genotype 1 (31.28 g) and genotype 33 (30.31 g). The lowest value for fruit weight was measured in the genotype 29 (6.32 g).

Studies in the literature carried out in different parts of Turkey showed that the values of fruit weight ranged from 9.46 to 40.80 g (Ozkan et al., 1997; Bostan, 2002; Bostan and Islam, 2007; Ercilsi et al., 2012).

The highest values in terms of fruit lengths were found in the genotypes 14 (40.12 mm) and 3 (39.74 mm). The lowest values were determined in the genotype 31 (20.69 mm). In previous studies, it was indicated that the fruit lengths ranged from 26.53 to 48.73 mm in the genotypes selected (Ozkan et al., 1997; Bostan, 2002; Bostan and Islam, 2007; Ercilsi et al., 2012). Our results are within the range of the values reported in the literature.

The fruit diameters of analyzed genotypes ranged from 23.10 to 42.65 mm. The highest value was determined in the genotype 3, as it was true for fruit length. In the literature, it was stated that the fruit diameters of identified genotypes varied from 23.67 to 42.51 mm (Ozkan et al., 1997; Bostan, 2002; Bostan and Islam, 2007; Ercilsi et al., 2012). Our fruit diameter results were almost similar to these values.

The width and length of calyx basin increased with the coarsening of fruit. For the width of calyx basin, the maximum value was determined in the genotype 15 (23.33 mm) and for the length of calyx basin, the maximum value was determined in the genotype 3 (12.94 mm).

The soluble dry matter contents of genotypes varied between 8-18%. In the literature these values ranged from 12.5 to 26% (Ozkan et al., 1997; Bostan, 2002; Bostan and Islam, 2007; Ercilsi et al., 2012).

The pH value of fruit juice was found between 3.62 and 4.76. These differences are not significant statistically.

The values of titreable acid contents were found between 2.35 and 11.93 g/l. These differences are not significant statistically too. Ozkan et al., (1997) and Bostan (2002) determined the titreable acid contents as between 1.91 and 8.71 g/l. Our results are linear with these findings except the genotype of 39 (11.93 g/l).

The maximum value of genotypes in terms of seed weight was found in the genotype 2 (4.28 g) and it was followed by genotype 4 (4.10 g). The lowest seed weight was found in the fruits of the genotype 29 (0.92 g).

Number of seeds in fruits was found above four in all genotypes except the genotypes 20, 22 and 36. On the other hand, the number of seeds was five in the genotypes 3, 32 and 39. Studies in the literature showed that the number of seeds were generally between 4 and 5 (Ozkan et al., 1997; Bostan, 2002; Bostan and Islam, 2007).

CONCLUSIONS

In this study, fruit characteristics of 39 genotypes were investigated. Four genotypes with fruit weight of 25 g or more, 6 genotypes with fruit length of 35 mm or longer and 6 genotypes with fruit diameter of 35 mm or more were determined. These leading genotypes have the potential of being used in developing new varieties.

In the study, 5 genotypes producing 17% soluble dry matter were regarded as outstanding genotypes because of their chemical composition and they also had high rate of titreable acid contents. This study carried out in the natural growing area of medlar revealed that the genotype 3 was promising in terms of the characteristics evaluated in variety development.

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THE CHOROLOGY OF *ARTEMISIA ALBA* TURRA, *A. LERCHIANA* WEBER AND *A. TSCHERNIEVIANA* BESSER *(ASTERACEAE*) IN ROMANIA

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Abstract

The paper presents chorological data concerning Artemisia alba Turra, Artemisia lerchiana Weber, and Artemisia tschernieviana Besser (Asteraceae) in Romania. These species of Artemisia are considered rare in Romania. Chorological data regarding Artemisia alba, A. lerchiana and A. tscherneviana distributions are presented using bibliographical information, data from different Herbaria of Romania and original data collected from fieldwork. An original chorological map using GEOCOD coordinates is presented for the first time.

Key words: *Asteraceae, Artemisia species, chorology, distribution map, GEOCOD coordinates, Romania.*

INTRODUCTION

Genus *Artemisia* L. is one of the largest and most widespread types of the nearly 100 genera that make up the family *Asteraceae*. It is considered that the genus includes about 500 species worldwide, of which 15 species are annual or biennial. Several members of the genus can be found as endemic species, introduced by man or, as is the case in South America and South Africa, appear as invasive species. *Artemisia* species are perennial, rarely annual or biennial (Bremer, 1994; Vallès and McArthur, 2001).

In 'Flora Europaea' *Artemisia* genus contains 57 species, and the Illustrated Flora of Romania it is mentioned the presence of 16 species (Ciocârlan, 2009), five of which are considered rare. In Romania there are few studies on rare species of the genus *Artemisia* (Badea, 2011).

Holobiuc and Blidu (2007) and Dihoru and Negrean (2003) realised a distribution maps of some rare species using Universal Transverse Mercator (UTM) system.

Artemisia lerchiana species was cited by Borza (1947) as being present in Dobrogea and Moldova. Concerning *A. tschernieviana* species (syn. *A. arenaria*) Borza (1947) cites the presence in Moldova and Dobrogea (FRE 2294) also mentioned that the dunes rare marine species from the Black Sea, Constanta to Mamaia from Tannery (Prodan, 1925).

The main objective of the present study is to add new and original chorological points and to document the geographic distribution of the *A. alba, A. lerchiana, A. tshernieviana* species in Romania using GEOCOD system.

MATERIALS AND METHODS

The chorological distribution of the species using UTM coordinates is expressed in Figures 4, 5 and 6. Descriptions and details of distribution of *Artemisia* are based on collections from Herbaria: BUAG-Herbaria of U.S.A.M.V. Bucharest, BUC-Herbaria of University of Bucharest, BUCA-Herbaria of Institute of Biology Bucharest, CL-Herbaria of University "Babes-Bolyai", Cluj-Napoca, CRA-Herbaria of University of Craiova, I-Herbaria of University "Al. I. Cuza" Iasi (according codes with Index Herbariorum, N. H. *Holmgren*). The chorological map of *Artemisia alba, A. lerchiana, A. tschernieviana* is based on the cited sources above and new personal records obtained during research, or different databases / scientific publications where this species was referred. The chorological maps of *Artemisia alba, A. lerchiana* and *A. tschernieviana* included in this work were made by taking in account the

principles of the GEOCOD System (Oltean and Stefanut 2002), which ensures an exact localization of villages, communes and towns where this species was found.

RESULTS AND DISCUSSIONS

***Artemisia alba* Turr** [syn. *A. saxatilis* Waldst. & Kit., *A. biasolettiana* Vis., *A. lobelii* All., *A. incanescens* Jord., *A. camphorata* Vill., *A. suavis* Jord.]

It is a rare, submediteranean calcicole species (Figure 1).

County ALBA: FS 94 Coltesti**,** leg. Csuros et Pàll, det. Gergely, 19.10.1957 (CL 659804); FS 94 Coltesti**,** 'Piatra Cetatii', leg. et det. I. Gergely, 22.09.1961 (I 89274, 45278, 33162); Mountains Hasmas: Mt. Hasmasul Mic, Trascaului pe "Piatra Cetatii", "Piatra Urdasului", "Piatra Podmon", Mt. Bedeleu, " Piatra lui Paul cel Mare" (Oprea, 2005);

County CARAS-SEVERIN: EQ 58 Ciclova (Oprea 2005, Savulescu et all., 1964);

County CONSTANTA: PJ 05 Cotul Vaii**,** leg. et det. Gavril Negrean, 21.08.2002 (CL 656524);

Couny CLUJ: Rimetea, (Savulescu et all., 1964); FS 95 Buru, leg. Badea Monica, det. V. Ciocârlan, 11.10.2010 (BUAG 23955);

County HARGHITA: Mt. Haghimasu Mic (Savulescu et all., 1964);

County SIBIU: KL 68/78 Ocna Sibiului, (FS, Savulescu et all.,1964);

County TULCEA: 6 Martie, leg. et det. G.Negrean, 1.06.1984 (BUCA 549790);

***Artemisia lerchiana* Weber** [syn. *A. incana* B. Keller, non Druce; *A. taurica* auct. roman., non Willd.]

It is a Xerophile, heliophile and calcicole plant widely spread in the Pontic-Aralo-Caspian area. The species can be found in Dobrogea ("Capul Dolosman-Jurilovca"). It has a preference for dry, rocky terrain with a gentle to medium slope and chernozem or kastanozems (Figure 2).

County IASI: NN 34 Tiganasi (Chifu et all., 1987);

County TULCEA: PK 35 Baia, 3.07.1978, G. Negrean (BUCA); PK 46 Jurilovca (Capul Dolosman), 31.10.1999, leg. et det. V. Ciocârlan (BUAG 23191); leg. Badea Monica, det. Vasile Ciocârlan, 4.10.2009 (BUAG 23959); G. Negrean, 2.07.1978 (HGN); Jurilovca, 27.06. 1983, G. Negrean (BUCM 77235);

***Artemisia tschernieviana* Besser** [syn. *A. arenaria* DC.; A. campestris subsp. inodora Nyman.]

It is a rare, continental, heliophile, psamophyllous plant. The western limit for her growth area is Romanian part of Dobrogea (Figure 3).

County CONSTANTA: PJ 28 Agigea, leg. C. Burduja et det. I. Sârbu, 5.08.1967, (I 43001, 43002); Capul Midia, leg. Badea Monica, det. Vasile Ciocârlan, 6.07.2011 (BUC 157623; I 137117); PJ 28/29 Constanta, leg. C. Petrescu et det. C. Dobrescu, 31.07.1915 (I. 24249, 1467); PJ 37/38 Eforie**,** leg. et det. C. Burduja, 27.07.1948 (I. 61355; 61356); PJ 37/38 Eforie**,** leg. et det. I. Sârbu, 19.10.1971 (I. 36912; 36193; 38340); PJ 37/38 Eforie**,** leg. C. Zahariadi, det. A. Popescu, 30.08.1960, (BUCA 129286); PJ 39 Mamaia, leg. et det. C. Burduja, (I 61357, 61358, 1467); PJ 39 Mamaia, leg. Grintescu, 11.08.1910, det. Beldie Alex.,1964, (BUCA 88643); PJ 39 Mamaia, leg. M.Tiesen, 11.08.1926 (CL 429167); PJ 39 Mamaia**,** leg. Al. Borza, 5.08.1923 (CL 501119, 501146); PK 20 Navodari, leg. Popescu, 18.05.1972 (BUCA 129079); PJ 27 Techirghiol,, leg. et det. G. P. Grintescu, 17.09.1925 (I 45271, 33158, BUCA 18848, 30326, 41826, 30380, 30379, 30378, 11278; CL 618230; CRA, 1467); Corbu, (Fagaras, 2008);

County SUCEAVA: MN 37 Moara Carp, reserve Frumoasa, leg. M. Paun, M. Olaru, Gh. Popescu, (CRA);

County TULCEA: NL 92 Grindul, leg. Popescu, 24.07.1968 (BUCA 133359; BUCA 133539), PL91 Letea (Buia, 1963), QL 00/10 Sulina (Buia, 1963) Sf. Gheorghe, Ciocârlan, 1994;

CONCLUSIONS

This study contains data from different Herbaria from Romania (BUC, BUCA, BUAG, CL, CRA, I) in which we made the revision of *Artemisia* L. (*Asteraceae*) genus and made photos of the herbaria sheets with *Artemisia alba, A. lerchiana, A.tscherneviana.*

The chorology maps of *Artemisia alba, A. lerchiana,* and *A. tschernieviana* species were developed for the first time using GEOCOD coordinates. New and original localities were added compared with bibliographical references or data sheets specimens from Herbaria.

Were placed in Herbaria specimens of rare *Artemisia* species (*Artemisia alba* and *A. lerchiana* in BUAG-Herbaria of USAMV Bucharest, *Artemisia tschernieviana* in BUC-Herbaria of University of Bucharest, I-Herbaria of University "Al.I.Cuza" Iasi).

These chorological maps add new data in our monographic study of *Artemisia* L. (*Asteraceae*) genus in Romania.

Figure 1. Morphological aspect of *Artemisia alba* Turra (orig. 1a)

Figure 2. Morphological aspect of *Artemisia lerchiana* Weber (orig.)

Figure 3. Morphological aspect of *Artemisia tschernieviana* Besser (orig.)

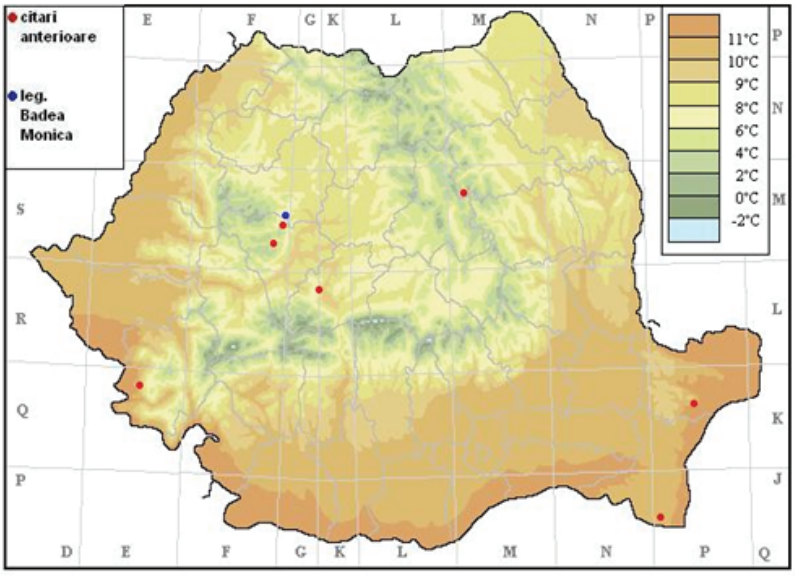

Figure 4. Chorology of *Artemisia alba* Turra in Romania (orig.)

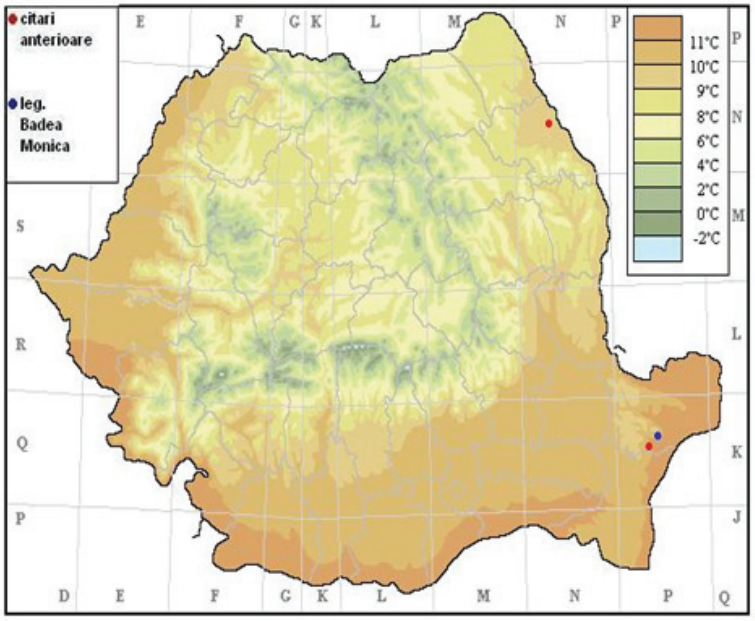

Figure 5. Chorology of *Artemisia lerchiana* Weber in Romania (orig.)

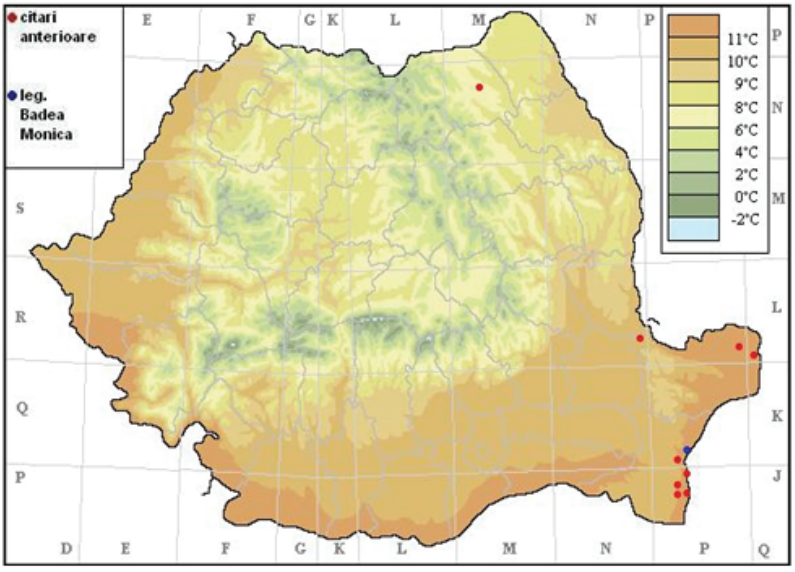

Figure 6. Chorology of *Artemisia tshernieviana* Besser in Romania (orig.)

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NEW HOST PLANT FOR VIRUS VECTOR NEMATODE *XIPHINEMAITALIAE* MEYL, 1953 (NEMATODA: LONGIDORIDAE) IN ROMANIA

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Abstract

Except direct damage to root system, Xiphinema italiae Meyl, 1953 has been reported to be a vector of Grapevine fanleaf virus (GFLV) (Cohn et al., 1958). Soil samples were collected at a depth of 20-40 cm from orchards and vineyards. Xiphinema italiae was identified in rhisosphere of peach orchard. A polymerase chain reaction protocol and the morphological and morphometrical characters has been used for the reliable identification of X. italiae. Morphometrics and illustrations of females are provided. Prunus persica L.is a new host plant for Xiphinema italiae for Romania.

Key words: *Longidoridae, morphology, PCR Multiplex.*

INTRODUCTION

Xiphinema italiae Meyl, 1953 is widespread migratory plant parasitic nematode, species occurring in southern and central Europe: Bulgaria (Peneva and Choleva, 1992, Peneva,1997) France (Wang et al., 2003) Greece (Avgelis & Tzortzakakis, 1997, Tzortzakakis et al. 2006) Hungary (Nagy, 1999), Italy (Martelli et al.,1966), Moldavia (Polinovskij, 1979), Serbia (Barsi & Lamberti, 2003), Slovakia (Liškova et al., 1993) and Spain (Teliz et al., 2007) (Gutiérrez-Gutiérrez et al., 2011).. Outside Europe it was found in Cuba (Dias-Silveira & Herrera, 1995), Egypt (Lamberti et al., 1996), Libya (Siddiqui et al., 1987), Nigeria (Khan et al., 1993) and South Africa (Knoetze et al., 2000). *Xiphinema italiae* has been reported to be a vector of GFLV according to Cohn et al., 1970). In Romania, Romaşcu, 1971 found *X. italiae* in association with grapevines from sandy soil in Platoneşti and Saveni (Ialomiţa county).

MATERIALS AND METHODS

For this study, soil samples were collected from the rhizosphere of peach trees at a depth of 20-40 cm from Valul lui Traian (Constanţa county).

Nematodes were extracted from 200cm^3 soil by a sieving and decanting technique, Nematodes were heat killed at 60ºC for two minutes and fixed in a 4% formaldehyde solution. The specimens were processed to mounted on permanent microscopic glass slides (Seinhorst, 1959).

The morphological and morphometrical observations were made using Leica DMLB microscope fitted with Leica FDC 295 camera.

Multiplex PCR. DNA isolation was carried out by placing 4 nematodes in 10 µL of lysis buffer (1X Platinum Taq DNA polymerase /Invitrogen and 60 µg of proteinase K/mL) between two glass slides and crushed gently. The homogenate was taken up carefully with a pipette, transferred to 0,2 mL Eppendorf tubes and frozen at-80°C for 15 min. After the tubes were incubated at 60°C for 1 h and 95°C for 15 min.

Amplification was carried out in a 25-µl reaction mixture containing the 2,5 µl lysis buffer (nematode lysate as PCR template), 1x Platinum *Taq* DNA polymerase buffer (Invitrogen), 1.5 mM $MgCl_2$ (Invitrogen), 0.2 mM each of dATP, dCTP, dGTP, and dTTP (Sigma 10mM), 0.8 pmol each primer, and 0.5 units of Platinum *Taq* DNA polymerase

(Invitrogen). The primers A-ITS 1, I27, D24, V18, ITA26 were used (Wang et al. 2003).
Amplifications were performed in a thermal cycler (Mastercycler Pro S – Eppendorf), with the following cycling conditions: 95°C for 3 min followed by 39 cycles at 94°C for 1 min, 58°C for 1 min, and 72°C for 1 min 30 s, and ending with 1 cycle at 72°C for 5 min and storage at 4°C.
Amplification product (10 µl PCR product) was separated on 1,5% agarose gel (Sigma) and 0,5X TBE at 100V. The gels were visualized with photo documentation system GENi (Syngene).

RESULTS AND DISCUSSIONS

Xiphinema italiae Meyl, 1953 (Table 1, Figure 3).
Female: Body almost straight, tapering forward and backward, tail end ventrally curved. Cuticle 1,5-1,7µm thick in postlabial region, 2,2-2,7 µm at mid body, 3-4,3 µm. Head end 4,3-5µm convex, clearly separated from adjacent body by a constriction, laterally rounded. Basal bulb measuring 17-18x113-120 µm. Prerectum 451-607µm, rectum 23-31µm. Tail conical, elongated, tapering ventrally and or dorsally before end. Terminus rounded.
Juveniles: The scatter plot diagram based on functional and replacement odontostyle and body length reveals the presence of three juveniles stages (the second, third, fourth) (Figure 1).

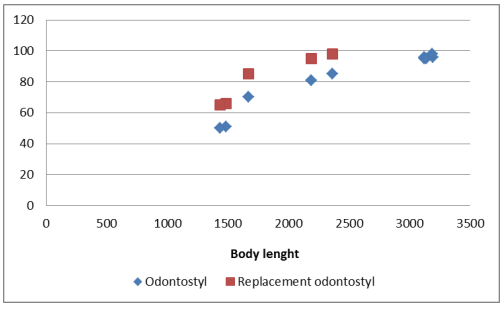

Figure 1. Scatter plot of odontostyle and replacement odontostyle agaist body length of Xiphinema italiae.

Table 1. Measurements of Xiphinema pachtaicum (all in micrometres)

Locality	Valul lui Traian			
Host plant	Prunus persica L.			
Character	Females	J2	J3	J4
n	5	2	1	2
L	3152±35,3	1486,1434	1671	2363,2189
a	98,6±1,6 96,5-101	71, 62	76	95, 87
b	8,3±0,1 8,2-8,4	5,5	6,3	6,6; 6,3
c	35,7±0,3 35,4-36	20,6	21,4	27,8; 27,3
c'	4,4±0,2 4,1-4,6	5,2	5,5	4,8
V%	46,8±1,1 45,5-48	-	-	-
Odontostyle	88,4±1,5 87-90	50,51	70	85,81
Odontophore	59,5±0,7 59-60	40,43	46	60,52
Replacement odontostyle	-	65,66	85	98,95
Oral aperture to guide ring	77,8±2,8 75-81	42,44	60	67,63
Pharynx	378,8±5,8 374	270, 260	265	357, 344
Tail	88,4±1,5 87-90	72	78	85, 80
Length of hyaline part	9,7±0,6 9-10	5,8	-	8,10
Body diameter at: - lip region	10,6±0,2 10,4-11	8; 8,5	8,7	9,4; 9,7
- guiding ring	23,1±0,4 23-23,4	15,6	18	20,21
- base of pharynx	28,5±0,7 28-30	22,5;23	21,5	24
- mid-body	32±0,4 31-33	21,23	22	25
- anus	20,1±0,7 20-21	13,8	14	17,5
- hyaline part	7	3,6	-	5

n=number of specimens; a=body length/greatest body diameter; b=body length/distance from anterior to end of esophageal bulb; c=body length; c´=tail length/anal body diameter; V%=distance of vulva from anterior end

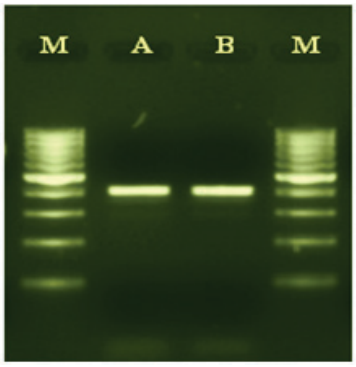

Figure 2. Electrophoresis of the amplification products from DNA isolated from Xiphinema italiae: lane M-100bp DNA ladder (Fermentas), lane A,B – X. italiae

Molecular differentiation showed a single fragment of approximately 414bp was amplified (Figure 2), according to Wang et al., 2003 which correspond to *Xiphinema italiae*.

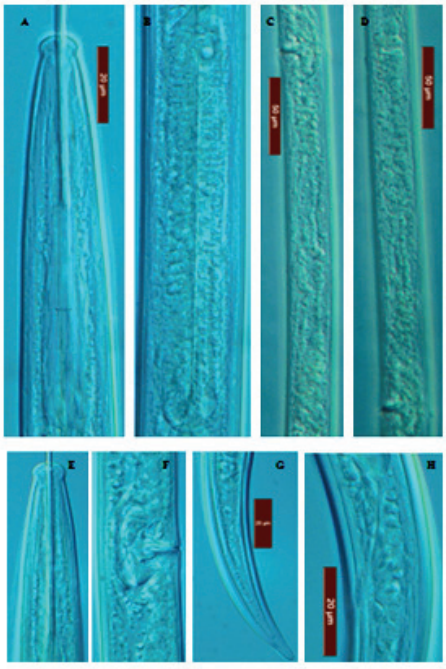

Figure 3. Xiphinema italiae Meyl, 1953: A, anterior region of female with lips region, odontostyle, odontophore, guiding ring; B, oesophageal bulb; C, posterior genital branch; D, anterior genital branch; E, head end; F, vaginal region; G, female tail; H, rectum. Scale bar: 20µm; 50µm.

CONCLUSIONS

Xiphinema italiae was recorded on *Prunus persica* for the first time in Romania.

The monitoring of virus vector nematodes through soil samples, before set up the orchards and vineyards, can assure healthy crop.

Accurate identification of *Xiphinema* spp. is important in regard to their virus transmission capability.

For a reliable diagnosis is necessary to combine identification using morphometric characters and molecular technics.

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STUDY ON THE FREE AMINO ACID PROFILE OF LEAVES FOR GRAPES VARIETIES OF GALBENĂ DE ODOBEŞTI SORTOGROUP

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Abstract

Researches on amino acid profile carried out so far in the genus Vitis showed its great variability, suggesting importance of the genetic involvement in this variability This paper presents preliminary results of investigating the amino acid profile from leaves to the grape varieties of sortogroup Galbenă de Odobeşti. The grape varieties taken in the study were: Galbenă de Odobeşti, Bătută neagră, Zghihară de Huşi, Negru moale and Negru vârtos. For extraction of free amino acids from the leaves of the vine has been used the method Bieleski & Turner (1966) adjusted for grapevine, and separation technique was performed by thin-layer chromatography (TLC). Identification and quantitative estimation of free amino acids was performed using analysis and image processing software - ImageJ ver.1.46. The amount of free amino acids ranged between 18.76 mg / mg fresh leaf at Galbenă de Odobeşti variety and 14.33 mg / mg for Negru moale variety. In the varieties Galbenă de Odobeşti, Bătută neagră and Zghihară de Huşi the most abundant free amino acids were: aspartic acid (Asp), glutamic acid (Glu), serine (Ser), threonine (Thr), proline (Pro) and glycine (Gly). The predominant amino acids for Negru moale variety were: aspartic acid (Asp), serine (Ser), glycine (Gly), glutamic acid (Glu), threonine (Thr), proline (Pro) and arginine (Arg). Amino acids predominantly to Negru vârtos variety are: aspartic acid (Asp), glutamic acid (Glu), serine (Ser), threonine (Thr), proline (Pro) and arginine (Arg). Aspartic acid (Asp) is found in large quantities compared with other amino acids, representing 31.7% of total amino acids identified for Negru vârtos variety, 31.5% at Zghihară de Huşi variety, 30.5% fpr Negru moale variety, 27. 5% for Galbenă de Odobeşti variety and 25.3% for the variety Bătută neagră. Statistical ratio Pro / Arg and amino predominant ratio (Asp / Ser), genetically differentiate the Bătută neagră variety the other varieties belonging to the sortogroup Galbenă de Odobeşti, with a confidence interval of 95%. These preliminary data provide a basis for further research that can demonstrate that amino acid profile of the leaves can be used as method in discriminant analysis of grape varieties.

Key words: *amino acid profile, Galbenă de Odobeşti, sortogroup, thin-layer chromatography.*

INTRODUCTION

The fund management in grape germplasm is one of the most important issues is the growing concern of researchers from all countries. Classical identification methods based on characteristics ampelographic / botanical not the most accurate, with certain restrictions due to instability morphological characteristics influence environmental conditions.

Research on amino acid profile made so far in the genus *Vitis* showed its great variability, suggesting importance of the genetic involvement in this variability (Kliewer et al., 1966, Kliewer 1969; Klub et al., 1978; Marcy et al. 1981; Notsuka et al., 1984, Huang and Ough, 1991). On vines, the total amino acids increases during aging reaching values between 200 and 6500 mg/l of each amino acid variations from one year to another, and from one variety to another (Ţârdea, 2007). Share amino acids in grapes is high and is 20 -30% of the total nitrogen compounds (Poux and Ournac, 1970). Total amino acid content especially predominant ratio of amino acids differ significantly from one variety to another, so knowing the amino acid spectrum of vegetative organs and grapes can be a means of differentiation of vine varieties in terms of genetically (Hernández-Orte et al., 1990). Studies on free amino acid profiles of grapes made so far reported variations in the genetic material and suggests new biochemical descriptors (Shiraishi, 1996).

The characterization of the grapevine varieties based on free amino acid profile shows a great importance to complement the modern methods on investigation of the vine varieties (isoenzymatic analysis and DNA analysis).

MATERIALS AND METHODS

The biological material was represented by five local varieties to Galbenă de Odobeşti sortogroup (Galbenă de Odobeşti, Zghihară de Huşi, Bătută neagră, Negru moale and Negru vârtos), belonging ampelographic collection of Research and Development Station for Viticulture and Winemaking Odobeşti. Samples for analyses were the young leaf obtained by forcing cuttings - eye. The leaf samples (2 or 3 leaves, ~ 5 g) were collected from each variety in plastic bags, labeled, stored on ice and brought to laboratory for analyses.

For extraction of free amino acids from the leaves of the vine has been used the method Bieleski & Turner (1966) adjusted for grapevine. This method ensures the extraction, separation and quantitative estimation of amino acids from small samples of vegetal fresh tissue, by thin layer chromatography technique. For extraction of free amino acids in biological material and for the preparation of standard solutions of amino acids was used a mixture solution with methanol, chloroform and water in a ratio of 12:5:3 v/v/v. For each grape variety was weighed a sample of 0.5 g biological material. The fresh leaves were lyophilized and crushed in a mortar with liquid nitrogen until was obtained a fine powder. 0,200 g was transferred for each sample in a Eppendorf tube 1.5 ml. Over powder was added 200 ml extraction solution (methanol: chloroform: water - M/C/W) in ratio of 12/5/3 (v/v/v), which allowed the removal of pigments and lipids from plant material in chloroform layer. Cell suspensions were treated with sonic frequencies for 1 hour at 4 ° C, causing rupture cell membranes. After sonication the samples were stored in a refrigerator at 4 º C for at least 1 h. To obtain the supernatant containing the amino acids, the sample was centrifuged at 13,500 rpm for 15 minutes at 4 ° C.

The chromatographic separation of amino acids was achieved on TLC plates with silica gel stationary phase 60 on aluminum foil 20 x 20 (TLC Silicagel 60), manufactured by Merck KGaA, Germany. TLC plates were made with size 10 x 7 cm and have been marked the areas of application for samples. Using standard amino acids were produced by Merck KGaA, Germany, in the solution of methanol: chloroform: water (12:5:3 v / v / v). Samples (2 µl) were applied with an automatic micropipette with volume control, from left to right at the bottom of the plate, in the areas marked for each cultivar. The chromatographic separation or development of plates was done in mono dimension, was used the development system based on n - butanol / glacial acetic acid / water (ratio 4:1:1 v/v/v). After chromatographic separation, the TLC plates are ready for viewing and identification of amino acids separated. To ensure reproducible results, the tests were repeated three times for predominant amino acids, to all five varieties.

View amino acids was performed using specific reagents – ninhydrin (a solution in concentration of 0,25%). Amino acids appear as separate spots colors. The TLC plates viewed ninhydrin solution, sensitive to light were scanned or photographed for the qualitative and quantitative evaluation of free amino acids separated from each sample. To identify amino acids separated in samples was calculated the retention factor (Rf) compared with each standard amino acid. Quantitative determination of free amino acids in the samples was performed using image analysis program - ImageJ ver 1.46 r, and the values obtained were expressed in µg free amino acid for 1 mg fresh leaf tissue.

The data obtained were processed statistically for analysis of variance (ANOVA test) and has been determined significance of differences for the total free amino acids content and the ratio between the predominant amino acids (Student test). Analysis of variance and Student test was performed using the Microsoft Excel menu Tools - Data Analysis.

RESULTS AND DISCUSSIONS

14 amino acids were identified. In Figure 1 and 2 are presented TLC plates with amino acids separated and visualized with ninyidrin solution for the five cultivars studied. Standard amino acids used: alanine (Ala) and histidine (His). In

Figure 3 is presented the amino acid profile in leaves (chromatogram) to the cultivars of Galbenă de Odobeşti sortogroup, with standard glutamic acid (Glu). The amino acid profile for the variety Galbenă de Odobeşti is presented in figure 4.

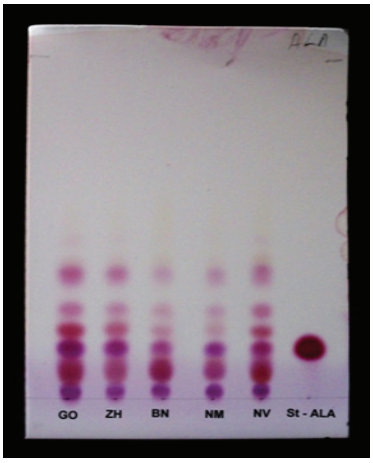

Figure 1. TLC plate with amino acids separated and visualized (St.– Ala)

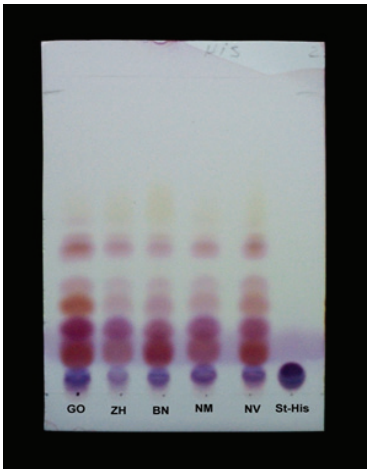

Figure 2. TLC plate with amino acids separated and visualized (St.– His)

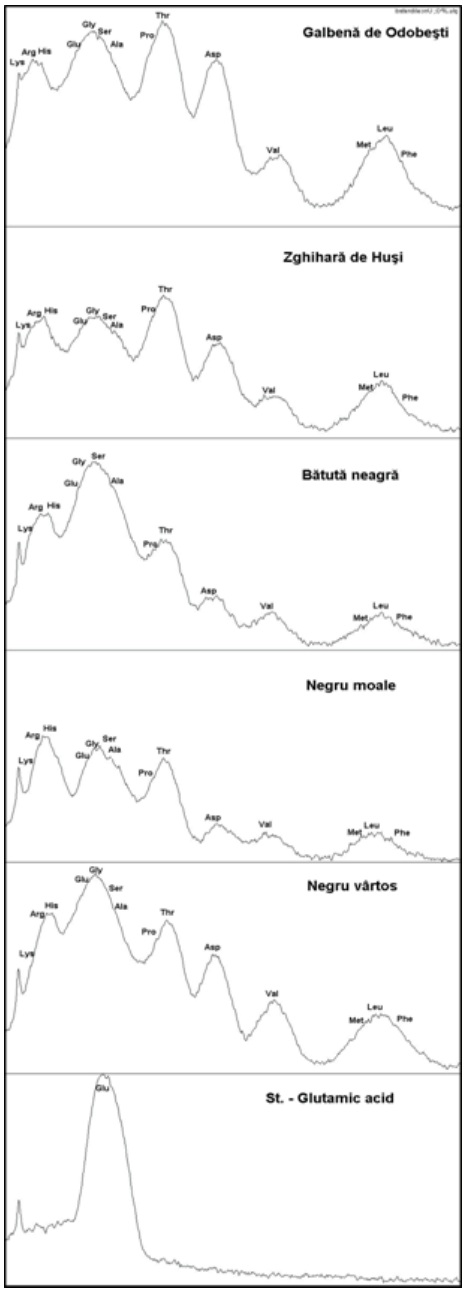

Figure 3. Amino acid profile of leaves for the varieties analyzed (St. - Glu)

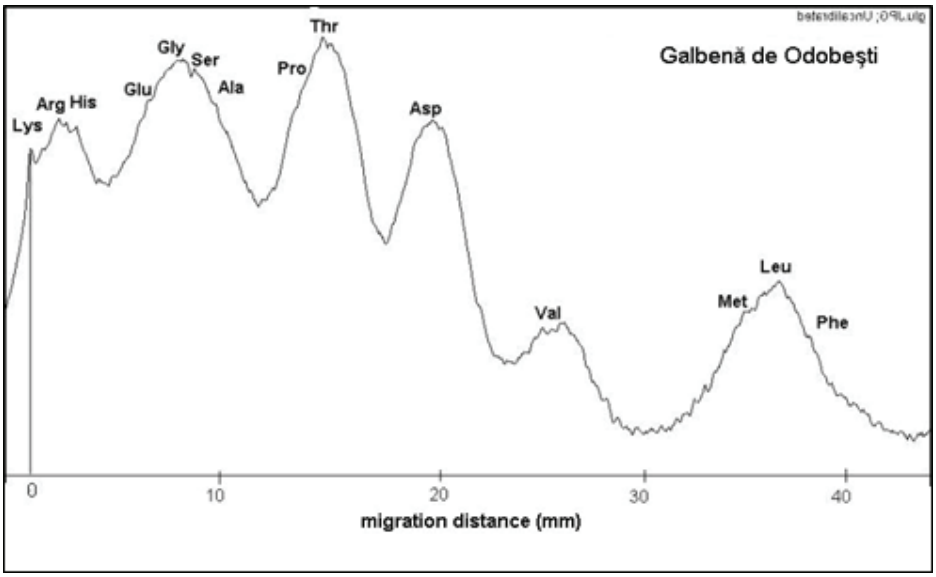

Figure 4. Amino acid profile of the leaves to cultivars Galbenă de Odobeşti

The results with the free amino acids content in leaves to the cultivars of Galbenă de Odobeşti sortogroup, expressed in µg/mg fresh leaf tissue and percentage are summarized in Table 1. The total content of free amino acids in leaves of vine varieties of Galbenă de Odobeşti sortogroup varied between 18.76 µg/mg fresh leaf tissue in the variety Galbenă de Odobeşti and 14.33 µg/mg fresh leaf tissue to the cultivar Negru moale, with intermediate values for the cultivars Zghihară de Huşi (14.54 µg/mg), (cv) Bătută neagră (15.20 µg/ mg) and (cv) Negru vârtos (17.74 µg/ mg). Aspartic acid (Asp) is found in much higher amounts than other amino acids identified, representing 31.7% of total amino acids identified to the cultivar Negru vârtos, 31.5% to the variety Zghihară de Huşi, 30.5% to (cv) Negru moale, 27.5% to (cv) Galbenă de Odobeşti and 25.3% to the variety Bătută neagră.

Table 1. Free amino acid content in the leaves at vine varieties of Galbenă de Odobeşti sorto group

The variety	Galbenă de Odobeşti		Zghihară de Huşi		Batută neagră		Negru moale		Negru vârtos	
Amino acid	µg/mg	%	µg/mg	%	µg/mg	%	µg/mg	%	µg/mg	%
Aspartic acid (Asp)	5.15	27.5	4.58	31.5	3.84	25.3	4.37	30.5	5.62	31.7
Glutamic acid (Glu)	2.04	10.9	1.37	9.4	2.17	14.3	1.30	9.1	2.06	11.6
Serine (Ser)	2.21	11.8	1.73	11.9	1.82	12.0	1.65	11.5	2.06	11.6
Threonine (Thr)	2.04	10.9	1.75	12.0	1.59	10.5	1.13	7.9	1.83	10.3
Proline (Pro)	1.28	6.8	0.82	5.6	1.46	9.6	1.13	7.9	1.15	6.5
Arginine (Arg)	0.99	5.3	0.71	4.9	0.87	5.7	0.88	6.1	1.26	7.1
Glycine (Gly)	1.27	6.8	0.86	5.9	0.91	6.0	1.35	9.4	0.71	4.0
Lysine (Lys)	0.93	5.0	0.72	5.0	0.81	5.3	0.76	5.3	0.81	4.6
Alanine (Ala)	1.09	5.8	0.75	5.2	0.56	3.7	0.53	3.7	0.72	4.1
Leucine (Leu)	0.81	4.3	0.69	4.7	0.49	3.2	0.45	3.1	0.50	2.8
Histidine (His)	0.65	3.5	0.37	2.5	0.47	3.1	0.54	3.8	0.54	3.0
Phenylalanine (Phe)	0.11	0.6	0.05	0.3	0.04	0.3	0.06	0.4	0.15	0.8
Valine (Val)	0.13	0.7	0.07	0.5	0.09	0.6	0.11	0.8	0.20	1.1
Methionine (Met)	0.06	0.3	0.07	0.5	0.08	0.5	0.07	0.5	0.13	0.7
Amino acid content	18.76	100.0	14.54	100.0	15.20	100.0	14.33	100.0	17.74	100.0

The most abundant of the free amino acids in leaves were:

- to the variety Galbenă de Odobeşti: aspartic acid (Asp), serine (Ser), threonine (Thr), glutamic acid (Glu), proline (Pro) and glycine (Gly), representing 74.7% of total amino acids identified;
- to the variety Zghihară de Huşi: aspartic acid (Asp), threonine (Thr), serine (Ser) and glutamic acid (Glu), representing 64.8% of total amino acids content;
- to the variety Bătută neagră: aspartic acid (Asp), glutamic acid (Glu), serine (Ser), threonine (Thr), and proline (Pro), representing 71.7% of the amino acids identified;
- to the variety Negru moale: aspartic acid (Asp), glycine (Gly), serine (Ser), glutamic acid (Glu), threonine (Thr), and proline (Pro), representing 76.3% of total amino acids content;
- to the variety Negru vârtos: aspartic acid (Asp), glutamic acid (Glu), serine (Ser), threonine (Thr), arginine (Arg) and proline (Pro), represents 78.8% of total amino acids content;

Statistical interpretation of data obtained on total amino acid content in leaves of vine varieties belonging to Galbenă de Odobeşti sortogroup by analysis of variance/ANOVA test shows that there is no statistical significance between the five varieties, because the value of P is 0.938854, greater than the critical value of P, 0.05.

The ratio proline/arginine and the ratio of predominant amino acids (aspartic acid/serine) are considered parameters what remain constant from year to year and differ significantly from one variety/cultivar to another and can be called descriptive biochemical parameters. The ratio Pro/Arg has values between 0.91 to the cultivar Negru vârtos and 1.68 for the cultivar Bătută neagră and the ratio Asp / Ser ranges from 2.11 to the variety Bătută neagră and 2.73 to the variety Negru vârtos (Table 2).

Statistical interpretation of experimental data obtained for the ratio Pro/Arg by analysis of variance/ANOVA test shows the existence of a statistical significance between the five cultivars because P value is less than the critical value of P, that is 0.05 (Table 3).

Table 2. The values of biochemical descriptors for grapevine varieties to Galbenă de Odobeşti sortogroup

The variety/ Biochemical descriptors	Galbenă de Odobeşti	Zghihară de Huşi	Bătută neagră	Negru moale	Negru vârtos
Pro/Arg ratio	1,29	1,15	1,68	1,28	0,91
Asp/Ser ratio	2,33	2,65	2,11	2,65	2,73

Table 3. The significance of differences to the ratio proline / arginine in the leaves of vine varieties to Galbenă de Odobeşti sortogroup

The vine variety	Galbenă de Odobeşti	Zghihară de Huşi	Bătută neagră	Negru moale	Negru vârtos
Galbenă de Odobeşti	0				
Zghihară de Huşi	0.06542	0			
Bătută neagră	0.00051	0.00064	0		
Negru moale	0.94536	0.06777	0.00093	0	
Negru vărtos	0.01346	0.06722	0.00096	0.01368	0

Statistical the ratio proline/arginine genetically differentiates the variety Bătută neagră the other varieties of Galbenă de Odobeşti sortogroup, with a confidence interval of 95%. A significant difference exists between the variety Negru vârtos and the varieties Galbenă de Odobeşti and Negru moale. Variance analisys/ANOVA test for the ratio predominant amino acids (aspartic acid/serine), statistically differentiates the variety Bătută neagră by the other varieties except the variety Galbenă de Odobeşti with a confidence interval of 95%, while this difference is not significant for the variety Galbenă de Odobeşti (Table 4).

Table 4. The significance of differences in the ratio aspartic acid / serine of leaf vine varieties of Galbenă de Odobeşti sortogroup

The vine variety	Galbenă de Odobeşti	Zghihară de Huşi	Bătută neagră	Negru moale	Negru vârtos
Galbenă de Odobeşti	0				
Zghihară de Huşi	0.11292	0			
Bătută neagră	0.23710	0.00732	0		
Negru moale	0.08869	0.93531	0.00357	0	
Negru vârtos	0.06510	0.44839	0.00510	0.39683	0

CONCLUSIONS

The total free amino acids content in leaves varies between 18.76 µg/mg fresh leaf tissue to the variety Galbenă de Odobeşti and 14.33 µg/mg to the variety Negru moale, with intermediate values for the variety Negru vârtos (17.74 µg/mg), (cv) Bătută neagră (15.20 µg/mg) and (cv) Zghihară de Huşi (14.54 µg/mg).

The most abundant of the free amino acids in leaves of native varieties to Galbenă de Odobeşti sortogroup are: Asp. Ser. Thr. Glu. Pro. Arg and Gly. Aspartic acid is found in large amounts compared with other amino acids predominant.

The ratio proline/arginine has differentiated statistically the variety Bătută neagră by the other varieties of Galbenă de Odobeşti sortogroup with a confidence interval of 95%.

Significant difference exists between the varieties Galbenă de Odobeşti and Negru vârtos and between the varieties Negru moale and Negru vârtos.

The ratio between predominant amino acids (aspartic acid/serine) has differentiated genetically the variety Bătută neagră by the other varieties (except the variety Galbenă de Odobeşti) with a confidence interval of 95%.

There is significant difference between the varieties Galbenă de Odobeşti and Negru vârtos and between the varieties Negru moale and Negru vârtos.

The amino acid profile of leaves can be used as discriminant analysis method of vine varieties to Galbenă de Odobeşti sortogroup. with the other modern methods of investigation (isoenzyme analysis and DNA analysis).

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STUDIES UPON THE PHONOLOGY OF ROSIE DE ARIES ONION PLANTS FROM THE FIRST YEAR OF THE SEEDS PRODUCTION PROCESS AND THE MAIN CHARACTERISTICS OF THE PARENT PLANTS FROM 2007 UNTIL 2009 YEAR

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Abstract

The research was carried out in the period of 2007-2009 year, in the environmental conditions of SCDL Iernut. This spanned the duration of vegetation phases of plans from the experimental variants, since Ist year-parent plant phase, in three eras of sowing. The vegetation period of the parent plants (emergence- bulb maturity) was, as average on this three years of study, of: 125 days in the Ist age (1751^{o}C), 110 days in the IInd age (1821 ^{o}C) and 106 days in the IIIrd age (2130 ^{o}C). The studied characteristics were: weight of the bulb, the longitudinal diameter, the transversal diameter, the shape index and the height of the plant.

Key words: *phenological dates, important characteristics of the bulb.*

INTRODUCTION

The area of origin and the spread of *Allium* genus on globe and also the phenotypic variability of characteristics for adaptability to the bulb to different environmental conditions.
Through the process of improvement and selection, experts have created valuable varieties and hybrids of onion.
Knowledge of the specific requirements of growth and development of each cultivar determines the development of specific production technologies.
This paper represents a sequence of study plant requirements of Rosie de Iernut red onion for the phases of growth and development in the environmental conditions of SCDL Iernut.

MATERIALS AND METHODS

The investigations were carried out on three biological cycles "from seed to seed".
The experiences were organized into four rehearsals and three epochs (ages).
The biological material used for the obtaining of the parent plants bulbs was made from the seed of the author, the Rosie de Iernut variety.
Have been studied the vegetation phases and phenophases, having as main objective the duration of phenophases in correlation with the amount of accumulated temperature on phenophases and the influence of some important characteristics of the biological material (bulbs – parent plants).
During the periods of experience for producing the bulbs-parent plant (Ist year) have been carried out specific maintenance work. Have been carried out observations and biometric measurements for the selection of biological material, where were made also the biological purification as special works in production of the biological material for the multiplication of a cultivar.
In the laboratory, after harvesting the bulbs have made observations and biometrical measurements for choice, selection of biological material typical for the variety. The biometric calculations were established selection parameters using confidence intervals of the varietal characteristics of the variety, thus eliminating ± the variants.

RESULTS AND DISCUSSIONS

The important stages of the experiences of producing bulbs were: sowing, emergence, commencement of the bulb (figure 1), the deeply bulb formation and bulb harvesting.

The studied phenophases (table 1), as duration (table 2, figure 2) and the sum of the degrees of temperature on phenophases (table 2, figure 3), accounted the periods between phases and the length of the growing season was represented by the period between plant emergence and plant harvesting.

Figure 1. Rosie de Aries variety

Table 1. The vegetation phenophases of the mother plants of Rosie de Aries onion variety, on sowing ages– the average on 3 years

Phenophase	Period		
	Ist age	IInd age	IIIrd age
Sowing-emergence	26.03-20.04	15.04-29.04	01.05-10.05
Emergence-bulb formation	20.04-10.06	29.04-05.06	10.05-11.06
Bulb formation-maturity consumer	10.06-10.08	05.06-02.08	11.06-10.08
Maturity consumer-harvesting	10.08-23.08	02.08-17.08	10.08-24.08
Vegetation period	26.03-23.08	15.04-17.08	01.05-24.08

The plant emergence had after: 25 days (141°C) during the Ist age, 15 days (112°C) during the IInd age and after 10 days (171°C) during the IIIrd age.

The commencement of the bulb formation had been manifested from the emergence as follows: 47 days (527°C) during the Ist age, 37 days (543^{o}C) during IInd age and after 32 days (585°C) in the IIIrd age.

The maturity consumer, the average on three years, was recorded in approximately 62 days (880°C) in the Ist age, 58 days (982°C) during IInd age and after 60 days (1262^{o}C) in the IIIrd age, from the commencement of the bulb.

Table 2. The length of phenophases and the amount of accumulated temperature degrees/phenophase, on sowing ages

Phenophase	Ist age		IInd age		IIIrd age	
	Period (Days)	^{o}C	Period (Days)	^{o}C	Period (Days)	^{o}C
Sowing-emergence	25	141	15	112	10	171
Emergence-bulb formation	47	527	37	543	32	585
Bulb formation-maturity consumer	62	880	58	982	60	1262
Maturity consumer-harvesting	16	344	15	296	14	283
Sowing-harvesting	150	1892	125	1933	116	2301

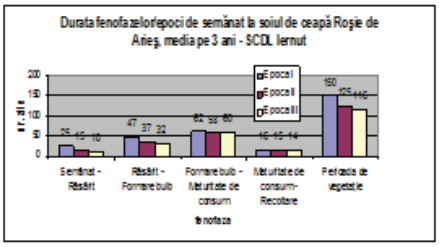

Figure 2. The length of phenophases/ages of sowing to the Rosie de Aries onion variety, the average on 3 years- SCDL Iernut

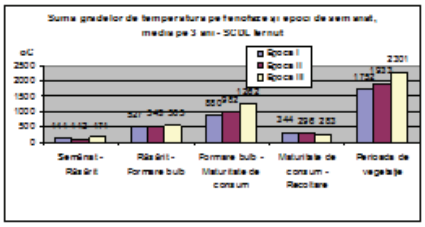

Figure 3. The amount of temperature degrees on phenophases and ages of sowing, the average on 3 years- SCDL Iernut

The harvesting of the bulbs was carried out after an average of 16 days (344°C) during the Ist age, 15 days (296°C) during the IInd age and after 14 days (283°C) in the third age, from the bulbs maturation.

During the growing season, the three-year average, it took 125 days (1751^{o}C) in the Ist age, 110 days (1821^{o}C) during the IInd age and after 106 days (2130^{o}C) in the IIIrd age.

The average of accumulated temperature' degrees (°C) /day regarding the phenophases growth and the mother plants development of Rosie de Aries variety on seeding ages was manifested by increasing from the first age

until the second one and the greatest values were recorded during the III[rd] age (table 3, figure 3).

Table 3. The average of accumulated temperature degrees (°C) /day to the phenophases growth and the mother plant development of Rosie de Aries, the average on 3 years – SCDL Iernut

Phenophase	I[st] age	II[nd] age	III[rd] age	Mean
Sowing-Emergence	5,64	7,46	17,1	10,06
Emergence-Bulb formation	11,21	14,67	18,28	14,72
Bulb formation-Mature consumer	14,19	16,93	21,03	17,38
Mature consumer-Harvesting	21,5	19,73	20,21	20,48
Vegetation period	11,68	15,46	19,83	15,66

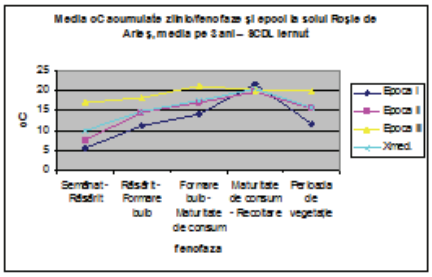

Figure 4. The°C average daily accumulated/phenophases and ages to Rosie de Aries variety, the average on 3 years – SCDL Iernut

The quantitative characteristics of onion bulbs were influenced by the temperature conditions during the growing season. There have been value differences between ages, in particular concerning the weight of bulb, bulb size (longitudinal diameter – ØL, transversal diameter – ØTr), and form index-IF.

In the I[st] age (table 4), the bulbs of the parent plant have been characterized through: the average weight of the bulb of 64.2 g, the index form (IF) - 0.88 and the plant height-56.8 cm.

In the II[nd] age (table 4), the bulbs of the parent plant have been characterized through: the average weight of 52,46 g, index form (IF) – 0.78 and the height of the plant – 56,12 cm.

In the III[rd] age (table 4), the bulbs of the parent plant have been characterized through: the average weight of the bulb-46 g, the index form (IF) - 0.62, the height of the plant – 48.2 cm.

Although the features: average weight of the bulb, the bulb-shaped index and the height of the plant have different values in different eras (ages), each of these characteristics were the same variability in all eras: the weight of the bulb has great variability in all eras, shape index recorded medium variability in all ages and the height of the plant has small variability in all ages (table 4).

Table 4. Variability indexes of the onion parent plant, the average (2007-2009), SCDL Iernut

Characteristic	Variability indexes					Variability
	x_{med}	s^2	s	$s_{\%}$	k	
I[st] age						
The weight of the bulb (g)	64,2	104,04	10,2	25	54-74,4	High
Form indexes	0,88	0,014	0,12	18,5	0,76-1,00	Medium
Height of parent plant (cm)	56,8	7,84	2,8	8,4	54-59,6	Small
II[nd] age						
The weight of the bulb (g)	52,46	345,96	18,6	30,08	33,8-71	High
Form indexes	0,78	0,02	0,14	10,0	0,6-0,9	Medium
Height of parent plant (cm)	56,12	11,62	3,41	12,65	52,7-59,5	Small
III[rd] age						
The weight of the bulb (g)	46	237,16	15,4	30,6	30,6-61,4	High
Form indexes	0,62	0,01	0,12	17,4	0,50-0,74	Medium
Height of parent plant (cm)	48,2	12,96	3,6	9,2	44,6-51,8	Small

CONCLUSIONS

During the phenophases - "sowing-emergence" and "emergence-bulb formation"-decreased the number of days since the I[st] epoch to the III[rd] age.

The phenophases - 'the beginning of the bulb formation-the maturity consumption' and 'the maturity consumption-harvesting' have almost the same period of days for all three ages.

The longest vegetative period was recorded in the Ist age and the shortest in the III[rd] age.

The average weight of the bulb decreases from the I[st] age to the III[rd] age, but records high variability in all ages.

The shape index tends to be almost unitary to the I[st] age dropping to the III[rd] age, recording middle variability to all ages.

The leaves' rosette of the plants recorded the largest height to the I[st] age and dropping down until the III[rd] age.

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BIODIVERSITY OF *AUCHENORRHYNCHA* INSECTS IN A PEAR ORCHARD FROM SOUTH-EAST OF ROMANIA

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Abstract

The aim of the study was detection and identification of existing planthopper, leafhopper and cixiid fauna in the pear orchard of University of Agronomic Sciences and Veterinary Medicine of Bucharest. Studied biological material consist of adult stage has been obtained from yellow and white sticky traps which were placed in host plant canopy. The identification of the collected material has been carried in the Entomology Laboratory of Central Phytosanitary Laboratory. Based on morphological characters were identified following species: Metcalfa pruinosa (Say, 1830) (Flatidae), Reptalus panzeri (Low, 1883) (Cixiidae), Fieberiella florii (Stal1864), Psammotettix notatus (Melichar 1896), Zyginidia pullula (Boheman 1845), Neoaliturus fenestratus Herrich-Schäfer 1834 (Cicadellidae). Photos with male genitalia details are provided.

Key words: *Flatidae, Cixiidae, Cicadellidae, morphological identification.*

INTRODUCTION

Planthopper, leafhopper and other related species are pests of cultivated plants and can be also vectors of different plant diseases.
The aim of the study was focused on the biodiversity of Auchenorrhyncha species (planthopper and leafhopper) assemblages of pear orchard in 2012 to identify possible vectors of specific disease on host.

MATERIALS AND METHODS

Survey was carried in a modern eight year old pear orchard planted with the cultivars Abbé Fétel, Red Williams, Conference, Beurre Bosc, Alexander Lucas, Clapp′s Favorite. Planting distance was 2 m within the row and 4 m between the rows. One sampling method was applied using sticky traps placed in tree′s canopy using one trap/15-20 tree. The sticky traps (yellow and white), sticky on one side were 25X20 cm size. Traps were hanged into the middle part of the canopy during the vegetation period. Regular checks and replacements of the traps were done for faunistical survey.
Accurate species identification requires examination of the structures of the male genitalia. Identification of the males to species requires removing the abdomen then placing in a 10% KOH solution for 12-24 h at room temperature. To examine genitalia remove the abdomen from KOH place it in a Petri dish filled with water for few minutes, then place it in a drop of glycerin to study. For microscopic observation a drop of glycerin was put on a slide on which dissection of the aedeagus was performed.
Identification were made to the genus and species level according to (Ribauld 1952), (Delia Giustina 1989), (Holzinger, 2003), (Le Quesne 1960).

RESULTS AND DISCUSSIONS

As a result of our investigation altogether 265 individuals have been found in pear orchard belonging to 3 *Auchenorryncha* families, namely *Flatidae*, *Cixiidae* and *Cicadellidae* (figure 1).
During the sampling period extending from May to October presence of 6 species was established. *Metcalfa pruinosa* (Say, 1830) from Flatidae family, *Reptalus panzeri* (Low, 1883) from Cixiidae family, *Fieberiella florii* (Stal 1864) , *Psammotettix notatus* (Melichar 1896), *Zyginidia pullula* (Boheman 1845),

Neoaliturus fenestratus Herrich-Schäfer 1834 from Cicadellidae family.

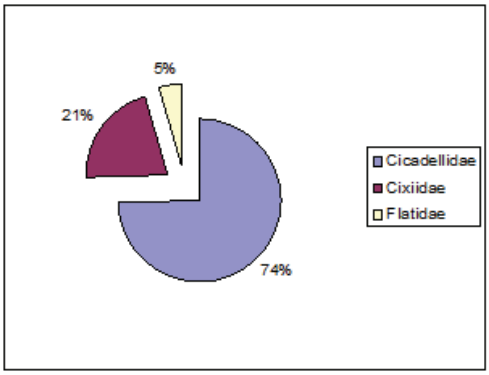

Figure 1. The structure of Auchenorrhyncha family in 2012

The most common species collected in this area, was *Neoaliturus fenestratus* 41 individuals, representing 15% of total record species, followed by *Fieberiella florii* and *Zyginidia pullula* species which were also present in large number in samples, 11% in first case and 12% in second (table 1) of total record species. The other recorded species were present with less frequency. Also, some species have remained unidentified.

Table 1. Identified Cicadellidae species and their density

No	***Cicadellidae* species identified**	**No of indiv.**	**Abundance (%)**
1.	*Fieberiella*	30	11
2.	*Neoaliturus*	41	15
3.	*Zyginidia*	32	12
4.	*Psammotettix*	8	3
	Total	111	

We present below some information on identified Auchenorrhyncha in the monitored area about their biology and few morphological characters useful for their identification.

Metcalfa pruinosa is an insect with one generation per year and is very polyphagous. Adults are present between July and October. This species overwinters in eggs stage, the eggs are inserted into the bark of host plants. They are 5.5 to 8 mm in length have broadly triangular front wings that are held close to the body in a vertical position. The color of adults is brown to gray, due to the presence or absence of a bluish white waxy powder. Forewings in the basal half have a pair of dark spots. It is an invasive species quite new for Europe, (introduced in Italy in 1970) and also for our fauna. Has been recorded in Romania in Constanta region in 2009 for first time (Preda et al., 2009), then in western part of the country in 2010 (Gogan et al., 2010) and also in Bucharest area in 2011 (Chireceanu et al., 2011).

Genitalia: Male pygofer and subgenital plates not differentiated from ringlike segment IX; anal tube short, with elongate tongue like process (grooved on midline) above lower angle; styles held vertically, in ventral aspect slender, slightly divergent near tips, in lateral aspect broadening towards tips, bearing recurved hook beyond tip of aedeagus, setose, articulated against undifferentiated sternite IX; connective linear; aedeagus curved dorsal, parallel-margined to truncate tip bearing two pairs of processes directed forward (CABI, 2013) (Annex I, figures 1A, 1B).

Reptalus panzeri, polyphagous, has one generation per year and larva overwinter. Adults polyphagouus and lives in the shrubs and herb layer. Imagoes are active from mid June till beginning of August. This insect can be vector diseases. It is believed that nymphs, like those of other Cixiids, are root feeders Adult has vertex much broader than long. Eyes usually grayish, sometimes marginated reddish. Overall length: 4.6-5.2 (male) and 5.7-6.8 mm (female) (Le Quesne, 1960). First segment of hind tarsus apically without platellae (Holzinger et al., 2003).

Genitalia: Styles symmetrical (Holzinger et al., 2003), male anal tube produced laterally into sharp angles posteriorly; projection of parameres long; sclerotized projections at lower margin of genital segment pointed apically (Le Quesne, 1960) (Annex I, figures 2A, 2B).

Neoaliturus fenestratus Body small, slender, general coloration of the body deep brow almost black with red tinge; total length of the male and female 3.9 to 4.5 mm; Forewings deep brown, apical third with irregularly shaped and sized whitish patches.

Genitalia: aedeagus oval narrowing at both ends, with tips biforked, the connective at the base of aedegus biforked posteriorly; genital plate triangular; its outer lateral margin with a row of identical spines (Al-Asady et al., 2003) (Annex I, figures 3A., 3B.).

Fieberiella florii is a polyphagous species living on woody plants. Has one generation a year and on woody plants and overwinter in stage of egg. Imagoes emerge from the beginning of June till end of October.
Length 6.5-7mm male and 7-7.5 mm female. Round vertex, wings and body covered with dark punctuation.
Genitalia: Pygofer in lateral aspect about 1% times as long as wide; aedeagus in lateral aspect broad medially, shaft curved laterally, tube like and narrow, shaft with numerous minute spines; style short in dorsal aspect simple, with distal half curved laterally; connective large (Ribaut, 1952) (Annex II, figures 4A., 4B.)
Ziginidia pullula small species overall length 2.2-2.6 mm male and 2,6-3.0 mm female. The general color is dark grey-yellowish. It is a multivoltine species, able to produce up to four generations a year in some area of the Europe.
Genitalia: the anal tube has a pair of appendix developed and sinuous; sides of male genital segment with Y-shaped lobe internally; aedeagus with two appendages long and thin which are very difficult to observe in lateral position (Delia Giustina, 1989) (Annex II. figures 6A., 6B.)
Psammotettix notatus:
Small, linear species. Length overall over 3 mm for male and female. Head much larger than pronotum. The general color of pronotum and fore wings very pigmented. Fore wings developed, rounded symmetrical covers the body entirely.
Genitalia: Genital sternit in trapezoidal form; basal part of the aedegus simple, without annexes; aedeagus in lateral aspect round or less sharp; shaft tubelike and those two arms of shaft like U or V; style in dorsal aspect shorter than connective and apex curved laterally; connective very long, free; gonopore on ventral surface, near apex, bifid apically in ventral aspect (Ribaut, 1952) (Annex II. figures 5A., 5B.)

CONCLUSIONS

The Fulgoromorpha and Cicadomorpha constitute an important part of the trophic network of land ecosystem.

Because some of the identified genera like *Fieberiella*, *Psammotettix* and *Neoaliturus* have been reported to transmit phytoplasmas to fruit trees (Fos et al., 1986), (Jensen, 1957), (Narayanasamy, 2011) it is important to monitor their presence in orchard in order to establish their role in propagation of the disease.

All planthopper, leafhopper and cixiid species identified in the orchard were recorded previous

in the country (Boguleanu, 1994), (Chireceanu et al., 2011), (Gogan et al., 2010), (Preda et al., 2009) but we must underline the presence of the exotic pest *Metcalfa pruinosa* in the monitored area. It is not very clear if this species can be a vector disease but its presence on host plants and ability to establish in new areas must be take in account. Following species haven′t been recorded in Bucharest area by Boguleanu (1994) : *Reptalus panzeri*, *Fieberiella florii*, *Psammotettix notatus* and *Zyginidia pullula*, so we can record here these species as result as our work.

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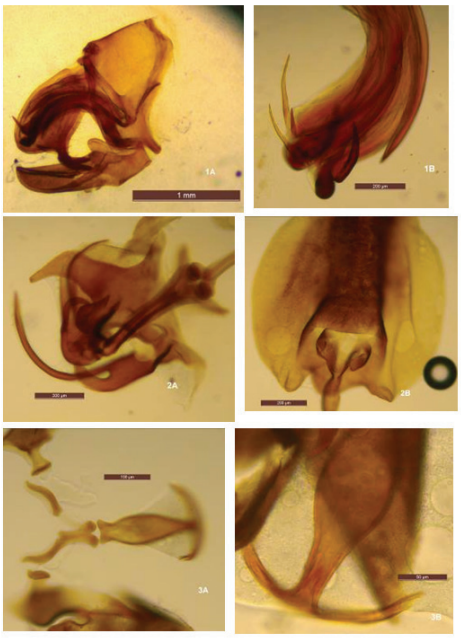

Figure 2. Annex I: figure 1A. Metcalfa pruinosa (genitalia), 1B. (aedeagus); figure 2A. Reptalus panzeri (genitalia complex), 2B. (aedeagus); figure 3A. Neoaliturus fenestratus (aedeagus with connective), 3B. (aedeagus in dorsal view).

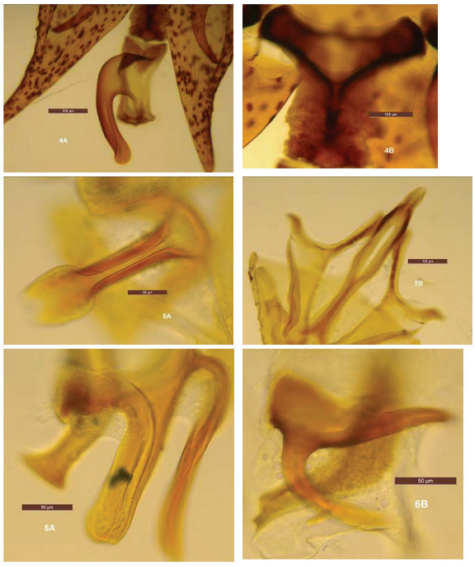

Figure 3. Annex II: figure 4A Fieberiella florii (genitalia), 4 B (connective); figure 5A Psammotettix notatus (aedeagus), 5 B (connective); Figure 6A Zyginidia pullula (genitalia complex in lateral view), 6B (aedeagus in lateral position).

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SSR ANALYSIS CONCERNING THE RESISTANCE TO PPV (*Plum pox virus*) IN SEVERAL ROMANIAN APRICOT PROGENIES

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Abstract

Plum pox virus (PPV) is a devastating stone fruit disease of major importance, and better understanding of the genetic control of resistance to this trait would be useful for more efficient development of resistant cultivars. Previous studies have reported a locus major effect from PPV resistance on linkage group 1. The hybrids were grafted simultaneously and subsequently inoculated with the PPV-M and D strains. The symptom scoring on leaves was performed three times over two vegetative cycles. The PPV resistant loci were mapped using composite interval mapping (CIM).This paper presents data from PhD thesis part of the project POSDRU/107/1.5/S/76888, funded by European Social Fund through the Sectorial Operational Programme Human Resources Development 2007-2013.

Key words: *disease, markers, Prunus armeniaca, PPV, SSR, Sharka.*

INTRODUCTION

Plum pox virus (PPV) infection causes the Sharka disease of *Prunus,* has spread from the Balkan countries throughout most of the European subcontinent and around the Mediterranean basin.

Considerable economic loss and significant reduction in productive areas stimulated breeding programs aimed at enhancing resistance to the pathogen in such countries as Greece (Karayiannis et all., 2002), France (Audergon et all., 1994), Italy (Bassi et all., 1995), Spain (Egea et all., 1999) and the Czech Republic (Polak, 1994).

As a result of the intensive search for a source of resistance within available apricot germplasm, some North American cultivars 'Stark Early Orange' (SEO), 'Goldrich', 'Harlayne', 'NJA 45', and others were found to have natural resistance to PPV (Martinez-Gomez eta ll., 2000). These cultivars were used as donors for a resistance trait in conventional breeding programs based on crosses between resistant and the best local cultivars susceptible to virus.

Recently, resistant selections have been released for regional trials (Badenes and Llacer, 2006; Dosba et all., 1992; Karayiannis et all, 1999; Polak et all., 1997)

Several studies suggest that the resistance is conferred by a limited number (1−3) of genes (Dicenta et all., 2000; Dosba et all., 1992; Krska B et all., 2002; Karayiannis et all., 2007). Development of molecular marker maps for segregating crosses is a significant accomplishment toward understanding the genetics of PPV resistance and developing markers that could potentially be useful in breeding programs. Four molecular genetic maps based on intraspecific crosses introducing PPV resistance from North American cultivars 'Stark Early Orange' and 'Goldrich' have been established to map a PPV resistance in apricot (Lambert et all., 2007; Sicard et all., 2007). On these maps, a major genomic region associated with PPV resistance was located on the Prunus G1 at a distance of 20−40 cm. In total, five SSR markers linked to the targeted resistance locus were identified in this region. Three of them have been already successfully tested for marker assisted selection (MAS) in a set of susceptible/resistant cultivars.

MATERIALS AND METHODS

Plant material

We are worked with 5 apricot population:

Pop 3 = Population 3 obtained by crosses between (‘Mari de Cenad, x,NJA 21′) x ‘Kesth Pshor′
Pop 2 = Population 2 obtained by crosses ‘Sirena′ x ‘NJA 42′
Pop 4 = Population 4 obtained by crosses ‘Cristal′ x ‚NJA 21′
Pop 1 = Population 1 obtained by crosses ‘Mari de Cenad′ x ‚SEO′
Pop 5 = population 5 obtained by crosses between (‘Viceroy′, x,NJA 2′) x ‘NJA17′
The apricot selection R9 P 53 (‘NJA 2′ ×‘Viceroy′) was crossed as a female parent to ‘NJA 17′ a PPV resistant apricot cultivar.The selection R13 VT 8/57 resistant to PPV (issued from ‘Mari de Cenad x NJA 21) was crossed as a female parent to ‘Kesth Pshor′ (susceptible to PPV) in the frame of the Faculty of Horticulture of University of Agronomic Sciences and Veterinary Medicine of Bucharest Romania in 2008. Crosses were performed by hand pollination with isolation of flowers after the petals and anthers removal from the flower buds. The F1 seeds were stratified at 5^{o}C for 3 months and subsequent seedlings were grown in an insect-proof greenhouse.
The young apricot populations sticks were grafted onto inoculated GF305 (used like susceptible rootstock) ready for testing to PPV resistance.

DNA extraction

Genomic DNA was extracted using the modified CTAB procedure [23]. DNA concentrations were measured and working solutions of genomic DNA at 10 ng/µl and at 100 ng/µl in 0.1× TE (0.01M Tris pH 8.0, 0,001 M EDTA) buffer was prepared for the targeted SSR and AFLP analyses, respectively.

SSR analysis

‘Stark Early Orange′, ‘R13 VT 8/57′ NJA and R9 P 53 were screened with 3 SSR primer combinations from [2], associated with PPVresistance.PGS 1.21, PGS 1-24 and ppb22-195-F:CTCTTCTCGCCTCCCAATTT and R:GCTTAGCCCTGGGTACAAG and F:ATCTGCTCTTTCCCTCACCT with R:GATTATCCCTCAACCCATCC.
PCR reactions, electrophoresis, and detection of PCR products for the ‘Kesth Pshor′ × R13 VT 8/57′ population were carried out according to conditions specified in (Zhebentyayeva et all., 2002). SSR primer combinations revealing polymorphism were screened all apricot populations. The mix PCR consit in 10X buffer-2ul, MgCl2 (25 mM)-1.2 ul, dNTP 10 mM – 0.16 ul, PGS 1.21-F – 0.6ul, PGS 1.21-R – 0.6 ul, PGS 1.24-F – 0.4 ul, PGS1.24-R – 0.4 ul, ppb22-195-F-0.28 ul,ppb22-195-R – 0.28ul and Taq 0.1 ul. A 2-µl aliquot of the PCR reaction was separated by electrophoresis on an agarose gel 2% in order to confirm the amplification of fragments of the expected size and DNA concentration. (Figure 1.).
The PCR-products were diluted (45 ul H2O and 5 ul DNA) and used to prepare the plate for sequencing.

RESULTS AND DISCUSSIONS

All four SSR primer combinations amplified expected size fragments in germoplasm under study. SSR scores for genotypes are included in supporting documentation, Table 1. For all SSR loci, we recorded genotypes in order of their electrophoretic mobility from fastest to slowest band.
The infection process was different for various plant individuals; in some plants the presence of PPV was detected after the first dormancy period, in some in the three vegetative cycles, while some plants were not infected at all.
Selections ‘Kesth Pshor′ × ′R13 VT 8/57′ and ′R9 P 53′ were screened with 3 SSR primer combinations. The products of PCR were separated by electrophoresis on an agarose gel 2% in order to confirm the amplification of fragments of the expected size and DNA concentration. (Figure 1)

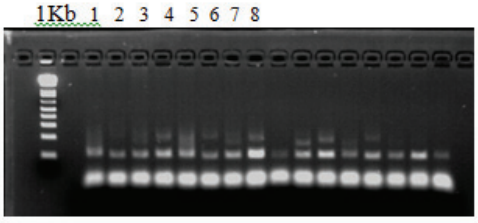

Figure 1. Electrophoresis for PCR with SSR markers in apricot progenies

These SSRs were polymorphic. This presence of polymorphism is slightly higher than that previously reported by Hurtado et al. (2002)

and Vilanova et al. (2003a; 46% and 42%, respectively) in apricot. Additionally, the SSRs, (PGS1_24)-F:CTCTTCTCGCCTCCCAATTT with R:GCTTAGCCCTGGGTACAAG and F:ATCTGCTCTTTCCCTCACCT with R:GATTATCCCTCAACCCATCC were significant for the first screening in a lager population and may be useful for starting a MAS in breeding for PPV resistance. Further evaluation of these loci will be necessary to characterize the genetic control of the PPV resistance trait. Due to the co-dominant nature of SSRs along with their high genetic transportability, the development of SSRs associated with PPV resistance in apricot could facilitate the use of MAS in breeding strategies aimed at breeding for natural resistance.

Table 1. Results concerning the implement of markers PGS 1,24 and Ppb0022-195 in Romanian progenies.

Génotype	Ppb0022-195 Map distance cM	Ppb 0022-195 Map dist.. cM	PGS124 Map dist. cM	PGS124 Map dist. cM
KesthPhor	112.01		129.53	
Viceroy	111.96		100.93	
H2+	107	116.4	98.93	102.9
MariCenad	111.98		100.92	
NJA 17	107.01	112.01	98.9	100.91
Cristal	111.84		100.78	102.73
Sirena	111.81		100.78	127.76
Tabriz	112.01		100.88	
SEO	107.11	111.97	98.9	100.91
Pop3-37	111.9		100.79	
Pop3-38	111.83		129.42	
Pop3-42	111.9		102.73	129.43
Pop3-49	111.93		129.42	
Pop3-64	107.05	111.98	98.89	100.92
Pop3-65	112		129.62	
Pop3-68	107.13		98.88	102.93
Pop3-71				
Pop3-73	107.08		98.94	
Pop3-74	107.12	112.03	98.96	127.93
Pop3-76	107.1	112.04	98.94	129.24
Pop3-77	106.97		98.76	
Pop3-78	111.91		100.81	
Pop3-79	106.94	111.91	98.81	102.76
Pop3-80	106.97	111.92	98.78	100.83
Pop3-81	111.9		100.77	
Pop1-20	107.08	112	98.94	100.96
Pop1-21	111.88		102.75	129.09
Pop1-22	111.89		129.18	
Pop1-55	106.96	111.86	98.8	127.76
Pop1-72	106.98	11.87	9875	137.97
Pop2-106	107.01	111.91	102.81	106.46
Pop2-14	107.03	11.87	98.74	100.78
Pop2-17	11.92		102.85	
Pop2-43	11.93		100.89	102.89
Pop2-47	107.06	111.99	100.87	106.51
Pop2-66	111.91		101.81	102.78
Pop2-63	111.97		100.85	102.83
Pop2-69	107		106.37	
Pop2-70	111.92		100.81	102.74
Pop2-82	111.84		100.75	
Pop4-104	111.92		102.9	129.28
Pop4-19	107.03	111.95	98.88	129.3
Pop4-45	107.07	111.92	98.83	129.22
Pop4-46	107.12	111.98	98.94	129.32
Pop4-48	107.91		98.75	
Pop4-54	106.97	111.91	98.74	129.11
pop4-59	106.94	111.87	98.74	129.13
pop5.51	112.3		100.97	
Pop5-52	112.4		100.95	
pop5-53	107.1	112.01	98.86	100.94

Pop 1 = Population 1 obtained by crosses 'Mari de Cenad x SEO'

Pop 2 = Population 2 obtained by crosses 'Sirena x NJA 42'

Pop 3 = Population 3 obtained by crosses between ('Mari de Cenad, x,NJA 17') x 'Kesth Pshor'

Pop 4 = Population 4 obtained by crosses 'Cristal x NJA 21'

Pop 5 = population 5 obtained by crosses between ('Viceroy', x,NJA 2') x 'NJA17'

For the marker 'Ppb0022-195' the region with resistance is situate between 107 / 112 (Tab. 1) The success of markers detection of PPV was confirmed to depend on the quality and quantity of isolated DNA during the experiments and (Guilford et all., 1997) applied a similar method of isolation in CTAB buffer.

CONCLUSIONS

Targeted SSR analysis is a very direct way to link the molecular markers to a trait of interest. SSR markers developed for specific genome regions have been used to identify genes of agronomic importance for evidence of selection during domestication in maize (Vigouroux et all., 2002) and to verify wheat–barley introgression (Hernandez et all, 2002). They are the most likely candidates for MAS in crops of economical importance and appear to be suitable for apricot as well (Ribaut and Hoisington, 1998; Badenes and Llacer, 2006).

The identifying of a natural source of resistance to PPV, using this resistant source into new crosses with Romanian commercial cultivars

well adapted in our country, and the implement of marker-assisted selection (MAS), based on markers tightly associated with resistance, as a measure to substantially streamline the breeding process, may be a promising strategy to obtain apricot varieties with natural genetic resistance to PPV.

First couple of markers PGS 1.21 (Reverse and Forward) could be enough for the screening of a larger population of apricot and then start to develop the others SSRs associated with PPV resistance to facilitate the use of MAS in Romanian apricot breeding program

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NECESSITY OF CULTIVATION AND CLASSIFICATION OF THE TABLE GRAPES VARIETIES FOR COMMERCIALIZATION

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Abstract

Research in this paper were conducted during 2010-2012 to INCDBH Stefanesti Arges refer to native table grapes varieties. Table grapes should be a pleasant and attractive. This condition is crucial because consumers consider primarily 'eye' size, shape and color of the grapes. In grape production, in addition to climatic conditions and variety cultivated a decisive influence has applied agrotechnics plantation. Obtaining high yields of high quality and at a low cost price agrotechnical requires the application of a differentiated varieties. In 2009, vineyards supplying grapes for table had 9.384 ha, representing 5.08% of the total area for growing plantations and nurseries. Table grape exports was insignificant in recent years, however imports soared.

Key words: *table grapes, export, productivity, commercialization.*

INTRODUCTION

Grape production is the indicator reflecting perhaps most visible as the hub biological potential and professionalism and ability to manage properly grower's holding in each year since the beginning of phenophases first to last, so a correctly applied technologies lead to obtaining an appropriate grape harvest both quantitatively and qualitatively.

Quality table grapes from the combination of all the physical, chemical and organoleptic requirements satisfy and stimulate consumer interest. It is estimated differently depending on the subject (consumer, retailer, manufacturer) and product. The consumer is interested, primarily organoleptic quality, based on taste characteristics (flavor, sugar content, acidity), olfactory (aroma), tactile (consistency pulp), visual (color, size, freshness, etc.).

Grain trader appreciates homogeneity, integrity, appearance (absence of defects in shape, parasites, flesh alterations, improper color), capacity retention and transport features which allow product to reach the consumer in the best conditions.

MATERIALS AND METHODS

After 1989, due to the difficulties of the transition and globalization expansion area covered with vineyards for grapes decreased continuously, reaching in 2008 to 10 732 ha and 62 ha come bearing live young (Dejeu L., 2010) (table 1). Table grape exports was insignificant in recent years, however imports soared. In the future it is necessary to relaunch the production lines, given the increased requirements for table grapes to consumers.

Table 1. Cultural situation vine vines for table grapes in Romania (after Dejeu L., 2010)

Specification	Year			
	2005	2006	2007	2008
Total vines on fruit for table grapes (ha)	12 813	12 578	11 523	10 732
Young vines (ha)	48	91	73	62
Total production of table grapes (t)	39 338	67 053	81 046	87 164
Table grape exports (t)	200	100	909	306
Importation of table grapes (t)	2 044	9 000	18 959	21 500
Average consumption of table grapes (kg / resident / year)	4,39	3,11	4,62	5,00

Quality of the items, the size of grapes (bunches) determined according to weight and elsewhere, is a character presentation importance in terms of trade in table grapes appearance (Sestras R., 2004).

Table grape varieties, as well as those for wine, sugar content (with acid) is one of the most

important elements of quality grape-vine. Of carbohydrates, monosaccharides are the most important because it represents over 95% of the total sugars accumulate in the grapes and the monosaccharides glucose and fructose are the most representative (Tardea C., 2000). Table grape varieties relationship between the two main sugars (glucose and fructose) should be in favor of glucose (Ardelean M., 1986).

New marketing standards for table grapes came into force in the EU in 2008, as a result of the European Commission Regulation no. 1221/2008. Table grapes can be divided into three categories:

- Extra. The grapes in this class must be of superior quality to shape, development and coloring typical of the variety, allowing the production area and have no defects. Berries must be firm, firmly attached to the pedicel, evenly covered the cob and bloom;
- Category I. Grapes must be of good quality, take shape, typical of the variety, corresponding to the production area. Berries must be firm, firmly attached to the pedicel and covered with bloom. Grains may have some slight defects that do not impair normal appearance, quality, keeping quality and presentation in the package of the product: slight defects of shape, color and burns caused by the sun, but affects only the skin.
- Category II includes grapes that can not be classified in the higher classes, grapes may show slight defects in shape, development and coloring, provided these do not impair the essential characteristics of the variety, allowing for the production. Berries must be firm and sufficiently attached to pedicel and, if possible, covered with bloom. Assigned to clusters may be less uniform than in other categories. Grains may have the following defects, provided they retain their essential characteristics as regards the quality, keeping quality and presentation: defects of form, color, light skin burns in the sun, slight bruising, slight skin defects.

RESULTS AND DISCUSSIONS

Table grape varieties are generally growing varieties with high force, high production potential and a lower capacity to accumulate sugars in the beans. This indicator of the quality of significance in that, in the case of grapes for fresh consumption, taste qualities are given by a balance between sugar content and acidity must.

Groups of varieties are found higher accumulation of sugars in varieties with medium production potential. Late maturing varieties, those with high production potential and high growth force accumulates lower amounts of sugars. In 2012, a year rich in resources heliothermal varieties studied have accumulated large quantities of sugars from the grapes recorded. Between 2010 and 2011, normal in terms of climate, accumulation of sugars were low, and because the higher production of grapes obtained (Table 2).

Table 2. Sugars values in table grape varieties cultivated at INCDBH Stefanesti-Arges

VARIETY	SUGARS g/l		
	2010	2011	2012
Argessis	140,3	138,5	155,2
Auriu de Stefanesti	140,2	140,9	146,3
Augusta	137,8	139,4	143,2
Muscat Adda	130,4	127,9	137,8
Perlette 10St	145,2	156,1	164,0
Muscat Adda 22St	140,5	145,2	198,0
Canner	140,8	150,1	169,0

For all varieties studied, the highest amounts of sugars accumulated in 2012 and lowest in 2010 (Table 1). This variation in sugar content of wine is determined mainly by the production of grapes, leaf area on each block. Such sugars that have accumulated grapes during the three year study ranged from 130.4 to 140.8 in 2010, 127.9 to 140.9 in 2011 and 137.8 to 198, 0 in 2012.

Titrable acidity of the must expressed in g / l H2SO4 was determined at full maturity of the grapes. Although the specific climatic conditions vineyard Stefanesti-Arges, acidity grape varieties of wine grape vines usually remains sharp, high temperatures in recent years indicate qualitatively affect this considerably. Thus, in 2012, due to high temperatures, acidity showed lower values, especially in the early and mid-maturing varieties such as Augusta and golden Argessis Stefanesti and in 2010 and 2011, when temperature and insolation values were close the annual average, titrable acidity was the characteristic varieties tested (Costescu A., 2012) (table 3).

Variations in acidity of the varieties studied, there were different due to the volume of foliar developed the hub, shading generated by it and equally grape production levels. Muscat Adda, extending the grain growth and delay their maturation achieved a higher level of titrable acidity of the must. Thus, this variety was average titrable acidity of 5.29 g / l H2SO4.

Table 3. Acidity values in table grape varieties grown in INCDBH Stefanesti-Arges

VARIETY	ACIDITY g/l H_2so_4		
	2010	2011	2012
Argessis	5,14	5,11	5,01
Auriu de Stefanesti	5,07	5,15	5,20
Augusta	3,50	3,56	3,50
Muscat Adda	5,15	5,21	5,51
Perlette 10St	3,80	4,15	3,30
Muscat Adda 22St	3,81	3,60	2,90
Canner	3,90	4,18	4,30

Varieties studied showed acidity values between 3.50 to 5.15 in 2010, from 3.56 to 5.15 in 2011 and from 2.90 to 5.20 in 2012.

Acidity values of varieties with less dense foliage device were located within specific table grape varieties (3.50 to 5.51) (Costescu A. and colab., 2010, Popa C. et all, 2007).

Glucoacidimetric index used to determine when consumer maturity, so to set the date harvest. Value of this index for table grapes is usually between 2.5 to 4.5 range, given that table grapes contain 135-200 g / l sugar and 3.5 to 6.0 g / l H2SO4 acidity (Martin, T., 1974).

Following glucoacidimetric index values (Table 4) shows large differences from one variety to another, between experimentation.

Varieties studied showed balanced values of the ratio of accumulated sugars and titrable acidity of must: Argessis (2.72 to 2.84), golden Stefanesti (2.63 to 2.71), Muscat Adda (2.25 to 2, 57), Augusta (3.75 to 4.04).

Table 4. Glucoacidimetric index values in the studied period (average 2010-2012)

VARIETY	GLUCOACIDIMETRIC INDEX		
	2010	2011	2012
Argessis	2,73	2,71	3,09
Auriu de Stefanesti	2,76	2,73	2,81
Augusta	3,93	3,91	4,09
Muscat Adda	2,53	2,45	2,50
Perlette 10St	3,82	3,76	4,97
Muscat Adda 22St	3,79	4,03	6,82
Canner	3,61	3,59	3,93

Taking into account the varieties studied, it is found that the highest values for this indicator were obtained from clone Adda 22 Del. Muscat. in 2012 (6.82) and lowest in Muscat Adda (2.50) also in 2012. Table grape producers constantly seek that level of quality to meet customer needs: large grapes, rare in grain, uniform in size, firmly attached pedicel, thin skin, evenly colored, crunchy flesh, pleasant, neutral or aromatic see Quality table grapes from the combination of all the physical, chemical and organoleptic requirements satisfy and stimulate consumer interest. It is estimated differently depending on the subject (consumer, retailer, manufacturer) and product.

The consumer is interested, primarily organoleptic quality, based on taste characteristics (flavor, sugar content, acidity), olfactory (aroma), tactile (consistency pulp), visual (color, size, freshness, etc.) ds few, small, or no seeds. Resistance is important for storage grain separation.

Grain trader appreciates homogeneity, integrity, appearance (absence of defects in shape, parasites, flesh alterations, improper color), capacity retention and transport features which allow product to reach the consumer in the best conditions.

The manufacturer aims to maximize besides grapes and satisfying the consumer and the trader. New marketing standards for table grapes came into force in the EU in 2008, as a result of the European Commission Regulation no. 1221/2008.

Quality standards refer to minimum requirements and rules that should be respected producers and exporters of fruits and vegetables and aim for food and fresh grapes, from varieties belonging to Vitis vinifera

Grain trader appreciates homogeneity, integrity, appearance (absence of defects in shape, parasites, flesh alterations, improper color), capacity retention and transport features which allow product to reach the consumer in the best conditions.

Rules define the quality characteristics that must have table grapes after preparation and packaging. Given the specific provisions laid down for each class and the tolerances allowed, grapes and berries must be:

-sound, produce affected by mold or deterioration such as to make them unfit for

consumption;-clean, practically free of any visible foreign substances and attacks by pests and diseases; abnormal external moisture-free, odorless and / or taste.

Also, the beans should be whole, well formed, normally developed. Grapes must be harvested carefully and degree of maturation to the transport, related operations and to arrive in satisfactory condition at the place of destination.

Must must have a refractometric index of at least:

-12 º Brix for the Alphonse Lavalle varieties, Cardinal and Victoria;

-13 º Brix for other varieties of seeds;

-14 º Brix for all seedless varieties.Alpha

In addition, all varieties must report sugar / acidity satisfactory. The standards of the International Organization of Vine and Wine on minimum maturity requirements for table grapes (VITI Resolution 1/2008) states that grapes that have a refractive index (° Brix) equal to or greater than 16 are considered mature. In contrast, white varieties (and pink) table grape with a refractive index less than 16, you must have a minimum ratio 'sugar (g / l) / acidity (g / l expressed as tartaric acid) '20 / 1 to be considered mature. If black varieties of table grape with a refractive index of between 12.5 and 16 must have a report 'sugar / acidity' of at least 20/1, to be considered mature. Grapes that have those values less than 12 are not considered mature. Minimum requirements determined by the weight calibration table grape varieties large and small grains grown in the field (or in greenhouses) are presented in Table 5.

Table 5. Minimal weight of grapes (g) for different qualitative categories (Reglement CE nr. 1221/2008)

Category	In the greenhouse	On the fild	
	Table grape	grapes with large berries	grapes with small berries
Extra	300	200	150
I	250	150	100
II	150	100	75

Each category are allowed tolerances in respect of quality and size of 5-10%. Each package must be uniform and contain content than grapes of the same origin, variety, quality and degree of maturation.

CONCLUSIONS

Table grapes must be harvested carefully and degree of maturation to the transport, related operations and to arrive in satisfactory condition at the place of destination.

Grapes and berries must be: healthy, produce affected by mold or deterioration such as to make them unfit for consumption, clean, practically free of any visible foreign substances and attacks by pests and diseases; without abnormal external moisture, odorless and / or taste.

Grapes for sale to be complete, well-formed, normally developed.

Quality table grapes from the combination of all the physical, chemical and organoleptic requirements satisfy and stimulate consumer interest. It is estimated differently depending on the subject (consumer, retailer, manufacturer) and product.

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IDENTIFICATION OF PLOIDY LEVEL ON VARIETIES AND HYBRIDS OF KIWIFRUIT (*ACTINIDIA SP.)*

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Abstract

The genus Actinidia includes over 66 species and over 118 taxon, that range in ploidy level from diploid to octoploid. Although there is basic information on ploidy levels of various species, sampling has been limited and little information on specific cultivars and hybrids is available. The objective of this research was to determine ploidy levels among a diverse collection of species, hybrids, and cultivars using flow cytometry. Nuclei were extracted, stained with propidium iodide (PI), and analyzed using a flow cytometer. Among the selections tested we found Actinidia arguta as diploid (2n = 2x) and tetraploid (2n = 4x), Actinidia deliciosa 'Hayward' as hexaploid (2n = 6x), Actinidia chinensis 'Soreli' tetraploid (2n = 4x) and the interspecific hybrid A. arguta x A. deliciosa as diploid (2n = 2x). This information provides further insight into reproductive biology, substantiation of numerous hybrids and induced polyploids that will help facilitate the development of improved hybrids in the future.

Key words: *chromosomes, flow cytometry, interspecific hybrid, polyploidy, plant breeding.*

INTRODUCTION

Commercial kiwifruit production is based on two *Actinidia* species, *A. deliciosa* C.F. Ling et A.R. Ferguson and *A. chinensis* Planch. Nevertheless, at present, *A. arguta* is commercially cultivated in Oregon in US, Chile and New Zealand, and small-scale production for local consumption is conducted in many regions under a relatively cool climate (Ferguson and Huang, 2001). The genus *Actinidia* Lindl. comprises 66 species and about 118 taxa with remarkably wide natural range extending from the tropics (latitude 0º) to cold temperate regions (50º N). Since the first seed introduction of *A. deliciosa* was made from China to New Zeeland in 1904, the economic potential of kiwifruit has been extensively exploited (Ferguson and Bollard 1990).

There is considerable genetic diversity amongst the species within the genus *Actinidia*, particularly in fruit skin type, skin colour, flesh colour and flavour (Ferguson and Huang, 2007).

This diversity provides many opportunities for developing new types of kiwifruit. Dioecy, long generation cycles, high heterozygosity and variation in ploidy make hybridization between *Actinidia* species difficult. Better knowledge and understanding of polyploidy of cultivars and hybrids could facilitate kiwifruit improvement.

Polyploidy has been an important process in the evolution of plants and is an important factor in plant breeding because it can influence reproductive compatibility, fertility, and phenotypic traits (Chen and Ni, 2006; Jones and Ranney, 2009; Ranney, 2006; Soltis et al., 2004). Hence, accurate and specific knowledge of ploidy levels of species and cultivars is important information for kiwi breeders.

The base chromosome number for *Actinidia* is 1n = 1x = 29. However, different subgenera contain species with a variety of ploidy levels ranging from 2n = 2x = 58 to 2n = 6x =174; respectively 2n = 8x =232. The range in ploidy levels within this genus also provides an opportunity to indirectly substantiate hybridity when parents differ in ploidy levels.

Because many *Actinidia* species are polyploids with high chromosome numbers, traditional cytology based on light microscopic examination is a difficult and time-consuming process.

Flow cytometry has proved to be an efficient means of estimating genome size and associated ploidy level (Dolezˇel et al., 2007; Jones et al., 2007). Therefore, the objective of this study is to identify the ploidy levels of a diverse collection of species, hybrids, and cultivars of *Actinidia* developing a database for use by kiwi breeders.

MATERIALS AND METHODS

The plant material was constituted by a collection of plants from *Actinidia arguta*, *Actinidia deliciosa*, *Actinidia chinensis* and one interspecific crosses of *Actinidia,* total of 130 plants were kept in a green house.

Flow cytometric analysis was performed for each of the *Actinidia* accessions by collecting leaf samples (3-5 per each), young fully expanded leaf collected from the shoot tips; to maintain an adequate moister and ensure a correct conservation tissues, the leaves were placed in plastic bags in a refrigerator at 4ºC.

Using the method of Galbraith et al. (1983), 50 mg *Actinidia* leaf tissue without midribs was placed in plastic Petri dishes chopped with a razor blade adding 0.5 ml of ice-cooled homogenization (Otto I buffer) to homogenize the tissues and release the nuclei, and kept on ice for 5 min.

After filtration through 42-µm nylon mesh the nuclear suspension were treated with 2.5 ml of a staining solution containing 10 ml Tris, 50 mM sodium citrate, 2 mM MgCl2, 1% (w/v) PVP 30, 0.1% (v/v) Triton X-100 and 1 mg/ml propidium iodide (PI), pH 7.5, letting the samples stand 5 min prior to flow cytometric analysis.

Samples were run on a Coulter Epics XL-MCL flow cytometer EXPO 32 ADC; for each accession was gated between 5000-10000 events of a sample. Relative fluorescence intensity was assessed using FL2, green light source detector (excitation 488 nm).

Data were interpreted using WinMDI 2.9 software. As an internal standard was used *Pisum sativum cv. Ctirad*. The measurements were tripricated by using three leaf samples collected from each plant.

RESULTS AND DISCUSSIONS

We have evaluate for ploidy level six seletions of *Actinidia arguta*, two of *A. deliciosa 'Hayward'*, one of *A. chinensis 'Soreli'* and one interspecific hybrid, *A. arguta x A. deliciosa,* using flow cytometry (Table 1).

Table 1. Selection of species, hybrids of kiwi (*Actinidia* sp.)

Species	**Genotype**	**No. plants**
Actinidia arguta	R8P23	10
Actinidia arguta	R10P10	10
Actinidia arguta	R9P18	10
Actinidia arguta	R8P1	10
Actinidia arguta	R9P16	10
Actinidia arguta x deliciosa	P1	10
Actinidia deliciosa'Hayward'	Hk	10
Actinidia deliciosa'Hayward'	H8	30
Actinidia chinensis'Soreli'	S	30
Total		**130**

The ploidy levels of *Actinidia* plants were clearly distinguished by flow cytometry. Among *Actinidiasp.* tested, we found: *Actinidia arguta* (2n=2x) R9P18, R8P23 as diploid plants, R10P10, R8P1, R9P16 as tetraploid *Actinidia arguta* (2n=4x), plants; for *Actinidia deliciosa 'Hayward'* (2n=6x) HK, H8 as hexaploid; for *Actinidia chinensis 'Soreli'* (2n=4x) tetraploid; for interspecific crosses *A. arguta x A. deliciosa* (2n=2x) P1 as diploid (Table 2).

Table 2. Estimation of ploidy level of kiwi genotypes (*Actinidia* sp.)

Species	Genotype	Ploidy level	No. chromosomes
Actinidia arguta	R8P23	2x	58
Actinidia arguta	R10P10	4x	116
Actinidia arguta	R9P18	2x	58
Actinidia arguta	R8P1	4x	116
Actinidia arguta	R9P16	4x	116
Actinidia arguta x deliciosa	P1	2x	58
Actinidia deliciosa'Hayward'	Hk	6x	174
Actinidia deliciosa'Hayward'	H8	6x	174
Actinidia chinensis'Soreli'	S	4x	116

The results of an analysis are described as a mono-parametric (fluorescence intensity/ object) histograms peaks, each of them

representing the fluorescence intensity of a population of nuclei. Their intensity (position of the histogram) is proportional to the amount of nuclear DNA (Figure 1).

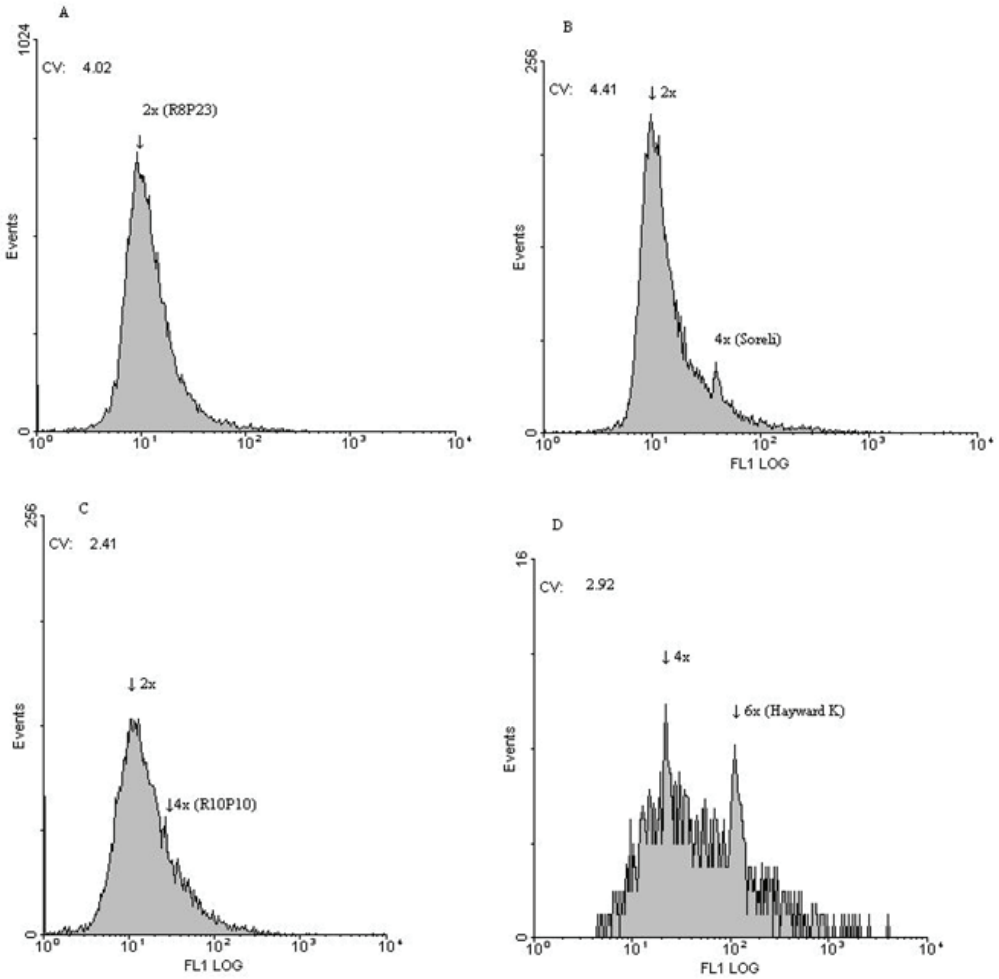

Figure 1. Frequency distribution histograms of fluorescence intensity stained with propidium iodide (PI) (A, A. arguta R8P23; B, A. chinensis 'Soreli'; C, A. arguta 108P10, D, A. deliciosa var. deliciosa cv. Hayward K; Log values of fluorescence intensity% CV for nuclei are given on each histogram).

The comparison between the position of the sample's peak and the internal standard's peak give a ratio of relatives intensities. The ploidy levels are calculated by comparing experimental values with the value obtained from *Pisum sativum* sample having a known ploidy level.

As a result, ploidy analysis in which the DNA contents of *Arguta sp.* collection, nuclei were compared to those from a specie having known ploidy (*Pisum sativum 2n=2x*).

This comparison can be made either between two analyses performed under identical conditions, or, in our case, through mixing the two samples for simultaneous measurement.

Counting chromosomes in *Actinidia* species and their hybrids is technically difficult due to the high numbers of chromosomes involved and their small size. Chromosome numbers have been reported for only a few species but the data support a polyploid sequence 2n = 2x, 2n = 4x, 2n = 6x with x= 29. To determine ploidy, the number of basic chromosome sets in

cell nuclei, using chromosome counting in dividing cells is an unambiguous way and is time consuming, that is way a high-throughput solution is to use flow cytometry, making possible a rapid and reliable ploidy estimation.

CONCLUSIONS

Flow cytometry (FCM) was originally developed as a rapid technique to analyse blood samples for medical diagnosis and is nowadays used for countless medical applications by the analyses of individual cells at high speed. In plant sciences, and breeding in particular, flow cytometry is mainly known as a tool for ploidy analysis. The first ploidy applications focused on crop plants (De Laat et al. 1987) and plant breeding still dominates this field.

The method is fast, accurate and simple and replaced microscopic chromosome counts since Galbraith et al. (1983) introduced chopping with a razor-blade as an easy standard protocol for plant analysis.

At different stages in plant breeding flow cytometry generates valuable information. As well for the selection of parent plants for hybridisation as for the evaluation of hybrids, ploidy determination or genome size analyses are useful. Flow cytometry is an indispensable tool in polyploidisation to screen plants treated with mitotic inhibitors.

Such conclusions clearly highlight the indispensability of cytotype determination (most effectively realized by FCM) in any experimental study that may involve heteroploid plant samples.

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EVALUATION CONCERNING THE VARIABILITY OF SOME CHARACTERISTICS AT A BULGARIAN TOMATOES COLLECTION CULTIVATED IN GREENHOUSE

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Abstract

The experience was conducted in a tomatoes collection consisting from 3 F_1 hybrids, Bulgarian origin - Prekos, Kom and Geo - with large percentage in the vegetable area near Bucharest. The observations and the biometric measurements from fruits were made during the growing season, in 2012 year. The researches was conducted in the Laboratory for Protected Cultures of the ICDIMPH-Horting Bucharest and were aimed the evaluation of some determinants characteristics to the production and marketing of this vegetable on internal market of Romania. The results show that the studied hybrids have genetic variability of the characteristics, favorable traits and are an important source of germplasm for improvement works of the species.

Key words: *Bulgarian seeds, Romanian tomatoes.*

INTRODUCTION

Currently, are appreciated the tomatoes with taste by „Romanian tomato".
This aspect is determinant in the marketing of this vegetable on the internal market of Romania; the consumers of our country have classical, traditional and less diversified options.
In our country, increasing interest for to preferentially use early tomatoes F_1 hybrids in protected spaces and field led to the predominant use of the foreign origin seeds, specifically adapted and intended for cultivation in warm greenhouses, with pretensions for advanced technologies (Vânătoru, 2006).
Although the price of hybrid seeds is very high, their use is recommended because have the favorable qualities - precocity, resistance to diseases and pests, quality, high production, etc. (Voican and Lăcătuş, 1998).
So, vegetable growers obtain Romanian tomatoes from import seeds.
The variety and production technology influences the quality characteristics of the tomatoes.
The Bulgarian tomatoes hybrids (Prekos, Kom and Geo) have large share in the cultivation area of the vegetables near Bucharest because the fruits have size, color, shape, taste by „Romanian tomato".
In the researches of the specialists, Prekos F_1 was marked by superior organoleptic qualities of the fruits (Maria et al., 2009).

MATERIALS AND METHODS

The biological material used in the research was formed from Bulgarian tomatoes - 3 hybrids F_1 - Prekos, Kom and Geo.
The description of the hybrids is shown in table (Table 1).

Table 1. The description of the Bulgarian tomatoes

Hybrid	Type of growth	Precocity	Resistances
Prekos	semideterminate	very early	VMT, Fusarium spp., Verticillum spp.
Kom	indeterminate	early	VMT, Fusarium spp., Verticillum spp., nematozi
Geo	indeterminate	early	VMT, Fusarium spp., Verticillum spp.

The tomatoes seedlings were produced in greenhouse specializes in producing seedlings.
The plants were obtained in alveolar trays, in nutritive substrate – peat, medium fertilized (Figures 1, 2, 3).

Figure 1. Prekos F1

Figure 2. Geo F

Figure 3. Kom F1

The culture was established on 21.03.2012, with seedlings aged 45 days old (Figures 4, 5, 6).

Figure 4. Prekos – 45 days

Figure 5. Kom – 45 days

Figure 6. Geo – 45 days

The conventional technology was used in the tomatoes crop (maintenance works, directing of the growth factors etc.) and the fertilization program presented (Table 2).

Table 2. Fertilization program of the tomatoes culture in the greenhouses - kg/ha (Voican and Lăcătuş 1998)

Moment	Ammonium nitrate (34% N)	Concentrated superphosphate (40% P_2O_5)	Complex 16:48:0	Potassium sulphate (45% K_2O)	Magnesium sulphate (16%MgO)
A	100-200	0-300	-	200-400	100-200
B	100	-	-	-	-
10–20 *	300	-	100	-	-
21–50*	200	-	-	200	50
51–80*	100	-	-	200	50
81–110*					

The experience included 3 plots (100 m^2/plot) cultivated with tomatoes, 270 plants/plot (ρ = 27000 plants/ha).
The first harvesting was realised at 2012/05/07 (Prekos) and 2012/05/14 (Geo and Kom).
The observations and the biometric measurements at tomatoes were made in the Laboratory for Protected Cultures of the ICDIMPH-Horting Bucharest.

RESULTS AND DISCUSSIONS

The results concerning the morphological characters of the fruits are presented in the table3.

Table 3. The main characteristics of the tomatoes collection

Characters of fruit	Prekos	Kom	Geo
Weight of fruit (g)	185	180	130
Predominant form of fruit	spherical sharp peak	spherical	spherical
Number of the seminal lodges	3; 4	5	3
Exterior color of immature fruit	green	green, with lid	light green
Exterior color of mature fruit	red	red	red

The fruit weight ranged from 130 g (Geo) to 185 g (Prekos).
The shape and the color to physiological maturity of the tomatoes presented a high variability; were obtained green fruits, with tip (Prekos), green fruits, spherical, with green lid (Kom) and green fruits, spherical and green fruits, lid without (Geo) - figure 7. The color was red at physiological maturity at all hybrids.
The exterior aspect of the fruits was smooth (Prekos) and easy costed (Geo, Kom).

The number of the seminal lodges ranged from a hybrid to another: 3-4 seminal lodges (Prekos), 5 seminal lodges (Kom), 3 seminal lodges (Geo) - Figures 8, 9, 10.

Figure 7. Exterior color of immature fruit

Figure 8. Prekos - 3; 4 seminal lodges

Figure 9. Kom - 5 seminal lodges

Figure 10. Geo - 3 seminal lodges

Interpretation of the results concerning the production / ha, by Duncan test, is shown in the figure 11.

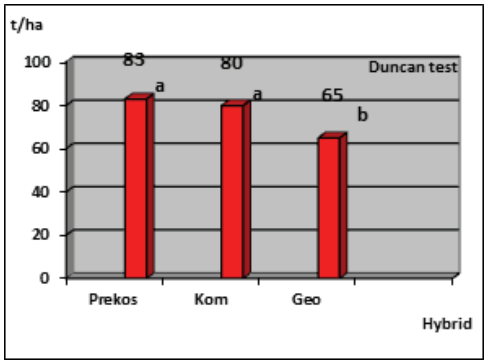

Figure 11. The production of the tomatoes hybrids

It is observed insignificant difference between the production/ha obtained from Prekos (83 t/ha) and Kom (80 t/ha) and significant difference from Geo (65 t/ha).

CONCLUSIONS

The tomatoes collection researched has an important genetic variability of the characteristics studied.

The tomatoes fruits presented characteristics - color, weight, shape, aspect, taste and number of seminal lodges - optimal, meeting the requirements of the producers and the consumers.

The hybrids investigated have optimal precocity and high production.

The Prekos hybrid is superior the Kom and Geo hybrids.

The tomatoes collection researched is a valuable source of germplasm for amelioration works.

These 3 hybrids F_1 of Bulgarian origin - Prekos, Kom and Geo - behaved optimal in greenhouse, in the climate conditions of Bucharest in 2012 year.

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RESEARCH REGARDING THE BREEDING OF PEACH IN DOBROGEA AREA

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Abstract

Peach is one of the most valuable species cultivated in Romania. At Research Station for Fruit Growing Constanta is the National Peach Collection with 855 genotypes from worldwide. Between 1981-2012, our peach breeders sorted the best genitors and made a lot of hybridizations, than they obtained thousand and thousand of hybrids. During the time, 31 new peach, pavie, nectarine and brugnone cultivars are registered to Bucharest ISTIS and this new biological material enriches and diversifies the Romanian assortment. This paper presents seven new cultivars

Key words: *Prunus persica (L) Batch, dwarf, fruit quality, processing*

INTRODUCTION

Peaches and pavies are appreciated for their nourishing and therapeutically qualities and are recommended for fresh consumption and for processing (Delgado, 1992; Bargioni, Pisani, 1993; Cepoiu, Manolache, 2006).
Thousand and thousand peach cultivars are in the world and annually, the breeders obtain new varieties (Monet, 1990; Fraccaroli, Bargioni, Febi, 2000; Sansavini, 1991; Dumitru, Cepoiu, Stanica, 2001).

MATERIAL AND METHOD

The biological material is representing by seven new cultivars: 'Cecilia' – registered in 2000; 'Raluca' and 'Catherine Sel.1' – omologated in 2001; 'Florin' and 'Filip' – in 2002; 'Craita' – in 2003; 'Monica' – in 2007.
The American cultivar 'Redhaven' – registered in 1964 in the Official Romanian Breeding Cultivar List of Plant was control of this experiment.
The rootstock utilised was 'Tomis 1', which was registered in 1997 and it was obtained in our station by Dr. Alexandra Indreias.
The orchard density was 833 trees / ha, for standard trees (4/3 m) and 2222 trees / ha for dwarf trees (3/1.5 m).
The trees were observed from the phenological point of view. There were made biometrical measurements on fruits and trees; physico-chemical analyses on fruit; appreciations on productivity, behavior to the attack of main diseases and parasites, etc.
The crown form was the improved vase.

RESULTS AND DISCUSSIONS

'Redhaven' is the American cultivar which was introduced in Romania in 1964. After 49 years, this variety persists to be cultivated in our peach-orchard. It is the control of this experiment (Photo 1).

Photo 1- Redhaven (Control)

The Romanian breeders try to obtaine new valuable cultivars, same (type) 'Redhaven', with yellow flesh, but not only, because the tastes of consumers is changing day by day.
Then, were created, for a change, aboriginal cultivars with white or orange flesh, with different taste, color, size, firmness, form, etc.
In this paper we present seven new cultivars obtained at Research Station for Fruit Growing Constanta, Romania.
'Raluca', the author is Liana-Melania Dumitru.
Is an early peach cultivar, similar to Redhaven; tree is standard, semivigorous, resistant to frost; autofertile; with big and constant yield; the fruit is red and attractive; the flesh is yellow and juicy (Photo 2).

Photo 2- Raluca

'Cecilia', the authors are Liana –Melania Dumitru and Vasile Cociu.
It is a dwarf peach with fruit similar to Redhaven; the highness of tree is about 1.40-1.70 m; fruits are big, red, with yellow flesh and good quality (Photo 3).

Photo 3- Cecilia

'Catherine Sel.1', was obtained by Liana-Melania Dumitru.
It is a clingstone cultivar, tree is standard, medium vigorous, resistant to *Taphrina deformans*; hight and constant productivity; fruit is big, orange with red, attractive, the flesh is orange, firm, flavoured, very sweet (Photo 4).

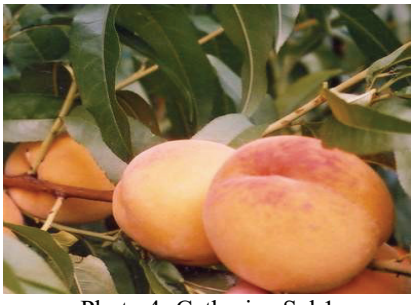

Photo 4- Catherine Sel.1

'Craita' - the author is Liana-Melania Dumitru.
It is a dwarf clingstone cultivar; the hightness of tree is 1.20-1.50 m; big and constant productivity; fruit is yellow-orange, with yellow and firm flesh, very good taste (Photo 5).

Photo 5- Craita

'Florin'- the author is Liana-Melania Dumitru.
It is an early cultivar with flat fruit and standard trees; big vigour, resistant to frost;

fruit is big for "sandwich" group; attractive, yellow with red; orange flesh, juicy (Photo 6).

Photo 6- Florin

'Filip' - the author is Liana-Melania Dumitru.
It is the best Romanian peach cultivar with flat fruit; the tree is standard, autofertil; has medium-big vigour; very good and constant productivity; fruit is very attractive, excellent taste, sweet, flavoured, rose-red, with white flesh; small stone, no adderence, juicy (Foto 7).

Photo 7- Filip

'Monica'- the authors are: Vasile Cociu, Liana-Melania Dumitru and Preda Ionescu.
It is also a "sandwich" peach, which has the ripening time after Filip; very attractive fruit, red-carmin colou; white flesh, sweet and juicy (Foto 8).

Photo 8- Monica

The most early cultivars are: 'Raluca' and 'Florin' and the latest are: 'Cecilia' and 'Monica' (Table 1).
The yield is between 22.5 t/ha ('Redhaven' – Control) and 40.0 t/ha ('Craita', dwarf pavie). 'Catherine Sel.1' (pavie or clingstone cultivar) has also a big production: 30 t/ha (Table 1).
The mean weight of fruit varies between 73 g ('Monica') and 225 g ('Catherine Sel.1').
The peach cultivars with flat-fruit have the size of fruit smaller than the classic one, but this fact is compensated by the excellent taste and the atractivity of their fruits (Table 2).
The raport stone/fruit is between 3% ('Filip') and 8% ('Redhaven'- Control) and it denotes the efficiency to processing.

Table 1. Ripening time and average yield (2010-2012) Valu lui Traian, Constanta, Romania

Genotype	Category	Ripening time	Average yield		Destination of fruits
			kg/tree	t/ha	
Redhaven (Control)	peach	09.07-16.07	27.0	22.5	flesh consumption and processing
Raluca	peach	30.06-07.07	29.0	24.2	flesh consumption
Cecilia	dwarf peach	01.08-13.08	14.5	32.2	flesh consumption and processing
Catherine Sel.1	clingstone (pavie)	27.07-10.08	36.0	30.0	processing and flesh consumption
Craita	dwarf clingstone	15.07-29.07	18.0	40.0	processing and flesh consumption
Florin	peach with flat fruit	02.07-11.07	27.5	22.9	flesh consumption
Filip	peach with flat fruit	14.07-29.07	35.0	29.2	flesh consumption and processing
Monica	peach with flat fruit	03.08-13.08	32.0	26.7	flesh consumption and processing

Dry matter (determinate refractometrique) is between 10.5% (to 'Raluca') and 16% (to 'Monica').
The acidity, which is expressed in mg. malic acid / 100 g flesh fruit, varies between 0.32 mg% ('Filip') and 0.67 mg% ('Redhaven'-Control) (Table 2).

Table 2. Quality test of fruit Valu lui Traian, Constanta, Romania

Genotype	Fruit mean weigh (g)	Stone mean weigh (g)	% stone fruit	Dry matter (%)	Acidity* (mg%)
Redhaven (Control)	150.0	12.0	8.0	11.0	0.67
Raluca	172.0	13.0	7.6	10.5	0.56
Cecilia	220.0	10.0	4.5	12.5	0.66
Catherine Sel.1	225.0	12.0	5.3	14.7	0.44
Craita	125.0	8.5	6.8	13.2	0.55
Florin	105.0	6.0	5.7	11.5	0.40
Filip	77.5	2.3	3.0	14.8	0.32
Monica	73.0	2.7	3.7	16.0	0.36

* Acidity: mg malic acid/100 g flesh fruit

Generaly, the cultivar with flat fruit have more sugar and less acidity ('Filip' and 'Monica') than normal peach cultivars.
A big percent of dry matter have also the clingstone (pavie): 13.2% ('Craita') and 14.7% ('Catherine Sel.1') (Table 2).

CONCLUSIONS

1. The new cultivars obtained at Constanta are suitable not only for ecoclimatic conditions of south-east of Romania, but also for other areas from the south, west and central part of Romania and also for other European countrys, like Ungary, Bulgary, France, etc.
2. All these new cultivars are more good than control cultivar ('Redhaven') and enriched the existing assortment.

ACKNOWLEDGEMENTS

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PRESENT AND PERSPECTIVE OF ALMOND IN SOUTH-EASTERN ROMANIA

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Abstract

Almond is almost unknown to most people in our country, even abroad is widespread and appreciated for its fruit with many uses. At Research Station for Fruit Growing Constanta, during 1984-1994, it were studied over 45 cultivars of almonds. Currently germoplasm consists of 54 cultivars and selections of almonds that have been studied regarding behavior in the phenology and pollination process.

Key words: *Prunus amygdalus Bartock, cultivars, phenology, pollination.*

INTRODUCTION

Almond belongs to the group of nuts crops and has a major economic importance in nourishment industry, because of its many uses and multiple chemical components of the fruit. Almonds is considered an almost complete fruit; depending of the cultivar, ripening time and place of culture their sweet or bitter core containing large amounts of fat, protein substances, carbohydrates, minerals, etc. (Cociu, 2003, 2007).

Being classified as thermopile tree species, the almond found in the south east part of the country optimal climatically conditions for culture, although almond orchards declined greatly, in the last two decades.

Currently, almond became a 'luxury' fruit; their fruit being exported in high quantities in most advanced countries at a higher selling price.

The purpose of this study is to provide data on the almond assortment recommended for climatic conditions in Dobrogea.

MATERIALS AND METHODS

RSFG Constanta is located in the south-eastern Romania, in the area between the Danube and the Black Sea and has specific steppe climatic conditions. The mean yearly temperatures are 11.6°C, hard winters and very hot summers with low rainfalls. Frosts return is a quite often phenomena in spring, fact that affects fruit trees with early blooming as almond.

Absolute temperature beyond the limits of resistance of almond species: - 26°C, -30 °C or above + 40°C is rare (once in 20 or once 30 years). Rainfall is deficient to the requirements of the trees; the average amount of rainfall is around 400 mm, with unequal distribution in the active growing season (April 1 to September 30). Chernozem soil type is deep, with good condition for water circulation, well supplied with humus.

The almond genotypes were studied at RSFG Constanta more than ten years. The planting distance was 5 m between rows and 4 m between trees on row; the almond rootstock was bitter almond. The crown shape was vase. The trees were pruned every year, fertilized and irrigated; the phyto-sanitary treatments were applied uniformly in the field.

All studied cultivars were observed from the phenological point of view. The beginning of flowering was considered when the first open flower was visible and the end of it was noticed when the last petals of the flowers fell. The blooming intensity was noted from 0 (absent) to 5 (abundant), according with the research methodology of fruit tree breeding (Cociu, 1989).

The self fertility of almond cultivars was evaluated by isolating branches with flowers using paper bags. The fruit were numbered and were expressed as percentage. The kernel strengthening occurs when the embryo cotyledons pass from liquid to solid state, and it

was evaluated by using a large-sized needle. The fruit on the branches were pierced during their growth. The kernel was considered strengthened when the needle had not penetrated the fruit. The almond kernel yield was evaluated by weighing the tree crop (kg/tree).

RESULTS AND DISCUSSIONS

The beginning of the flowering was gradually, starting with Tuono (25.03), followed by Mari de stepa (29.03); the last one that flowering was Tardy non Pareille (18.04). Also, the end of the flowering was recorded between 16.04 (Mari de stepa) and 1.05 (Ai). The flowering on the same tree at the studied cultivars is gradually. That was noted to other fruit tree as peach and apricot (Manescu, 1975). The late flowering cultivars flowering time ranged from 12 to 14 days; the cultivars that bloom earlier had a longer flowering period, even over 30 days (Tuono). The flowering intensity was abundant and very abundant, being noted by 5 or 4-5 to all studied almond cultivars. The kernel strengthening of almond begins on 8.06 (Ferragnes) and finish on 20.08 (Teteny Botermo, Nikitski, Feraduel). The kernel strengthening phase has the highest requirements for water and nutrients consumption (critical phase). The fruit yield is reduced during the very dried growing seasons; many of them remain small, dry or incompletely formed; also, the phenomena was noticed by Cociu (1954). The ripening time started on 3.09 (Preanîi), followed by Mari de stepa, continuing every 2 or 3 days, until on 2.10 (Tuono) for a period of one month. All cultivars studied are auto incompatible in the pollination processes, as shown in table 2.

Table 1. The phenology of flower buds and ripening time of almond at Valu lui Traian, south-eastern Romania (multiannual date)

Cultivar	Beginning of flowering	End of flowering	Flowering time (days)	Intensity	Kernel strengthening	Ripening time
Preanîi	3.04	21.04	18	5	17.06	3.09
Mari de stepa	29.03	16.04	19	4	10.06	6.09
Teteny Botermo	6.04	22.04	16	5	20.06	10.09
Lovrin	5.04	22.04	17	5	11.06	17.09
Pomorie	3.04	21.04	18	4-5	8.06	18.09
Thompson	8.04	27.04	19	5	17.06	19.09
Nikitski	9.04	27.04	18	3-4	21.06	22.09
Feraduel	16.04	28.04	12	5	20.06	28.09
Ferragnes	16.04	30.04	14	5	8.06	1.10
Ai	14.04	1.05	17	4-5	11.06	20.09
Tardy non pareille	18.04	30.04	12	4-5	10.06	20.09
Marcona	10.04	27.04	17	4-5	19.06	26.09
Tuono	25.03	28.04	34	2	9.06	2.10

Table 2. The pollination behavior of almond cultivars, Valu lui Traian

Cultivar	Self pollination			Open pollination	
	Number of flowers in paper bags	Number of fruits	%	Number of flowers	Number of fruits
Preanîi	264	0	0	-	-
Mari de stepă	-	-	-	98	16
Teteny Botermo	240	0	0	-	-
Lovrin	153	0	0	-	-
Thompson	315	0	0	458	36
Nikitski	250	0	0	420	159
Feraduel					
Ferragnes	320	0	0	197	40
Ai	255	1	0	-	-
Marcona	338	0	0	-	-

The highest yields were recorded at Preanîi (8.8 kg /tree), followed by Lovrin (7.0 kg/ tree) and Ferragnes (6.7 kg/tree), table 3. A big kernel weight was recorded to Feraduel (1.7 g). The shells of the studied cultivars were both hard and thin, table 3.

At RSFG Constanta the present assortment has the following cultivars and selections: Sabina, Sandi, Cristi, Adela, April, Ana (created at RSFG Oradea) and Autofertil 1 Autofertil 2 Autofertil 3 (hybrids obtained at RSFG Constanta) Teteny Record BT almond 1-12, Migdal RT 70-12, Migdal T.B. 12-24/61, 12-25/51 Kedvenk, T.B. 12-27, Apolka 12-33/36, Andosa, Szeget (almond cultivars and selections introduced from Hungary).

In 2012, a number of 54 genotypes were grafted in order to be introduced in germplasm found.

Table 3. Average yield of almond at Valu lui Traian, south-eastern Romania (multiannual date)

Cultivar	Average yield kg/tree	Shell weight (g)	Kernel weight (g)	Softness of shell
Preanîi	8.8	1.8	1.0	soft
Mari de stepa	3.4	3.5	1.4	hard
Teteny Botermo	3.8	2.2	1.0	soft
Lovrin	7.0	4.6	1.2	hard
Thompson	3.0	3.1	1.0	soft
Nikitski	3.5	4.0	1.4	soft
Feraduel	5.0	5.9	1.7	hard
Ferragnes	6.7	3.5	1.4	hard
Ai	3.5	3.0	1.5	soft
Marcona	5.0	1.5	0.8	hard
Tuono	1.0	-	-	hard

CONCLUSIONS

The almond cultivars studied provide good yields and can be recommended to be planted in orchards in south-eastern part of Romania although flowering time occurs earlier than in other fruit species.

The almond cultivars studied are auto incompatible; therefore it should be provided pollinators cultivars for orchard.

Studied cultivars yielding for one month, starting in early September (Preanîi) until early October (Tuono).

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THE INFLUENCE OF FERTILIZATION RECIPES UPON SEED PRODUCTION OF MADARASENI CLIMBING BEAN VARIETY

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Abstract

The investigations were conducted at SCDL Iernut.. The experience has included 11 fertilization types based on nitrogen, phosphorus and potassium (N, P_2O_5 and K_2O), in four repetitions. The spread fertilizers was made gradually, in three main points: 1. In autumn was applied the whole dose of P_2O_5 from superphosphate; 2. Before sowing, moment in which was administered 1/2 N (nitrogen) and 1/2 K (kalium) doses; 3. During the growing season, in the development plant stage of the climbing bean "early flowering', was applied 1/2 N (nitrogen) and 1/2 K (potassium) doses. From the comparison of the yields productions as the average achieved over the three-year study of the experimental variants, both toward the witness V1 as well as against the average of 11 variants revealed that the best option was V_4 ($N/P_2O_5/K_2O$ -100/150/150) variant.

Key words: *climbing beans, fertilization recipes, seed.*

INTRODUCTION

Ensuring the environmental conditions specific to each cultivar determines the achievement of cultivars production at the full potential. Both temperature and humidity conditions and cultivar specific nutrients are the main factors in their productions (Heitz A.K., 2013).

In this paper are presented the results of researches on the influence of some fertilizer recipes (NPK) of Madaraseni climbing bean variety under the environmental conditions of SCDL Iernut.

MATERIALS AND METHODS

Researches has been carried out in the period of 2010-2012 year on Madaraseni climbing bean variety (Figure 1,2,3), created at SCDL Iernut.

It was used as a biological material – pre-basic seed.

The purpose of the experiments was to force the phonotypical expression of genetic potential regarding the capacity of seeds production of Madaraseni climbing bean by using the best recipes of chemical fertilizers (NPK).

Experience has encompassed 11 variants ($N/P_2O_5/K_2O$):V_1-0/0/0, V_2-0/150/150, V_3-50/150/150, V_4-100/150/150, V_5-200/150/150, V_6-100/0/150, V_7-100/75/150, V_8-100/300/150, V_9-100/150/0, V_{10}-100/150/75, V_{11}-100/150/300; in 4 repetitions, where V_1-the unfertilized variant was used as control group (Table 1, Figure 4).

Figure 1. Madaraseni variety-plants

Figure 2. Madaraseni variety – pods and flowers

Figure 3. Madaraseni variety-seeds

Table 1. Experimental variants

The variant	The applied fertilizer dose (kg s.a./ha)		
	N	P_2O_5	K_2O
V_1	0	0	0
V_2	0	150	150
V_3	50	150	150
V_4	100	150	150
V_5	200	150	150
V_6	100	0	150
V_7	100	75	150
V_8	100	300	150
V_9	100	150	0
V_{10}	100	150	75
V_{11}	100	150	300

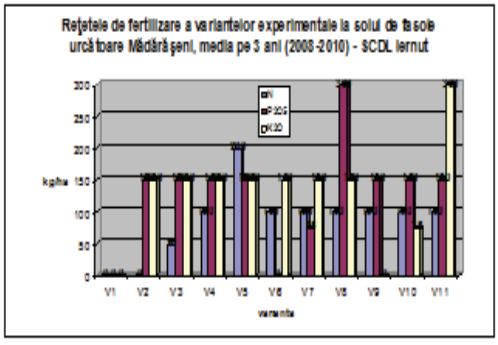

Figure 4. Fertilization prescriptions of the experimental variants of Madaraseni climbing bean, the average (2010-2012) – SCDL Iernut

The setting of the experience-in superposed blocks, randomized, four repetitions (Ceapoiu, 1968) with tape on all the edges of experience (Figure 5).

R4: $V_3, V_4, V_5, V_6, V_7, V_8, V_9, V_{10}, V_{11}, V_1, V_2$
R3: $V_9, V_{10}, V_{11}, V_1, V_2, V_3, V_4, V_5, V_6, V_7, V_8$
R2: $V_6, V_7, V_8, V_9, V_{10}, V_{11}, V_1, V_2, V_3, V_4, V_5$
R1: $V_1, V_2, V_3, V_4, V_5, V_6, V_7, V_8, V_9, V_{10}, V_{11}$

Figure 5. Arranging experimental variants

Method of working

Management of fertilizer was made gradually, in three main points:

1. In fall was applied, on variants, the entire dose of P_2O_5 from superphosphate;
2. At the preparation of the seedbed for seeding, at which time was administered the dose of 1/2 N (nitrogen) and 1/2 K (potassium);
3. During the vegetation period, in the development phase-*'starting blooming'*-of the climbing bean plant was applied the dose of 1/2 N (nitrogen) and 1/2 K (potassium).

The cultivation technology

Setting up experience has been carried out in the second decade of May, at the time when the ground was not recorded temperature decreases below the 8-10°C at the depth of sowing.

The location of the experience

The experience has been carried out on the ground with medium texture, with a neutral PH slightly acidic (pH 6.5-7.0). The land preparation began on fall through a furrow of 22-24 cm deepness and through the fertilizers' incorporation (superphosphate) from the base fertilization. On spring, before sowing, was made the soil mobilization, herbicide, the application of experimental variants, fertilizing with half from the total dose of nitrogen and potassium on the experimental variants. The experience was encased after the hoeing vegetables, after the planting scheme: 80cm between rows and 35 cm between plants/row (Figure 6).

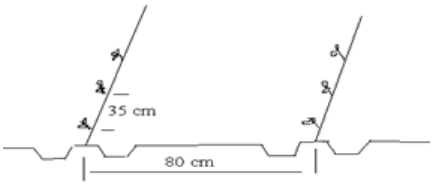

Figure 6. Sowing chart (scheme)

Before sowing, the seed was treated with Nitragin-beans.

During the growing season were made 2 mechanical hoeing with the growers followed by the manual hoeing on row (for three times).

Fertilization from the vegetation period was carried out at the *'early blooming'* time with the second half of the nitrogen and potassium fertilizers.

During the growing season have been made phenotypically observations and biological purifications by which the untypical plants have been removed, damaged by disease or pests with mechanical blows from different sources. Harvesting was performed in the physiological maturity stage, gradually, on experimental variants.

RESULTS AND DISCUSSIONS

After extracting and selecting seeds manually, on variants, the quantity of produced seeds in each variant has been weighed separately. The experimental results (Table 2, Figure 7) for the production of seed were statistically processed.

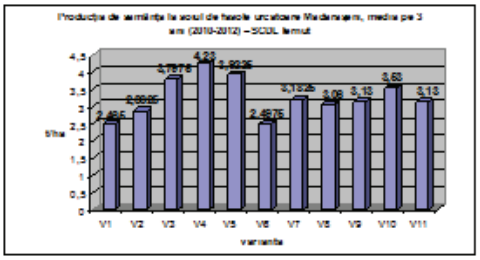

Figure 7. Seeds production of the Madaraseni climbing beans, the average on 3 years (2010-2012)-SCDL Iernut

In comparative culture organized on variants in four repetitions have been calculated the seed production/ha (Table 2) by which was established the fertilizers recipes influence on seed production per unit area by using the signification of statistical differences (Table 3, 4).

Table 2. Bean seeds′ production (t/ha) of Madaraseni variety (2010-2012), on variants and repetitions – SCDL Iernut

Variant	R1	R2	R3	R4	V	mean
V1	2,43	2,5	2,43	2,5	9,86	2,465
V2	2,7	3,06	2,83	2,86	11,45	2,8625
V3	3,73	3,83	3,93	3,7	15,19	3,7975
V4	4,3	4,16	4,13	4,33	16,92	4,23
V5	3,8	3,86	3,93	4,1	15,69	3,9225
V6	2,6	2,46	2,53	2,4	9,99	2,4975
V7	3,1	3,3	3,2	3,13	12,73	3,1825
V8	2,96	2,96	3,06	3,26	12,24	3,06
V9	3,06	3,2	3,06	3,2	12,52	3,13
V10	3,46	3,6	3,5	3,56	14,12	3,53
V11	3,16	3,1	3,03	3,23	12,52	3,13

Dispersional analysis (Ceapoiu N., 1968) has been determined by indicators relating the sum of squared deviations for: total (SP_T), rehearsals (SP_R), versions (SP_V), error (SP_E) and the degrees of their freedom (GL) (Table 3).

Table 3. Dispersional analysis (2010-2012)

Variability cause	SP	GL	s^2	Testul F
TOTAL	13,1139	43		
REPETITIONS	0,05022	3		
VARIANTS	12,774	10	1,277	130,64 (2.16; 2.98)
ERRORS	0,293	30	0,009	

Because the calculated value 'F' is greater than the theoretical value of 'F' indicates that between variants exists differences significant distinctly or very significantly, as it continues the statistically calculation for the interpretation of the obtained results.

Table 4. Influenţa reţetelor de îngrăşămintelor chimice asupra producţiei de sămânţă/ha la soiul de fasole urcătoare Mădărăşeni, media pe 3 ani (2010-2012) – SCDL Iernut Influence of chemical fertilizer recipes on seed production/ha to the Mădărăşeni climbing bean variety, the average on 3 years (2010-2012) – SCDL Iernut

Var.	Yield (t/ha)	%		Diff. ($x_{.med}$)	Signif	Diff. (Mt)	Signif
		$x_{.med}$	Mt				
$x_{.med}$	3,25	100	132	0	Mt	0,78	**
V_1 – Mt.	2,46	75,8	100	-0,78	00	0	Mt
V_2	2,86	88,0	116	-0,38	-	0,39	-
V_3	3,79	116	154	0,54	*	1,33	***
V_4	4,23	130	171	0,98	***	1,76	***
V_5	3,92	120	159	0,67	**	1,45	***
V_6	2,49	76,8	101	-0,75	00	0,03	-
V_7	3,18	97,9	129	-0,06	-	0,71	**
V_8	3,06	94,1	124	-0,19	-	0,59	*
V_9	3,13	96,3	127	-0,12	-	0,66	**
V_{10}	3,53	108	143	0,28	-	1,06	***
V_{11}	3,13	96,3	127	-0,12	-	0,66	**

$s_d = 0,221$; $t_{5\%} = 2.04$; $t_{1\%} = 2.75$; $t_{0.1\%} = 3.65$
$DL_{5\%} = 0,221 \times 2.04 = 0,450$
$DL_{1\%} = 0,221 \times 2.75 = 0,607$
$DL_{0.1\%} = 0,221 \times 3.65 = 0,806$

From the statistic analysis of the results, as average on three years, concerning the significance of the differences against the variants average (Table 4), have been resulting:
-V_4 has recorded a difference very significant,
-V_5 has recorded a difference distinctly significant,
-V_3 has recorded a significantly difference,

-V_5 has recorded a difference distinctly significant,
-V_1 and V_6 have recorded a difference distinctly negative significant.
From the statistic analysis of the results, as average on three years, concerning the significance of the differences against the V_1-Mt (Table 4) witness variant have resulted:
-V_3,V_4,V_5,V_{10} have recorded a difference very significantly positive towards V_1 –Mt variant;
-x_{med}, V_7, V_9, V_{11} have recorded a difference distinctly positive significant towards V_1 –Mt variant;
-V_8 has recorded a difference significantly positive towards V_1 –Mt variant;
-V_2 and V_6 have recorded a difference insignificant positive towards the control.

CONCLUSIONS

The experimental results, as average on three years of study, showed that:

-V_4 variant-100/150/150 has recorded a difference very significantly positive both from the V_1-0/0/0 witness variant and from the average of the variants, from which results that V_4 represents the best recipe of fertilization.

-Increasing the dose of nitrogen is justified only up to 100 kg/ha, and the doses of phosphorus and potassium are justified only up to 150 kg/ha.

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DETERMINATION ON VITAMIN C IN SEVERAL OLD ROMANIAN APPLE CULTIVARS BY HPLC DURING COLD STORAGE

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Abstract

High pressure liquid chromatographic (HPLC) methods were used for measurement of vitamin C and organic acid changes of forty old Romanian apple cultivars ("Prescurate","Gurguiate","Zori","Carla","Mohorat", "Trotuse", "Mere Tari","Mar Orbai" etc.) during cold storage. Harvested apples at the last stage of commercial ripeness were placed in perforated stored at 0°C temperature and 90-95% relative humidity for 60 days. Vitamin C content decreased in all cultivars but no significant differences were found in the most important of them from the beginning to the end of the storage. The highest share of total acids was contributed by citric acid. The high level of vitamin C was measured in the cultivars" Trotuse", "Ancuta","Wachsman Sammeling"and "Wachsman Amalie". Malic acid content of cultivars also decreased with storage time. Tartaric, oxalic and fumaric acid contents fluctuated during storage, but at the end of cold storage these organic acids had decreased in comparison to initial values.

Key words: *apple, acids, HPLC, organic ,storage, vitamin C.*

INTRODUCTION

The Apple (*Malus x malus*) is one of leading fruits which is being grown in temperate region of the world. Its beautiful appearance, crispy flesh, pleasant flavour and sweet taste attract the consumers and fetch high (Adisa, 1986)

Of the old genotypes known to exist in the Carpathian Basin, almost 200 local cultivars have been collected in the germoplasm collection over the last years.

Some of the cultivars found in the germoplasm collection could be use not only in breeding, but also in organic farming, so there is a great need for the re-evaluation of the old apple cultivars. Some of the old apple varieties have become well adapted to the soil and climatic conditions of the Carpathian Basin producing good yields and highly appreciated fruit quality (Mitre et al., 2009)

It is important to examine old apple cultivars because the pomological descriptions available for old cultivars are not uniform. Many collections of cultivar descriptions use several names for one cultivar, or the same name for several cultivars. Nowadays, in most cases the guidelines given by UPOV (Union Internationale pour la Protection des Obtentions Végétales) or CPVO (Community Plant Variety Office) are applied, as the brief descriptions and number codes provide sufficient information for cultivars to be differentiated. They have the advantage that they can be applied on an international scale and enable the results obtained by different research teams to be easily compared.

The nutritional value of apples is mainly due to the content of Vitamin C (Sanz et al., 1999). As antioxidant content is becoming an increasingly important parameter with respect to fruits and vegetables, it is of great interest to evaluate changes in the antioxidant status during fruit storage (Perez and Sanz, 2001).

During the postharvest period of strawberries, prompt cooling and providing proper temperature (0°C) and relative humidity (90-95%) are the most important factors to preventing the undesirable quality changes (Kader, 1990). The concentration of organic acids is an important factor influencing the organoleptic properties of fruits (Lee and Kader, 2000). Their changes during storage should be reduced. Besides good sensory features, consumers prefer apples because of their high content of vitamin C (Schöpplei et al., 2002).

Vitamin C, one of the most important nutritional quality factors in apples, has been

found to prevent the formation of N-nitroso compounds, the cancer causing substances from nitrates and nitrites found in preserved meats and some drinking water (Du et al., 2009). Vitamin C has many biological activities (reducing carcinogenesis and cardiovascular diseases, stimulating the immune system) in the human body (Simon, 1992).

There are several methods to determine vitamin C content; however some of them need subjective evaluation and some are not practical (Agar, 1995). Several postharvest factors influence the vitamin C and organic acid contents of apple. Despite many investigations in the area of nutrition and postharvest changes of apples, knowledge about the determination of vitamin C and organic acids by using HPLC is inadequate. It has been indicated that ascorbic acid content of fruit should be measured by HPLC because ascorbic acid produces an oxidative-reduction reaction (Asami et al., 2003). The aim of this research was to measure the vitamin C (ascorbic acid) and organic acid contents of 20 old Romanian apples varieties by using High Performance Liquid Chromatography (HPLC) during cold storage period.

MATERIALS AND METHODS

Forty old apples cultivars (Prescurate, Gurguiate, Viesti, Rosii Stetin, Zori, Carla, Mohorat, Gustav Durabil, Wachsman Sammeling, Wachsman Amelie, Ancuta, Ardelean, Trotuse,etc.) grown in the research and application center of Horticulture Department in Bucharest located in south of Romania region were harvested at the last stage of commercial ripeness (red colour with a surface area of > 75-80%). Harvested fruits in the early morning were transported to the post harvest laboratory within 30 min. Apples cultivars were sorted to eliminate fruits with defects including overripe or too small fruit. Fruits were selected randomly and placed in perforated (8 perforations with 10 mm diameter on each box) plastic boxes (capacity: 750 g) for each replicates. Four replicates were used per treatment. Packaged fruits were stored at 0°C temperature and 90-95% relative humidity for 10 days. Apples fruits cultivars were analyzed at 5 days intervals (0, 5, and 10 days of storage) during cold storage.

Vitamin C (Ascorbic acid) and Organic Acid Analysis

The HPLC analysis was carried out to determine the vitamin C and organic acids on a Shimadzu class LC VP HPLC system with class LC-VP software, a pump (LC-6AD), and a UV-VIS detector (SPD-10AV VP). The columns used were YMC Pack-ODS (250 mm x 4.6 mm I.D., 5 μm) for organic acids and SGE (250 mm x 4.6 mm I.D., 5 μm) for vitamin C. The mobile phases were water adjusted to pH 2.2 with trifluoroacetic acid (organic acids) and to pH 3 with phosphoric acid (vitamin C). Separation was carried out by isocratic elution with a flow rate of 0.4 ml min-1 and column temperature was ambient. The UV detector was set at 210 nm and 254 nm, respectively. Quantitation was based on the peak area measurement.

Sample (10 g) was extracted in 10 ml water adjusted to pH 1.5 with trifluoroacetic acid for organic acids and with 10 ml phosphoric acid-water (2%, v/v) for vitamin C. The extracts were filtered through filter paper. Then, 1.5 ml buffer (0.01 M KH2PO4, pH 8.0) was added to 1.5 ml sample extract. From this, 1.5 ml (organic acids) and 1 ml (vitamin C) of these mixtures were loaded on to C18 cartridges. After loading, 3 ml water adjusted to pH 1.5 with trifluoroacetic acid for organic acids and 2 ml phosphoric acid-water
(2%, v/v) for vitamin C were passed through the cartridges. For HPLC, 20 μl of the eluents were injected.

RESULTS AND DISCUSSIONS

Generally, fruits and vegetables show a gradual decrease in vitamin C content as the storage temperature or duration increases (Adisa, 1986). In this research, change in vitamin C of apples during cold storage is shown in Figure 1. Vitamin C levels decreased for most of cultivars from the beginning to the end of the storage, but this reduction was not statistically significant ($P<0.05$) in 'Trotuse' and 'Ancuta' showed an average content of vitamin C at harvest of 35.32 mg/100 g and 31.42 mg/100 g, and at the end of the storage these values decreased to 14.94 mg/100 g and 13.42 mg/100 g, respectively. (Figure 1) On the other hand a slight increase was found in vitamin C content of apples stored in air (Perez and Sanz, 2001).

Likewise, vitamin C content of 'Gurguiate, Mohorat si Rosii de Stetin, Muntenesc cu coada scurta' decreases drastically at the 15th day of storage in comparison to initial value (Figure 2). This can be due to continuous ripening process of fruits.

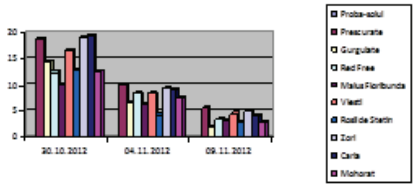

Figure 1. Vitamin C of old apples cultivars during cold storage.

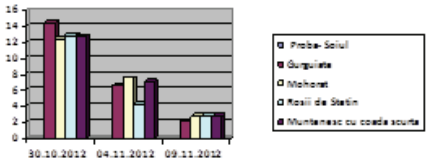

Figure 2. Vitamin C content of varieties 'Gurguiate, Mohorat si Rosii de Stetin, Muntenesc cu coada scurta'

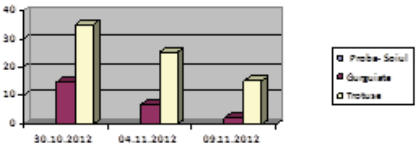

Figure 3. Vitamin C content of varieties 'Gurguiate' and 'Trotuse' at the end of stor¬age.

Vitamin C is quite unstable and thus it is also an indication of fruit freshness (Holcroft and Kader, 1999). Vitamin C content of 'Gurguiate' was lower than 'Trotuse' at the end of storage (Figure 3). It can be concluded that the change in vitamin C content is cultivar dependent. Therefore, this characteristic of cultivars should be taken into consideration in choosing a cultivar for storage. The cultivars which lose less vitamin C during storage could be preferred.

Table 1. Results concerning the vitamin C in old Romanian apples varieties 0, 5, and 10 days of storage

Nr. Crt.	Cultivar	30.10.2012 Mg/100 g.p.p.	04.11.2012 Mg/100 g.p.p.	09.11.2012 Mg/100 g.p.p.
1.	Prescurate	18.59	10.11	5.59
2.	Gurguiate	14.52	6.51	2.04
3.	Red Free	12.45	8.24	3.45
4.	Malus Floribunda	10.04	6.22	3.04
5.	Viesti	16.54	8.45	4.52
6.	Rosii de Stetin	12.82	4.22	2.82
7.	Zori	18.86	9.15	4.86
8.	Carla	19.15	8.98	4.17
9.	Mohorat	12.49	7.52	2.79
10.	Gustav Durabil	14.57	9.36	4.69
11.	Wachsman Sammeling	24.34	16.3	8.34
12.	Wachsman Amalie	28.55	19.51	10.55
13.	Ancuta	31.42	25.61	13.42
14.	Ardelean	17.98	8.96	4.43
15.	Trotuse	35.32	25.36	14.94
16.	Rosii de Geoagiu	25.86	13.51	4.86
17.	Knis	12.91	9.36	3.91
18.	Nobile de Geoagiu	21.78	12.36	5.78
19.	Favoritul lui Polocsay	12.87	8.89	3.87
20.	Mere tari	14.73	8.52	4.73
21.	Malus Teifera	15.28	7.69	5.28
22.	Pokomache	15.01	8.61	5.01
23.	Satmaresti	16.50	9.63	5.50
24.	Cormose	18.83	12.31	4.83
25.	Calugaresc	16.96	12.36	5.26
26.	Anisovska	15.93	8.96	3.93
27.	Marut alb	14.36	8.21	4.36
28.	Seghese	15.12	9.65	5.12
29.	Poinic	19.91	14.31	5.91
30.	Mar Muntenesc	15.23	9.63	4.23
31.	Smeurii	12.27	7.25	3.27
32.	Muntenesc cu coada scurta	12.73	6.94	2.73
33.	Rosior calugaresc	15.68	8.51	3.68
34.	Rosior romanesc	19.32	12.35	5.32
35.	Mar Orbai	18.49	13.21	6.67
36.	Verzi de Radaseni	18.57	11.11	4.57
37.	Fara nume	24.42	21.32	9.42
38.	Dulci de Radaseni	22.50	16.63	10.50
39.	Cernenko	19.65	12.67	4.76
40.	Rosu de Cluj	23.11	19.20	13.11

CONCLUSIONS

The accurate analysis of vitamin C and organic acids of apples by HPLC enables us to observe the quality changes during postharvest period. Vitamin C and organic acid content of the majority of cultivars changed as a function of storage time. Both cultivars had lost vitamin C contents at the end of the storage, but 'Trotuse' showed a greater decrease than 'Gurguiate'.

These results showed that changes in vitamin C contents of apples are cultivar dependent. On the other hand, the consumer should take into consideration that the loss of vitamin C increases with storage time. During storage, the highest share of total acids was exhibited by citric acid. This acid decreased by 10 days of cold storage in comparison to initial values.

In future investigations, we propose that the objective analytical determination of these critical components should be coupled with subjective evaluation by a taste panel to provide useful and meaningful information about quality changes of apples during the storage.

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INFLUENCE OF WINTER FROSTS ON SOME PEACH CULTIVARS OF DOBROGEA

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Abstract

This heat-loving species always found good conditions for growth and fructification in the south-eastern part of Romania, and especially in Dobrogea. Climate accidents are increasingly studied in fruit trees in recent years under global climate change. The limitative factor of the peach production in this area is represented by temperature oscillations during winter, i.e. relatively high values followed by low temperatures, which may compromise the fruit yield in certain years (2010; 2011; 2012). At the Research Station for Fruit Growing Constanta, a total of 6 cultivars of peach (Springcrest, Springold, Collins, Cardinal, Redhaven, Southland) with different maturation periods were studied. This paper presents the manner in which the peach tree species replied to winter frosts in the climatic conditions recorded in the winters of 2010, 2011 and 2012. The obtained results demonstrate the importance of choosing the proper assortment of peach cultivars for the region.

Key words: *Prunus persica, late frosts, Cardinal, Redhaven, Southland, loses.*

INTRODUCTION

Peach fruit tree is the third species after apple and plum trees in our country and is grown in warmer areas with average annual temperature of 10 to 11.5°C, with deep porous soil, pH between 5.7 and 7.5 and active limestone content not exceeding 7% g/g when using franc rootstock, and 15% when the rootstock is almond (Stanica F. and Braniste N., 2011).

Due to climate change in recent years it has been found that the resistance of peach cultivars is very different from one year to another.

The Black Sea Coast is situated in the area with the largest annual average sums of day length on the country′s territory, sums which exdeeds 2250-2300 hours (Paltineanu Cr. et al., 2000). Previous research papers hay revealed that the impact of climatic changes upon fruit-growing species can already be felt. For instance, by the end of the 1990s, the flowering of the trees in Germany was occurring several days earlier (Chmielewschi F.M. et al., 2004 and 2005). The vegetative season in Europe became longer by 10 days in the past 10 years (Chmielewschi F.M. and Rotzer T., 2002). Due to the early flowering of the trees, in certain regions of Europe there was an increase in the risk of damage caused by late frosts (Anconelli et al., 2004; Sunley et al., 2006; Legave J.M. and Clauzel G., 2006; Legave J.M. et al., 2008; Chitu E. et al., 2004 and 2008) or by the disorders in the pollination and fruit setting processes (Zavalloni C. et al., 2006).The purpose of this paper is to highlight the influence of winter frosts on some cultivars of peach production of Dobrogea in the lest three years.

MATERIALS AND METHODS

The observations and determinations were carried out in the plots cultivated with some of the nectarine tree cultivars 3 to 5 days after the climatic accidents recorded in the years 2010, 2011 and 2012. The plots are situated in the experimental base within the Research Station for Fruit Growing (R.S.F.G. Constanta), Valu lui Traian. The degree of differentiation of the flowering buds was relatively good. Samples of branches were collected and analysed, these belonging to 6 peach tree cultivars: Springold, Springcrest, Cardinal, Collins, Redhaven and Southland, which were planted in 1986. The stock parent that was used was the franc peach tree with a density of 625 trees/ha (4m x 4m

planting scheme). The chosen shape of the canopy was the free palmette.
The soil is a calcareous chernozem, with a loamy texture and a low alkaline pH (8.2) on its entire profile. On average, the climatic conditions were also favourable to the growth and fructification of the trees, with the exception of the years 2010, 2011 and 2012, when a strong frost occurred in January and February, causing the loss of several flowering buds. The climatic data were recorded with the aid of an automatic meteorological station, type WatchDog, and were processed as diurnal averages.
It was found that the resistance is very different peach cultivars from year to year due to climate change in recent years and the magnitude of climatic accidents. Determinations were carried out in order to assess the losses of flowering buds due to temperature variations during winter and the low diurnal temperatures.

RESULTS AND DISCUSSIONS

Although the south-eastern part of Romania has been considered to be favourable to the culture of peach tree, this suffered because of the climatic variations, mainly the aggressiveness of the low temperatures in alternation with the maximum positive values. The peach tree recorded losses because of these variations which occurred during the dormancy period in the climatic conditions of 2010, 2011 and 2012.It was noticed that the resistance of peach tree cultivars differs from one year to another because of the climatic changes occurred in the past years. Other factors are: the alternation between minimum and maximum temperatures during winter, which reduces the trees' resistance and last but not least, the severity of the climatic accidents (Figure 1).
Figure 2 reveals the fact that the coldest month in the period October 2009 – March 2010 was January 2010, when, for 10 consecutive days, the values recorded ranged between-10.1°C (January 29th) and-17.7°C (January 24th and 25th). Moreover, in the same period, the temperatures in the valleys dropped bellow-18°C, up to-20°C (local observations). These values, together with the big diurnal differences in temperature in the month of February caused the loss of some flowering bud, in early cultivars such as Springold (61%), Springcrest (59%) and Cardinal (39%).

Figure 1. Aspects of the winters of 2010, 2011 and 2012 with the frost on the branches

In the October 2010-March 2011 period, the lowest temperature was recorded in January:-12°C. The lowest temperature recorded during this period affected Springold cultivars in 40% and Spingcrest with 38%.
As can be observed in Figure 2c, January was the coldest month, with 9 days displaying average diurnal values ranging between-10.2°C and-17.6°C. These values, together with the extreme amplitudes in February (7 days with average diurnal values ranging from-10.4°C to-16.4°C) and 8 consecutive days of glazed frost and ice on branches caused the loss of 31%-63% of the flowering buds of all the studied cultivars.

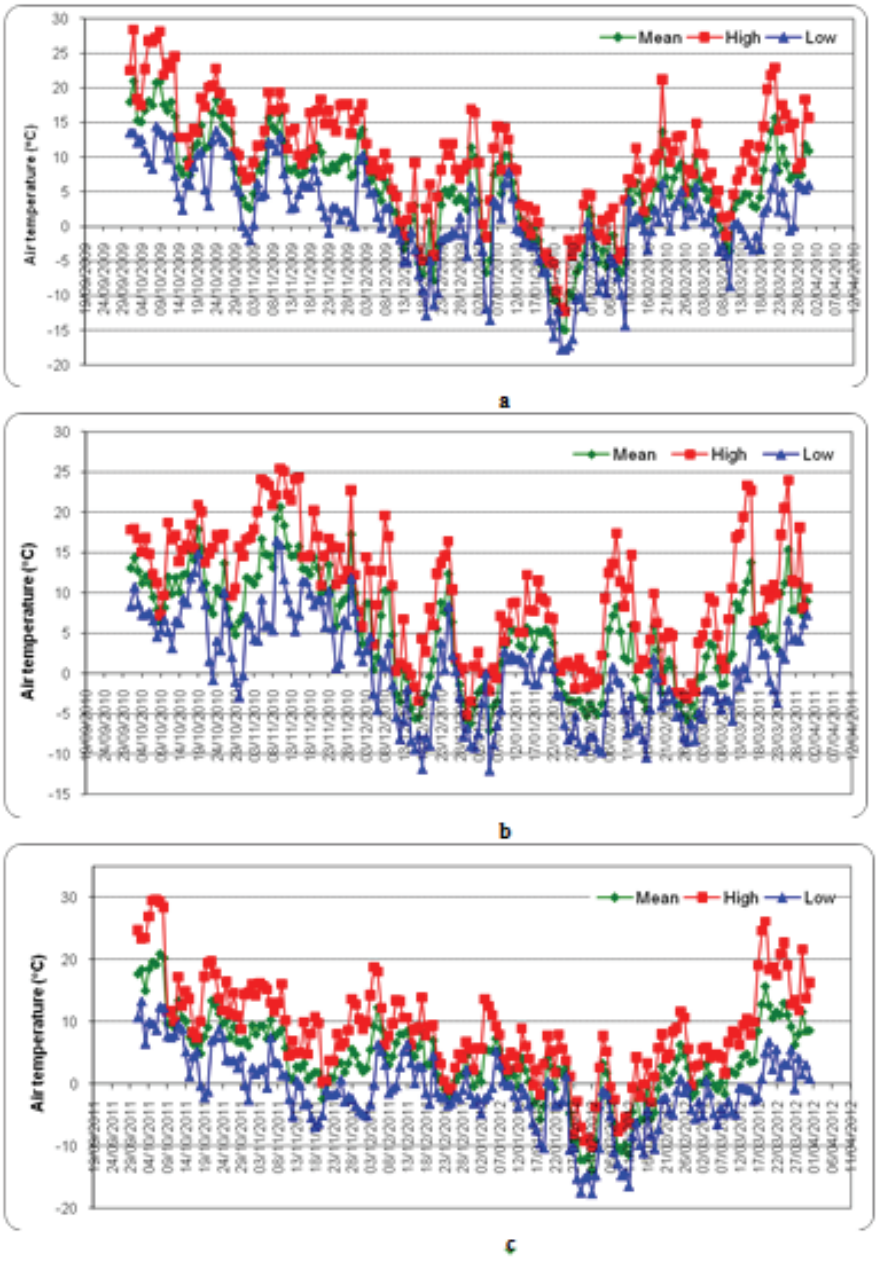

Figure 2. Air temperature (°C) in the cold periods: October 2009 – March 2010 (a), October 2010 – March 2011 (b), October 2011 – March 20120 (c) at Valu lui Traian, Constanta

Thus, the losses for the Springold cultivar were of approximately 61% in 2010, 39% in 2011 and 89% in 2012, there being differences between cultivars. The losses caused by frost for the Springcrest cultivar were of 59% in 2010, 37% in 2011 and 84% in 2012. For the Cardinal cultivar the losses were of 39% in 2010, 29% in 2011 and 66% in 2012, whereas for the Collins cultivar, the values were 37% in 2010, 21% in 2011 and 54% in 2012. For the Redhaven cultivar the values were the following: 32% in 2010, 23% in 2011 and 62% in 2012. Finally, for the Southland cultivar, the

losses represented 29% in 2010, 16% in 2011 and 48% in 2012 (Figure 3).

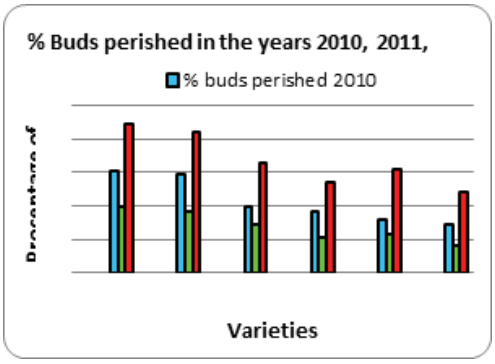

Figure 3. Procentage of peach tree flowering buds perished due to frosts during the winter of 2010, 2011 and 2012 at Valu lui Traian, Constanţa

Under these conditions, the Springold and Springcrest cultivars were destroyed at a level of magnitude over 60%, the Cardinal cultivar – 45%, the Redhaven cultivar, which was less afftected, was destroyed at a level of 39%, while the Collins and Southland cultivars were affected with 37% and 31%, respectively (Figure 3). The climatic accidents recorded in the months of January and February 2010 and 2012, when the temperature suddenly dropped to-17°C (minimum diurnal temperature in 2010) and-16.4°C + 8 days of hoarfrost in 2012 affected the peach production for the early cultivars Springold, Springcrest and Cardinal and partially for the Redhaven, Collins and Southland cultivars (Figure 4 and 5).

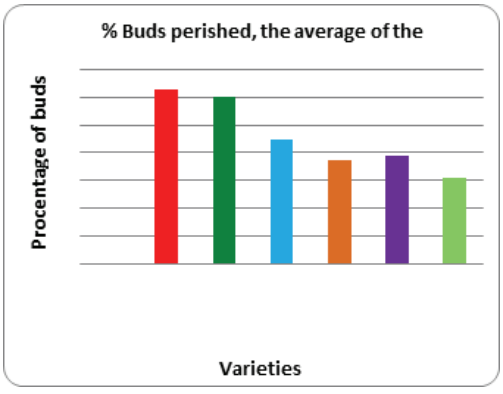

Figure 4. Procentage of peach tree flowering buds erished because of frosts (average over the three years), Valu lui Traian

Springold 2012

Cardinal 2012

Figure 5. Aspects of the winter of 2012 with glazed frost on the branches

CONCLUSIONS

The fruit production of the peach tree species was affected in variable percentages according to the cultivar, following the climatic accidents recorded in the winters of 2010, 2011 and 2012.

The novelty of the results is the fact that the frosts in the winters of 2010, 2011 and 2012 affected the peach tree species according to the cultivar (approximately 31-63%).

The flowering buds losses were over 60% in Springold and Springcrest cultivars: however these cultivars were also planted in the lowest altitude locations.

The smallest losses in the three studied years (2010, 2011 and 2012) were recorded the Southland cultivar.

There was an increasing trend in frost damages for the last three years.

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INFLUENCE OF FUNGICIDES AND ANTAGONISTIC YEAST PRODUCT ON POSTHARVEST STRAWBERRIES QUALITY

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Abstract

Decay of fruits after harvest often causes loss as a great 30-40% of harvest crop. Much of this is due to rot microorganisms which are currently controlled by fungicides and antagonistic yeast treatments but they may have potential toxicity on human health and the environment. Biological control of postharvest diseases presents an alternative and attractive option. Therefore the aim of this study was to evaluate effects of preharvest application of fungicide treatments on decay and quality of strawberry fruit and during storage. Strawberry fruits were analysed in all experimental variants for quality parameters (dry matter, titratable acidity, soluble solids, ascorbic acid content, anthocyanins) at harvest and after cold storage. The results obtained indicates that preharvest application of antifungic treatments maintaing quality of strawberry postharvest and during storage and reduce the appearance of gray mold. Vitamin C and soluble solids slightly decreased after cold storage period for both control and treatments variants. Also, preharvest treatment does not affected the total anthocyanins content in fruit at harvest and during cold storage.

Key words: *biologic control, Botrytis cinerea, decay, fruit quality.*

INTRODUCTION

Strawberries are known as a highly perishable fruit and susceptible to mechanical injury, physiological deterioration and microbial decay, but very appreciated by the consumers (Costa et al., 2011). However, a considerable amount of strawberry fruit is lost during fruit growth and after harvest because decay.

The flavour is one of the most important properties that gives commercial value to the fruits in generally. Strawberry flavor is conditionated in part by the balance between sugars and acids expressed in ripe fruit. It is very important to know the best stage at which we can harvest the fruits. Attempts have been made to assess the stage of ripeness of strawberry fruits in terms of titratable acidity or sugar/acid ratio.

The high perishability of strawberry is the reason for its relatively short period of harvest compels the producer to sell the fruits immediately, evidently prejudicing him with respect to the reduced price due to its sale in large volumes. Due to high moisture, sugars and acids content, these fruits are high perishable, being an ideal substrate for the proliferation of microorganisms, such as fungus of the generous: *Botrytiscinerea* and *Rhizopus stolonifer*.

Among the main problems associated with the quality of strawberry, we can distinguished the grey mold (*Botrytis cinerea*) a common type of rottenness that attacks the fruit during any of its developing stage, and is the main disease during ripening time. (Sesan, 2006; Wszelaki and Mitcham, 2003).

Due to the high affinity to rotting, researches are being conducted to find a method of conserving the fruit for a longer period by the use different methods in order to make its transport to farther markets viable.

Promising results have been achieved using antagonistic microorganisms to effectively inhibit postharvest pathogens of different harvested commodities (Abano and Sam-Amoah, 2012; Zhao et al, 2011; Xianghong and Shiping, 2009; Grabenisan et al., 2007; Janisiewicz and Korsten, 2002).

Taking into the account these and the fact that fruits are eaten especially by the children and by the people with health problems, the researchers are concerned to find storage methods without chemicals like synthetic fungicides (De Souza et al.,1999; Sanz et al., 1999). The cold storage atmosphere prevents decay development by retarding pathogenic microorganisms growth and reducing pathogen enzyme activity (Menel et al., 2012).

The use of synthetic fungicides render severe side effects affecting the environment and human health. The usage of antagonistic yeast product against postharvest pathogens offers a viable option with hopeful results.

The potential use of *Saccharomyces cerevisiae* yeast was studied and emphasize by some authors for corn and sorghum species (Piccinin et al., 2005; Roncatto and Pascholati, 1998). Until now, in literature there are very few information about the effects of *S. cerevisiae* yeast on disease and maintaining quality postharvest of strawberry (Gouvea et al., 2009). Therefore, the objective of this study is to evaluate the combined effect of antagonistic yeast (based on S.cerevisiae), synthetic fungicides and cold storage to prevent decay development and extend the shelf life of strawberry.

MATERIALS AND METHODS

Strawberry cultivars studied were Favette, Cardinal, Pandora, Hood. For all cultivars were applied three plant treatments prior to harvest, in different stages: at full bloom, fruit onset and preripening of fruit in three experimental variants:

V1-control-plants was sprayed with distilled water

V2-plants was sprayed with Topsin solution

V3-plants was sprayed with antagonistic yeast product (suspension of *Saccharomyces cerevisiae*)

Samples were taken from 15 fruit at harvest and after 6 days during cold storage (4º-5ºC). There were three replication for the assays in each treatment, and the experiment was repeated in two seasons. Fruits quality attributes was analyzed by specific methods:

- dry matter was measured by drying some known amount of fresh fruit to a constant weight in a oven at 105°C, the results were expressed in percentage
- soluble solids content (SSC) was determined by measuring refractive index of strawberry juice using an Abbe refractometer with temperature correction, and the results were expressed as °Brix
- titratable acidity (TA) content was measured by titration of fruit juice with solution 0.1 N NaOH until reaching an endpoint of pH 8.1 and expressed as a percentages of citric acid
-the ratio between the soluble solids content and the titratable acidity, which reflects the fruit taste feature, was derived.
- ascorbic acid content was spectrophotometrically determined using the 2,6-dichlorophenol-indophenol method and the results were expressed as mg /100 g FW
- total anthocyanins content was determinated using the pH diferential method (Giusti and Wrolstad, 2001). The pigment content was calculated and expressed as pelargonidin-3-glucoside/100 g FW, the most abundant anthocyanin in the strawberry fruit.
- the presence of Botrytis cinerea was visually evaluated during the experiment, expressed as a percentage of fruit showing decay symptoms.

RESULTS AND DISCUSSIONS

Strawberry fruits were analyzed in all experimental variants for quality parameters at harvest and after 6 days of cold storage (4-5ºC) in the aim to evaluate influence of antifungic treatments on fruit quality evolution.

The dry matter content remained practically constant at Favette and Pandora cultivars at harvest for all 3 variants (table 1). However we can observe an increase of dry matter for V2 and V1
variants at Cardinal and Hood at harvest. After storage dry matter increased slightly in case all variants studied for all four cultivars (table 2).

The fruits treated with antagonistic yeast (V3) had higher levels of the SSC to control for all cultivars studied at harvest stage. These results are in accordance with dates obtained by Gouvea et al., 2009. Strawberry fruit SSC decreased slightly after 6 days of cold storage for all three variants studied. Similar

results were obtained by Costa et al., 2011 and Almenar et al., 2007. This parameter is of commercial interest, especially for fresh fruit, because the consumer prefer sweeter fruit.

Little differences in TA content were also observed among treated strawberry and control at harvest (table 1) Strawberry presented an increase in acidity during storage as seen in table 2. These results are in agreement with studies of De Souza et al., 1999; Sanz et al., 1999.

The SSC/TA ratio decreased after 6 days of cold storage ranging from 16.62 to 8.54 (table 2) with values above the commercial required (8.00) characterized by equilibrate taste.

Sugars and acids are utilized as the main substrates of respiratory metabolism, causing corresponding changes in SS, TA and pH during storage. The differences in TA and SSC results among different experiments may be related to different respiratory rates of cultivars. Thus as higher SSC degradation is related to great respiratory rate and to higher fruit decay.

At harvest there are no differences between the anthocyanins content of varieties treated with fungicides or yeast product and the untreated varieties (table 1). The content of anthocyanins varies according to the cultivar. Such as Hood cultivar have a content higher compared to Favette and Cardinal and closed to Pandora These results are in agreement with results of Costa et al., 2011 and Zheng et al., 2007.

After 6 days of storage the total anthocyanins content increase slightly. There are no differences between cultivars treatments and untreatment after storage.

The strawberry are fruits with medium ascorbic acid content and all cultivars studied presents an average content of 65 mg/100 g fresh weight and varied with cultivar at harvest**.** After 6 days of cold storage ascorbic acids content decrease for all cultivars studied and there are no differences between control and treatment fruit (table 2).

It can be seen that the cultivars with high content of anthocyanins at the same time have a high concentration of ascorbic acid. These cultivars have also had a low percentage of *Botrytis cinerea* compared to other, after 6 days of storage.

The quantity of decayed fruit increases with storage time but is decrease in variants treated with fungicides and antagonistic yeast (table 2). In our study the presence of Botrytis cinerea was observed in great percent at untreated sample especially after 6 days of cold storage. These results are in agreement with observations of Costa et al., 2011 and Menel et al., 2012. Thus it can be concluded that as both treatments with fungicides and antagonistics yeast support resistance to infections and thus increase shelf –life of cultivars.

According to the results obtained by us, an essential role in maintaining the quality of fruits and disease resistance postharvest it has the antioxidant capacity of cultivars expressed their increased content in anthocyanins, ascorbic acid, polyphenols. Spraying with fungic treatments were effective in inhibiting strawberry fruit decay especially at harvest. Mold development on the fruits were also reduced by cold storage and treatments with yeast.

CONCLUSIONS

The results showed that efficacy of yeast product in inhibiting gray mold decay and maintaining the quality of fruit during storage. Evolution of quality parameters postharvest and after cold storage was dependent on cultivar.

An essential role in maintaining the quality of strawberries and disease resistance postharvest it has the antioxidant capacity of cultivars.

Therefore a combination of yeast product treatment with resistant cultivar provides a great new potential in preventing and controlling major diseases.

The results suggest that application of antagonistic yeast product before harvest may be a promising technology to maintain quality of strawberry postharvest and during cold storage.

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BEHAVIOUR OF SOME NEW VARIETIES OF TABLE GRAPES IN THE FIRST THREE YEARS AFTER PLANTING ON IMPROVED SANDY SOILS FROM SOUTHERN OLTENIA

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Abstract

The study was effectuated out on a number of 12 varieties of autochthonous and foreign origin. The experience was founded in the year 2010. Climatic conditions were favorable for cultivation of vines in year I and II and less favourable in the third year after planting, when they recorded, in winter, the minimum negative temperatures (-27 °C), well below the limit of resistance of the vine and in the summer very high temperatures associated with drought rendered and sunstroke. After planting all vines were entered in vegetation. At the end of vegetation period the percentage of normally developed vines was between 75 and 100. In year II continued the process of planting in places empty. In the year III (2012) have obtained the grapes on the buds situated at base of vines because the buds situated above the snow (about 35-40 cm thick) were perished all buds. With all these difficulties were emphasized a few varieties from the point of view of precocious and from the point of view of the potential to make on the short elements (2-3 eyes). From the point of view of precocious has noted the Prima Cl. 1022, that reached maturity of consumption at 15.07.2012. Transilvania and the Prima Cl. 1022 varieties, were highlighted, and in terms of the production of grapes, which means they have the potential to make on the short elements. The Prima Cl. 1022 achieved 9998 Kg/ha yield and Transilvania achived 10073 Kg/ha yield.

Key words: *range, sandy soils, table grapes, vine.*

INTRODUCTION

Viticulture is an important branch of culture in our country. Culture of table grape varieties is the second production direction for harvesters in the areas with higher heat as sandy soils from Southern and South-Western Oltenia. Vine varieties with table grapes are appropriate conditions of culture in our country (Martin T. et al., 1974).

In order to establish the different types of table grape varieties have carried out studies on their behaviour in different areas (Baniţă P., Vlădoianu Em., 1979; Costescu Adriana et al., 2012; Dumitru I. et al., 2009; Rotaru L., 2005; Mohammad A, Popa A., 2005).

After an assortment of table grape varieties is continuous improvement a priority of this process (Cichi D, Costea D.C., 2008; Popa C. et al., 2008; Popa C. et al., 2009; Stroe M.V. et al., 2012).

MATERIALS AND METHODS

The study was effectuated out on a number of 12 varieties of autochthonous and foreign origin. The experience was founded in the year 2010. The climatical conditions were favorable for cultivation of vines in year I and II and less favourable in the third year after planting, when they recorded, in winter, the minimum negative temperatures (-27 ^{o}C), well below the limit of resistance of the vine and in the summer very high temperatures associated with drought and sunstroke.

The studied varieties were the following: *Silvania, Timpuriu de Cluj, Muscat de Hamburg Cl. 4 Pt., Tamina, Someşan, Splendid, Napoca, Victoria, Prima Cl. 1022, Coarnă neagră selecţionată, Muscat de Hamburg Cl. 202, Transilvania.* Were planted 20-40 vines from each variety. The fertilization, at land preparation, made with 60 t/ha manure, 300 kg/ha Complex 15 15 15. At planting were applied 5 Kg/pit

manure semifermentated. In vegetative period, in may month, was applied 100 kg/ha Complex 15 15 15. To combat pests and diseases, we maked a total of 11 chemical treatments, 3 with Ridomil plus 48,5 WP – 0.3% + Sulfomat 80PU - 0.5%, 3 with Shavit F 72 WDG - 0.2%, 3 with Champ 77 WG 0.3% + Sulfomat 80PU - 0.5% and 2 with Dithane M45- 0.2%+Sulfomat 80PU -0.5%.

Were effectuated the following experimental observations and measurements:

- entrance in vegetation;
- planting rate of striking root;
- the number of eyes formed on the vine during the year;
- annual increases total length;
- number of shoots with thickness exceeding 6 mm at the second internode;
- grapes production in III year after planting.

The climatical conditions were favourable in I and II years (2010 and 2011 years) after planting and less favourable in III year (2012 year). In 2012 year perished all buds located above the layer of snow, which have 35-40 cm thick. Although all vines entered in vegetation after planting but not all have developed normally in the first year (Table 1). At the *Transilvania* variety, all planted vines have developed normally. In others, losses were between 1 and 9 vines, respectively 2.5% at the varieties *Coarnă neagră selecţionată* and *Muscat Hamburg Cl. 202* and 25% at the variety *Someşan*.

Table 1. Percentage of vines developed normally at the end of vegetation table grape varieties in first year after planting

Variety	Number of planting vines	Remaining vines		Number of vines sickly or feeble	
		nr.	%	nr.	%
Silvania	40	33	82.5	7	17.5
Timpuriu de Cluj	20	18	90	2	10
Muscat de Hamburg Cl. 4 Pt.	40	36	90	4	10
Tamina	20	19	95	1	5
Someşan	20	15	75	5	25
Splendid	40	37	92.5	3	7.5
Napoca	20	17	85	3	15
Victoria	40	31	77.5	9	22.5
Prima Cl. 1022	40	31	77.5	9	22.5
Coarnă neagră selecţionată	40	39	97.5	1	2.5
Muscat de Hamburg Cl. 202	40	39	97.5	1	2.5
Transilvania	40	40	100	-	-

The vigour of vines is shown by the length of the annual total number of nodes formed on vine (Table 2). The total length of annual increases recorded the values between 173 cm/vine at *Victoria variety*, and 507 cm/vine at *Transilvania variety*. With good results in this regard were highlighted *Tamina variety* (453 cm /vine). The worst result were achieved at *Timpuriu de Cluj* variety (185 cm/vine) and *Someşan* variety (188 cm/vine).

Although, internodes length is character variety, the number of nodes formed on a vines are approximately proportional to the length total annual increasing. The largest number of nodes formed at *Transilvania* variety (120/vine) and the lowest, the *Victoria* variety (39/vine).

In II year after planting continued the process of planting in places empty.

Table 2. Vine vigour in the first year after planting the varieties of table grapes in first year

Variety	Total length of annual increases in the vine (cm)	Number of nodes formed
Silvania	230	65
Timpuriu de Cluj	185	58
Muscat de Hamburg Cl. 4 Pt.	293	81
Tamina	453	110
Someşan	188	49
Splendid	296	63
Napoca	326	87
Victoria	173	39
Prima Cl. 1022	199	53
Coarnă neagră selecţionată	368	83
Muscat de Hamburg Cl. 202	385	91
Transilvania	507	12

In this year the buds have resisted over the winter, so that the percentage of viability of vegetation was 100, all varieties.
Plant vigour, expressed through the length of vegetative increases and the number of shoots with a diameter greater than 6 mm above the insertion point, the values differ from one variety to another (Table 3).

Table 3. The viability of the buds at the entrance of vegetation and vigor all the different varieties of vines with table grapes in the II year of planting

Variety	Viability of the buds at the entrance of vegetation %	Total annual increases (cm/vine)	Number of shoots with a diameter greater than 6 mm above the insertion point/vine
Silvania	100	153	3
Timpuriu de Cluj	100	280	3
Muscat de Hamburg	100	300	4
Tamina	100	275	2
Someşan	100	555	2
Splendid	100	620	3
Napoca	100	410	3
Otilia	100	366	3
Victoria	100	260	2
Prima Cl. 1022	100	350	3
Coarnă neagră selecţionată	100	980	4
Muscat de Hamburg Cl. 202	100	554	3
Transilvania	100	770	4

The most vigorous variety was *Coarnă neagră selecţionată,* which on the four shoots registered the annual increases of 980 cm/vine. The variety with vigour of the lowest was *Silvania* (153 cm/3 shoots).
In the III year (2012) have obtained the grapes on the buds located at base of vines because the buds situated above the snow layer (about 30 cm thick) were all perished.
Because to the reduce temperature value the dry cutting was effectuated using the short elements, of 2-3 eyes length. Even in these conditions have not been in all growth buds, at all varieties. The percentage of bud growth was between 70 and 100 (Table 4). Two varieties have a viability percentage of 100%, *Timpuriu de Cluj* și *Splendid,* only. The lowest number of buds go in the vegetation at the *Tamina* variety, 68 percent. With the growth of buds over 90% were most varieties, 8, *Silvania* and *Muscat of Hamburg*, with a percentage of 95. Other varieties have a percentage of the growth of buds between 80 and 89.
Vines vigour was expressed by the sum of total annual increases, the number of eyes formed on the vine and the number of shoots with a diameter greater than 6 mm, in the course of a year.
The difference of vigour between the vines are very large, in specially, as regards the amount of the total annual increases and the number of eyes formed on the vine in the course of a year (Table 4).
Thus, if the *Silvania* variety recorded 625 cm/vine, the annual increases and 64 eyes formed on the vine, at the *Victoria* variety, the same elements have values of 1364 cm/vine and 84 eyes/vine. The less vigorous varieties are part of *Silvania*, are *Timpuriu de Cluj* and *Someșan*. Differences were recorded regarding of the number of the shoots with diameter of 6 mm to the vine, which has values from 3 to 5.
Although it suffered considerable losses of buds and wood stocks were able to fruiting, even if not at the level of genetic potential. Had demonstrated the potential of fruiting of these varieties to make grapes on the short elements (2-3 eyes length). If some varieties of fruiting process was symbolic, others that production was at the level of a normal year from climatical point of view, with a large capacity of fruiting on the short elements inserted to the vine base, such as the *Transilvania* (10073 Kg/ha) and the *Prima Cl. 1022* (9998 Kg/ha), (Table 5). A level of production have been satisfied with the varieties *Muscat de Hamburg* (5302 Kg/ha), *Muscat de Hamburg Cl 202* (4999 Kg/ha) and Victoria (4923 Kg/ha). Without the potential for fruiting on the short elements were *Otilia* (1515 Kg/ha) *Someşan* (2196 Kg/ha), *Napoca* (2272 Kg/ha) and *Coarnă neagră selecţionată* (2575 Kg/ha). The quality of production of grapes had advantages and disadvantages due to the climatical conditions of this year for agriculture (Table 5).

Figure 1. Prima Cl. 1022 variety

The advantages in terms of the content of total sugars, which recorded higher values. Instead the weight of 100 grains and total acidity titrable were smaller. Varieties of table grapes accumulates usually, lower levels of sugars, at the consumption maturity.

In this year the content of sugars exceeded the value of 152 g/l in all varieties, from the *Transilvania* variety, to 241 g/l. The lower sugar content of 152 g/l was recorded the *Prima Cl. 1022* variety, which has reached maturity early consumption, to date 15.07. 2012.

Table 4. The viability of buds at the entrance of vegetation and vigour all the different varieties of vines with table grapes in the 3rd year of the planting

Variety	The viability of the bud at the entrance of vegetation %	Sum of total annual increases (cm/vine)	Number of eyes formationed on the vine	Number of shoots with a diameter greater than 6 mm, in the course of a year mm/vine
Silvania	95	625	64	3
Timpuriu de Cluj	100	658	66	5
Muscat de Hamburg	95	788	82	5
Tamina	68	826	86	5
Someşan	92	690	72	5
Splendid	100	770	67	5
Napoca	92	818	64	3
Otilia	84	790	74	4
Victoria	84	1364	84	4
Prima Cl. 1022	87	898	65	5
Coarnă neagră selecţionată	90	1124	85	5
Muscat de Hamburg Cl. 202	90	1068	80	5
Transilvania	100	1256	99	5

A sugar content of over 200 g/l were recorded and the varieties *Otilia* (204,5 g/l), *Muscat de Hamburg* (214,1 g/l). A sugar content of more than 180 g/l have been *Tamina and Coarnă neagră selecţionată* (184,3 g/l), *Someşan* (185,4 g/l) and *Timpuriu de Cluj* (192,8 g/l). A lower potential of sugar, along with the *Prima Cl. 1022,* are *Napoca* (162 g/l).

Climatical conditions influenced the negative weight of 100 grains of grapes specially to late maturing varieties. The varietiy which has recorded the lowest weight, 167 g, was *Silvania* and the variety with the highest weight was the *Tamina,* 661 g. Were emphasized the *Victoria* (648 g) and *Transilvania* (616 g) varieties. Varieties with a weight of 100 grains smaller are *Silvania, Someşan, Napoca, Timpuriu de Cluj.* Total titrable acidity expressed in g/l H_2SO_4, decreased due to very high temperatures and drought in all varieties studied, with values between 2.1 and 4.2 g/l H_2SO_4. The lower the value of the total titrable acidity was the *Silvania* variety (2.1 g/l H_2SO_4). Higher values, which have contributed to a more balanced taste, were recorded at *Transilvania and Tamina* varieties (4 g/l H_2SO_4.

Lower values of total titrable acidity registered at varieties *Timpuriu de Cluj* (2,15 g/l H_2SO_4), *Napoca* (2,25 g/l H_2SO_4) and *Victoria* (2,8 g/l H_2SO_4).

In this year the vegetative stage of vines were carried out close to normal until around June 15 (Table 6). Amid increasing temperature and installation of drought, the sum of temperature for a certain vegetative stage was achieved in a
shorter time, so the vegetative stage have succeeded with rapidity. In this way the precociousness of varieties has increased, evidence that some varieties of ripe stage began on the 26.06.2012, at *Prima Cl. 1022* variety.
The appearance of leaves, flourished and started farming grains stages were conducted like some normal years of climatical point of view. The appearance of leaves started most early on the *Someşan at* 04.04.12 and the latest, on the date of 14.04.12, at *Coarnă neagră selecţionată variety*. The end of this vegetative stage occurred, most early on the *Someşan* on 9.4.2012, and later, on data 20.04.12 at *Coarnă neagră selecţionată variety.* The *Prima Cl. 1022* variety, which was the early, the appearance of leaves began on the 9.4.2012 and finished in 16.04.2012. Blooming stage began, most early, on 12.05.2012 and ended, at early, on 23.05.2012 data to *Prima Cl. 1022* variety.

Table 5. The production of grapes and the quality of the different varieties of vines in the 3rd year after planting

Variant	Yield Kg/ha	Weight of 100 grapes grains g	Total sugar g/l	Total titrable acidity g/l H_2SO_4
Silvania	2575	167	173.7	2.1
Timpuriu de Cluj	1628	261	192.8	2.15
Muscat de Hamburg	5302	305	214.1	3.8
Tamina	2424	661	184.3	4
Someşan	2196	237	185.4	3.75
Splendid	4544	399	173.7	3.1
Napoca	2272	265	162	2.25
Otilia	1515	250	204.5	3.5
Victoria	4923	648	153.8	2.8
Prima Cl. 1022	9998	372	152	3.8
Coarnă neagră selecţionată	2575	316	184.3	3.75
Muscat de Hamburg Cl. 202	4999	389	196	3.5
Transilvania	10073	616	241	4.2

Table 6. Phenological observations at different vine varieties with table grapes in the 3rd year after planting, 2012year

Variant	The appearance of leaves		Blooming		Farming grains -Biginning-	Ripe stage -Biginning-	Maturity
	Biginning	end	Biginning	end			
Silvania	10.04.12	17.04.12	20.05.12	03.06.12	27.05.12	10.07.12	20.08.12
Timpuriu de Cluj	06.04.12	12.04.12	19.05.12	03.06.12	25.05.12	07.07.12	16.08.12
Muscat de Hamburg	06.04.12	12.04.12	21.05.12	03.06.12	26.05.12	12.07.12	17.08.12
Tamina	06.04.12	12.04.12	20.05.12	04.06.12	26.05.12	12.07.12	17.08.12
Someşan	04.04.12	09.04.12	20.05.12	04.06.12	26.05.12	13.07.12	14.08.12
Splendid	05.04.12	12.04.12	22.05.12	04.06.12	27.05.12	08.07.12	14.08.12
Napoca	07.04.12	13.04.12	14.05.12	29.05.12	19.05.12	06.07.12	20.08.12
Otilia	05.04.12	12.04.12	20.05.12	04.06.12	26.05.12	09.07.12	17.08.12
Victoria	10.04.12	16.04.12	22.05.12	06.06.12	27.05.12	15.07.12	20.08.12
Prima Cl. 1022	09.04.12	16.04.12	12.05.12	23.05.12	18.05.12	26.06.12	15.07.12
Coarnă neagră selecţionată	14.04.12	20.04.12	23.05.12	09.06.12	28.05.12	18.07.12	25.08.12
Muscat de Hamburg Cl. 202	09.04.12	15.04.12	22.05.12	06.06.12	27.05.12	12.07.12	20.08.12
Transilvania	12.04.12	17.04.12	23.05.12	09.06.12	28.05.12	18.07.12	22.08.12

Blooming stage was immediately followed by the beginning of the growth of the grains, which triggered the main early on 25.05.2012 data at *Prima Cl 1022* variety. Where as blooming stage lasts about 12 days, the period of growth of the grains overlap a few days over this stage, because the blooming has broken down. The following vegetative stages were produced in fewer days than was known due to the accumulation in a shorter time to

temperature required for a different stages. As I mentioned above ripe stage began on June 6.06. 2012 at *Prima Cl 1022* variety and on 6.07.2012 at *Napoca* variety.

CONCLUSIONS

In first year at the *Transilvania* variety, all planted vines have developed normally. In others, losses were between 1 and 9 vines, 2.5% at *Coarnă neagră selecţionată* variety and *Muscat Hamburg Cl. 202* variety, and 25% for the *Someşan* variety.

From point of view of vigour emphasized *Transilvania* variety with 120 nodes formed on vine and 507 cm the total length of annual increases.

In the II year of planting the vine vigour, expressed through the length of vegetative shoots and the number of shoots with diameter greater than 6 mm/shoot above the insertion point, the values differ from one variety to another. The table grape varieties at more vigorous variety was *Coarnă neagră selecţionată variety,* which on the four shoots registered a value of 980 cm.

The year three after planting, also, is for formation. Because of this, and to the fact that in 2012 the buds located at the height under 15-20 cm, were affected by the negative minimum temperatures, in the winter time, the varieties in question have not been expressing the true potential of fruiting. In this regard for the next year will take action to protect 2-3 shoots.

With all these difficulties were able to tear off a few varieties, from the point of view of the precociousness, or from the point of view of the potential to fruiting on the short elements (2-3 eyes length).

From the point of view of precociousness grapes table varieties noted the *Prima Cl. 1022* that reached consumption maturity at 15.7.12. *Transilvania* variety and the *Prima Cl. 1022* variety, were highlighted, and in terms of the production of grapes, which means they have the potential to fruiting on the short elements.

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RESEARCH REGARDING THE BEHAVIOR OF CLONAL FETEASCA NEAGRA 10 PT TO LOCAL CLIMATE CHANGES

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Abstract

Throughout numerous research stations and prestigious institutes and wine traditions in our country, owner of germplasm fond, we encounter vineyard center Pietroasa, which quality attributes derive from, on one hand the ecopedoclimatic specific conditions existing here and on the other hand from the scientific activity headed to creating new vine varieties and improving the main soils of the assortment through clonal selection. In the last years, though, as in almost all our country regions, we assist with certain worry to a series of extreme climate events (strong winds, maximum extreme temperatures in summer, minimum extreme temperatures in winter as well as the phenomenon called freezing rain, all with effects on the normal growing cycle of vine plants. In this paper it is observed the influence of the climate changes on the agrobiological and technological potential of the clonal selection Feteasca neagra 10, the newest achievement of S.C.D.V.V. Pietroasa (patented in 2010) between 2010-2012. Climate data has been collected from the research station's own weather station and implied daily observations regarding the evolution of the parameters – temperature, precipitations, insolation – and based on these parameters were calculated the climate indexes that define the favorability degree of an area, as well as the Huglin index. The results obtained after the study prove that they are in direct correlation with these area climate changes, and that on the short run have a positive influence on the precocity of grape maturation, on the sugar accumulation potential, all together giving an extra quality to the final product, the wine.

Key words: *climatical index, grape varietes, favourability, vineyard.*

INTRODUCTION

Although in the vineyard's assortment prevails grape varieties for white wines, the main winery profile is obtaining white, superior quality wines, in the Pietroasa wine area, characterized by a moderate drought microclimate, warm temperate, with cool nights (IS1, IH4, IF3), there are favorable conditions for varieties of quality red wines (Feteasca neagra, Babeasca Neagra, Merlot). In the present study, the evolution of qualitative parameters of the clonal selection Feteasca neagra 10 obtained in 2010 at P.V.R.D.S Pietroasa was observed in the conditions determined by area's climate changes troughout three wine years (2010-2012), which proved to be special under the climate recorded indexes report. At the same time were analyzed the correlations met between the accumulation and increase of the sugar quantities of the grape must and the higher values of the Huglin index (Tonietto and Carbonneau, 2004, Laget et al., 2008). The observations made are of local interest as well as national interest, because it gives undeniable proofs of climate annual changes, of which manifestations have consequences on the annual growing cicle of the vine. (Jones et al., 2005). The necessity of our reasearch derives from the fact that, in present time, the wine assortment is formed of old varieties and the replacement of these ones with new clonal selections is wanted, and have to correspond with the following parameters: to make maximum usage of the climate conditions, to have medium productivity and vigor, constant quality productions according to superior quality wines, and the quality to be expressed in a superior alcohol and acidity potential, and to have a very good pest, environment factors and diseases resistance and so on.

MATERIALS AND METHODS

To accomplish the objective presented above, the research was made between 2010-2012 in an experimental device placed on an sloping land, in the superior third of the slope with southeastern exposition and 12% inclination. The soil is limestone, the mother rock is at low depth, the reaction is low alkaline, with a high level of calcium carbonate which varies between 14% in the A horizon and 20-36% in the B horizon; in the C horizon limestone mother rock predominates. The biological material which is the object of this research is the clonal selection Feteasca Neagra 10Pt (Table 1). The selection was grafted on the Kober 5 BB rootstock, the grapevines were conducted on a semi-stem (Guyot on a semi-stem) at a planting distance of 2,0/1,2m, with a load of 30 buds/vine. The data was collected from the vineyard′s own weather station and regarded daily observations about the evolution of the parameters – temperature, precipitations, insolation and based on these parameters were calculated the climate indexes which define the degree of favorability of an area, the real heliotermic index (IHr), the hidrothermal coefficient (CH), the bioclimatic index of vine (Ibcv), oenoclimatic aptitude index (IAOe), as well as Huglin index calculation. The Huglin index (HI) is calculated from April the 1st to September 30th, in the northic hemisphere and it′s defined as follows:

$$IH = \sum_{01.04}^{30.09} \frac{[(Tm-10)+(Tx-10)]}{2} \times k$$

T*m* = Medium air temperature (ºC)

T*x* = Maximum air temperature (ºC)

k = day length coefficient according to the lattitude, with values between 1,02-1,06 for lattitudes of 40-50^0, and for Romania (44,1^0 – 46,0^0) it has the value of 1,04.

This reference index is used on a large scale in vineyards because it gives information about the heat potential of the area, presenting a high primary importance in choosing the right assortment on one hand and it is positively correlated with the accumulated sugar quantity on the other hand. The values of this index calculated in different wine regions determines this way not only a classifications of the indexes, but the establishment of the minimum temperature required for the progress of the growing cycle of the vines in that area.

The clonal selection (Table 1) was observed throughout the whole phenological specter, and in the harvesting moment, on a medium sample of 15 grapes there were made the following determinations: average weight of a grape, average weight of 100 grapes, gluco-acidimetric index, production/vine, sugar (g/l), acidity (g/l sulfuric acid). The results obtained were analyzed with the one-dimensional indexes – arithmethic mean, maximum, and minimum, indexes that can be applied for the majority of the quantitative characters which have the property to variate in time and space.

Table 1. Main characteristics of the clonal selection Feteasca Neagra 10 Pt

	**Ampelographic characteristics** Clonal selection of the Feteasca neagra variety, characterized by a large productivity potential accompanied by a high sugar accumulation potential. The grape is medium-large, cylindrical-conical, compact, with small, black grapes, uniform in size and colour, without manifesting the grape shrinking disease called "small grains" and "very small grains".
	Agrobiological and technological characteristics Fertility: 68% fertile buds Grape weight: 142g Production per bud: 2,8 kg Sugar: 242 gramms per liter Total acidity: 5,5g/l H_2SO_4
	Production direction (clonal selection type) It ensures quality productions and obtaining high quality red wines, intense in colour, smooth and balanced, with controlled name of origin (D.O.C). Important attributes of the selection: good productivity, high sugar content which in favorable years can reach 267 g/l (quality clone).

RESULTS AND DISCUSSIONS

Climate features of the wine years during experimentation period

Wine year 2010. Under the aspect of the thermal regime, January was extremely cold, and between January the 22nd – January the 31st there were registered consecutively minimum temperature values of the air under 25ºC, the absolute value of winter (of the month) was-26,6ºC, on the soil being of-27,9ºC, affecting the biological resistance of the plants. The hydric regime was a little bit over the normal values in spring, accompanied by the thermal regime as well as over the normal for the period, associated with the overheated temperatures, higher than 35ºC from August which favored the installation of hydric stress and the rush of ripening process of the grapes, the dehydration of the grapes and the reducing of their volume. Autumn was not uniform, drought in September and extremely cold in October (-4,4ºC), and in November it was registered a thermal surplus of +73,6ºC, (maximum values of 24ºC).

Wine year 2011. Regarding the temperatures, winter was close to the multi-annual values of the season. Summer was close to the normal thermal regime, with a medium season temperature of 21,5 ºC from the multi-annual average of 21,3ºC. The rain regime was variable during the summer, knowing a growth of 77,8 mm between June-July when hidrometeorological extreme phenomenons were signaled such as torrential rains, wind intensifications with an aspect of storm and severe hail on 24th of August which by intensity and duration produced damages of about 75-90%. Autumn was not uniform under the thermal and hydric aspect, excessively hot, with maximum values over 33-34ºC in the air temperature, in September, and cold with negative values under-5,2ºC in October.

Wine year 2012. The cold season registers severe temperatures (under -23ºC) and snow (February). Extreme negative temperatures, blizzard and glazed frost between January 24th and February 6th brought values of-23,1º C in air temperature, on soil recording -26,7ºC. February registered a record medium temperature value of -5,5ºC which was 4,4º C lower than the average multi-annual temperature of-1,1ºC. The amount of bud losses was due to the large interval in which temperatures maintained critical, but also to the rain phenomenon which froze on the vines strings (freezing rain) signaled between February the 4th-February the 6th. Spring was close to the normal limit, and the summer of 2012 was extremely drought, with a high hydric defficit on the base of a large thermal surplus which marked the progress of the physiological and biochemical processes at normal parameters, but as well as on the quality and quantity of the grape production. The summer of 2012 was remarked by a large number of days with consecutive maximum temperatures over 35ºC (41ºC-August 15th) and consecutive nights (tropical) with minimum temperatures of the air larger than 20ºC. Autumn was extremely hot, with air temperatures of 33ºC (September), poor in precipitations and the rain deficit accentuated in autumn was rebuilt increasingly starting with November.

The analysis of climate conditions in relation to the synthetic indexes

Analyzing the growing active period in accordance with the active balance, we can conclude that the year of 2012 was the only year in this study interval that had a high thermal contribution (3835,5) with multiple influences (positive and negative) in the growth and development of plants. So, the level and the amount of temperature degrees associated with a plus of insolation hour number, but also the soil drought cumulated with the atmosphere drought, determined the maturation phase of the grapes, 7 days earlier than normal (25th of July), determining an advance of the full maturity. Analyzing the values of the four synthetic indexes, it can be observed that the wine station registers high heliothermic resources, which have as a correspondent low water resources and that the most sensitive is the bioclimate index, which′s large specter is situated between 5,38-11,2. Regarding the evolution of the values of Huglin index, the values recorded during the time of the study show that it suffers a growth tendency from one year to another, with some exceptions (2007-2009), reaching a maximum of 2639,7 in the year of 2012, conditions in which the wine areal characterized by a warm temperate

climate (IH4), becomes for this year a hot climate (IH5) – (IS1, IH5, IF3).

Analyzing the obtained qualitative data

It is observed that, the results of the experiment are directly correlated with the unfavorable evolution of the climate factors during 2010-2012 and that, each year of culture, through the evolution of the weather recorded phenomenon, leaves a mark on the manifestation of one and each variety. Although the clonal selections comes from an old local soil (Feteasca neagra), with a climatic remarkable adaptability, the waves of cold and the absolute minimum temperatures recorded in the air of-26,6 ^{0} C (January 2010), of-23,2^{0}C (January 2012) produced important bud losses during the growing rest period.

In table 3, it is observed that the clonal selection Feteasca neagra 10 Pt, records a medium value of 42% winter buds viability, with a minimum of only 20% in the year 2012, minimum which was due to the large time period in which the temperatures maintained critical, but also to the phenomenon of rain frozen on the vine strings (freezing rain), between February the 4th-February the 6th. Analyzing the recorded production of 6,3 tones per hectar it is also observed that the smallest value is recorded by the clonal selection in 2012, when it obtained the smallest values of a grape medium weight values (175g), as well as a minimum weight value of 100 grapes (140g). It can be mentioned the fact that on this fond of low productivity, the sugar accumulated quantity reached the maximum level of 243 g/l, quantity that offers qualitative constancy and a high alcohol potential because this selection accumulates in the good wine years, around 242 g/l.

Table 2. Evolution of the climate elements in the wine area of Pietroasa (2007-2012)

Specification		Average 2007-2009	Year 2010	Year 2011	Year 2012	Max	Min
Thermic balance	global	4233,4	3920,4	4019,1	4205,7	**4233,4**	**3920,4**
	active	3577.2	3473,1	3388,3	**3835,5**	**3835,5**	**3388,3**
	useful	1677,2	1626,2	1616,2	**1955,6**	**1955,6**	**1616,2**
Absolute minimum temperature°C	Air	-17,13	-26,6	-16,1	-23,1	**-16,1**	**-26,6**
	Soil	-19,5	-27,9	-17,4	-26,7	**-17,4**	**-27,9**
The sum of the hours of real insolation (Sir)		2060,7	2036,4	2049,3	**2125,3**	**2125,3**	**2036,4**
The sum of the annual precipitations (mm)		522,6	**655,2**	601,1	579,6	**655,2**	**522,6**
Number of days of active period		205,6	214	207	**220**	**220**	**205,6**
Indices agroclimatics	The hydrothermic coefficient CH)	0,82	1,17	**1,19**	0,97	**1,19**	**0,82**
	The real heliotermic index (IHr)	**1,37**	1,12	1,05	1,08	**1,37**	**1,05**
	The viticultural bioclimatic index (Ibcv)	9,05	5,96	5,38	**11,2**	**11,2**	**5,38**
	Index of the oenoclimatic aptitude (IAOe).	**5185,7**	4816,4	4373,2	5074,5	**5185,7**	**4373,2**

Table 3. Evolution of quality parametres during 2010-2012

Specification		% viable buds	Yield (kg/vine)	Sugar (g/l)	Acidity g/l H_2SO_4	Gluco-Acidimetric Index	Average weight of a grape (g)	Weight of one hundred grapes (g)	Full maturity
Clonal selection Feteasca neagra 10 Pt									
Wine year	**2010**	**57**	**8,0**	235	**5,5**	4,3	**180**	**210**	16.09
	2011	49	7,0	**231**	5,8	**4,0**	**180**	165	**18.09**
	2012	20	**6,3**	**243**	**5,5**	4,4	**175**	**140**	**10.09**
	average	42	7,1	236,3	5,6	4,2	178,3	171,7	15.09
	min	**20**	**6,3**	**231,0**	**5,5**	**4,0**	**175,0**	**140,0**	**10.09**
	max	**57**	**8**	**243,0**	**5,8**	**4,3**	**180,0**	**210,0**	**18.09**

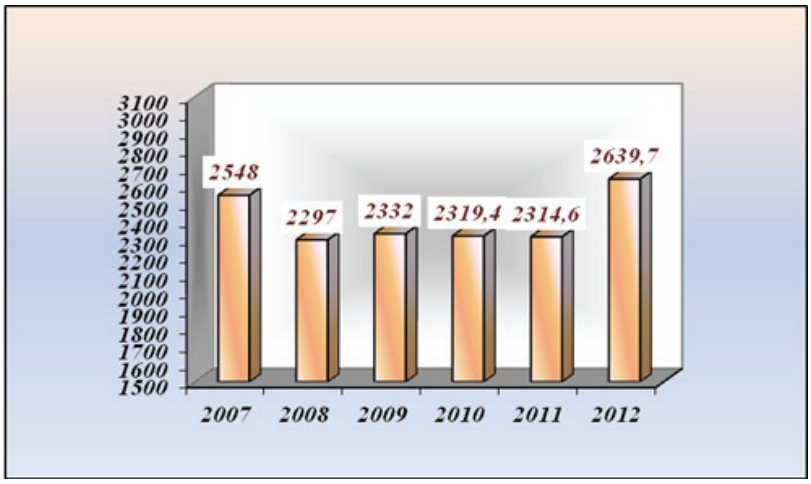

Figure 1. Evolution of Huglin Index between 2007-2012 in the wine area of Pietroasa

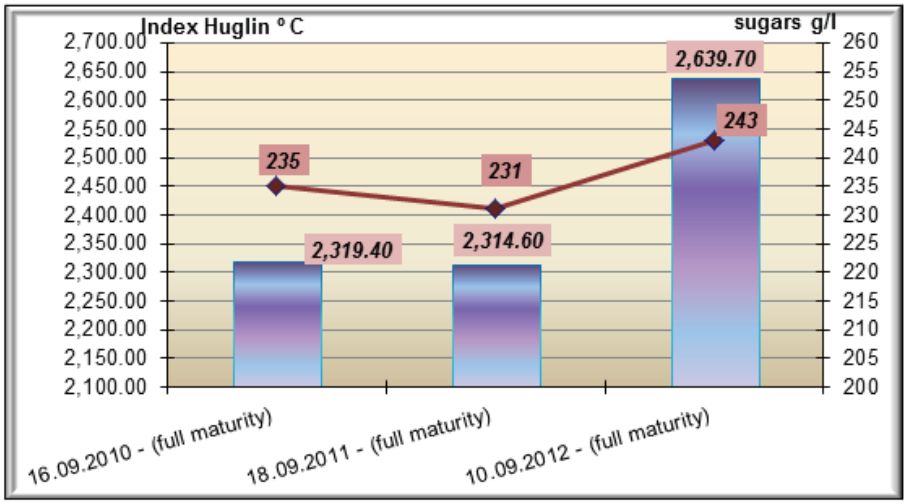

Figure 2. Evolution of Huglin Index and content sugars (g/l) for clonal selection Feteasca neagra 10 Pt

A partial conclusion that can be made is that the particularities of these wine years left a mark on the agrobiological and tehnological behavior of the clonal selection Feteasca neagra 10 Pt, and that particularly, the productions obtained in this years are much under the selection limits, practically hierarchial descending, as follows: 2010, 2011, 2012 without being majorly affected by those parameters that define and insure the quality of a wine (sugar, acidity).

It is worth mentioning the fact that, low productions of the year 2011 were due to the hydrometeorological extreme phenomenons under the form of torrential rains, wind intensifications with storm aspect and extreme hail on the 24th of August, which by intensification and duration produced damages in the Pietroasa area of 75-90%, and in the year of 2012, due to the extreme air temperatures limits (-23,1ºC) and (-26,7ºC – record value) at soil, which lead to bud losses of approximately 80% for all cultivated varieties in this wine area.

After the study, following the evolution of Huglin Index values in the wine area of Pietroasa (index that offers relations regarding the thermal potential of the wine area) and the

quantities of sugar accumulated in the maturation process, it can be observed a direct correlation in general (figure 2) and only in the conditions of the year 2012 the recorded values overcome the potential of the clonal selection (242 g/l). These accumulations (235 g/l, 231 g/l) reach a level which insures obtaining a good alcoholic potential for superior quality wines. Based on the same data, it can be observed a precocity of grape maturation (6-8 days in advance) undependable of the production year.

Figure 3. Clonal selection Feteasca neagra 10 Pt, 2010

CONCLUSIONS

It is observed that, special climate features of the last years, defined by the climate unspecific changes to Pietroasa station, determines a faster process of the phenophases and have an effect on the precocity of grape maturation and sugar accumulation which finally bring a plus of quality to the wines that are obtained.

Clonal selection newly obtained Feteasca neagra 10 Pt present promising perspectives due to the high degree of adaptation, and the success of integrating and expanding it in the culture depends on finding adaptation and long-lasting solutions to the climate changes in culture technologies, oenological practices and so on.

These information represent the basic elements taken into consideration for a better, deeper reflection on what it means choosing the assortment, on introducing into culture some varieties and clonal selections more appropriate for the culture technologies, on finding some long-lasting adaptation solutions to the climate changes of the technologies, oenological practices and so on.

In conclusion, the biological value of the new clones obtained by applying the clonal selection is sustained by the hereditary analyzed specific of each variety, biotype, or assortment group.

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PHYLOGENETIC ANALISYS OF *MANGIFERA* BASE ON *RBCL* SEQUENCES, CHLOROPLAST DNA

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Abstract

Genus of Mangifera has 69 species that mostly distributed around Borneo, Sumatra, Java and Malay Peninsula. Phylogenetic study of this genus is conducted in order to investigate the ancestor trait and relationships among those species. Phylogenetic tree is constructed based on nucleotide variation in rbcL gene within 16 samples of Mangifera : 13 species from Indonesia and 3 species from Thailand. Two species from the other genera are added as outgroups. Genomic DNA was extracted using CTAB protocol and amplified with rbcL primers. Sequencing result is analyzed using BLAST function on NCBI. Multiple sequence alignment from all samples of rbcL sequences is generated using Bioedit and ClustalX program. Subsequently phylogenetic is constructed by using Maximum Parsimony method in PAUP 4.0b10 software. The aligned rbcL comprised 905 characters which had 72 characters of parsimony informative with consistency index (CI) 0,889 and retention index (RI) 0,962. Phylogeny generated four main groups. Group I consist of M. cochinchinensis and M. macrocarpa (Thailand); group II : M. indica M. cesia, M. aplanat and M. altisima ; group III : M. laurina, M. longipes, M. similis, and M. gedebe ; group IV : M. laurina (Thailand), M. foetida, M. caesia, Mangifera spp, and M. odorata. Phylogenetic analysis revealed that Mangifera is monophyletic. There is a diversification between M. laurina from Indonesia and Thailand, as well as M. macrocarpa. Phylogenetic analysis also provides information which support the assumption that M. odorata is a hybrid of M. indica and M. foetida, and strongly support the assumption that M. longipes is a synonim of M. laurina.*

Key words: *Mangifera, Phylogenetic, rbcL.*

INTRODUCTION

Mangifera is a genus of Anacardiaceae. Most of its member are spread in Borneo, Sumatra, Java, Malay peninsula, and also other part of Asia (Mukherjee, 1953). Classification system of *Mangifera* has been developed. Mukherjee (1953) classified *Mangifera* in two sections with five species *incertaesedis*.

Today *Mangifera* has 69 species and classified to three subgenus they are *Mangifera*, *Limus* (Marchand), and *uncertain position* Kostermans and Bompard (1993).

Mangifera was determined from one ancestor (Mukherjee, 1953) otherwise Kostermans and Bompard (1993) contradicted that theory. They suggested that the genus original was two different ancestors.

Classification of *Mangifera* is still labile (Hidayat dkk, 2011). It is because the complexity of the vegetative and generative organ. The newer classification base on morphology is doubted (Yonemori *et al*., 2002).

It can be revealed by *uncertain position* for 11 species, beside that, there are two controversial species: *M. longipes* and *M. odorata.* In the old classification there is M. *longipes* (Mukherjee, 1953; Hou, 1978) but in the latest classification there is not (Kosterman and Bompard, 1993). They said that *M. longipes* is synonym with *M. laurina* but they showed different some morphology characters.

In other species, *Mangifera odorata* was the hybrid result between *M. indica* dengan *M. foetida* (Hou, 1978), but Kosterman and Bompard (1993) rejected the statement.

Some previous molecular phylogenetic analyses in *Mangifera* were done. A research of *internal trancribed spacer* (ITS) DNA nuclear

ribosomal to investigate 13 species of *Mangifera* (Yonemori et al., 2002); Using *amplified fragment length polymorphism* (AFLP) information by Yamanaka (Yamanaka *et al*., 2006); using *trn*L-F gene sequence to analysis four species of *Mangifera* (Fitmawati and Hartana, 2010); also phylogenetic and diversification of *Mangifera* from Indonesian and Thailand by Hidayat (Hidayat *et al.,* 2011).

All molecular phylogenetic researches of *Mangifera* were to analysis the phylogenetic and phyletic original of ancestor. So that, it is quite important to construct phylogenetic tree and analyze phylogenetic of *Mangifera* using different molecular marker, especially based on *rbcL* gene sequence as marker in plant. *rbc*L is gene for coding *ribulose-1,5-bisphospate carboxylase* (RuBisCO).

All kind of plants have this gene with moderate mutation. Mutation in *rbc*L has positive correlation with species diversification in Angiosperm (Barraclough *et al*., 1996), so it is expected will be able to give phylogenetic information closer to the real condition.

MATERIALS AND METHODS

16 samples of *Mangifera,* 13 samples of leaf are collected from Indonesia (Kebun Raya Bogor) and three samples from Thailand (Forestry Departemnt of Kasetsart University, Bangkok). Two *Outgroup,* they are *Bouea macrophylla* from Bogor and *Anacardium occidentale*. The last outgroup is taken from NCBI genebank (Aguilar and Sosa, 2004).

Three main steps of research are *rbc*L primer design, DNA genome isolation from *Mangifera* leaf and *rbc*L amplification, and the last is phylogenetic tree construction.

Template of *rbc*L gene was retrieved from *Mangiferaindicarbc*L gene in NCBI (Gadek, et al., 1996). That sequence was used for designing primer both *rbc*L-F and *rbc*L-R by *GenamicsExpression* software and confirmed with *primer blast* at NCBI.

DNA Genome was extracted from *Mangifera* leaf using CTAB method protocol (Porebski et al., 1997) with modification. Then, *rbc*L gene was amplified by PCR and sequenced in Macrogen *Inc* (Korea) with the same primer.

For constructing Phylogenetic tree, all the sequences were edited and performed alignment by *Bioedit* and *ClustalX* program (Thompson et al., 1997)

Phylogenetic tree constructed with maximum parsimony (MP) and neighbour joining (NJ) using PAUP* 40.b10 (Swofford, 2002). Appearance the phylogenetic tree use tree view win 32 software (Roderic, 2001).

Table 1. Plant material and origin

Number	NAME OF SPECIES	ORIGIN
1	*Mangifera caesia* Jack	Java, Indonesia
2	*Mangifera similis* Auet	Sumatera, Indonesia
3	*Mangiferamacrocarpa* Blume	Java, Indonesia
4	Mangifera *laurina* Blume	Java, Indonesia
5	*Mangiferagedebe* Miquel	Sumatra, Indonesia
6	*Mangifera* indica Lin	Java, Indonesia
7	*Mangifera sp*	Borneo, Indonesia
8	*Mangiferaapplanata* Kosterm	Borneo, Indonesia
9	*Mangiferacasturi* Kosterm	Borneo, Indonesia
10	*Mangiferaodorata* Griff	Java, Indonesia
11	*Mangiferafoetida* Lour	Java, Indonesia
12	*Mangiferaaltissima* Blanco	Java, Indonesia
13	*Mangiferalongipes* Griff	Java, Indonesia
14	*M. cochinchinensis* Engler	Thailand
15	*Mangiferalaurina* Blume	Thailand
16	*Mangifera macrocarpa* Blume	Thailand
17	*Bouea macrophylla* Griff *	Java, Indonesia
18	*Anacardium ocidentale* Lin**	Accession number in NCBI: AY462008.1

= outgroup

* *= outgroup which taken from* NCBI

RESULTS AND DISCUSSIONS

Phylogenetic tree result

The aligned *rbc*L comprises 905 characters. Of these, 807 characters are constant and 72 are potentially parsimony informative. From the most parsimony tree (MPTs), consistency index (CI) is 0,889 and retention index (RI) is 0,962. The values showed that all characters are important in constructing tree and RI reveal that homoplasy is very small.

Phylogenetic tree as shown in figure 1, it was constructed with maximum parsimony method and bootstrap 1000x. *Neighbourjoining* (NJ) method is also done to show difference of genetic distance and analyze similarity sequence among samples.

Phylogenetic analysis *Mangifera*

Phylogenetic analysis from the tree had revealed the important answer about the ancestor trait. It is monophyletic tree with four main groups. The first group consists of two species from Thailand which are *M. macrocarpa* (Thailand) and *M. cochincinensis*. Group II consist of *M. indica, M. caesia, M. aplanata*, and *M. altisima*. Group III consist of *M.longipes*, *M. laurina, M. similis,* and *M. macrocarpa*. Group IV consist of mix samples from Thailand and Indonesia, such as *M. laurina* (Thailand), *M.* sp*, M. kasturi, M. foetida,* and *M. odorata.*

The result reveal that two species of *Mangifera* from Thailand grouped in one but other species (*M. laurina*) join to Indonesian *Mangifera*. The group systems show some differences with classification system made by Kostermans and Bompard (1993).

Monophyletic character of *Mangifera* ancestor trait based on *rbc*L gene shows the same result with ITS (Yonemori et al., 2001) and *mat*K (Hidyat et al., 2011) with different DNA sequences. Overall results of *Mangifera* ancestor are monophyletic. The monophyletic ancestor of *Mangifera* is supported by character of stomata (Hidayat et al, 2009). Therefore, the consequence for the ancestor is agree with Mukherjee (1953), that said *Mangifera* come from one origin and divided into three species. That is *M.duperreana* as *root* of section I, *M. lagenifera* and *M.macrocarpa* as root of section II. That species are the oldest among all species of *Mangifera*.

Phylogenetic analysis also shows biogeography relationship of *Mangifera*. It can be seen from the diversification of same species, which is taken from difference land with long distance. Phylogenetic pattern among species also give information in species status and taxonomy implication in genus *Mangifera*.

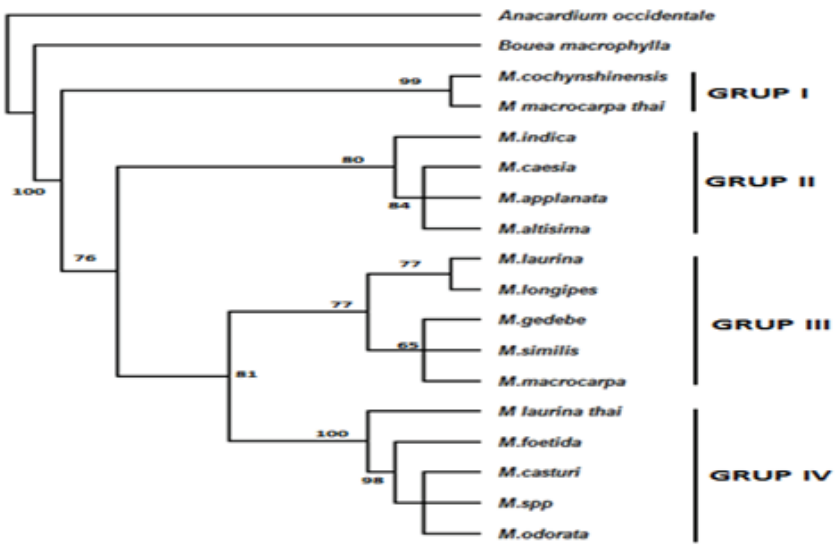

Figure 1. One of the most parsimony tree with bootstrap 1000x. The number on the node is Bootstrap value in%.

Biogeography of Genus *Mangifera*

Two species of *Mangifera* from Thailand made group I: *M. cochynsinensis* and *M. macrocarpa* (gambar III.1), meanwhile *M. laurina* joint in group III. It reveals diversification among species from Indonesian islands and Thailand especially in *M. laurina* and *M. macrocarpa* from Thailand and Indonesia.

Phylogenetic analysis based on *mat*K (Hidayat et al., 2011) in *Mangifera* also shows separation between species which come from different geography. It may be caused by different natural geographical condition since many years ago. So the sequences of DNA are changed or mutated. Another hypothesis is calculated from different variety of sample, yet this hypothesis is weak.

Phylogenetic relathionship and member status of *Mangifera*

Some closes species based on the phylogenetic tree, are *M. cochinshinensis* and *M. macrocarpa* from Thailand. These species are group I. While in group II, *M. caesia, M. aplanata*, and *M. altissima* also had *a* close relationship and *sistergroup* with *M. indica*. Relationship between *M. altissima* and *M. applanata* also close *Mangifera* phylogenetic based on *mat*K (Hidayat dkk, 2011). In group III, *M. gedebe, M. similis*, and *M. macrocarpa* closed and sister group with *M laurina* & *M. longipes*.

Group III is similar to *mat*K phylogenetic, otherwise *M. macrocarpa* in *mat*K is Thailand samples. Group IV, *M. odorata*, *M.* spp and *M. casturi* closed and *sister group* with *M. foetida,* beside *M. laurina* from Thailand is in group but outer than other.

Relationship in phylogenetic based on *rbc*L sequences also reveals status of *M. odorata* and status *M. longipes.* Species of *M. odorata* is the hybride of *M. indica* and *M. foetida* (Hou, 1978) . The conclusion does not directly agree with that opinion, but our analyses reveal it is possible. Not all the species (*M. odorata,M. indica* and *M. foetida*) are in one group. *M. odorata* and *M. foetida* are in one grup (group IV), while both of them are separated with *M. indica* (group II).

M. odorata and *M. foetida* also have close relationship based on ITS marker (Yonemori et al., 2002). AFLP analysis in showing hybrid status of *M. odorata* reveal that similarity index between *M. odorata* and *M. foetida* is higher than *M. indica* and *M. odorata* (Kiew et al., 2003; Teo et al., 2002). They indicate that *M. odorata* is hybrid result of *M indica* and *M foetida*, it was followed by *backcrossing* with *M. foetida*. So, it refers to be similar with *M. foetida* than *M. indica*.

The next research using *mat*K sequences analysis shows a different result. It shows that *M. odorata* is closer to *M. indica* than *M. foetida* (Hidayat dkk, 2011). This difference result among *rbc*L gene, ITS and *mat*K still support hybrid status of *M. odorata*). It needs more analysis using three combination of that marker to answer that controversial.

Phylogenetic tree give information of *M. longipes* status. Species *M. longipes* in newer classification of *Mangifera* is synonym with *M. laurina*. Species of *M. longipes* Griff spread in Sumatera, Malay Peninsula, Borneo, Lesser Sunda island and Philipina (Hou, 1978). however *M. laurina* Blume is endemic species in Philippines archipelago and Selayar island (Sulawesi) with local name are Mangga Aer, Mangga parih and Apale/i (local name in Palawan island). Based on the analysis, it is possible that both of them are different species.

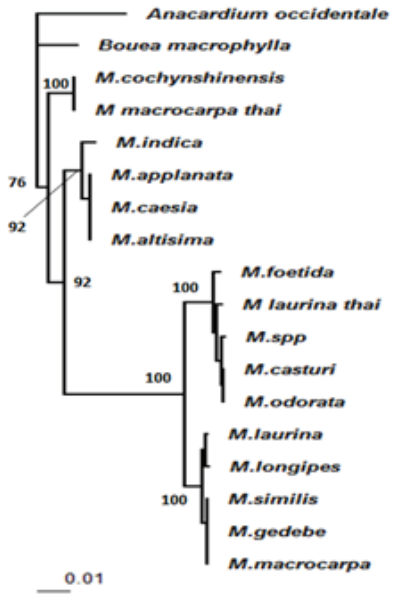

Figure 2. Phylogenetic tree using Neighbour Joining methods. Numbers on the nodes are bootstrap value in% and number bellow is genetic distance.

Phylogenetic tree using MP likely to support that *M. longipes* is synonim with *M. laurina.* It show on phylogenetic tree, *M. longipes* and *M. laurina* make one same clade at one internal nodus. In phylogenetic, it means booth of them come from one ancestor and are very close taxon. Phylogram tree (fig2) using NJ methods reveal some genetic distance between *M. laurina* and *M. longipes* but very little. Therefore, the conclusion for this controversy is strongly support that *M. laurina* is synonym with *M. longipes*.

Taxonomic implication

Phylogenetic information of Mangifera based on *rbcL* can become reference and base in *Mangifera* classification without ignore morphology and anatomy information as the first reference. Topological analysis of tree Phylogenetic uncover different pattern with newer classification of *Mangifera.* For example the closer kinship species *M. laurina, M. gedebe, M. sismilis* and *M. macrocarpa,* are different subgenus and different section. Phylogenetic based on *rbcL* gene is supported by matK gene and this difference pattern of classification also indicated by ITS marker (Yonemori et al., 2002). It means that the classification system of Mangifera today is inconsistence.

In different case, as a reference, species member of *Caragana* (Fabaceae) are reformed after molecular analysis from *tribe* of Galegeae to become different tribe of Hedysarea (Zhang et al., 2009). Based on molecular information *rbc*L, *trn*S-*trn*G and ITS, another section and group in *Caragana* are recommended to contemplate and observe

Our research was limited in samples and sequence of base so it is too early in recommending for classification reform but the result can consider in reanalysis of *Mangifera* classification. It is strongly supported by another molecular marker such as ITS and *mat*K, so it is very important for collaborating some molecular marker in making best classification system of *Mangifera*.

CONCLUSIONS

Phylogenetic analysis of 16 species of *Mangifera* using *rbc*L gene sequence in chloroplast reveal that Mangifera is a monophyletic ancestor, there are diversification between Thailand and Indonesian sample.

It result also supports that *M. odorata* is hybrid result of *M. indica* and *M.Foetida.* The analysis also support that *M. longipes* is synonym with *M. Laurina.*

The classification system is revealed quite differently with previous system.

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VARIABILITY OF SOME APRICOT VARIETIES AND HYBRIDS PRODUCTIVITY TRAITS CREATED IN ROMANIA

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Abstract

*Current requirements of the species Prunus armeniaca in terms of creating new varieties require a conducted extensive research in the apricot breeding program in the south-eastern of Romania. It's been proceeded for early selections based on correlations in order to create new varieties with high productivity and organoleptic qualities. Characteristics and traits of the 36 varieties and hybrids of apricot studied, grouped according to the period of maturation, were studied starting with the IPGRI descriptors used in Genus Prunus. The characteristics were followed: trunk cross-sectional area (cm^2), fruit production (t/ha), the number of fruit tree branches unit length of thick branch and fruit branch type specific for apricot. The resulting correlations between fruit production (t/ha) and the number of fruit tree branches unit length of thick branch R^2=0,1084***. For series of data belonging to fruit production (t/ha) and number of fructification branches (spur branches, short branches, long branches and mixt branches) the correlation coefficient had a lowered value, between 0,0007 si 0,0524**. So, this resulted in a somewhat correlation between fruit production (t/ha) and number of spur branches to the unit length of thick branch R^2= 0524**.*

Key words: *apricot, varieties, productivity, fructification branches, correlations.*

INTRODUCTION

The creation of apricot varieties with different fruit maturation periods, especially extra early and late maturation (Bassi D. and Audergon J.M., 2006), has been a priority since 1980 to improve the program in Romania. The market had a demand for extra early apricots (Audergon J.M., 1995), until recently satisfied by importing them from the Mediterranean countries like Italy, France, Spain and Turkey is a strong argument for the scientists involved in the improvement of this species.

MATERIALS AND METHODS

The biological material is represented by 36 varieties and hybrids of apricot with different fruit maturation periods: very early (ve), early (e), middle (m) and late (l).

These were grouped according to the period of maturation and studied starting with the IPGRI descriptors used in Genus Prunus.

The characteristics were followed: trunk cross-sectional area (cm^2), fruit production (t/ha), the number of fruit tree branches unit length of thick branch and fruit branch type specific for apricot.

The trunk cross-sectional area was calculated after the formula TSA (cm^2) = D x d, in which D = diameter of the trunk on the rows direction and d = diameter of the trunk perpendicular on the row direction.

Characteristics of fructification type is a genetic particularity and it shows the predominating fructification of the varieties. 3 trees were marked from each variety and hybrid, choosing and marking the thick branch in which the dynamically numbered and measurements of the fructification branches (Cociu V. and Oprea St., 1989). They were counted and registered: number of fructification branches unit length of thick branch, number of spur branches unit length of thick branch, number of short branches unit length of thick branch, number of long branches unit length of thick branch and number of mixt branches unit length of thick branch.

Fruit production was calculated from the medium production, cross-referred to the density of 625 trees per hectare (4 x 4m).

For a more objective interpretation, the results were statistically processed using statistical software, obtaining the coefficient of variability

analysis of variance to express the variability in the character analysis.

RESULTS AND DISCUSSIONS

Trunk cross-sectional area (cm^2)

The lower section of the trunk had the phenotypes: Andrei (m) with 180 cm^2, 82.12.2 BIV (e) and Valeria (ve) with 184 cm^2 and Rares (ve) with less than 190 cm^2. The most phenotypes with over 250 cm^2, resulted to be: Adina (l), Excelsior, Ilinca, Bucovina (m) and Favorit (l).

Significant differences were provided for a probability of error of up to 5% between maturation groups, with limits ranging from 189 cm^2 to 231 cm^2 (Figure 1). Variability to the index of section of the trunk has a high value, expressed by the variability coefficient of 55,92%.

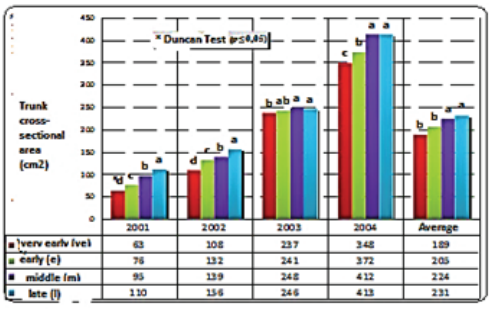

Figure 1. Phenotype influence on cross-sectional area of the trunk based on the year of study

The total number of fructification branches / linear meter of thick branch

The phenotype Ilinca (m) had the highest average number with 47 of fruiting branches. 45 of fruiting branches had the phenotypes: Viorica (e), Nicusor (m) and Excelsior (m). With 44 of fruiting branches presented the phenotypes: Adina (l), Favorit (l) and Carmela (e) each with 43 of fruiting branches and Dacia (e) with 40 of fruiting branches. The coefficient of variability of the total number of fructification branches/linear meter of thick branch, expressed a medium-high value by the coefficient of 21.81%.

Number of spur branches / linear meter of thick branch

The phenotypes with the bigest number of spur branches were: Nicusor (m) – 27 branches, Valeria (ve), Viorica, Carmela (e) with 26 branches, Dacia (e) and Rares (ve) with 25 branches, Ilinca (m) – 24 branches, Alexandru and Andrei (m) each with 21.

The variability of number spur branches /linear meter of thick branch has a high value expressed by the coefficient of 71,57%.

Number of short branches /linear meter of thick branch

The phenotype 85.2.89 BIII (m) had the most short branches number/linear meter of thick branch (over 22), followed by the phenotypes: Adina (l), 85.4.108 BIII (m), 85.3.100 BIII (m), 82.28.62 BIV (m) and 82.12.7 BIV (l), with medium between 15-20 short branches /linear meter of thick branch. The variability of the number of short branches/linear meter of thick branch had a high value, expressed by the coefficient of 52,61%.

Number of mixed branches /linear meter of thick branch

The phenotypes with the most mixed branches number were: 82.16.7 BIV (l) with 26 mixed branches/linear meter of thick branch, Excelsior (m), 82.15.48 BIV (l), 82.32.9 BIV, 82.7.65 BIV,

Ilinca (m) and 82.4.41 BIV (l) between 20 and 25 mixed branches/linear meter of thick branch. Groups of very early phenotypes do not bear fruit on the mixed branches.

Significant differences were provided between the late maturation group (15 branches), the medium (10) and the early (2 branches) (Figure 2). The variability of the number of mixed branches /linear meter of thick branch has a high value, expressed by the coefficient of 102,05%.

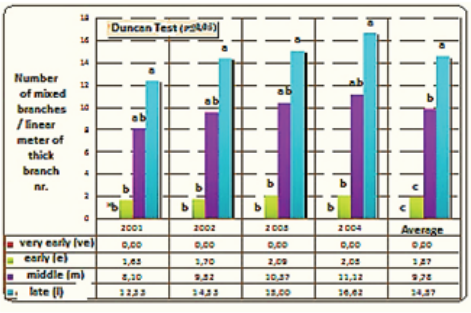

Figure 2. Influence of maturation class of fruits on on the number of medium branches / linear meter of thick branch based of the year of study

Number of long branches /linear meter of thick branch

The phenotypes with highest number of long branches number with medium maturation were: 85.18.5BIII, 85.1.96 BIII – Nicusor, 85.4.108 BIII, 85.4.95 BIII, Excelsior Mt., 85.2.89 BIII and the phenotype with early (e) maturation Carmela. The variability of number long branches /linear meter of thick branch has a high value, expressed by the coefficient of 59,66%.

Fruit production (t/ha)

The most productive phenotypes were: Dacia, Viorica (e), followed by Excelsior (m), Adina (l), Carmela (e), Nicusor, Siret, Ilinca, Favorit, Bucovina, the differences were not statistically assured. Variability in fruit production (t/ha) had a high value, expressed by the coefficient of variability of 72,96%.

Correlations between fruit production (t/ha) and its components

On the 36 phenotypes a series of correlations were made between fruit production (t/ha) and its components referring on the number of the fructification branch / linear meter of branch and the type of fructification branches with direct implication on fruit production. First correlation is showed between fruit production (t/ha) and the number of fructification branches per unit length of thick branch, by the existence of a high coefficient of correlation 0,1084 (Figure 3).

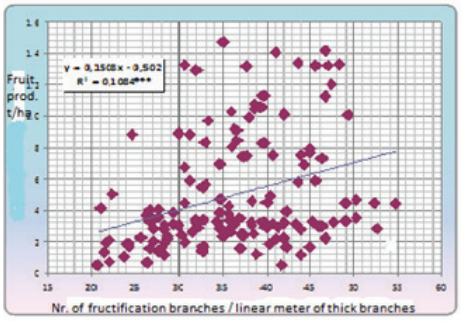

Figure 3. Intensity correlation between fruit production and the number of fruit tree branches unit length of thick branch

A strong correlation was observed between fruit production (t/ha) and tree trunk cross-sectional area which is based on determining a high correlation coefficient of 0,7748 (Figure 4).

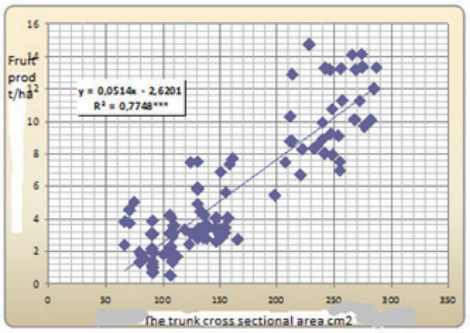

Figure 4. Intensity correlation between fruit production and tree trunk cross sectional area

The correlation of coefficient calculated between the number of fructification branches and number of spur branches was 0,2379 (Figure 5), between the number of fructification branches and number of long branches 0,1072 (Figure 6), between the number of fructification branches and number of short branches 0,0623 (Figure 7) showing a high correlation, while the correlation coefficient obtained between the number of fructification branches and number of mixed branches had a smaller value of 0,0117 (Figure 8), which indicate a reducted degree of correlation.

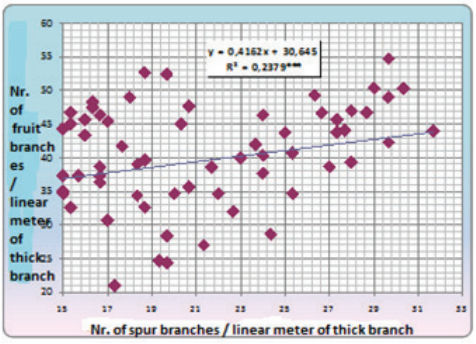

Figure 5. Intensity correlation between the number of branches of fruit and number of may branches to the unit length of thick branch

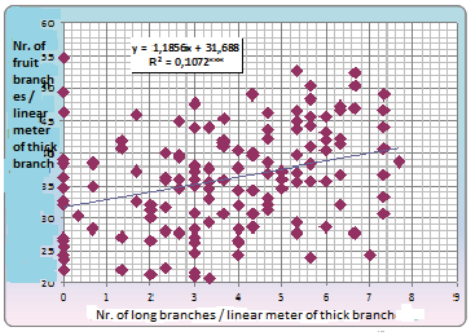

Figure 6. Intensity correlation between the number of fructification branches and number of long branches to the unit length of thick branch

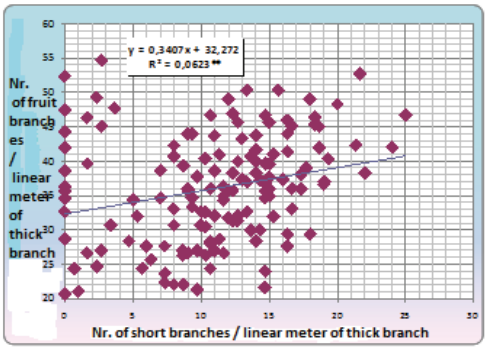

Figure 7. Intensity correlation between the number of branches of fruit and number of short branches to the unit length of thick branch

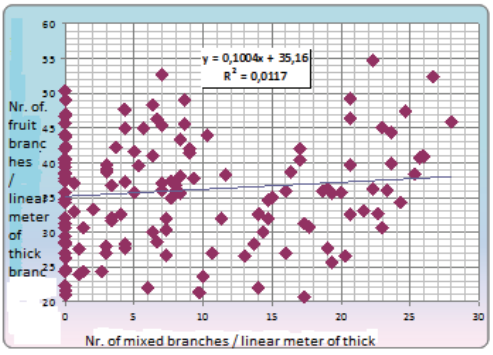

Figure 8. Intensity correlation between the number of branches of fruit and number of mixt branches to the unit length of thick branch

Correlation between trunk cross-sectional area and the number fruiting branches

Direct relationship between trunk cross-sectional area and the number of fructification branches/linear meter of thick branch is highlighted by a correlation coefficient of 0,466 (Figure 9), but with other types of fruit branches, the correlation is different.

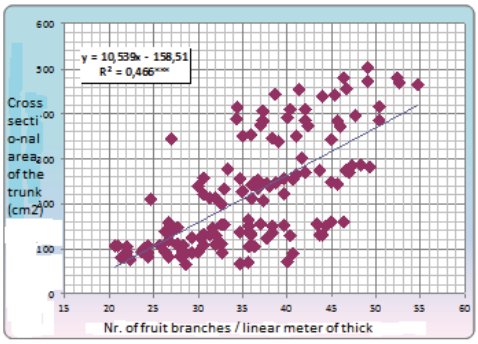

Figure 9. Intensity correlation between cross-sectional area of the trunk and the number of fruit branches to the unit length of thick branch

CONCLUSIONS

These significant correlations were found between:

- fruit production (t/ha) and number fruiting branches/linear meter of thick branch R^2 = 0,1084***.

- fruit production (t/ha) and tree trunk cross-sectional area R^2 = 0,7748***.

- the number of fruit branches and the number of spur branches R^2 = 0,2879***.

- the number of fruit branches and the number of long branches R^2 = 0,1072 ***.

- trunk cross-sectional area and the number fruiting branches / linear meter of thick branch R^2 = 0,466 ***.

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NEW H1 BUZAU F1 HYBRID OF EGGPLANT OBTAINED AT V.R.D.S. BUZĂU

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Abstract

The absence of local hybrids for greenhouses imposed starting an intensive breeding program at V.R.D.S. Buzau since 1996. The main purpose of the program is obtaining valuable hybrids which show strongly F1 heterosis. Through inter and intraspecific hybridization works in Solanum genus, besides disease resistance inheritance, valuable features can be obtained: genetical resistance at extreme weather, extremely high or low temperatures, water stress or salinity (Downey M.C.,1991). Obtaining productive hybrids with genetical resistance at Verticilium dahliae fungus allows the elimination or the decrease of chemical treatments which would lead to cost reduction and environmental pollution decrease (M. Tudor,1996). After evaluation and intensive breeding work with germplasm resource, it was obtained a number of 22 stable genitors. After general and specific combining ability were obtained a large number of hybrid combinations. L1 A and L1 S hybrid showed F1 superiority and phenotipical uniformity, obtaining H1 Buzau F1 hybrid in 2010. Comparative crops both from greenhouses and field revealed valuable genetical resource which demonstrated phenotipically reproductive and adaptive heterosis and also high productivity and ecological plasticity.

Key words: *breeding, heterosis, hybrid, genitor, germplasm.*

INTRODUCTION

Hybrid F1 eggplant seeds become a necessity, especially for glass crops. In our country, the lack of local hybrids at these species led to the purchase of foreign hybrids at very high prices and these did not meet the consumers and growers requirements. As a result, Breeding Laboratory from V.R.D.S. Buzau studied a research plan since 1996 which aimed obtaining F1 local hybrids at eggplant in competition with ones from prestigious brands. In the breeding works has been studied a valuable genetic material, adapted to our environmental conditions but it had not been neglected foreign genotypes which had shown important features.

MATERIALS AND METHODS

The research started in 1996 acquiring valuable genetical material for collection field. Germplasm resource contains over 60 important lines advanced breeded. After forming the collection field, it was evaluated with observation sheets and chromosomal map. After the evaluation the important material was transferred from the collection field to the work field where was intensively improved. Working field contains 22 valuable genitors which are part of the conservative selection plan. The main criteria which formed the base for choosing the material for collection and to transfer it in the working field were:

- genetical inheritance of the genitors which manifests clearly important phenotypical features
- genitors stability and uniformity expressed through decreased variability of the main characters and their progeny transfer
- genetical ability of the genitors to hybridization process, this aim being reached by testing combining general and specific ability

The 22 genitors that form the work field were crossed and were obtained a number of combinations in order to obtain reproductive, adaptive and metabolic heterosis. Hybrid combination which demonstrated clearly this phenomenon was realized between L 1 A and L 1 S genitors. It was used classical hybridization by female flowers castration and elimination of stamens before opening to avoid self pollinating.

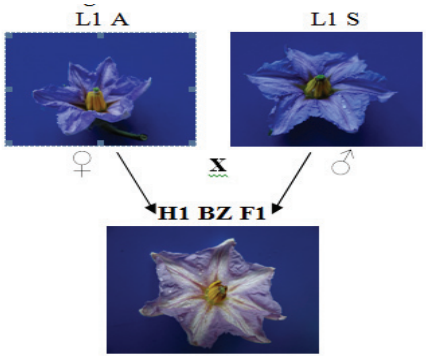

Figure 1. Hybridization

As novelty in hybridization process (Figure 1) was the implementation of a new technology method of pollen transfer from maternal to paternal genitor. This method was elaborated at V.R.D.S. Buzau and consists of using a liquid solution of water and sugar or honey mixed with patern pollen and then the flowers are sprayed bathing with this solution. This method has many advantages as:

-the liquid solution feeds and hydrate pollen grains giving them long life and resistance to drought.

- adding pollen grains to female flower is a softer action avoiding aggression and mutilation.

- sugar or honey are adherent so they are fixing the pollen grains to flower stigma avoiding pollen release.

-higher efficiency, secure and easer work in the hybridization process.

RESULTS AND DISCUSSIONS

The research undertaken at this species from 1996 since now had finished with valuable results:

-it was constituted and conservated a germplasm resource of which could be obtained new valuable creations

-were obtained 22 important genitors with high ability to create new varieties and hybrids

-the entire collected material was tested for general and specific combining ability and the results were saved on computer

-H1 Buzau F1 hybrid was obtained in 2010 which meets the main proposed objective.

H1 Buzau F1 hybrid was studied 3 years after the release in two crop systems: greenhouse without heat and in open field. Crop technology was the classical one for each system. To highlight the main parameters of the new hybrid, Aragon by Hazera, a top market hybrid was used as monitor.The main data from the both crop systems measured at genitors, new hybrid and monitor plants and fruits are presented in table nr. 1,2, 3 and 4:

Table 1. The main biometric data measured in greenhouse

Cultivar	Plant height (cm)	Shoot no.		Leaf no./plant		Habit	Plant diameter (cm)
		main	sec.	big	small		
L 1 A	200	3	8	32	36	erect	70
L 1 S	80	3	6	35	62	erect	65
H1 Bz F1	100	4	8	52	86	Globular	70
ARAGONF1 (MT)	92	4	8	48	68	globular	67

The registered values highlight the main characters distinctibility of the genitor, hybrid and monitor plants. In what concerns plant height, genitor L1 A range first followed by H1 Bz. In what concerns shoots number/plant, H 1 Bz came first followed by monitor. The big number of leafs, superior to genitors and monitor hybrid demonstrates that this plant manifest somatic heterosis which is an important feature for breeding. Altough genitors of the hybrid have erect habit, F1 hybrid resulted has an uniform globular shape resembling with the one of monitor. Plant diameter highlights increased vigor of the hybrid from both genitor and monitor.

Table 2. The main biometric data measured in field

Cultivar	Plant height (cm)	Shoot no.		Leaf no./plant		Habit	Plant diameter (cm)
		main	sec.	big	small		
L 1 A	118	3	6	24	22	erect	46
L 1 S	68	3	5	26	36	erect	40
H1 Bz F1	75	4	6	38	48	Globular	45
ARAGONF1 (MT)	71	4	5	32	41	globular	42

The values registered in field are significantly reduced at all studied parameters both at genitors and H1 Bz hybrid and monitor. The habit of the plant was not transformed in this environmental conditions.

Table 3. The main biometric data measured at fruits in greenhouse

Cultivar	Fruits no. /plant	Fruit weight (gr)	Fruit diameter (cm)			Fruit lenght (cm)	Fruit colour		Pulp consistency
			base	middle	top		outside	inside	
L1A	12	380	3.4	5.5	1.5	24	black	Yellow	Normal
L1 S	6	441	4.8	8.1	4	20	black	Yellow	Normal
H1 Bz F1	8	777	5.4	8.4	6	28	black	White	Fluffy
ARAGON F1 (MT)	8	628	4.8	7.2	5.1	26	black	White	Fluffy

Table no. 3 presents that the number of fruits per plant at H1 Bz hybrid represented an average of the genitors values but average weight was significantly higher than gemitors and monitor. The fruit shape could be reconstituted easily after the values concerning fruit base, middle and top shape, measurements which demonstrated H 1 Bz superiority. The inside and outside fruit colour and consistency shows that hybrid production is high quality and meets the present requirements of the consumers. (Figure 2).

Table 4. The main biometric data measured at fruits in field

Cultivar	Fruit weight (gr)	Fruit diameter (cm)			Fruit lenght (cm)	Fruit colour		Pulp consistency
		base	middle	top		outside	inside	
L1A	223	2.8	4.3	1.3	19	black	Yellowish white	Normal
L1 S	315	3.6	6.8	3.3	17	black	Yellowish white	Normal
H1 Bz F1	482	4.5	7.2	5.4	22	black	White	Fluffy
ARAGON F1 (MT)	420	3.9	6.6	4.6	21	black	White	Fluffy

Biometric measurements registered in the field shows that all studied cultivars presented significantly reduced values at all characters, only inside and outside colour and pulp consistency remaining unchanged. Even in this crop system, the new hybrid showed superiority both to the monitor and genitors.

Figure 2. Crop detail; fruit lenght and longitudinal section of fruit

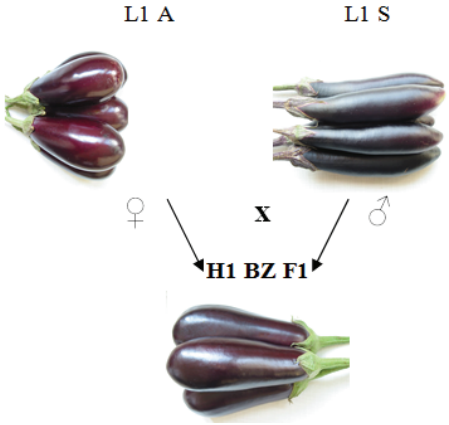

Figure 3. Hybridization (fruit group detail)

CONCLUSIONS

The registered values of H 1 Bz hybrid (Figure 3) in the two crop systems, both greenhouse and field, showed clearly reproductive and adaptive heterosis phenomenon objectified through yield significantly higher than genitors

but the fruit had a reduced number of seeds and the pulp is white and fluffy.

After testing for 3 years at V.R.D.S. Buzau and in other vegetable areas where the seed had been spread, they came to the conclusion that this new hybrid must be introduced widely for production replacing the missing varieties for greenhouse and field so it was registered and proposed starting with 2013 for patenting.

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NEW LINES OF *AMARANTHUS* OBTAINED AT V.R.D.S. BUZĂU

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Abstract

The conservation and revaluation of biodiversity initiated by S.C.D.L. Buzau and Genetics and Breeding Laboratory aimed to study Amaranthaceae species. These species were neglected until now both scientifically and as crop. The appeareance of these species is not known but it is well known that were here since ancient times. A proof is the existence of endemic populations and a wide range of biotypes which contains 16 species of Celosia and Amaranthus with origin in the Romanian geographic area.The research of S.C.D.L. Buzau during 2005-2012 highlighted new valuable data, especially in what concerns their multiple uses and wide range of expressivity of these species. This study of 3 new obtained lines is a step towards this species. Data and germplasm source accumulated till now guarantee that in the future we can enrich scientific data.

Key words: *biodiversity, biotype, endemic, expression, germplasm.*

INTRODUCTION

Modern possibilities to inform people nowadays and free travelling abroad since 1990 highlighted new valuable data about *Amaranthaceae* family. Altough for many people this species is considered a weed, the scientists proved otherwise, that this can be a valuable food, an exceptional medicinal herb, an important biomass resource and last but not least a real ornamental plant. In the past, in our country, this plant was collectively known as ″red amaranth″, being used in Romanian households in various dishes and wild amaranth cultivars were used in animal feed. As the time passed this edible plant was neglected and nowadays we rarely find it in traditional households. (Figure 1)

Starting 2005, Breeding Laboratory of V.R.D.S. Buzau studied this species creating and implementing a specifical breeding program for this species.

The main objectives of this program were:

-preservating genetic sources and enriching countinously the general collection field with new genotypes

-valuable genotypes breeding for obtaining new creations with phenotypical expression specific for uses direction

-gathering a database for better knowing the species.

Figure 1. Amaranthus seedlings lines

MATERIALS AND METHODS

Breeding works started with a documentation program focused on national and international achievements. After this study we concluded that nationally this species is little known compared with international top achievements.

Genetic autochthonous heritage was inventoried and 16 species were discovered in spontaneous flora, many belonging to *Amaranthus retroflexus*, *Amaranthus liividus* and *Amaranthus blitoides* species. Worldwide we found that are over 800 species of *Amaranthus*.

The next step aimed to form a collection field which has presently 20 valuable genotypes from local and foreign origins. After intensively breeding works, 3 of them were promoted in the work field: L1, *Amaranthus retroflexus*, L4, *Amaranthus caudatus*, L5, *Amaranthus cruentus*. These lines correspond D.U.S. criteria demonstrating distinctness, homogeneity and stability as for were undergone to conservative selection program. Crop establishment was made by seedlings grown on 70 holes alveolar pallets on red grounded nutritional turf substrate. Seedlings production is similar to the other vegetable species production, to mention that seedlings were thinned after spring and a single plant was left per hole. This work was necessary because of the extremely small size of the seeds, making imposible the introduction only of one seed in a hole. Field crop establishment was made on 1,4 m shaped land using L 445 tractor in aggregate with MMS 1,2. Planting was made in equidistant rows spaced at 70 cm and 35-40 cm distance between plants per row. The crop did not require special care works, were only manually and mechanical breed and irrigated. Was not necessary to apply chemical or biological treatements against pests and diseases or soil and foliar fertilization. The 3 crops displayed original potentiall for successfully ecological cultivation.

RESULTS AND DISCUSSIONS

Breeding works ended obtaining until now 3 new valuable lines with different application directions. Also a rich germplasm collection was gathered containing valuable lines in different breeding state, one of them grown for the first time in our country and would be presented in our future works.

The obtained lines are the following:

L1-*Amaranthus retroflexus*

This line (Figure 2) comes from an endemic local population discovered in the Buzau mountain side, Lopatari locality composed from rare villages placed 700-800 m altitude. The residents used it in the past as edible plant especially to prepare soups. As the plant matured, it lost its juiciness becoming string and being used for animal feed. After specifically selection works we limited the main characteristics variability, we eliminated atypical biotypes and the species performances dramatically increased. The main use of the line is the edacious one because of its exception properties : juiciness of shoots and leaves, yield potential, over 22 t/ha and last but not least red or garnet natural colour present all over the plant.

Figure 2. Seedling details: entire plant, upper and underside of the leaf

Figure 3. L1 crop and inflorescence detail

L4- *Amaranthus caudatus*

This line (Figure 3 and 4) was cultivated also for the first time in our country, was purchased through a biologic material exchange with a private Dutch collector. This species is collectively called ″elephant trunk″, similar

varieties existed in our country too but called ″turkey crest″. Initially this cultivar presented many biotypes but after a rigouros selection atypical biotypes were eliminated, the main biotype that respected criteria required by ″variety″ notion was maintained.
In the breeding program, the main objective for this line was aimed on ornamental use of the plant that was successfully accomplished. The possibility of using this line like an edible plant is not excluded but we mention that the edible vegetative mass yield is smaller than the one obtained at L1 and more restricted concerning period of time. It can be used with that purpose until flowering.

Figure 4. Seedling details: entire plant, upper and underside of the leaf

Figure 5. L4 crop and inflorescence detail

L5-*Amaranthus cruentus*
This line (Figure 5 and 6) comes from the same place as line 4. This line was also cultivated from the first time in our country since 2006. At the beginning it behaved as a large main characters variability cultivar and after the implementation of the breeding program we limited these characters variability to a normal state. The aim of breeding was to use the plant as an ornamental one but we did not exclude other uses, especially alimentary one. This plant is vigorous, remarkable by its erect spike inflorescence intense red garnet coloured, extremely beautiful. (Figure 7). The studies undertaken until now showed that this biologic creation and also the previous ones did not require special technologies, L4 and L5 could be cultivated in protected grounds and ornamental pots mentioning that their size dramatically diminished in pots compared with natural field conditions.

Figure 6. Seedling details: entire plant, upper and underside of the leaf

Figure 7. L5 crop and inflorescence detail

The main characteristics of *Amaranthus* lines in seedling state are presented in table 1 and the main characteristics of the plants in table nr.2:

Table 1. The main characteristics of Amaranthus seedlings lines

Characteristics/lines	L1	L4	L5
Sowing date	3.04.2012	3.04.2012	3.04.2012
Spring date	9.04.2012	9.04.2012	9.04.2012
Planting date	23.05.2012	23.05.2012	23.05.2012
Seedling height (cm)	20	22	24
Collar diameter (mm)	4	3	4
Number of leaves	16	10	12
Leaf lenght (cm)	3	5,7	6
Stalk lenght (cm)	2,3	2,3	2

The undertaken research demonstrate that all 3 obtained lines produce a large number of seeds, L5 ranks first after L4 and the last being L1. We conclude that seed maturation is phased starting with inflorescence base to the top. All the lines preserve germination ability because of seed body covered with a glassy and chitin integument that confers long storage period. According to the conducting tests made in 2005 and restored on the same seed batch in 2012 germination percentage meanwhile has been decreased averagely for all the lines with 5%.
The seeds sizes are too small, L1 has a seed of 1-1,2 mm diameter (Figure 8), L 4 (Figure 9) presents a very shiny seed of 1 mm diameter and L5 (Figure 10) has a smaller seed of 0,8 mm, slightly flattened similar with grains of sand.

Figure 8. L1 seeds detail

Figure 9. L4 seeds detail

Figure 10. L5 seeds detail

Table 2. The main characteristics of the plants

Character/line	L1	L4	L5
Plant height (cm)	85	165	115
Stem height (cm)	6	28	16
Number of shoots/plant	12	3	7
Plant diameter (cm)	70	55	75
Inflorescence colour	greenish-red	purple red	garnet-red
Inflorescence length (cm)	12	78	38
Number of inflorescence ramifications	4	6	8
Seeds colour	black	rose-white	black

CONCLUSIONS

Research carried out in 2005-2012 ended until now with the following results:

-a germplasm collection was gathered at this species from collection field and work field.

-breeding works for L1, L4 and L5 lines ended and would be registered and proposed at I.S.T.I.S. for patenting and seed production and broad range multiplication.

-a valuable database was gathered which would contribute successfully at breeding works.

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PLANT PRODUCTION SYSTEMS


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THE EFFECT OF CONTAINER TYPE AND SOIL SUBSTRATES ON GROWTH AND ESTABLISHMENT OF SELECTED LANDSCAPE TREES

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Abstract

Root coiling and spiraling are the problems faced by the nurserymen for producing quality tree seedlings for landscaping. The effects of various container types and substrate interactions on plant growth, and the influence of container type on post transplanting in the desert environment were investigated. Two arid- region plant species known for producing deep taproots (Acacia saligna and Eucalyptus viminalis) were selected for the study. Conventional nursery pots were compared with root trainers and spring rings to determine the root growth and architecture. Results showed that Acacia plants grown in spring rings showed significant increased plant height where as conventional pots give highest root weight and as a consequence produced greater plant biomass. Clear trends for Eucalyptus was less obvious, but tended to contrast with the findings for Acacia. Studies on the effect of combination of organic soil and container type revealed that Eucalyptus plants grown in conventional containers have the highest plant growth. Among the soil mixes, Eucalyptus grown in 100% clay soil had a greater leaf area. When the plants were transplanted into an arid landscape, the plants grown in the spring rings distributed in all directions in the soil, and this habit is likely to aid the tree in future. In this study, the results showed that container type could affect the aerial parts but this depends on the plant species. Results demonstrated that spring rings reduce harmful root biomass (encircling roots) and encourage root primordia. Differences in root and shoot growth resulting from the use of a range of growing media did not seem to interact with container type. The effect of the spring ring on plants grown in the landscape was obvious visually in the short term but not apparent from growth quantification.

Key words: *arid, containers, landscaping, root trainers, spring rings.*

INTRODUCTION

Development of management strategies that potentially promote rapid post-transplant root growth is the key to successful seedling establishment. The urbanization demands huge quantity of diversified quality planting materials, growing medium and the plant containers. Moreover, with the introduction of indoor and miniature gardens different types of containers and soil mixes are found to be essential for the proper growth of the plants. Plants grown in conventional containers for too long often have deformed roots that are kinked or grow along the sides or bottom of the root ball. Root restriction is an inherent problem with container grown trees (Arnold, 1996). Delay in transplanting from a conventional container to the landscape increases the chance of developing poor root architecture. Many alternative container types have been designed to reduce the incidence of deformed roots (Gilman et al., 2003). The important factor in deciding an improved container is to prevent the development of a few dominant roots, and so produce a fibrous root system on all sides that holds the root ball together (Mullan and White, 2002). The longevity of individually container grown trees depends on container volume, dimensions and the container shape. Container type (Sutherland and Day, 1988) and container dimension (Schuch and Pittenger, 1996; Nesmith and Duval, 1998) also have a marked effect on root and plant growth (Handreck and Black, 1984). In a work on *Eucalyptus camaldulensis*, Ngulube (1989) find that seedling growth increases with planting tube size.

Soil physics also interacts with root architecture. The physical property of the soil determines the growth of the root system (Cockroft and Wallbrink, 1966). Roots tend to elongate more in a sandy soil whereas they are short and more branched in a loamy soil (Perry, 1982; Muthana et al., 1984). When the physical factors experienced by container grown plants are compared to landscape destination, the

performance of the container plants might be improved in long term. The growing media texture could affect plant growth since it will control moisture, aeration and nutrients (Awang and Hamzah, 1986). The rate and pattern of root growth in the soil vary with the physical, chemical, and microbiological properties of soil (Brown and Scott, 1984). The physical properties of the soil can modify root diameter, development of root hairs and the branching pattern of lateral roots (Lucas, 1987). However the interaction between the container size and soil substrates is less well understood and less frequently studied.

Considering the massive greenery activity in Kuwait, it is important to produce plants with quality characteristics, and with no initial deformation in their root system. To achieve this objective, suitable plants as well as the best possible production technologies for optimization of greenery enhancement is to be developed (Bhat, 1997; Taha et al., 1988). Poorly formed root systems may disrupt management objectives and cause unplanned maintenance expenses. The development, size, form and function of root systems are controlled by environmental and management conditions that modify the expression of characteristics (Harris, 1992). The findings of this study are likely to help landscape engineers and environmentalists.

The present study tries to understand the effectiveness of alternative containers and different soils on tree growth. Evaluation of different containers on plant growth after transplanting in the field at a desert environment was also studied.

MATERIALS AND METHODS

Experiment no.1

The first two experiments were conducted at a greenhouse of Plant Sciences Department, University of Reading, United Kingdom with an average daily maximum temperature of 34°C and a minimum of 18°C. The Seeds obtained from Chiltern Seeds Company were germinated in plug trays. The dimension of each cell in the tray was 3.7x5.5x1.5 cm. Three weeks after germination, seedlings were transplanted into the treatment containers filled with SHL potting mixture. Conventional nursery plastic pots (4.5x9x3cm) were compared with root trainers (4x10x3cm), and spring rings (3.5x10x3.5cm). Every week each container was turned 90 degrees so that light levels around each plant were relatively even. After fifteen weeks, plants were harvested and recorded the data. The number of leaves per plant was counted and leaf area was measured with an automatic leaf area meter (Delta T Devices). Leaf and shoot fresh weight was taken immediately after excision from plant. Leaf and shoot dry weights were recorded. Dry weight for leaf and shoot was determined after drying for 72 hours at 80°C. Shoot height from the soil level to the tip was recorded. The fresh and dry weight of the root and the root length was also measured. The experiment was laid out in a randomized design with five plants per treatment. Three blocks consisted of three treatments with five replications, giving a total of 45 replicates for each experiment

Experiment no; 2

A total of 120 uniform seedlings were chosen for the trial. The container treatments were Conventional pots, Spring rings and Root trainers where as clay 100%, sand 100%,sand 85% and clay 15%, sand 70% and clay 30%, sand 55% and clay 45 were the soil series treatments. Throughout the study, containers were rotated and excess bottom roots were clipped to maintain root growth within the containers. The time gap between the two destructive harvests was five months. The experiment was laid as a completely randomized design with eight replications.

Experiment no. 3

Eucalyptus seedlings grown in United Kingdom were air shipped to Kuwait and was experimented at Salmiya waterfront experiment station. Spring rings, Root trainers, and Round containers were used as treatments. The dimensions were 3.5x10x3.5cm, 4x10x3 cm and 3.5x10x3.5cm respectively for Spring rings, Root trainers, and Round containers. The plants remained in the containers for nine months and then transplanted into an open field in a randomized block design at a spacing of 3x3 m. Destructive harvesting took place after a year. All plants were carefully dug up from the field and the soil particles were washed off. Fine sieves were used to prevent any loss of root biomass.

Data were subjected to statistical analysis with the SAS (SAS Institute Inc., Cary, NC) package. Method of least significant different (LSD) was applied to separate means.

RESULTS AND DISCUSSIONS

Effect of container geometry

The effect of different containers on root and shoot growth of *Acacia saligna* and *Eucalyptus viminalis* was listed in (Table.1). *A. saligna* plants grown in spring rings show a significant increase in plant height. None of the experimental containers allowed Acacia plants to produce a marked difference in leaf area or leaf number. Even though the leaf fresh and dry weight was higher in conventional pots, it did not vary significantly from the spring rings. The negligible difference in the shoot fresh and dry weight and also total top biomass fresh and dry weight reveals that the differences in containers did not affect much in the shoot growth of the plants. The low fresh and dry weight of roots in spring rings may be due to the self pruning of roots when come in contact with air after emerging from the numerous holes. The net result shows that the total plant biomass has significantly higher in conventional pots and root trainers than other treatment. Any environmental change or restriction might affect the plant morphological growth. For example, on apple trees caused a decrease in leaf area and dry weight of total plant, but these growth declines may be expected where resources are limiting relative to the ability of the root system to meet the needs of the top growth (Ferree, 1989). It was found that in spring rings under both water and root restrictions branching of the shoot and total plant dry matter accumulation were greatly reduced (Krizek and Dubik, 1987).

The actual mechanism by which the difference in plant height among different containers could occur is not clear. It may be due to the container shape and the openings around spring rings that will produce a better growing medium as a result of better gas exchange. The growing media in containers should have high water movement, good drainage and aeration (Donahue et al., 1983). The excess water not used by a seedling produces a waterlogged condition that impairs aeration; this in turn reduces photosynthesis, translocation and growth (Sutherland and Day, 1988). It may also be that the proliferation of root tips due to air pruning in spring rings could lead to an increase in root produced hormones. Alternatively, plants grown in spring rings have suffered from higher levels of moisture loss and hence the reduction in root growth could be a form of stress response.

Table 1. Effect of different containers on root and shoot growth of A. saligna and E. viminalis.

Parameters	*Acacia saligna*			*Eucalyptus viminalis*		
	CP	RT	SR	CP	RT	SR
Plant height (cm)	57.40b	51.20b	60.90a	85.83a	75.17b	84.90a
Leaf area (cm2)	34.94	24.32	30.69	41.57	37.38	41.25
Leaf number	17.67	14.80	14.67	179.20	174.80	189.40
Leaf fresh weight (gram)	17.14a	11.79b	13.63a	6.77b	7.99a	6.43b
Leaf dry weight (gram)	3.20a	2.25b	2.93a	2.72	2.71	2.67
Shoot fresh weight (gram)	5.35	4.47	5.58	7.85b	6.30b	8.64a
Shoot dry weight (gram)	1.46	1.26	1.77	3.26a	2.39b	3.44a
Total top biomass fresh weight (gram)	22.49	16.26	19.21	17.33	16.99	17.74
Total top biomass dry weight (gram)	4.66	3.51	4.70	5.97	5.10	6.11
Root length (cm)	16.43c	23.70a	19.90b	14.80c	21.40a	19.20b
Root fresh weight (gram)	15.19a	6.20b	5.52b	11.77b	16.30a	11.63b
Root dry weight (gram)	4.74a	2.73b	3.52ª	1.60b	2.28a	1.76b
Total plant biomass fresh weight (gram)	58.77	49.68	49.32	29.10	33.30	29.37
Total plant biomass dry weight (gram)	9.40a	6.24b	8.22ª	7.57	7.38	7.87

CP: Conventional Nursery Pot; RT: Root Trainer; SR: Spring Ring; Level of significance (0.05)
Within each row means followed by a different letter are significantly different from each other.

In *E. viminalis*, conventional pots produced plants with maximum height but did not vary significantly from spring rings. No significant differences are seen among different containers

in leaf area and leaf number. The difference in shoot fresh and dry weight was found to be negligible in both conventional pots and spring rings. No marked significant variation in total top biomass showed that shoot growth was not affected by the differences in containers. Schuch and Pittenger (1996) grew *Eucalyptus citriodora* in two different containers and found no differences in shoot dry weight. Root length, root fresh and dry weights were significantly higher in root trainers than the other treatments. Root length is influenced by container depth and hence perhaps it is not surprising that root trainers gave the highest value. The type of nursery container used during production can have a dramatic impact on root morphology of container grown plants (Arnold, 1996).

Effect of different soil mixes and container type over two periods of destructive harvest

Table 2. Interaction level of soil mixes and containers at two harvest level.

Interaction parameters	Plant height	Leaf area	Aerial weight	Root weight	Total weight
Containers	*	*	*	*	*
Soil		*	*	*	*
Containers X Soil	*				
Harvest	*	*	*	*	*
Containers X Harvest	*	*	*		
Soil X Harvest	*		*	*	*
Containers X Soil X Harvest	*				

Level of significance-0.05.

The above showed that the plant height was affected positively by the time period (expected) but also by container type. Plants grown in a conventional container were the tallest in comparison to plants grown into other types of container. The container formation may retain soil moisture more successfully, or produced a root patterning that allowed more effective nutrient up take those results in an increased plant height. However it is important not just to focus on height as an indicator of growth success as plants grown in spring rings had a higher leaf area. It is known that growing media can be the determining factor for plant development and vigor. Different inorganic soil ratios can give negative or positive effects on plant growth, based on both physical and chemical factors that can affect the shoot and root ratio (Aung, 1974) **.** Different soil media can affect growth and possibly survival of container grown seedlings. However in this trail the effect of soil type was not significant for plant height but Eucalyptus grown in soil with 100% clay did have a greater leaf area. The results again suggest that different plant parts respond differently to different types of environment.

The total aerial dry weight was affected strongly by interactions between container, soil and harvest time but the relationship was complex and clear trends are hard to discern. There was an interaction between container type and harvest time and soil type and harvest time. This could reflect the relative rates at which roots colonize the different soil volumes and the time at which some growth equilibrium is reached. Root vigor can be determined by weight increment over a standard time (Rogers and Vyvyan, 1934). A desirable trend was that sand performed well at the first harvest but poorly by the second. This could be due to nutrient exhaustion or inability to effectively meet the moisture needs of the larger plant biomass. In this study the container type had great impact on root dry weight but there is inevitably an interaction with time (Gilman and Kane, 1990).There was also a strong relation between soil and harvest period for root dry weight. Data from an underground root laboratory has shown that the extent of contact between root and soil is dynamic and can vary with time (Atkinson and Wilson, 1979). The longer the roots are growing in the same media and in the same container the greater the increase the root biomass that is likely to be produced, but fluctuations in root mass can also occur. However if a plant is left for a long time in the same container it will become root bound and the roots themselves will become the barrier to aeration and water movement. This might be not true with the new spring rings. In this study air pruning affects root biomass and led to less overall plant biomass, but longer term trails may give different results.

Effect of container type on post transplanting

The data from (Table 3) showed that plant height increment and number of branches did not differ significantly between the treatments.

Also, the dry biomass and root length did not significantly among the treatments. Plants which were grown in the spring ring containers had root systems that were distributed evenly through the soil and in all directions. The root systems from plants grown in root trainers and round containers had roots that were more active in the base and greater biomass. It is well recognized that tree survival and growth is strongly influenced by the root system. The root system is the means by which soil-based resources are used, tree anchorage is achieved (Fitter, 1991).

Table 3. Effect of alternate containers on plant growth in arid climate

Parameter	Air Pruner	Root Trainer	Round container	
Plant height increment	55.8	78.0	72.0	
Number of branches	24.0	22.0	30.0	
Root biomass	7.54	8.32	10.18	
Root length	57.19	63.3	42.70	*

Level of significance-0.05

A positive root distribution was found in plants Sprig ring containers. This would improve the tree′s ability to tolerate the harsh environment of Kuwait′s desert. In the long term, plants grown in conventional containers might face problems with environmental stresses in Kuwait. Good root systems can be shaped in nurseries using proper containers (Long, 1978). There was only a significant difference in the root length. This could aid the plant in absorbing moisture during drought stress and strengthen anchorage in high winds. From the observations and the data, it is clear that plant growth was not affected by the container type. The plant root system was well distributed in all directions when growth in the field, and no deformed roots were detected in plants initiated in spring ring containers.

CONCLUSIONS

This study reveals that spring rings have better results on *A. saligna* plant height whereas conventional pots gave the highest in total biomass production. Clear trends were less obvious for *Eucalyptus*, but tended to contrast with the findings for *Acacia*. Container type could affect the aerial parts but this depends on the plant species. On the other hand container type and shape had direct impact on root behavior but not necessarily on root production. Among the soil substrates Eucalyptus grown in 100%clay had a greater leaf area. Spring ring containers reduced harmful root biomass and encircling of roots. The plant root system was well distributed when grown in the field, and no deformed roots were detected in trees transplanted from spring ring containers.

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THE GROWTH CHARACTERISTICS OF SIX PEAR CULTIVARS UNDER THE "TRIDENT" TRAINING SYSTEM IN SOUTH-EAST OF ROMANIA

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Abstract

New orchards are heading to increase the planting density per hectare or to create an increased number of productive structures (scaffolds, axes, etc.) per surface unit. One way to accomplish the second task is to divide the growth vigor over more branches. This goal can be achieved by new tree training systems asthree-axis shape called "Trident" "Candelabro", "Chandelier" or "Candlestick". A replicated trial was established in the orchard of the University of Agronomic Sciences and Veterinary Medicine of Bucharest to evaluate the behavior of some self-rooted pear cultivars on "Trident" training system. The orchard spacing was 4 X 2.0 m and studied varieties were Abbé Fétel, Conference, Clapp's Favorite, Max Red Bartlett, Beurré Bosc and Alexander Lucas. The trunk diameter, total annual shoot length and shoot number, tree height and other growth parameters were measured annually at the beginning of growing season. The obtained results indicate differences between varieties. The greatest values for height tree were registered in Abbé Fétel variety in both season and the lowest values for Clapp's Favorite variety in 2011 and Max Red Bartlett variety in 2012.The data referring to trunk cross section pointed out very significant positive differences at Abbé Fétel and significant positive differences in case of "Conference" variety from average used as control in 2011. In 2012, two varieties showed significant positive differences from the average experience, respectively Conference and Max Red Bartlett.In 2011 varieties Conference, Abbé Fétel and Max Red Bartlett produced more long shoots than the average of trial and in 2012 the varieties mentioned above and Beurré Bosc" formed long shoots more thanthe average.

Key words: *orchard system, self-rooted trees, tree growth.*

INTRODUCTION

Tree architecture is an important aspect for the breeders having regard that growth vigour and specific type of growth and fructification affects directly the number of trees/unit of area. The need to reduce both pruning costs and the use of growth regulators changed the objectives of researches mainly in optimization of training methods based on natural tree habit (Lauri et. al., 2000). There are numerous technical and organizational innovations (cultivars, rootstocks, cropping techniques and defense techniques) that affect the whole life of an orchard (Galli et al., 2011). Two aspects, trees cultivated on their own roots and "Trident" training system were the subject of our study.

The use of self-rooted cultivars has had a great success in pear in the last decade. It offers the possibility to obtain high quality yields and it is good technique that can be extend in pear orchard (Stanica et al., 2000). It also could provide some tolerance to disease, especially fire blight (*Erwinia amylovora*) (Spornberger et. al., 2008).

The "Trident" system proposes a central leader and two side branches that are trained vertically that means finally the tree present three leaders (Vercammen, 2011). Distributing vegetation over three axes induces less vigour since tree sends nutrients responsible with growth in three axes instead of one. As bi-axis system "Trident" system is based on the same concept and the same effects, such as: a good exposure of fruit to sunlight, reducing tree height, reduction of cultural practices, less use of growth regulators, considerable speeding of harvest and pruning should appear (Dorigoni, 2008). The aim of the present work was to study the behavior of six self-rooted pear varieties in terms of vegetative growth of the trees.

MATERIALS AND METHODS

The study was conducted between 2011-2012 in a modern pear orchard located in Bucharest

area of latitude 26.5 degree East and longitude 44.3 degree North. The altitude is about 90 m above the sea level.
The plant material used in this study included self-rooted cultivars "Abbé Fétel", "Max Red Bartlett", "Conference", "Beurré Bosc", "Alexander Lucas", "Clapp's Favorite". Spacing between rows was 4 m and in the row 2 m, the trees being leaded as "Trident" leading form. A randomized block design for each cultivar in tree replications with three trees per plot was set-up.
There were used two support systems, one namely T 4- wire with galvanized wire (figure 1) and the other with two wire and three bamboo tutors/tree (figure 2).

Figure 1. T-4 wire support system

To assure stability of system in ground was used classical anchorage system and on the row every 10 meters, concrete espaliers were placed.
The alleyways were cultivated with perennials and were mowed mechanical in the growing season. On tree row the soil was maintained clean of weed by hand and mechanical cultivation.

Figure 2. Two wire and three bamboo tutors

The existing drip irrigation system on each rows provides 2l/hour water. It consist of continuous dripping line and individual drippers every 0.5.m.
The soil is typical brown-reddish with 40% clay content in the surface layer.
The average annual temperature is 10.6C and annual sum of precipitation is 574.3 mm.
Measurements were carried out at the beginning of each season, early in the spring, with roulette and caliper and results were expressed in cm.
The trunk thickness was measured at 50 cm above ground and was used to calculate the trunk cross sectional area. Also were measured: tree height, the total length and/or number of vegetative shoots. Total shoots were measured or counted and classified as vegetative shoots or flowering shoots. Some data were processed with variance analysis and t-test was applied.

RESULTS AND DISCUSSIONS

The growing vigour of the trees cultivated in high density system shows us that between the pear varieties have appeared differences regarding the trunk thickness growth, the height of trees and transversal cross section.
The trunk is an important element which characterizes the tree vigour and it is analyzed and correlated with a series of other biometrical process and indices (Comanescu et al., 2012). The analysis of tree height values among the varieties showed that tree height was lowest in

"Clapp's Favorite" in 2011 where the height of the tree constituted 170 cm and "Max Red Bartlett" in 2012 with the height of the tree constituted 200 cm. The highest values for this parameter was registered in "Abbé Fétel" in both seasons, with the height of the tree constituted 250 cm in 2011 and 280 cm in 2012 whereas in other varieties the recorded values were intermediate (table 1).

Values of the trunk thickness comprised between 2.10 and 2.93 cm in 2011 registered the pear tree varieties: "Max Red Bartlett: (2.70 cm), "Clapp's Favorite" (2.10 cm), "Beurré Bosc" (2.62 cm), "Alexander Lucas" (2.50 cm), "Abbé Fétel" (2.93 cm) and "Conference" (2.88 cm). In 2012 the recorded values were placed between 2.80-3.82 cm with lowest values at "Clapp's Favorite" (2.80 cm) and highest at "Conference" variety (3.82 cm).

Growth of trees, expressed as a trunk cross section area registers extreme values, comprised between 3.5 cm^2 at "Clapp's Favorite" variety and 6.7 cm^2 at "Abbé Fétel" variety in 2011. In the next year the values comprised between 6.2 cm^2 at "Clapp's Favorite" variety and 11.6 cm^2 at "Max Red Bartlett". The data from 2011 were statistically processed as compared to the average of the trial, used as control and pointed out very significant positive differences at "Abbé Fétel" and significant positive differences in case of "Conference" variety. In 2012 two varieties showed significant positive differences from the average of experience, respectively "Conference" and "Max Red Bartlett". Significant negative differences, as compared with average, taken as control, registered the "Clapp's Favorite" variety. Vigour with insignificant differences, as compared with average had the varieties "Beurré Bosc", "Clapp's Favorite", "Alexander Lucas", "Max Red Bartlett" in 2011 and "Abbé Fétel", "Beurré Bosc" and "Alexander Lucas" in 2012.

The average of annual vegetative shoot growth in 2011 was 147.8 cm/tree in "Clapp's Favorite", 257.8 cm/tree in "Beurré Bosc", 288.2 cm/tree in "Alexander Lucas", 320.1 cm/tree in "Conference", 327.7 cm/tree in "Max Red Bartlett" and the highest value (413.5 cm/tree) in "Abbé Fétel". In 2012 the registered values were as follows: 346.5 cm/tree in "Alexander Lucas", 360.1 cm/tree in "Clapp's Favorite", 386.8 cm/tree in "Abbé Fétel", 405.6 cm/tree in "Conference" and 411 cm/tree in "Beurré Bosc" varieties (fig. 3). In 2011 trees from "Conference", "Abbé Fétel" and "Max Red Bartlett" produced more long shoots than the average of trial (292.5 cm/tree). In 2012 the varieties mentioned above and additional "Beurré Bosc" produced long shoots more than the average (384 cm/tree).

In 2011, a large number of vegetative spurs produced "Conference" (68) and "Beurré Bosc" (45) while "Max Red Bartlett" and "Clapp's Favorite" formed the fewest number of spurs (39 and 38).

Table 1. Vegetative growth in 2011 and 2012

Pear variety	Tree height (cm)		Trunk thickness (cm)		Transversal cross section (cm^2)		Differences as to average (cm^2)		Significance	
	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012
Abbé Fétel	250	280	2.93	3.48	6.7	9.5	+1.3	+0.35		N
Conference	210	250	2.88	3.82	6.5	11.4	+1.1	+2.25		
Beurré Bosc	190	250	2.62	3.28	5.4	8.5	0	-0.65	N	N
Clapp's Favorite	170	220	2.10	2.80	3.5	6.2	-1.9	-2.95	N	
Alexander Lucas	180	210	2.50	3.14	4.9	7.7	-0.5	-1.45	N	N
Max Red Bartlett	180	200	2.70	3.84	5.7	11.6	+0.3	+2.45	N	
Average	196.6	235	2.62	3.39	5.4	9.15	-	-	-	-

DL 5 %=0.80 cm^2 (2011) N= not significant DL 5%=1.8 cm^2 (2012)

DL 1%=1.14 cm^2 *= significant difference DL1%=2.5 cm^2

DL 0.1%=1.65 cm^2 **= distinctive significant difference DL 0.1%=3.7 cm^2

In 2012 "Alexander Lucas" produce the largest number of vegetative spurs (122), followed by Beurré Bosc" (80) and the lowest number was registered in "Clapp's Favorite" (table 3).

The total length of the flowering shoots registered the highest value in both years for "Max Red Bartlett" (119.4 cm/tree in 2011 and 395.8 cm/tree in 2012) and the lowest value for "Beurré Bosc" (16.8 cm/tree in 2011 and 293.2 cm/tree in 2012) (table 2). The varieties "Max Red Bartlett", "Conference" and "Abbé Fétel" produced over than 300 cm/tree of flowering brindles in 2012 (table 2).

The values of offshoots length varied between 0 and 26.1 cm/tree in 2011 and 7.8 -107.8 cm/tree in 2012 with the highest value registered in "Max Red Bartlett" variety in 2011 (26.1 cm/tree) and "Alexander Lucas" variety in 2012 (107.8 cm/tree) (table 2).

"Alexander Lucas" variety formed the largest number of flowering dards in 2011 (67) and "Abbé Fétel" variety in 2012 (33) (table 3).

Trees formed also fruit bourses, one of them remained undeveloped others are formed by different shoots as spurs, dards or spurs and dards. "Abbé Fétel" and "Conference" formed constantly spurs, dards and bourses but the highest number of bourses with dards was registered in 2011 for "Alexander Lucas" variety (99) followed by "Clapp's Favorite" variety with 54 bourses with dards (table 3).

Table 2. Flowering shoots (cm/tree) registered between 2011-2012

Pear variety	Flowering shoots (cm/tree)					
	Brindles		Offshoots		Total length	
	'11	'12	'11	'12	'11	'12
A. Fétel	33.1	302.2	11.8	61.8	44.9	364
Conf.	27.5	321.7	15.3	14.5	42.8	336.2
Beurré Bosc	16.8	213.5	0	7.8	16.8	221.3
Clapp Fav.	17.6	271.2	0	22	17.6	293.2
Al. Lucas	103.8	250	8.6	107.8	112.4	357.8
Max Red Bart.	93.3	363.1	26.1	32.7	119.4	395.8

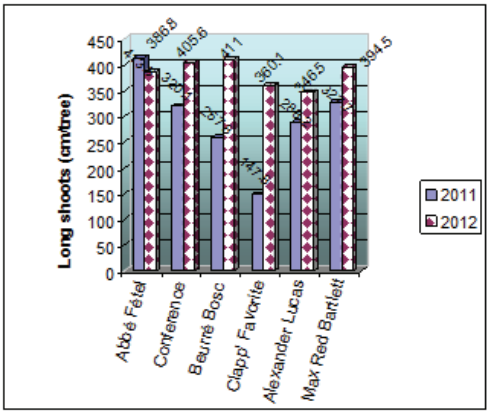

Figure 3. Long shoots registered (cm/tree) between 2011-2012

Table 3. Average number/tree and type of vegetative and flowering shoots

Pear variety	Vegetative shoots (no/tree)		Flowering shoots (no/tree)									
	Spurs		Dards		Fruit bourses							
					undeveloped		with spurs		with dards		with spurs&dards	
	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012
Abbé Fétel	49	51	24	33	3	5	57	6	5	1	4	0
Conference	68	54	25	10	0	16	10	61	0	0	0	0
Beurré Bosc	54	83	9	5	0	0	0	8	0	0	0	0
Clapp's Favorite	38	50	14	3	0	3	5	2	54	0	0	0
Alexander Lucas	45	122	67	24	0	3	5	11	99	0	0	0
Max Red Bartlett	39	60	11	22	7	0	54	57	1	8	0	0

CONCLUSIONS

The results showed that the studied pear varieties have capability to growth in Bucharest area.

In term of tree height we registered insignificant differences between self rooted varieties that could be interpreted as a uniformity of growth of studied cultivars.

In 2011 trunk cross section area showed differences allowing cultivars to be ranked in order of decreasing vigor: "Abbé Fétel", "Conference", "Max Red Bartlett", "Beurré Bosc", "Alexander Lucas" and "Clapp's Favorite". In

2012 the order was "Conference", "Max Red Bartlett", "Abbé Fétel" "Alexander Lucas" and "Clapp's Favorite".

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RESEARCHES ON THE MICROSPOREGENESES AND POLLEN TUBE DEVELOPMENT OF SOME CHERRY VARIETIES IN EXPERIMENTAL CONDITIONS

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Abstract

Biological characteristics of pollen formation and development are dependent on weather conditions in the winter and early spring thermal stabilization. In the last years, the weather disturbances manifested by late frosts, affected, mainly, physiological processes in mature pollen, which occurred by the reducing pollen germination capacity both as a percentage and also the development in terms of development in length (LPT) of the pollen tube. It were used specific methods Carnoy fixation for high lighting the microsporogenesis stages and the germination on liquid medium in order to selection optimal variants for the maximum potentialities of the pollen biological value. The work has been done on Romanian varieties of sweet cherry with different periods of ripening: Boambe de Cotnari, Severin, Daria, from Research & Development Station for Pomiculture Baneasa orchards. We observed a normal evolution at the anthers an the trades level of microspores, consisting a good premise for the germinative manifestation capacity of the pollen. In vitro conditions of the developmentdynamics of the pollinic tube varied from 18% at 45% as dominant values. In conclusionwe was considered germinated pollen all the granulates that had pollinic tubes length approximately equal with double the diameter pollen.

Key words: *cherry, length pollen tube, microsporogenesis.*

INTRODUCTION

Microsporogenesis is determined by genetic factors and is dependent or conditioned during his deployment, by sudden thermal fluctuations in winter wich often produce profound disturbances.

Microsporogenesis begins with reduction division (R!) and marks the passage the transition from deep winter rest to optional rest (Bordeianu et al.,1961; Tarnavschi, 1963).

Transition to the tetrad stage, then uninucleate microspores and pollen stage transition to binucleat pollen, depends on

Pollen maturation phase corresponds to the biological threshold (+6.5°C) for swelling buds (Ivaşcu, 2002).

Gonzales et al. (2001), in its study on microsporogenesis, said on the other species economic value, there is no strict relationship between the type and configuration microsporogenesis fourfold orientation is strongly influenced by tree especially during meiosis and there is also no direct correlation between the type and diaphragm microsporogenesis mature pollen grains.

Hedhly et al. (2004), said the pollen germination is the stage preceding the polenic tube growing in stil. Each of these two stages (germination and pollen tube growth is stimulated (driven) by ambient thermal conditions such as: moderate temperature that stimulates the stigma secretion, increases the adherence of the pollen and promotes the germination and the slightly higher temperature accelerate the pollen tube growth and simulates the process of fertilization (Hedhly, 2004).

Concerning nutrition media for the pollen germination consulted in national literature on different species of fruit trees, these contains 1,5% agar-agar (Cociu, Oprea, 1989; Butac et al., 2006; Blidariu et al., 2008), but also with some exceptions such as liquid medium (Iordache et al., 2010).

The object of this paper/research, is the analysis of the pollen through microscopically methods, microsporogenesis determination, degree of maturation pollen by the evolution of sporoderma, the final size from young

microspore to mature pollen, determination/analysis of pollen viability and germination capacity, and the relationship between variations of media and dynamic pollen tube germination, of three Romanian varieties of cherry.
These three varieties of cherry are available in our plantation of fruit trees and have not been investigated (studied) and characterized from this point of view.

MATERIALS AND METHODS

In 2011 there were evaluated microscopically three Romanian cherry cultivars with medium and late ripening period: Severin, Daria, and Boambe de Cotnari. The age of the trees alternates between 7 and 9 years and belong to the Baneasa SCDP collection. The samples consisted of flowering buds and open flowers that were harvested as follows: flowering buds were collected in February-March and in April the flowers were collected in the first day of anthezis and then the flowering buds. Flowering period lasted approximately 7 days.
The flowering shoots were first fixed in Carnoy solution for several hours then preserved in ethanol 70ºC (Andrei et al., 2003).
Open flowers and the buds being opened (balloon stage) were analyzed immediately after harvest (not being necessary or appropriate their setting and preserve).
By dividing into sections (severing) the flowering buds that are being in progress (stage) before the swelling buds (pre-swelling) and swelling of the bud stage (March-April), we obtained the necessary data in the process of observing the early stages of the microsporogenesis (tetrad with microspores, both very young and young microspores, the gradual appearance of the specific elements of sporoderma, the apertures forming, etc.)
The microscopical examination af samples in March has made on permanent preparations in glycerin gelatin, using optical microscopy IOR type ML4-M. It was used objectives 10x, 20x for camera and 40x for microscopic examination.
For better observation (examination) of the morphological elements (features) mentioned, the preparations were stained with Carmin Acetic Acid (ACA) or Methylene Blue vital dye alcoholic solution (Andrei et al., 1972).
They highlighted easier the differences between the microspores with normal maturation of the immatures, were identified viable microspores by the non viables.
At the pollen viability were estimated (V%) viability and germination capacity (G%) for each variety separately. They used anthers extracted from several flowers forming a homogeneons sample that represents faithfully the biological potential of the pollen at that time. Viability (V%) was expressed as a percentage in comparison of the viable pollen with all pollen grains of microscopic fields examined.
To assess (estimate) the capacity of germination (G%), anthers were placed in each small bottle as indicator (watch glass) and few drops of distilled water for hydration for pollen release.
These unessential process and comparable with natural hydration of pollen on the stigma secretion (Xie B. et al., 2010).
The pollen contained in each watch glass was an sample mean for the cultivar examined. From the sample mean of each variety have been sowings of germination media two different concentration of sucrose (15% and 20%).
The culture media that are used to the assess of the pollen germination are liquid media (distilled water) containing and 0,01% boric acid (H_3BO_3).
For each concentration of sucrose were seeded three versions (v_1, v_2, v_3) with which (by means of them) was tasted the action of some flower parts on (upon) germination.
For the safety results were made in all three repetitions (parallel sowing) as follows:

- v_1 – the drop of liquid medium has been seeded only with pollen;
- v_2 – the drop of liquid medium has been seeded with pollen together with pestle;
- v_3 - the drop of liquid medium has been seeded with pollen accompanied by empty anthers.

Pestle was introduced to try a simulation of the conditions *in vivo* referring to the stimulating effects that gineceu induced on the germination release (on the stigma) and then on the development of the pollen tube. Pestle but

could have a negative effect of environmental contamination with saprophytic germs (yeast, molds) and may be itself an undesiderable nutritional support for the development of these germs.
Therefore, similarly I kept 3-5 anthers emptied in the drops (v_3), to pursue these possible negative processes.
After sowing the first laboratory tests were done after an interval of 5 hours.
Microscopic examination of samples taken in April, was done by transmitted light and the phase contrast with objectives 10x, 20x, 40x.
To maintain unaltered microscopic preparations, both microspors extracted from the flowering buds (February-March) and the mature pollen extracted from open flowers or buds in the process of flowering (April) used to assess the viability and germinative capacity, were included after examination, in permanent preparations in glycerin gelatin (Andrei et al., 2003).

RESULTS AND DISCUSSIONS

Concerning microsporogenesis and the development of young microspores, the flowering cherry buds taken in February it was revealed the normal development of anthers in appearance and size during organogenesis in the three varieties studied.
The flowering cherry buds of 8 March – were pointed out (highlighted) tetrades of microspores that characterizes pre-swollen bud stage (before flowering buds swelling). The appearance being normally not observed distartions of the microspores in tetrad or disproportionate development between microspores. It was also observed the uniformity and normality of the cellular content between tetrad components.
The microscopic field were observed and pollen mother cells (PMC), due to non synchronizing of microsporogenesis process (Figure1, Figure 2).

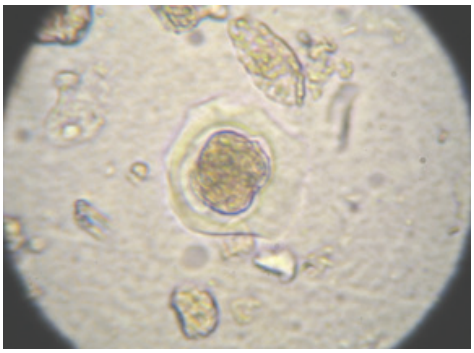

Figure 1. Pollen mother cells (PMC), Ob.20x, Oc.10x

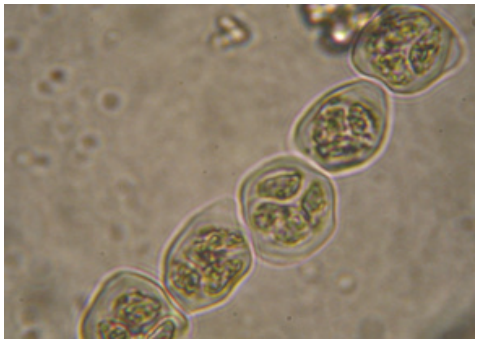

Figure 2. Tetrade chain of microspores in cherry variety Boambe Cotnari, Ob.20x, Oc.10x

On March 18 began to appear very young microspores that still coexist with tetrades and the flowering cherry buds of 21 March it was observed that anthers, microspores very young contains, recently released from the tetrad. Exin contour was devoid of visible ornaments and was examined with objectives 10x,20x,40x.
Contour was approximately circular. Uniform appearance, almost spherical, is explained by the lack of sporoderma stratification.
The apertures not appear obvious just because exin is still thin and devoid (without) ornamentations. In some granules, aperturs are marked by obvious folds.
The flowering cherry buds of 25 March noted tjat microspores are large rand have a maximum size of approx. 23,5 μ. Change in sizes and uneven appearance of microspores are due to non synchronizing of maturation stage of microspores at different anthers of some bud.
There are also differences from one variety to another on the stage of maturation of

microspores at certain date. Microspores are significantly different from those of 21 March as they start to differentiate at sporodermas level weaks ornamentations and we observe the apertures shape. However it also notes the cytoplasmic granulation at the granules with still thin sporoderma .

Concerning mature pollen: as the flowering cherry buds of 6 April, sporoderma has a specific appearance for mature pollen, we proceeded of ots application to test the viability. Were revealed the microspores appearance with a normal development for approx. 70% in deep red and yellow microspores containing reduced or absent cell and pollen with methyl blue staining vital dyestuff alcoholic solution, to highlight the presence of oil droplets that always accompany young pollen maturation (Figure 3 and Figure 4).

Viability and germinative capacity of the three Romanian varieties of cherry have maximum value for version 2 (v_2) with 20% sucrose. Boambe de Cotnari cultivar had viability (V%) 80% and maximum germination (G%) of 48%. Severin variety had viability (V%) 75% and maximum germination (G%) of 25% and Daria variety had viability (V%) 60% and the maximum germination (G%) of 18%.

As currently practiced were considered as being germinated the grains that has pollen tube lenght at least equal twice the diameter of pollen.

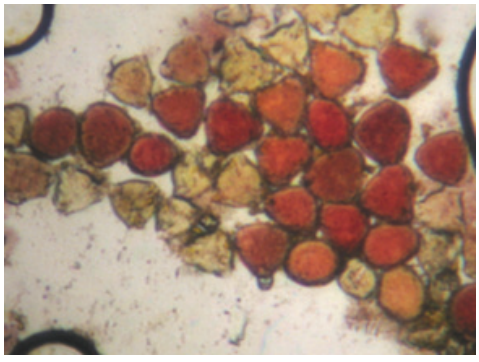

Figure 3. Red color, intense reaction to viable mature pollen during the test for viability, in cherry Severin variety, Ob.10x, Oc.10x.

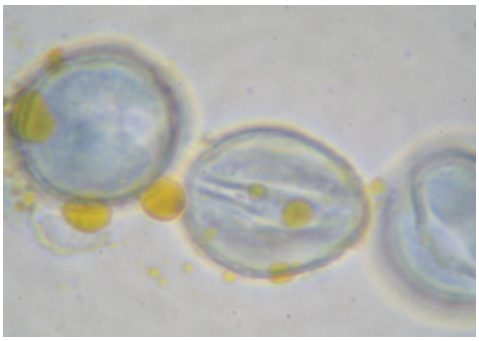

Figure 4. Staining Pollen with methylene blue vital dyestuff alcoholic solution, to highlight the presence of oil droplets that always accompany young pollen maturation in Daria variety, Ob.20x, Oc.10x

The results of 3 repetitions for each experiment, were expressed as a percentage based on the corresponding arithmetic mean (Figure 5).

The pollen tube length (PTL) / variety correlated with average sucrose % in variants v_1, v_2, v_3 are thus: pollen tube germinated at cherry varieties in the Romanian culture media, varies in length from approx. 30µ to about 400µ. (Figure 6).

To determine if a relationship exists between pollen tubes development and the medium the pollen germinated it was formed the graphic which were placed at intervals in order of length (µ) all „PTL max" and the corresponding experiments (Figure 7).

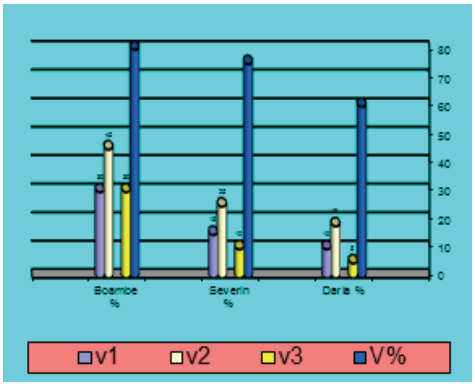

Figure 5. Dynamic pollen (V% and G%) for 3 varieties of cherry in variants (v1,v2.v3) with 20% sucrose.

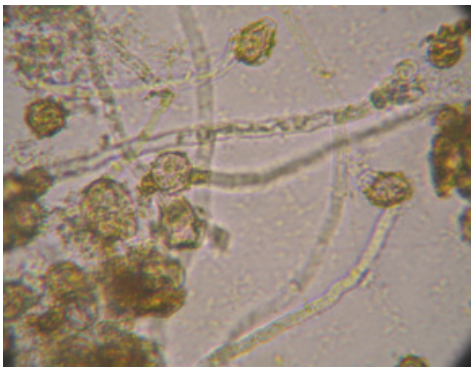

Figure 6. Mature pollen during germination, in cherry Boambe de Cotnari variety , Ob.10x, Oc.10x

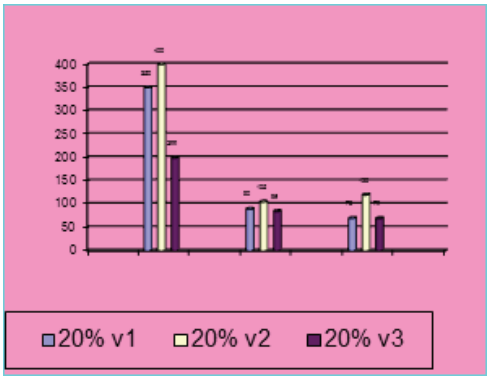

Figure 7. Dynamic pollen tube length (PTL μ) for 3 varieties of cherry in variants (v1,v2.v3) with 20% sucrose

CONCLUSIONS

As a result of these experiments conducted in 2011, in which has been evaluated the biological value of the pollen at 3 varieties of Romanian cherry, we conclude the following:

The pollen maturation went in normal physiological conditions, undisturbed in accordance with the evolution of relatively mild weather winter 2011.

Tetrades and microspores had a normal aspect for the development phasem.

Mature pollen showed viability between 60% and 80% and germination 18% - 45%.

The best germination has been on liquid medium with sucrose 20% and (H_3BO_3) 0,01%.

Boambe de Cotnari cultivar is in the top, both in viability (80%) and in germination (48%) and variety Daria is in the last place with 60% viability and 18% maximum germination.

The best germination of all varieties was obtained in variant (v2/medium + pollen + pestle) with 20% sucrose. Thus confirming the stimulant role of pestle in triggering of germination and pollen tube growth.

The poor germination was v_3 with 20% sucrose and v_3 with 15% sucrose in all varieties. Version 3 (v_3/medium + anthers) usually has a minimum value due to the negative influence of environmental anther tissue on germination.

For version (v_1) 20% sucrose, germination was equivalent to (v_1) 15% sucrose and and had moderate values. Version 1 (v_1/medium + pollen) can be considered indicative value for potential germination of pollen specific granules in the absence of pistle influence.

PTL max. was recorded in variety Boambe de Cotnari (400 μ) also in the version (v2) on an average of 20% sucrose.

The 3 Romanian varieties cherry have brought forth the specific potential of each.

It confirms good germination (18-45%) and the corresponding binding undisturbed weather conditions during flowering and microsporogenesis.

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RESEARCHES ON POLLEN VITALITY IN SOME APRICOT HYBRIDS

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Abstract

Pollen vitality as a biological feature is an important factor in the reproduction on amfimictic way and has major implications for the quantity and quality of fruit. In 2012, the negative effects upon the flowering buds that are produced in winter by climatic factors manifested by sudden thermal fluctuations with persistent frost and hard frost, without intermediate temperatures from a period to another have led to strong hurting of buds of fruit. Physiological disturbances due to the low temperatures have had a prolonged effect with repercussions in the microspores maturation, regarding the pollen viability and germinative capacity in some apricot tree. The object of the work is to evaluate the performance in germination %R(G/V) of the pollen, relationship expressed through germinal capacity and of mature pollen viability released from anthers that was affected by frost. There were evaluated microscopically the pollen vitality at apricot tree, hybrids: HB.82.62B.IV. and Nicusor cultivar with a different maturation period from the existing collection of SCDP Baneasa. As a result of the effectuated experiment there were obtained following values: the two biological indicators of mature pollen from apricot, the germinal capacity (G%), viability (V%) and their relation expressed by the performance in germination %R(R/V), on both sucrose environments (15% and 20%),have had values between 11%-33% for germinal capacity (G%), 25%-50% for viability (V%)and for efficiency in germination %R(G/V)between 44%-77% . In conclusion, leaders were the 826.62 hybrid and Nicusor cultivar.

Key words: *germination capacity, pollen tube, viability.*

INTRODUCTION

The assessment of the fertility degree through pollen vitality and "fruit bounded, fruit set" quantity in natural conditions for fruit trees holdings, always involves, the effect of environmental conditions, too.

In vitro experiments of the pollen viability and germination, is practiced method for the fertility estimation of pollen of fruit growing species, (cultivar or hybrid), in forecasting crop, and for to check resistance, tolerance and adaptability pollen (respectively cultivar), to the fluctuations and weather risks (very cold winter frosts return spring frosts, etc.,).

In vitro experiments are a good test for forecasting fertility rates in plantation flowers (Hedhly et al., 2004).

Concentrations of sucrose used by some researchers for the pollen germination testing in vitro environments, were different, (Cociu and Oprea, 1989; Butac et al., 2006; Pădureanu, 2007; Blidariu et al., 2008; Iordache et al., 2010).

Boric acid (H_3BO_3) was added to the medium *in vitro,* at various concentrations (Butac et al., 2006; Iordache et al., 2010).

Both germination and pollen tubes development, are stimulated and depended by ambient thermal conditions.

Temperature during germination, has a determinative effect on pollen tube kinetics and dynamics (both in medium as in style), stimulating then the fertilization process (Hedhly et al., 2004), in comparative study of two cultivars of *Prunus avium* L., Spain and Canada.

The temperatures that for the pollen germination used were were between 18°C, and 25°C (Butac et al., 2006; Pădureanu, 2007; Blidariu et al., 2008).

The favorable temperature of pollen tube development for fruit trees, is between 10°C and 20°C, (Hedhly et al., 2004).

The temperatures below 10°C and above 20°C determine the reduced germination rate and pollen tube development (Hedhly et al., 2004).

The objective of this paper, is to evaluate the potential fertility pollen, in laboratory experimental conditions.

These apricot hybrids experienced in this research, are existing in ours fruit tree plantation and have not been examined / tested and characterized and this point of view. the pollen germination (*in vitro*), in liquid medium (deprived of agar-agar), because we considered it may be relatively comparable, with intercellular fluid composition of stylar tissue, that pollen tube develops, and allow better dispersion of pollen and thus favors in liquid medium, the development of pollen tubes.

MATERIALS AND METHODS

Nicusor cultivar. Age of the trees is 8, with medium and late ripening period. In April (on the first day of anthesis in 04.04.2012), there were taken from open flowers and flowering buds for determing the viability and the capacity of pollen germination.

To asses the viability and to represent as real possible the biological potential of the pollen at that time, to each sample and analysis partly, were used fresh anthers that were extracted from the stem filaments of the flowers or current flowering buds.

directly on microscope slide glass, there were applied (according to the Method Andrei and Paraschivoiu, 2003), directly on the fresh and mature pollen, e few drops reagent 2,3,5-Trifeniltetrazol Clorid, for coloring reaction (Andrei and Paraschivoiu, 2003).

The pollen viability was evaluated under a microscope in transmitted light, by examining of the morphological and physiological characteristics of the pollen cell.

The method is recommending the counting the colored grains only as a result of the deep red reaction (Andrei and Paraschivoiu, 2003).

The viability was expressed in per cent (V%) confronted by the total grains counted in the field by reporting of the viable pollen to total grains of microscopic fields examined.

For creating the media culture *in vitro* to determine / assess germination capacity (G%) of the mature pollen, was hydrated (previously) the pollen, released from anthers fresh , on several slides glass.

This essential process is comparable with natural hydration of pollen on the stigma secretion (Xie B. et al., 2010).

Then separately, were made sowing on germination media in 2 different and separated concentration of sucrose (15% and 20%) in which added 0,01% boric acid (H_3BO_3).

We believe that, the pollen germination advantage on the liquid medium directly on slide glass, allows at better microscopic examination through transparency and the transmited light unlike the germination on solid medium in Petri dishes, which cannot be examined only in direct light at o "power enlargement" of max. 200x for stereo magnifier.

Also the pollen germination testing, was done in 3 different germination the tasting in 3 germination variants (v1,v2,v3) by introducing of some floral parts (ginaeceum / pistil and the remaining emptied anthers), in germination medium to emphasize their influence / action on pollen germination (Iordache et.al., 2010).

So each microscopic slide was a test variant (V1,V2,V3) thus as follows:

- Variant V1- liquid drops was seeded only with pollen
- Variant V2 – drop of liquid was seeded with pollen together pistil, for a simulation of the conditions *in vivo*, relating to the stimulating effects that gynaeceum induces on starting of germination (on stigma) and then on pollinic tube development.
- Variant V3 – liquid drop was seeded with pollen together remaining emptied anthers for to have in view these possible negative processes.

Slides with media were kept at on average temperatures 17°C to 20°C in wet atmosphere so that the liquid medium doesn't evaporate and thus it is maintained constant concentration in boric acid and sucrose.

To reduce the risk of environmental contamination and to avoid the deterioration of germination medium, all the tools with which they were working, including filter paper and cultural medium were sterilized previously (Andrei and Paraschivoiu, 2003)..

After sowing, the first laboratory tests were made after a period of 5 hours of testing and 24 hours.

As currently is practiced they were considered germinated grains that had pollen tube length at least twice the pollen diameter.
To point out the pollen tube and nuclei were applied specific colorings on germination media with dilluate solution of Methyl Blue. (Andrei and Rădulescu, 1972).
The germinative capacity of the viable pollen was expressed as a percentage (G%) based on the corresponding arithmetic media.
Then the values of germination (G%) were reported, the viability (V%) corresponding to the hybrid / cultivar to obtain of the efficiency in the germination of pollen % R(G/V).
After the microscopical preparations, the germinated pollen was included in glycerin jelly to maintain the microscopical preparation unaltered (Andrei and Paraschivoiu, 2003).
For microscopic examination was used optical microscope IOR type ML-4M.
To point out the viability and the pollen germination, examination, assessments and photographs were made in transmitted light, polarized light, and objectives 10x, 20x, 40x and C.F. (phase contrast) with 10x ocular.
It was used ocular micrometer to measure polinic dimensions.

RESULTS AND DISCUSSIONS

Regarding pollen viability evaluation (V%): viability ratio (%) is the first condition in pollen germination and gives us information about the probability of fertilization of the pistil.
After the application of the specific enzymatic method for the determining viability (V%) of the pollen, the intense red color reaction has occurred at the following hybrids of apricot: Hybrid 82.6.62.B.IV. had maximum of approx. 50% and at the apricot Hybrid 82.28.62.B.IV. has registered a low value of approx 25%, having as leaders / having in view the viability), the Hybrid 82.6.62.B.IV. and Nicusor cultivar (Table 1, Figure 1).
The viable mature pollen grains at apricot, had the following dimensions: from 48,3µ - 50,1µ in the equatorial optical section (image obtained in polar view) and from 44,0 µ - 46,3 µ in optical meridian section (image obtained in equatorial view).

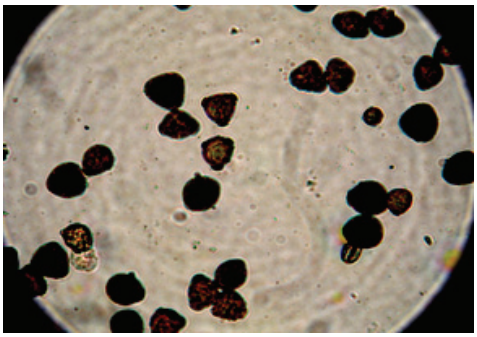

Figure 1. Viability at Nicusor apricot cultivar, 05.Apil.2012

It was found that in terms of size and morphological aspect and the apertures development, the germinal grains, so, with the normal physiological development have dimensions close to those typical of the same species (Tarnavschi et al., 1981-1984).
Regarding evaluation of germination (G%) by the action of pollen composition averages on 15% and 20% sucrose: the germinative capacity (G%) of each hybrid and cultivar individually has expressed by two maxim values corresponding germination on the two medium with 15% and 20% sucrose, to variant (v2).
The highest values of germination capacity (G%) were at the Hybrid 82.6.62.B.IV. and Nicusor cultivar, (table 1, figure 2, figure 3): 28% and followed by 33% on sucrose medium 20% followed by 33% and 37% on sucrose medium 15%.
It is a remarkable fact that from the point of practical view, in general the germination (G%) in 30% is considered satisfactory, because the specialized literature recognizes that this germination is representative for the fertility degree of the flowers, respectively the binding of future fruit (Ivascu, 2001).
Therefore, germination value (G%) presented in table and graph, are the maximum values recorded for each hybrid, to certain concentration of the medium with sucrose included in the experiment.

Table 1. Relationship between germination G% viability and germination yield % R(G/V) at the apricot cultivars and hybrids evaluated in 2012

Hybrid/cultivar	MATURE POLLEN				
	Germination max.(G%) of total pollen		Germination max.(G%) of total pollen	Germination max.(G%) of total pollen	
	Zh 20%		*Zh 20%*	*Zh 20%*	*Zh 20%*
HB 82.28.62.B.IV	11	15	25	44	60
HB 82.4.41.B.IV	17	19	30	57	63
HB 82.6.62.B.IV	28	33	50	56	66
NICUŞOR	33	37	48	68	77
(*)The viability is determined by coloring with 2,3,5 Trifeniltetrazolclorid (**)The germination productivity (% RG/V) is calculated by the ratio of germination/viability (%)					

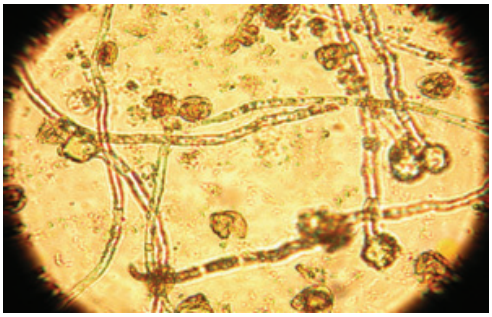

Figure 2. Apricot hybrid 82.662.BIV. on medium, with 115% sucrose (04.April.2012)

Regarding the evaluation of pollen germination (G%) by the action of experimented floral parts in 3 variants (v1,v2,v3), on pollen germination on the mediums with 15% and 20% sucrose: the maximum values obtained depending on the variants are representative for pollen germination from each of the hybrids studied.

The highest germination values are observed at in second variant (V2/medium+pollen+pistille) and it is confirmed the incentive role of the pistil (at both mediums with 15% and 20% sucrose), except apricot hybrid 82.28.62.B.IV., where V1>V2 on both environments.

Generally the size relation between the three variants (v1,v2,v3) is the following:

- Variant (V2/medium+pollen+pistil) has maximum value because the incentive role of the pistil in the germination and the pollen tube growth.
- Variant (V3/medium+anthers), has a minimum value as a result of a possible negative influences on germination that the anthers tissue has.
- Variant (V1/medium+pollen), has an average value (in the absence of favorable influence of the pistil, and the absence of the negative influence of the anthers) and can be considered the indicative value for the specific germination potential of pollen grain.

The percentage germination (G%) appears correlated with viability (V%) respecting the natural relationship between them.

For each hybrid and cultivar as well, the germination value were assigned to the viability values (V%), separately for germination medium with sucrose 15% and separately for the germination medium with 20% sucrose.

In this way was given by the productivity in germination % R(G/V), that expressed the degree of correlation between the two biological characteristics of the pollen (the power of germination and pollen viability) and the germination relation/viability expresses as germinable, viable the pollens are, because not everything is viable has the power/ its ability to germinate.

The highest potential in germination %R(G/V) is 77%, the leader being Nicusor cultivar of apricot Hybrid 82.6.62.B.IV. on average of 15% sucrose and the lowest %R(G/V) is 44% for Hybrid 82.28.62.B.IV. on average 20% sucrose .

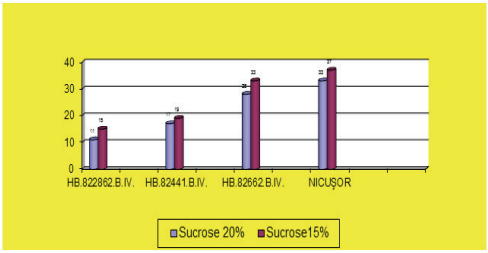

Figure 3. Action composition average 15% and 20% sucrose on pollen germination of apricot cultivars and hybrids evaluated (2012)

CONCLUSIONS

From experiments in 2012 in which was evaluated the viability (V%), the germination capacity (G%) and the efficiency in germination %R(G/V), we have drawn the following conclusions:

The flowering of the apricot this year started in the first days of April.

The investigated apricot cultivars and hybrids have yielded in 2012 accordingly to the specific and individual potential but with negative influences due to the microsporogenesis that was damaged in part and poor flowering in small proportion.

Regarding the two biological indicators of the pollen, the viability V% and germination G% and their relationship expressed by efficiency in germination %R(G/V), on both sucrose medium (15% and 20%), were obtained the following values:

The highest germination yield %R(G/V), it has Nicusor apricot cultivar on 15% sucrose medium that presented 77% R(G/V) in terms of only 48% viability (V%) and 37% germination (G%).

The best germination percentage regarding the action in media composition were recorded on liquid medium with 15% confronted with 20% sucrose medium.

The highest values of germination and also of experienced floral representative parts in 3 variants (v1,v2,v3), has consistency two variant (v2/medium+pollen+pistil) under the stimulant influence of pestle on both environments.

Therefore the variant V2 we consider more concluding, because of the interaction between pollen and pistil for binding fruits prognoses than V1.

In vitro conditions, the germination (G%) of the pollen expresses by the pollen fertility potential and this relationship germination viability expresses as germinable and vigorous are viable pollens and the germination degree %R(G/V) express the correlation degree between these two biological characteristics of the pollen.

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SOME MORPHOLOGICAL PROPERTIES OF DIRECT SOWED SWEET CORN

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Abstract

In our trial we compared the effect of propagation time and floating cover on the growing season on some valuable properties of sweet corn. The following technological variations were compared with the help of the variety Spirit (normal sweet, very early ripening): 1. direct seeded plants with floating cover (with 2 sowing dates); 2. direct seeded plants without cover (with 2 sowing dates). The covering by earlier sowing time had favourable influence on plants highness, ear weight, ear length and no influence on tassels length, and dept of seeds. The covering by later sowing time had favourable influence on tassels length, ear weight, ear length and dept of seeds and no influence on plants highness.

Key words: *sowing time, plants covering.*

INTRODUCTION

Based on its present growing area, the sweet corn is the vegetable which is grown on the greatest area in Hungary. After dates of Hungarian Fruit & Vegetable Interprofessional Organization in 2003 the growing area was about 38,000 hectares. After 2003 followed a sudden and sharp decline, so in 2005 the growing area was "just" 24,000 hectares. After diminishing, the plant returned in rise, in 2006 against over 30,000 hectares.

As early as in the beginning of the 20th century some researchers (Cserháti, 1901) highlighted the importance of the sowing date. Ripening can occur earlier when sowing earlier and using high quality seeds as compared to normal or late sowing. I'só (1969) and Pásztor (1966), after their multi-year sowing date trial, concluded the following: in the case of an earlier sowing seed germination will be more protracted, but from the point of view of fruit maturing it was more favourable than late sowing.

Also I'só and Szalay (1966, 1969), studied occur of maize generative phenophases. They concluded, that by earlier sowing germination will be more protracted, but silking and harvesting occur sooner than by lately sowing time.

After multi-year trial Berzsenyi et al. (1998) have studied the effect of different sowing times on maize development. Direct seeded sweet corn under vlies cover showed earlier ripening and gave better yields in the experiments of Kassel (1990).

In case of direct seeding, as propagation method, another earliness increasing solution is the temporary covering with plastic or vlies, used in different combinations (Hodossi and Kovács, 1996).

About the covered early sowing as a technological variation (Aylswirth, 1986) mentioned, that from an early sowed crop, made in first week of April, arranged in twin rows (42 cm) and covered by plastic, we could harvested marketable cobs.

MATERIALS AND METHODS

The experiment was set up in 2008 on an area equipped for irrigation at the Experimental Farm of the Faculty of Horticulture of the Corvinus University of Budapest.

The results of the analysis of the soil sample collected at the beginning of 2006 from the trial area prior to direct seeding are contained in Table 1.

Table 1. Soil analysis results

pH_{H2O}	Salt %	Humus %	K_A	P_2O_5 mg/kg	K_2O mg/kg	$CaCO_3$ %
8,03	0,035	1,31	<30	293	205	<1

The pH of soil was considered calcarous. The nutrient content of soil in nitrogen was low, in phosphorus very good and in potash good.
The test variety was Spirit, a normal sweet corn with a very early growing period (85 days). Average plant height is 159 cm, ear height is 37 cm. Average ear length was 19.6 cm in the variety comparison trials carried out by the Central Agricultural Office and average ear weight was 245 g (Kovács, 2002).
The following treatments were applied during the experiment:
P1 = uncovered direct seeded (April 8th), P2 = covered direct seeded (April 8th), P3 = covered direct seeded (April 21th), P4 = the control, uncovered direct seeded (April 21th).
By both sowing times (April 8th and April 21th) a part of the stand was covered with Novagryl floating row cover having a weight of 19 g/m^2 at the two propagation times in order to enhance earliness. The floating row cover was removed on May 13th. The stand was created to contain 60,607 plants per hectare, according to the recommendations of the owner of the variety, at a spacing of 110+40x22 cm in twin rows. Each plot had an area of 6x7m (8 parallel rows and 30 seeds sown in each row). The edge was the outer two rows of the 8 rows of the plot, respectively. All treatments were set up in four replications.
Fertilization was done by top dressing with N. No farmyard manure was applied.
During the experiment, we studied some plant morphological properties according to the following:
highness of plants (cm), length of tassels (cm),
Ears, together with the husks, were collected from the four central (two twin) rows. After that 20 ears of average appearance were selected from each row and the following measurements were carried out: unhusked ear weight (gram), total ear length (cm), depth of seeds (mm).
The statistical analysis of the results was carried out by using the programme RopStat 1.1. When the standard deviations were identical the mean values were compared by pairs using the Tukey-Kramer test, while in the case of the non identical standard deviations the means were compared using the Games-Howell test (Vargha, 2007).

RESULTS AND DISCUSSIONS

The highness of plants (cm) is represented in the figure 1.

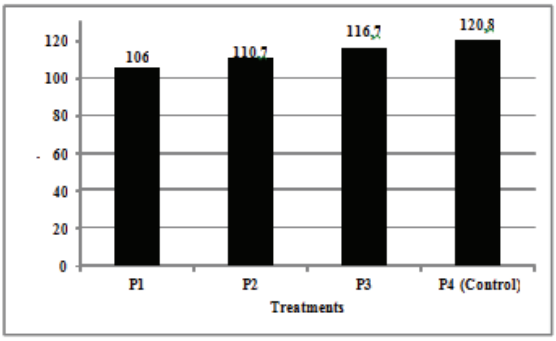

Figure 1. Highness of plants

The effect of covering (P2) was favourable on plant high compared to uncovered (P1) treatment by earlier sowing time. The highest value of plant highness was registered by plants of (P4 control) treatment, difference was significantly (at $p<0.01$ level), compared to earlier sowed (P1) uncovered and P2 (covered) treatments. Among other treatments plant highness no significantly difference.
Evolution of tassels length (cm) is summarised on figure 2:

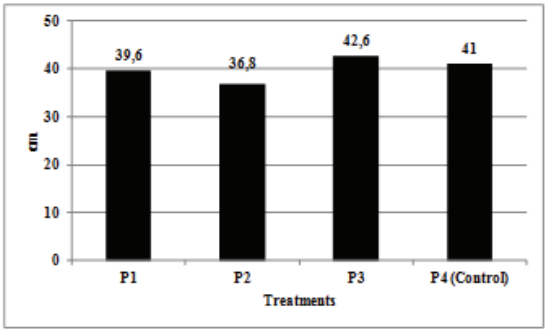

Figure 2. Tassels length

In case of tassels length the time of later sowing has greater influence. Plants from later sowed covered (P3) and uncovered, control (P4) treatments had significantly (at $p<0.01$ level) longer tassels compared to earlier sowed covered (P2) treatment and longer, but not significantly, compared to earlier sowed uncovered (P1) treatment.

The unhusked ear weight (g), one of the major yield parameters, is illustrated in figure 3.

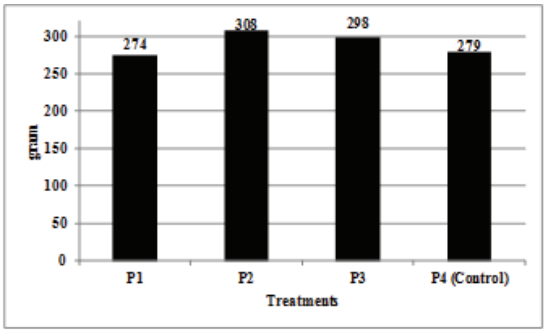

Figure 3. Unhusked ear weight

Analysing the measured data for unhusked ear yield, we saw that the average weight of the ears of the treatment P2 (earlier seeded, covered plants) was significantly (at $p<0.01$ level) higher as compared to the other treatments.

The average unhusked ear weight of the P3 treatment (later seeded, covered plants) was significantly higher (at $p<0.01$ level) compared to the uncovered treatment P1 and higher, but not significantly, compared to P4 treatment.

The data concerning, an important characteristics for market appeal, total ear length (cm) are contained in figure 4.

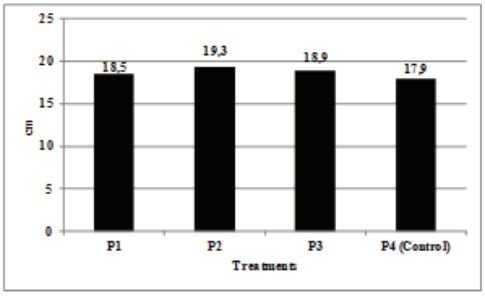

Figure 4. Total ear length

Studying the data of total ear length, we found that the lengths of later seeded, uncovered (control) treatment P4 were also statistically significantly (at p<0.01 level) lower to the sizes of the other treatments (P1, P2 and P3).
The average total ear length of the P2 treatment (earlier seeded, covered plants) was significantly higher (at p<0.01 level) compared to the other treatments. No statistically demonstrable difference was found between the ear length of the treatments P1 and P3.
From customer viewpoint depth of seeds (mm) is an important parameter and the measured average results are presented on figure 5.

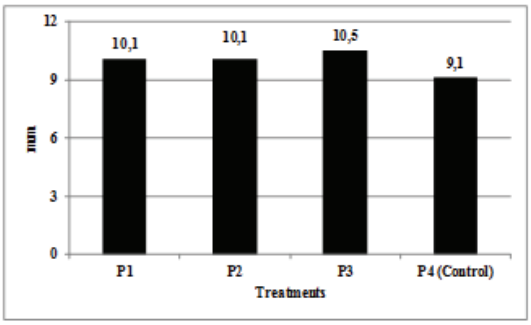

Figure 5. Depth of seeds

Analyzing the size (depth) of seeds we observed a statistically demonstrable (at p<0.01 level) difference among control treatment (P4) and other treatments. Seeds depth of later seeded, covered treatment (P3) was bigger, sustained statistically (at p<0.01 level), compared to the other treatments.

CONCLUSIONS

Effect of covering has favourable effect on highness of plants by earlier sowing time, in 2008.
Covering had also positive effect on evolution of tassels length by later sowing time.
The unhusked ear weight presented the highest results in case of treatment P2 (earlier seeded, covered). In case of later seeded treatments (P3, P4) the results were quite square.
Measuring ear length, we observed the same tendency as in case of ear weight. P2 treatment's ear produced the highest values.
From customer viewpoint important parameter, depth of seeds, the later seeded, covered treatment P3 presented the better results, in 2008.

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ORNAMENTAL PLANTS, DESIGN AND LANDSCAPE ARCHITECTURE


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SOME CONTRIBUTIONS ON INTRODUCTION OF THE GENUS *ABIES* MILL. SPECIES IN THE REPUBLIC OF MOLDOVA

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Abstract

The main objectiveof the presentpaper is to studythe biological peculiaritiesof the genus Abies species and formsgrowing and newly introduced in the Republic of Moldova, by their subsequent identification of the most perspectives. As a resultof the investigationsfor the first time arerefined the taxonomicalcomposition that include 23 species, 3 hybrids and 26 forms and cultivars. The questions ofgrowth and development, also the peculiarities offlowering andseed-bearing are studied. Thesustainability of the species and forms ofthe genus Abiesto unfavorable environmental factors i. e. to drought hardiness experimentally are established. The peculiaritiesof seed andvegetative propagationare investigated. For the first timeare tested variousways ofgrafting for decorative formsoffir in thesoil and climatic conditions. Based on the analysis of obtained data are proved the perspectiveof breeding somespecies andgarden formsby vegetative ways. The optimal grafting terms,graftingmodalities and their modificationswith reference to the conditions are recommended. A result of investigationsselected andrecommended for usein green buildingthe mostornamental speciesand cultivars offir.

Key words: *introduction, coniferous, fir, species, cultivars.*

INTRODUCTION

Fir (*Abies* Mill.) is a genus of evergreen forest-forming woody plants in which are provided more than 50 main species is one of the oldest of the eleven existing genera of the pine (*Pinaceae* Lindl.). The species of this genus predominantly in mountainous regions of the northern hemisphere, where they form dark coniferous forest are widespread. The most of them in the area of sub-zones of middle and southern taiga of Siberia and North America, as well as in the mountainous forests of the temperate and subtropical zones of Central and Southern Europe, North Africa and foreign Asia are located (Крылов Г. В. и др., 1986). The species of genus *Abies* have a number of valuable ornamental qualities necessary in green building - this is the durability and monumentality, the high sanitary and recreational properties and the emotional impact on people. These properties in combination with a diversity of ecological peculiarities of different species of fir it can be successfully used to create park, forest park, and other types green spaces.

The introduction in green plantings composition the introduced species is one of the perspective ways of enrichment the biological diversity, as well as increasing the aesthetic value of cultural landscapes. The representatives of the genus *Abies* does not grow in natural conditions of the Republic of Moldova. The first steps on introduction of firs relate to the second half of XIX century – beginning of XX in the gardens and parks of the landlords (Андреев В. Н. 1957; Леонтьев П. В., 1967). Furthermore, the experience on introduction of *Abies* species was accumulated in the botanical gardens and arboretums and, particularly active fir has been implemented from the middle of XX century. However, up to present not yet summarized the rich experience in creating and growing of fir plantings in the Republic of Moldova.

MATERIALS AND METHODS

As biological material for the investigations were served the species and cultivars of *Abies* genus, which grows in the Botanical Garden Academy of Sciences of Moldova (the old and new territory), arboretums, parks and squares

of Chisinau, also the old parks. For carrying out the actual researches a number of known methods, recommendations for clarification of the species composition, determination of heat and drought resistance, winter hardiness, reproductive ability, level of adaptation and the perspective of introduction have been used (Гирс Г. И., Древесные … 1975; Ермаков Б. С., 1981; Зубарева О. Н., 1979; Иванова З. Я., 1982; Методика … 1975; Хромова Т. В. 1980; Черепанов С. К., 1975).

RESULTS AND DISCUSSIONS

As a result of determining and clarifying the taxonomic composition of the genus *Abies* in the Republic of Moldova we have established the 23 species, 3 hybrids, 26 forms and cultivars (Table 1).

Table 1. Taxonomic composition of genus Abies Mill. species in the Republic of Moldova.

Species and hybrids	Cultivars
Abies alba Mill.	Aurea, Columnaris, 'Pendula', 'Pyramidalis'
A. amabilis (Dougl. ex Loud.) Forb.	-
A. arizonica Merr.	-
A. x *arnoldiana* Nitz.	Ioan Pavel II
A. balsamea (L.) Mill.	'Nana', 'Piccolo', 'Hudsonia' Pyramidalis
A. borisii-regis Mattf.	-
A. cephalonica Loud.	-
A. cilicica Carr	-
A. concolor (Gord.) Ldl. ex Hildebr.	'Argentea', 'Compacta', 'Violacea', 'Lowiana'
A. fraseri (Pursh) Poir.	-
A. holophylla Maxim.	-
A. homolepis Sieb.et Zucc.	-
A. x *insignis* Carr. ex. Bailly in Rev.	-
A. koreana Wils.	Brilliant 'Brevifolia', 'Piccolo', 'Lumenetta', 'Silberlocke'
A. lasiocarpa (Hook.) Nutt.	'Compacta'
A. nephrolepis Trautv.) Maxim.	-
A. nordmanniana (Stev.) Spach	'Golden Spreader', 'Pendula'
A. numidica De Lann. ex Carr.	-
A. pinsapo Boiss.	'Glauca'
A. procera Rehd.	'Glauca', 'Kelleris', 'Obrighoven'
A. recurvata Mast.	-
A. sachalinensis (Schmidt) Mast.	-
A. sibirica Ledeb.	-
A. spectabilis (D.Don) Spach	-
A. veitchii Lindl.	-
A. x *vilmorinii* Mast.	-

CONCLUSIONS

As a result of determining and refinement of the taxonomic composition of the genus *Abies* in perennial plantations of the Republic of Moldova revealed 51 taxa. Our studies concerning the growth and development of the genus *Abies* have shown that the soil and climatic conditions of the Republic of Moldova are favorable for growth of many ornamental fir species and cultivars. The entry of 16 fir species in the generative phase indicates to their adaptability to new environmental conditions. The good germinating capacity of seeds of some fir species creates the possibility of their mass reproduction and its following use in the ornamental gardening. On the example of fir blue species was proved that the last have a high heat resistance with respect to the types. Thus, when creating a green plantations under conditions of increased heat should be given preference to the species with a blue coloration of the needles. Based on the researches was proved the perspectivity of reproduction of fir species and cultivars by vegetative way: low growing form by cuttings and with high stems by grafting. For landscape gardening we can recommend 13 fir species and, their ornamental cultivars.

The highest number of forms is distinguished: *A. concolor*, *A. koreana* and *A. procera*. Taking into account the global floristic reserves of the genus (56 species, 2 subspecies, 9 hybrids, 2 varieties and 625 cultivars) [Васильев Н. Г., Уханов В. В., 1949; Крылов Г. В. и др., 1986; Den Oden P., Boom B. K. 1978; Aris G. Anders and Derek P., 2012;], the assortment of used in the green building of the Republic of Moldova is comparatively poor. This basically

it is *A.alba* and *A.concolor*. The other species are used for creating decorative groupings in botanical gardens, arboretums, old parks, as well as in private gardens. Seasonal the growth of shoots is one of the main periods of woody plants life, closely related with climatic conditions of growing.

The study of growth and development of introduced plants in different soil and climatic conditions allows to judge about their adaptation to the new environment and to identify the existence of perspective for the economy. Our observations showed that in Central of Moldova (Chisinau) at the investigated species of fir the growth axial shoots begins in late April – early May, with an average daily temperature of 8-16^{o} C. The end of growth in most species occurs at the end of June – beginning of July. Deadlines of beginning and end of growth vary from year to year, so that the duration of growth is different. The most intensive growth of shoots is observed in May. Blossoming and seed wearing is an important moment in the life of any plant. The entry into generative phase is one of the criteria for assessing the success of plant introduction. Under the conditions of Republic Moldova 'blossom' and form seeds of 16 species of fir. Their strobilation occurs in the first half of May, with an average daily air temperature 9-18° C and the sum of positive temperatures 290-480° C. Strobilation period varies from year to year, is dependent on the weather and lasts from 6 to 12 days. Seed ripening begins in the first decade of October. Whole period of cones from flowering to maturity, depending on the species, lasts 100 to 130 days. For the full development necessitates the sum of positive temperatures – 2150-2800° C. The determination of the quality seeds has shown high laboratory germination (over 70%) in *A. concolor*, *A. nordmanniana* and *A. numidica*, average (40-50%) at *A. alba*, *A. sibirica*, *A. pinsapo* and low (10-25%) in other species. In our opinion low seeds germination is due to the insufficient number of trees of that species. As a result of experimental study (the testing into the water chamber of ultrathermostat UT-15) was established more expressed heat resistance of fir species needles with blue color as compared to green. It is known that an important role in the introduction plays winter hardiness, of plants, moreover in the process of acclimatization, it can change. Currently, 90% of cultivated species of the genus *Abies* have the highest scale of hardiness - I. The part of species has a transitional point, depending on the climatic conditions of the year - I-II. During the period of investigations types and forms of fir showed the complete drought resistance, i. e. in all cases was observed the drought resistance - V by M. R. Duval-Stroev five-point scale [1966]. We have also investigated the peculiarities of seed reproduction. In our experiment, seeds of the local reproduction were used. In the research program was to identify the optimal growing seedlings of some fir species, for what were tested different variants and substrates and pre-sowing preparation of seeds, as well as different sowing dates. The higher germination of seeds group up to 56% of *A. concolor* and *A. nordmanniana* on the substratum consisting of sod soil and river sand (3: 1) was attested. The use of chemical solutions (potassium permanganate - 1%, heteroauxin - 0.01%, superphosphate - 0.5%) for pre-sowing preparation of seeds led to a significant increase in soil germination. Along with the seed method of reproduction, which for the most species of *Abies* was the major, we carried out the experimental study on the impact of different growth factors on the rooting of cuttings dwarf cultivars. We have précised and expanded the reproduction methods of fir cuttings. The higher percentage of rooting from 40 till 55% of the cuttings had the following cultivars: *A. balsamea* Nana', *A. concolor* Compacta', *A. koreana* Piccolo', *A. lasiocarpa* Compacta'. For the first time in the soil and climatic conditions of Republic Moldova was carried out researches on inoculations different species and cultivars of the genus *Abies*. The periods, optimal methods and the impact of chemicals on the intergrowth of inoculations were studied. In our country great attention was paid to the involvement of different fir species and cultivars by transplantation methods. On the basis of the obtained data, we formulated the following conclusion that a highly ornamental fir species and cultivars should be propagated by grafting. The optimal for the reproduction is ***in the fissure of axial sprout through the apical buds***

by cambium on the very center – method modified by us. The best results are obtained by grafting during the spring period, at the beginning of the swelling buds and in summer-fall after the end of shoot growth. The processing of the grafts cut site by solution of succinic acid (0.01%) and dimethyl sulfoxide (0.1%), directly before inoculation leads to increasing the percentage of survival. On the basis of many years of study the growth, development, sustainability and decorativeness for green building of our country we recommend the following species of the genus *Abies* such as: *A. alba*, *A. balsamea*, *A. cephalonica*, *A. concolor*, *A. holophylla*, *A.homolepis*, *A. koreana*, *A. nephrolepis*, *A. nordmanniana*, *A. numidica*, *A. pinsapo*, *A. procera*, *A. sibirica*, and also their highly ornamental cultivars.

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RESEARCHES CONCERNING THE POSTHARVEST CARE OF *LISIANTHUS RUSSELIANUS* CUT FLOWERS

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Abstract

Lisianthus popularity is due not only to the wide range of assortment (small-flowered varieties Piccolo type, edging - Panther Curly, striped -Lilac Shadow), but also due to the attractive character of flowers. Purple color of the petals is the dominant at the most variety (35 %), followed by white (21 %), pink (12 %), yellow (8 %), and green (9 %), varieties with bicolor petals (9 %). Experiences regarding the postharvest care, using Lisianthus russellianus varieties have been developed in the flower shop "Decor Studio", Cluj-Napoca, Cluj County.
Biological material used in experiments with Lisianthus russellianus varieties, consisted in tree cultivars as following: 'Piccolo White" (white flowers) "Mariachi Pink" (pink flowers), "Echo Blue" (blue flowers). During the experiences it was investigated the effect of four solutions (Belle Fleur, Floralife, Vitalife and tap/normal water) on the morphological characters of the studied varieties and the on period of storage. The results obtained show that the variety with the longest storage period is "Echo Blue" (30 days), and the most favorable nutrient solution was Fleur Bell.

Key words: *preservation, nutrient solutions, Eustoma.*

INTRODUCTION

Lisianthus russellianus is relatively new species in floricultural assortment which it belongs to the *Lisianthus* genus, family Gentianaceae. This species is known as *Eustoma grandiflorum* (Armitage, 2001). *Lisianthus* genus originates in North America, especially Mexico. Genus name allude at the beauty of calyx and corolla, the shiny satin aspect and very nice border of the flower („liseé" in French – means smooth).
In the areas of origin, it is spontaneous species inhabits grasslands stretching from Nebrasca to Colorado, Texas and Mexico (Cantor 2010; Bala, 2010).
In Texas is popularly known as 'blue bell', 'prairie rose', and 'prairie gentian'.
From the wild forms with blue petals resulted through breeding new forms with a great perfection extremely varied flowers with colors and shapes (Toma, 2011; Draghia, 2011).
The leaves of this 40 cm tall plant are thick and blue-green. The flower are commonly violet to lavender but have been bred in white, pink, and purple, usually with a darker eye in the center. Flower can be simple or abundant and more flowers are distributed on a stem that opens successively (Armitage, 2004).
Plant breeders around the world have discovered its marvelous properties as a cut flower, and flowers have been bred into a myriad of colors, occurring as singles or doubles in florists' coolers across the country (Armitage, 2001). *Lisianthus* is the most important greenhouse cut flowers, this North American species continues to be crossed by American, Dutch, Japanese, and Israeli breeders (Armitage and Laushman, 2003).
Some of the cut flower cultivars are also used in garden design, particularly the Yodel series (single flowers) and the Echo series (double). 'Yodel Lilac' and 'Echo White' have performed quite well in outdoor beds in Athens (Armitage, 2004).
It is needed well-drained soils, and can be propagated by seed. Plants are raised almost exclusively from seed by specialist propagators; terminal cuttings are only occasionally used because they tend to flower irregularly (Armitage, 2004).
Regarding the harvesting of *Lisianthus* many growers find that best results occur when the central bud is removed, so that more flowers will be open simultaneously. Harvest when one

flower is fully colored. Postharvest life is excellent, 10–15 days. Small buds often fail to develop after harvesting, and flowers (particularly blue and pink flowers) fade badly in low light conditions; if placed in high light, these conditions become less severe (Kawabata 1995). A 25% decrease in light intensity determine results a 40% decrease in color intensity (Griesbach 1992). Several solutions have been tested, with varying results. Interestingly, Song et al. (1994) found that pretreating stems with STS (silver thiosulfate) or Chrysal AVB prior to placing in preservatives had little effect on longevity but resulted in more flowers opening in the vase. Other research showed that treatment with 0.1 mM STS for 24 hours before placing in distilled water increased the vase life significantly. Sucrose too has been studied and recommended as an alternative to STS. Another recipe, consisting of 10% sugar, citric acid, and antimicrobial agents, pulsed for 24 hours, resulted in 13-day postharvest life and opening of all flower buds on the cut stem (Armitage, 2003).

MATERIALS AND METHODS

Experiments concerning the postharvest care of *Lisianthus russellianus* were done at „Decor Studio" flower shop from Cluj-Napoca, Cluj county. Experiments were installed on 11.11.2011. It took on average of 38 days.

Observations were made at an interval of two days between 15.11-21.12.2011. Light and moisture conditions were specific as a normal living space.

The biological material used in experiments with species *Lisianthus russellianus*, consisted in three cultivars, as follows: Piccolo White (white flowers), Mariachi Pink (pink flowers), Echo Blue (blue flowers). The material used comes from the Netherlands and was acquired by the company Greenlit from Cluj-Napoca.

The control of experiments was Piccolo White cultivar.

As nutrient solution were used the followings: Belle Fleur, Floralife, Vitalife and tap/normal water.

The experience was bifactorial with 12 variants which were placed in randomized blocks, in three repetitions.

RESULTS AND DISCUSSIONS

The recorded data concerning the effect of nutrient solution on the postharvest life of *Lisianthus* were statistical interpreted with „LSD" test (Least Significant Difference) to illustrate the significance of differences.

At the set up of experiences, were made some observations were made on morphological characters of varieties studied. Were analyzed the following characteristics: flower stem length, number of leaves, flower diameter, number of petals and number of flowers per stem.

Regarding the effect of nutrient solution on the length of floral stem can observe that all solutions appear with a non significant difference, which means that neither influenced this character (Table 1). The result from Table 2 shows the similar data. Neither cultivar influenced favorable the stem length.

Table 1. The influence of nutrient solution on the length of floral stem at Lisianthus russellianus

Nutrient solution	Stem length		±D (days)	Signification of difference
	Absolute (cm)	Relative (%)		
Tap water (C)	68,11	100,0	0,00	-
Bell Fleur	66,47	97,6	-1,64	-
Vitalife	67,89	99,7	-0,22	-
Floralife	66,28	97,3	-1,83	-
LSD (p 5%)			2,11	
LSD (p 1%)			2,89	
LSD (p 0,1%)			3,93	

Table 2. Unilateral influence of cultivars on the stem length at Lisianthus russellianus

Cultivars	Stem length		±D (cm)	Signification of difference
	Absolute (cm)	Relative (%)		
Piccolo White (C)	66,79	100,0	0,00	-
Mariachi Pink	66,10	99,0	-0,69	-
EchoBlue	68,67	102,8	1,88	-
LSD (p 5%)			2,57	
LSD (p 1%)			4,25	
LSD (p 0,1%)			7,96	

In the Table 3 are presented the data concerning the influence of nutrient solution on the number of leaves at *Lisianthus russellianus* cultivars. The result shows that the best nutrient solution was Vitalife, which achieved a very

significant difference. The solutions like Bell Fleur and Floralife registered significant positive difference. Regarding the cultivar influence, Mariachi Pink shows a distinct significant difference, that exceed the control with 7,67 pieces (Table 4).

Table 3. The influence of nutrient solution on the number of leaves at Lisianthus russellianus cultivars

Nutrient solution	Number of leaves		±D (piece)	Signification of difference
	Absolute (piece)	Relative (%)		
Tap water (C)	22,0	100,0	0,00	-
Bell Fleur	28,89	131,3	6,89	*
Vitalife	32,67	148,5	10,67	***
Floralife	28,33	128,8	6,33	*
LSD (p 5%)			5,56	
LSD (p 1%)			7,63	
LSD (p 0,1%)			10,38	

Table 4. Unilateral influence of cultivars on the number of leaves at Lisianthus russellianus

Cultivars	Number of leaves		±D (piece)	Signification of difference
	Absolute (piece)	Relative (%)		
Piccolo White (C)	24,67	100,0	0,00	-
Mariachi Pink	32,32	131,1	7,67	**
EchoBlue	26,92	109,1	2,25	-
DL (p 5%)			4,31	
DL (p 1%)			7,14	
DL (p 0,1%)			13,36	

Just one of the nutrient solution influenced favorable the diameter of flower. Bell Fleur generated a difference of 0.53 cm, which shows a significant differences comparing with the control (tap water). The rest of solutions determine a negative difference (Table 5).

Table 5. The influence of nutrient solution on the diameter of flowers at Lisianthus russellianus cultivars

Nutrient solution	Flowers diameter		±D (cm)	Signification of difference
	Absolute (cm)	Relative (%)		
Tap water (C)	5,42	100,0	0,00	-
Bell Fleur	5,96	109,8	0,53	*
Vitalife	5,36	98,8	-0,07	-
Floralife	5,38	99,2	-0,04	-
LSD (p 5%)			0,43	
LSD (p 1%)			0,59	
LSD (p 0,1%)			0,81	

Table 6. The unilateral influence of cultivar upon flower diameter at Lisianthus russellianus

Cultivars	Flower diameter		±D (cm)	Signification of difference
	Absolute (cm)	Relative (%)		
Piccolo White (C)	4,33	100,0	0,00	-
Mariachi Pink	5,75	132,7	1,42	*
Echo Blue	6,50	150,0	2,17	***
LSD (p 5%)			0,94	
LSD (p 1%)			1,56	
LSD (p 0,1%)			2,91	

Concerning the unilateral influence of cultivar upon flower diameter at *Lisianthus russellianus,* the results described in the Table 6 shows that Echo Blue registered very significant differences that exceed the control with 2.17 cm.

Data from Table 7 shows that one of nutrient solutions had a favorable influence on the number of flowers/stem. Bell Fleur nutrient solution determines a very significant difference of 1.05 cm, which exceeds the control of experiment with 9.3%.

Table 7. The unilateral influence of nutrient solutions on the number of flowers/stem at Lisianthus russellianus

Nutrient solution	No. of flowers/stem		±D (piece)	Signification of difference
	Absolute (piece)	Relative (%)		
Tap water (C)	11.28	100,0	0,00	-
Bell Fleur	12.33	109,3	1,05	***
Vitalife	10.36	91.8	-0,92	ooo
Floralife	11.38	100.8	0,01	-
LSD (p 5%)			0,43	
LSD (p 1%)			0,59	
LSD (p 0,1%)			0,81	

Table 8. Cultivars influence upon the number of flowers/stem at Lisianthus russellianus

Cultivars	Number of flowers/stem		±D (piece)	Signification of difference
	Absolute (piece)	Relative (%)		
Piccolo White (C)	10,17	100,0	0,00	-
Mariachi Pink	13,08	128,7	2,92	*
Echo Blue	9,75	95,9	-0,42	-
LSD (p 5%)			2,02	
LSD (p 1%)			3,34	
LSD (p 0,1%)			6,26	

Results from table 8 shows that Mariachi Pink registered significant differences concerning the number of flowers/stem. The difference was 2.92 pieces, which exceed the control cultivar.
Concerning the results from Table 9 neither solutions influenced favorable the no. of petals/flowers. Bell Fleur generates a difference of 0.33 cm, but it is not statistically assured.

Table 9. Unilateral influence of nutrient solution on the no. of petals/flowers at Lisianthus russellianus cultivars

Nutrient solution	No. of petals/flowers		±D (piece)	Signification of difference
	Absolute (piece)	Relative (%)		
Tap water (C)	10,22	100,0	0,00	-
Bell Fleur	10,56	103,3	0,33	-
Vitalife	9,89	96,7	-0,33	-
Floralife	9,22	90,2	-1,00	-
LSD (p 5%)			2,10	
LSD (p 1%)			2,87	
LSD (p 0,1%)			3,91	

Table 10. The unilateral influence of cultivars upon the number of petals/flower at Lisianthus russellianus

Cultivars	Number of petals/flower		±D (piece)	Signification of difference
	Absolute (piece)	Relative (%)		
Piccolo White (C)	5,00	100,0	0,00	-
Mariachi Pink	13,33	266,7	8,33	***
Echo Blue	11,58	231,7	6,58	***
LSD (p 5%)			1,79	
LSD (p 1%)			2,96	
LSD (p 0,1%)			5,54	

Data from Table 10 shows the unilateral influence of cultivars upon the number of petals/flower at *Lisianthus russellianus.* Cultivars Mariachi Pink and Echo Blue show very significant differences exceeding the control cultivar with 8.33 pieces respectively 6.58 pieces.
In the Table 11 is presented the unilateral influence of nutrient solution on the postharvest of *Lisianthus russellianus*. Bell Fleur and Floralife assure a long period of postharvest life from 12.78 days to 11.89 days, comparing with the control.

Table 11. Unilateral influence of nutrient solutions on the postharvest period

Nutrient solution	Number of days		±D (days)	Signification of difference
	Absolute (days)	Relative (%)		
Tap water (C)	22,11	100,0	0,00	-
Bell Fleur	34,89	157,8	12,78	***
Vitalife	17,67	79,9	-4,44	000
Floralife	34,00	153,8	11,89	***
LSD (p 5%)			2,53	
LSD (p 1%)			3,47	
LSD (p 0,1%)			4,72	

Regarding the unilateral influence of cultivars upon postharvest period, the results from Table 12 show that Echo Blue cultivar achieved significant difference and this exceed the control cultivar with 4.92 days.

Table 12. The unilateral influence of cultivars upon postharvest period

Cultivars	Number of days		±D (days)	Signification of difference
	Absolute (days)	Relative (%)		
Piccolo White (C)	25,67	100	0,00	-
Mariachi Pink	25,25	98,4	-0,42	-
Echo Blue	30,58	119,2	4,92	*
LSD (p 5%)			3,04	
LSD (p 1%)			5,03	
LSD (p 0,1%)			9,41	

CONCLUSIONS

Analyzing the obtained results from researches concerning the postharvest care of *Lisianthus* cut flowers using three cultivars and four nutrient solutions results the following conclusions:

Analyzing the length of floral stem under the effect of four nutrient solutions can conclude that neither solution influenced favorable this character. Results shows that neither cultivar influenced favorable the stem length.

The best nutrient solution regarding the number of leaves was Vitalife, which achieved a very significant difference. The solutions like Bell Fleur and Floralife registered significant positive difference. Regarding the cultivar influence, Mariachi Pink shows a distinct significant difference, that exceed the control with 7,67 pieces.

It was studied the influence of nutrient solutions on the diameter of flowers at *Lisianthus russellianus* cultivars. Bell Fleur generated a difference of 0.53 cm, significant differences comparing with the control (tap water). Echo Blue registered very significant differences that exceed the control with 2.17 cm.

Regarding the unilateral influence of nutrient solutions on the number of flowers/stem at *Lisianthus russellianus,* that Bell Fleur achieved a very significant positive difference of 1.05 cm, which exceed the experiment control. Mariachi Pink registered significant differences concerning the number of flowers/stem. The difference was 2.92 pieces, which exceed the control cultivar.

Concerning the influence of nutrient solution on the no. of petals/flowers at *Lisianthus russellianus* cultivars, results show that neither solution recorded favorable influence. Cultivars Mariachi Pink and Echo Blue show very significant differences exceeding the control cultivar with 8.33 pieces respectively 6.58 pieces.

In the case of the unilateral influence of nutrient solution on the postharvest of *Lisianthus russellianus*, can conclude that solutions as Bell Fleur and Floralife assure a long period of postharvest life from 12.78 days to 11.89 days, comparing with the control. Echo Blue cultivar achieved significant difference and this exceeds the control cultivar with 4.92 days.

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USE OF ORNAMENTAL PLANTS ON DIFFERENT SOIL TYPES FROM TRANSYLVANIAN PLAIN

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Abstract

The paper include necessary issues to help specialists in landscape architecture to choose dendro-floricol assortment, which exploit the studied maximum potential edaphic conditions, given the multitude of requirements expressed by flower plants to edaphic environment. To highlight the issues shown above it was chosen to exemplify some soil types from Transylvanian Plain where soil conditions are not the best for all ornamental plants. Thus we studied and analyzed the main physico-chemical properties of calcareous soils, sandy, acidic soils and substrates with moisture excess. The main ornamental plants presented in this paper are adapted to these extreme conditions and can be a solution for use in landscaping.

Key words: *soil types, ornamentals, landscape design.*

INTRODUCTION

Soil occupies a well settled place in the biosphere, finding the boundary between two worlds, lithosphere and atmosphere, forming the so-called pedoshere. It is known that the soil has an important influence on health and plant growth rate. The soil has a strong influence on the plants (Reed, 2011). The knowledge of soil types helps in keeping and growing plants effectively and the use of soil type required for plant will be essential in the growth and development of its faster (Paulette et al., 2010).

This paper is based on the study of plants grown on different soil types and it's a helping hand in choosing these for specific conditions or places in the garden.

In most soils, the relative proportion of clay, sand, and silt particles influence its physical and chemical nature. The main exception is peaty soil, which is dark in color and rich in organic matter. Peaty soils are derived from sedges or mosses, which have decomposed in waterlogged conditions. They are acidic and moisture-retentive, providing ideal conditions for acid-loving plants like rhododendrons (Reed, 2011).

Clay soils are fertile but are slow to warm in spring, sticky, and slow-draining after rain, baking hard in dry weather. Silty soils feel silky or soapy and are easily compacted. Sandy soils feel gritty and will not stick together to form a ball (Reed, 2011; Paulette et al., 2010). They are light and free draining and quick to warm in spring, but they will need frequent irrigation and fertilizing. Chalky soils are alkaline, usually pale in color and stony, with chunks of alkaline minerals visible on the surface. They are often shallow and sometimes sticky. The ideal soil type is a loamy one, which has an approximately equal mixture of clay, silt, and sand. Loamy soils are good for the widest possible range of plants (Reed, 2011).

Bellow is presented the studied soil types and the dendro-floricol assortment.

MATERIALS AND METHODS

Soils were analyzed according to the "Methodology of soil study development-ICPA-1987 (Research Institute for Pedology and Agrochemistry) completed by soil classification as SRTS-2012 (Romanian Soil Toxonomy System).

1. Calcaro-rendzic leptosols (WRB – SR-1988) present the next succession of horizons: Am A/R Rrz.

The phisico-chemical properties of calcaro-rendzic leptosols is characterized by: field capacity (CC%) between 23 and 41%; wilting coefficient (CO%) 6-14%; available moisture

holding capacity (CU%) 4.5-7.1%; the content of organic matter is middle; the content of N is middle for the entire soil profile 0,172-0,262%; the mobile P is low in the entire soil profile (10-16 ppm); the content of mobile K is middle for Am and low for A/R; cation exchange capacity (T) is 37-38 me/100g soil; degree of base saturation V% is higher 87-92%; the soil pH is slightly alkaline (Buta, 2009).

Due to favorable physicochemical properties, calcaro-rendzic leptosols are distinguished through a very high fertility.

Many of the world's favorite plants occur naturally on alkaline or limestone soils. They include pinks, clematis, and many of the jewel-like alpine plants found growing on the limestone mountains of Europe and Asia. Soils over limestone are almost invariably alkaline in nature, but they can also be very fertile if they are deep and rich in organic matter – a wealth of plants give their ornamental best on such soils (Reed, 2011; Cantor, 2008). For calcaro-rendzic leptosols the following species are recommended: *Chamaecyparis lawsoniana* 'Intertexta', *Fraxinus ornus, Morus nigra, Buddleja sp., Cornus mas, Cotinus coggygria, Deutzia crenata* 'Nikko', *Helianthemum* 'Rhodanthe Carneum', *Potentilla fruticosa* 'Red Ace', *Campsis radicans, Jasminum nudiflorum, Clematis* 'The President', *Asplenium trichomanes, Colchicum autumnale, Dicentra spectabilis, Amarantus caudatus, Dianthus caryophyllus, Cheiranthus cheiri,Alyssum maritimum, Iresine lindenii, Iresine herbstii, Myosotis alpestris, Cercis siliquastrum, Platycodon grandiflorus, Pulsatilla vulgaris, Rudbeckia laciniata* 'Herbstsonne', *Cotoneaster franchetii, Leontopodium alpinum* (Selaru, 2007; Iliescu, 2006).

2. Calcaric arenosols (WRB – SR-1988) present the next succession of horizons: Ap Ao A/R A/B ka.

The phisico-chemical properties is characterized by: field capacity (CC%) between 27 and 39%; wilting coefficient (CO%) 22-23%; available moisture holding capacity (CU%) 3.7-16.10%; the content of organic matter is low for the entire profile; the content of N is low for the entire soil profile 0.112-0.130%; the mobile P is low in the entire soil profile (4-8 ppm); the content of mobile K is middle for Am – 135 ppm and low for A/R – 74 ppm; soil texture is sandy for the entire profile > 57% sand (Buta, 2009).

The recommended dendro-floricol assortment is the following: *Stipa gigantean, Portulaca grandiflora, Salvia splendens, Celosia argentea var. cristata, Delphinium cultorum, Santolina chamaeciparyssus, Hibiscus syriacus, Betula ermanii, Pinus sylvestris* Aurea Group, *Robinia pseudoacacia* 'Frisia', *Cytisus* x *praecox*, *Erica australis, Lavandula pedunculata* subsp. *Pedunculata, Lavatera* x *clementii, Perovskia* 'Blue Spire', *Phlomis fruticosa, Achillea* 'Walther Funcke', *Dictamnus albus, Eremurus robustus, Eryngium* x *tripartitum, Lupinus* 'The Chatelaine', *Oenothera macrocarpa, Ornithogalum umbellatum, Salvia officinalis* 'Tricolor' (Reed, 2011; Toma, 2009).

3. Distric cambisols (WRB – SR-1988) present the next succession of horizons: Ao Bv C.

The majority of acid-preferring plants are originally from woodland areas, and they prefer a cool, more or less shady environment and a soil that is leafy, organic, and moist but welldrained. In nature, such soils are fairly fertile because nutrients are annually replenished by the recycling of fallen leaves. There are also many acid-preferring plants that need or tolerate more open sites in sun, such as witch alder, *Lithodora diffusa* 'Heavenly Blue', and most heather (Reed, 2011; Draghia, 2011).

The phisico-chemical properties of district cambisols is characterized by: field capacity (CC%) between 25 and 32%; wilting coefficient (CO%) 7-10%; available moisture holding capacity (CU%) 25-32%; the content of organic matter is low; the content of N is middle for the entire soil profile 0.150-0.260%; the mobile P is low in the entire soil profile (< 1.2 ppm); the content of mobile K is middle for Ao-Bv (23 ppm); cation exchange capacity (T) is 17-29 me/100g soil; the soil is very acid with a pH between 4.3-4.6 (Buta, 2009).

For district cambisols are recommended the following species: *Abies lasiocarpa* var. *arizonica* 'Compacta', *Acer japonicum* 'Aconitifolium', *Cercis canadensis* 'Forest Pansy', *Camellia japonica* 'Lady Vansittart', *Calluna vulgaris, Dryopteris filix-mas*, *Erica cinerea* 'Romiley', *Hamamelis* 'Brevipetala', *Magnolia liliiflora* 'Nigra', *Magnolia stellata*,

Pinus sylvestris ‘Gold Coin’, *Rhododendron luteum, Skimmia japonica* ‘Rubella’, *Vaccinium vitis-idaea, Deschampsia flexuosa* ‘Tatra Gold’, *Gentiana sino-ornata, Lilium superbum* (Cantor, 2008; Reed, 2011; Toma 2009).

4. Hyperskeletic leptosol (WRB – SR-1988) present the next succession of horizons: Ao R.

There are recommended species which tolerate very sandy, stony, or shallow and alkaline soils. Hot and dry sites present a challenge to plant survival, not only because of the obvious lack of moisture needed for growth, but also because the leaves of many plants – even some committed sun-lovers – scorch in very hot sun, particularly where the water supply is short or unreliable (Reed, 2011).

The phisico-chemical properties of hyperskeletic leptosol are characterized by: field capacity (CC%) between 10 and 20%; the content of N is very low for the entire soil profile 0.70 ppm; the mobile P is low in the entire soil profile (< 1.5 ppm); the content of mobile K is low for the entire profile (67-120 ppm) (Buta, 2009).

Plants for these sites: *Adonis vernalis*, *Alyssum-saxatile, Gleditsia triacanthos* ‘Rubylace’, *Robinia* x *slavinii* ‘Hillieri’, *Caragana arborescens* ‘Nana’, *Cytisus multiflorus, Lavandula dentate, Phlomis purpurea, Allium hollandicum* ‘Purple Sensation’, *Amaryllis belladonna, Anthemis tinctoria* ‘E.C. Buxton’, *Catananche caerulea* ‘Major’, *Echinops ritro* ‘Veitch’s Blue’, *Festuca glauca* ‘Blaufuchs’, *Fritillaria imperialis, Gaillardia* x *grandiflora* ‘Kobold’, *Geranium cinereum* ‘Ballerina’, *Oenothera speciosa* ‘Rosea’, *Papaver orientale* ‘Allegro’, *Tulipa praestans* ‘Unicum’, *Verbena bonariensis, Viola x wittrockiana, Ajuga reptans, Sedum sp., Anemone cornaria, Oxalis adenophylla, Lobelia erinus, Saxifraga cuneifolia* (Reed, 2011; Iliescu, 2006; Selaru, 2007, Chelariu, 2011).

5. Haplic gleysols (WRB – SR-1988) present the next succession of horizons: Ao AGo Gr.

The plants which are developing well on this type of soils are known as moisture-lovers, but they are often sold as bog plants. This can be misleading, since many moisture-loving plants will not tolerate totally waterlogged soils. Boggy soil saturated with water is usually better for shallow-water, or marginal aquatic plants. These plants can also be used to surround ponds or pools to bridge the gap between water and land. Here, they will mask the edge of the water in an attractive way, and if the water is still clear, plants like *Salix alba* ‘Britzensis’ or *Lysichiton camtschatcensis* give more than double the value when their form is reflected in its mirrorlike surface (Reed, 2011).

The phisico-chemical properties of haplic gleysols are characterized by the followings: clay has high values of 22.8% in Aow horizon, and lower in A/Go horizon (21.63%); the content of N is high for the entire soil profile 0,500% in the first cm; the mobile P is low in the entire soil profile (1.2-0.2 ppm); the content of mobile K is low (7-15 ppm); cation exchange capacity (T) is 13-21 me/100g soil; degree of base saturation V% is lower 40-60%; the soil pH is acid 5.2-5.4 (Buta, 2009).

Plant species recommended for this soil type are the following: *Metasequoia glyptostroboides, Salix alba* ‘Britzensis’, *Cornus alba* ‘Elegantissima’, *Rhododendron* ‘Bow Bells’, *Vaccinium corymbosum, Astilbe* x *crispa* ‘Perkeo’, *Carex pendula, Darmera peltata, Filipendula rubra* ‘Venusta’, *Fritillaria meleagris, Gunnera manicata, Hosta* ‘Frances Williams’, *Iris versicolor* ‘Kermesina’, *Lobelia cardinalis, Hemerocallis flava, Iris sibirica, Lysichiton americanus, Lythrum salicaria* ‘Feuerkerze’, *Matteuccia struthiopteris, Pontederia cordata, Primula japonica* ‘Postford White’, *Rheum palmatum* ‘Atrosanguineum’, *Rodgersia pinnata* ‘Superba’, *Sagittaria latifolia* (Reed, 2011).

CONCLUSIONS

This paper aimes to support experts in landscaping for choosing dendro-plants flower assortment depending on restrictive soil conditions.

For example were chosen five soil types, as the most representative with calcareous substrates, sandy, acidic, skeletic and excess moisture.

Depending on restrictive soil conditions has been established an assortment of dendro-floricol plants which is suitable for landscape design.

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***WRB (World Reference Base for Soil Resources).

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'CANDIDA ALI' AND 'EXCELSA' - ROMANIAN *Gladiolus* CULTIVARS RECENT HOMOLOGATED

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Abstract

Gladiolus x hybridus L. is a popular bulb plant grown in Romania in field for cut flowers in summer season. Nowadays in Romania the activity for improve the assortment of gladiolus by breeding program is limited. This is because of the small number of researchers devoted to sustainable breeding work. The Floriculture Department of University Agricultural Sciences and Veterinary Medicine Cluj, in collaboration with Research Fruit Station Cluj, do an intensive from many years until the present. 'Candida Ali' and 'Excelsa' cultivars have recently been registered and patented (2011) having a great floral potential do to their color and good morpho-decorative characteristics.

Key words: *cultivar, breeding, characters, selection, bulb plant.*

INTRODUCTION

Gladiolus x hybridus L. is a popular floricultural crop in Romania grown mainly for cut flowers. The modern *Gladiolus* cultivars offer a diversity of colors, shapes, and sizes that is available in few other flowering plants (Cantor and Tolety, 2010).

During the last quarter of a century an increasing interest was generated in new crops. Dozens of new species and genera enter the commercial arena each year. Some new cultivars are only selections; others are results of intra-and interspecific hybridizations (Craig, 2003).

Currently many hybridizers work on creating new Gladiolus cultivars, but in Romania this activity is limited. This is because of the small number of researchers devoted to sustainable work for improving the Gladiolus assortment by breeding in order to obtain new varieties with superior characteristics and more adapted to the climate of Romania.

Gladiolus cultivars suitable for cultivation under the temperate climate of the Transylvanian areas of Romania have been developed by the Floriculture Department, University of Agricultural Sciences and Veterinary Medicine, from 1998 until the present. A total of 14 new *Gladiolus* cultivars that have a broad spectrum of colors and desirable characters such as: multiple flowering, vigor, resistance to pests and diseases, different colors etc. 'Candida Ali' and 'Excelsa' have recently been registered and patented.

Origin

'Candida Ali', tested as H 1/20, resulted from a controlled cross between 'Early Riser' and 'Priscilla', made by M. Cantor and L.M. Chis at UASVM Cluj-Napoca in 2001, fallowed by clonally selection and vegetative multiplication by corms (Figure 1). Further characterization of this hybrid began in 2007 at ISTIS Bucharest (The State Institute for Variety Testing and Registration).

'Excelsa' resulted from the intraspecific hybridization method between the cultivars 'Priscilla' and 'Speranta'. The cross was made in 2001 by M. Cantor, and it was selected as a hybrid H 18/1 in 2003 (Figure 2).

The purity certificate no 1324/2009 was obtained in 2009 under the name 'Candida Ali' and 'Excelsa' after being tested in ISTIS Bucharest on the base of the DUS (distinctivity, uniformity and stability) test and was recommended for introduction as commercial crops in Romania.

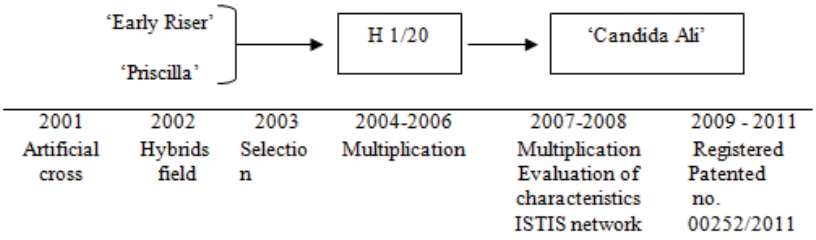

Figure 1. Pedigree of 'Candida Ali'

'Excelsa' resulted from the intraspecific hybridization method between the cultivars 'Priscilla' and 'Speranta'. The cross was made in 2001 by M. Cantor, and it was selected as a hybrid H 18/1 in 2003 (Figure 2).

The purity certificate no 1324/2009 was obtained in 2009 under the name 'Candida Ali' and 'Excelsa' after being tested in ISTIS Bucharest on the base of the DUS (distinctivity, uniformity and stability) test and was recommended for introduction as commercial crops in Romania.

In 2011 'Candida Ali' (patent no. 00252) and 'Excelsa' (patent no. 00251) were patented as protected cultivars (Figure 3A, B).

To maintain the characteristics of those cultivars, they must be vegetative propagated by corms and cormels.

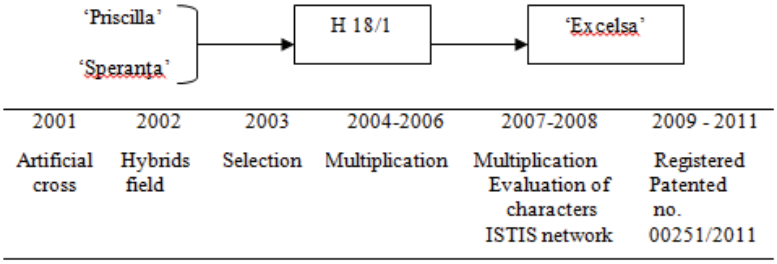

Figure 2. Pedigree of 'Excelsa'

Figure 3. A. Candida Ali (H 1/20)

Figure 4. Excelsa (H 18/1)

Description

'Candida Ali' cultivar has a delicate color of florets (dark pink bronze with intense pink neck, white stripes) and it is currently a popular cultivar on the market (Table 1). It is an early midseason bloomer in Transylvania area. The flowers are bell-shaped when open and have good longevity in the vase as cut flowers. It has a good vigor (112.1 cm), a long spike and prolific corm producer (115 cormels/corm) which facilitates multiplication (Table 3).

The performances of the new cultivars were compared with a very popular cultivar in Romania, 'Priscilla' which is also one of the parents in the cross-breeding process.

In 2009 the cultivar 'Candida Ali' received a Diploma and Silver Medal at the International Salon of Research and Invent 'PROINVENT' Cluj-Napoca.

Table 1. Morphological characteristics of the new Gladiolus cultivars

Cultivars	Flower color	Floret shape	Spot	Another color	Use
Candida Ali	Dark pink bronze with intense pink neck, white stripes	Round	yes	purple	Cut flower, border or group in the field
Excelsa	Purple red with white narrow	Round	none	white	Landscape design Cut flower
Priscilla-control	Light rose with dark rose lines	Round	yes	white rose	Cut flower, garden

Table 2. Quantitative characteristics of the new gladiolus cultivars

Cultivars	Days to flowering from planting	Plant height (cm)	Spike length (cm)	No. of florets/ flower	Flower width (cm)	No. of simultaneously flowering florets	Vase life (days)
Candida Ali	77	112.1	74.0	15.4	11.5	5.7	5.4
Excelsa	66	100.4	45.0	14.3	11.4	5.2	5.0
Priscilla-control	82	121.3	86.2	15.0	11.5	5.1	4.7

Table 3. Corm productivities of new Gladiolus cultivars

Cultivars	No. of cormel/plant	Circumference of corm (cm)	Corm weight (g)
Candida Ali	115	14.4	42.5
Excelsa	42	13.8	33.7
Priscilla-control	65	14.0	41.3

The ‘Excelsa’ cultivar is characterized by the remarkable achievement of combining superior morphological characteristics. This cultivar blooms earlier than many commercial *Gladiolus* cultivars, 66 days from planting, and it has a lovely color that looks beautiful in vases (Table 2).

As a conclusion the new cultivars represents a step forward in combining a high qualities in genus *Gladiolus*, they contributed to improving the Romanian assortment.

Availability

Limited quantities of ‘Candida Ali’ and ‘Excelsa’ cultivars may be obtained from UASVM Cluj-Napoca, by addressing requests to Maria Cantor at the Department of Floriculture, room 91.

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RESEARCHES CONCERNING THE MULTIPLICATION *IN VIVO* OF LISIANTHUS FOR PROMOTING IN ROMANIAN GREEN HOUSES

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Abstract

Current concerns of plant growers in Romania are to improve the flowers assortment with new species. Our researches focused on herbaceous ornamental plant Lisianthus russelianus Hook., (Eustoma grandiflora L.). It is a relatively new species in the range of cut and potted flowers for her beautiful colored and vase life. The new species introduced requires establishing efficient multiplication techniques. The biological material used in the experience were seeds from Sakata company (USA), represented by three cultivars: 'Echo Lavender', 'Flamenco White' and 'Mirage Pastel Pink'. Also vegetative multiplication by cuttings was experimented on different culture substrate. Plants were grown in greenhouses of USAMV Cluj-Napoca and Botanical Garden "Alexandru Borza" Cluj-Napoca. The results obtained will be using for Romanian growers for diversification their assortment in greenhouse.

Key words: *eustoma, cultivars, propagation, seeds, cuttings, Gentianaceae.*

INTRODUCTION

Lisianthus is a relatively new species in the range floricultural, Japan being the largest producer. *Lisianthus* is a species with great horticultural potential in Romania.

Lisianthus is a moderately cold-tolerant annual or biennial plant native to the southern part of the United States and Mexico (Roh and Lawson, 1988), belong to *Gentianaceae* family. In Texas is popularly known as 'blue bell', 'prairie rose' or 'prairie gentian'. Genus name alludes to the beauty calyx and corolla, the flower look is glossy, satin and beautiful border („lisieé" in French means smooth, glossy). From crossing wild forms, which shows blue flower petals, resulting in improvement works form a large flower perfection extremely varied in color and shape.

In Europe started to be cultivated only after the 1970s. After France, the Netherlands ranks second in the culture of this beautiful flower. In Romania the first cultures were established from Companies Codlea and early cultures were initiated at University of Agronomic Sciences Bucharest since 1989 (Cantor, 2009).

This plant grows to 50-75 cm in height with 20-40 flowers. By nature, *Lisianthus* initially forms a rosette and grows very slowly during the winter, stems elongate in the spring, and it flowers in summer (Roh et al., 1989). In recent decades, breeders have developed a variety of cultivars with respect to many traits such as uniform flowering throughout the year, lack of rosetting, heat tolerance, flower color, and flower size and form, including double flowers etc (Harbaugh, 2006). The importance of this ornamental flower is due to its beauty, diversity of colors, excellent keeping quality, and wide range of different forms (Ali et al., 2008, Kanwar and Kumar, 2009). It is known that to this genus *Lisianthus* (*Eustoma*) are belonging 27 species, herbaceous and woody plants. It is a relatively new species in the range of cut and potted flowers.

Due decorative qualities lisianthus culture's expansion took in most of Europe and thus flower growers and enthusiasts have expressed a particular interest in this crop. *Lisianthus* flowers are much used by those who deal with flower arrangements and bouquets for different occasions. Lisianthus is highly regarded not only as a cut flower, and as the plant pot. Currently, in our country, lisianthus culture is not widespread, although there is market demand. Most flowers sold and used by florists are imported from Holland.

For the new species introduced are required efficient multiplication techniques to be established.

Eustoma randiflorum is commonly propagated by seed or cutting. Sexual propagation used to obtain seedlings seeds brought from abroad (Netherlands, USA, France, etc). From a gram of seeds can be obtained about 8000 plants (Bala, 2010).

Generally, sowing the plants of Lisianthus is in autumn or January-February. Industrial culture, sowing can be done in half, and according to this period, the number of days to flowering may vary.

Propagation by cuttings is less practiced. Cuttings are cut to a length of 10 to 15 cm (which have three pairs of leaves) and placed on the substrate of peat and perlite, sand or perlite simple. Rooting takes place for 40-50 days. The disadvantage of this method is that the percentage of shoots of the plant is weaker, we get a few plants and can easily transmit diseases and pests (Toma, 2009).

MATERIALS AND METHODS

For the new species introduced are required efficient multiplication techniques to be established. The study was about conventional propagation methods, by seeds. The biological material used in the experience comprised in seeds from Sakata Company, represented by three F_1 hybrids of *Lisianthus* russelianus: „Echo Lavender", „Flamenco White" and „Mirage Pastel Pink". These were used to obtain plants to start the *in vitro* and *in vivo* experiments in order to establish the germination and the rooting rates. Seeds were treated thiuram pelleted. The biological material presents the following characters:

„Echo Lavender". It is one of the most popular cultivars with early flowering. Plants are vigorous in spring, while in summer droughts become more fragile. The leaves are 5-8 cm long, elliptical, slightly sharp and succulent; they look dull and bluish-green color, with 3-5 ribs clearly visible. Summer flower buds open in cones than 5 cm in diameter, showing many shades of purple.

„Flamenco White". The flowers are simple, is suitable for cultivation in summer when temperatures are high and days are long. Stems are vigorous and flowers on top of them are white. Leaves are skin, colored bluish green, located opposite the stem. Stem height is 50 cm. Blooms two weeks earlier than hybrid *Mirage Pastel Pink.*

„Mirage Pastel Pink". Flowers are simple, ideal for summer flowering. Has smaller petals, and are resistant to transport. The flowers are pink, with the little white. The leaves are green and vigorous stems are about 40-50 cm in length. It is resistant to high temperatures and botrytis.

Experience was made in greenhouses of USAMV Cluj-Napoca and the greenhouses of the Botanical Garden Alexandru Borza Cluj-Napoca.

Propagation by seeds

Sowing was done on 04.03.2011, in small pockets trays using the neutralized peat substrate. The seeds were sown on the surface because they are photosensitive (germinate in the presence of light). Greenhouse temperature was 20-22°C during germination, and then decreased to 18-20°C. Relative humidity was 70-75% and 80-85% of the substrate, maintaining this level through daily watering. Germination occurred at 21 days, after which observations were made on the percentage of germination. During the period of germination were assured maintenance, or weeding, watering and ventilation greenhouse. Lisianthus from each hybrid were sown one hundred seeds.

After about six weeks on 4/24/2011 plants produced two little leaves true. Four days later, on 05.28.2011 was carried out first transplantation in alveolar larger trays, then on 6/10/2011 moved in pots 7x7cm (Figure 1).

Figure 1. Plants in cellular trays and pots (original)

Vegetative propagation by cuttings

Cuttings were made from plants grown in the greenhouse of the Botanical Garden 'Alexandru Borza' Cluj-Napoca from the seeds of the three hybrids studied. Leaves were removed from cuttings length exempting those in the apical zone (Figure 2).

Cuttings were trimmed to the size of about eight cm and planted in wooden boxes on different rooting substrates.

For rooting of cuttings were used three types of substrate:-S1-sand river; -S2-peat + sand, mixture of 1:1 and; -S3-peat + sand + garden soil, mixture of 1:1:1.

After 40 days there have been observations on rooting percentage. *In vivo* plants were grown and maintained in the greenhouse of the USAMV Cluj-Napoca and served to multiply by cuttings and *in vitro* propagation.

Figure 2. Aspects of in vivo propagation by cuttings (original)

RESULTS AND DISCUSSIONS

Results of germination rate

In vivo experience in seed germination percentages first comment on were made at about 21 days, at which time it was considered the emergence over. Data on the percentage of germination are shown in Table 1. The performed analyzes on the percentage of germination is a weak seed germination in all hybrids analyzed, with an average rate of 65% (Table 1).

Table 1. The percentage of germination in vivo three hybrids examined

Hybrid name	No of seeds sown	No of seeds germinated	Percentage of geminated seeds (%)
Mirage Pastel Pink	100	64	64
Echo Lavander	100	69	69
Flamenco White	100	62	62
Average	100	65	65

Analyzing the data in Table 1 it can be seen that the highest percentage of germination was obtained in the F_1 hybrid *Echo Lavender*

respectively 69%, followed by hybrid *Mirage Pastel Pink* with a germination rate of 64%. The lowest percentage of germination was obtained in hybrid *Flamenco White* of only 62%.

The data obtained are in accordance with the literature, which mentions a low germination in this species, both because of the very small size of seeds and germination special conditions, namely the presence of light (Cantor, 2009).

Results for rooting cuttings

Data on percentage of rooting cuttings from three hybrids analyzed are presented in Table 2.

Table 2. Rooting percentage in the three Lisianthus hybrids

Variant[1]	Number of rooted cuttings used	Number of rooted cuttings	Percentage of rooting (%)
S1E	30	0	0
S2 E	30	5	16
S3E	30	3	10
S1F	30	0	0
S2F	30	4	13
S3F	30	3	10
S1M	30	0	0
S2M	30	8	26
S3M	30	4	13
Total number	270	27	10

1Substrate 1Hybrids;
S1-river sand; E-*Echo Lavender;*
S2-peat + sand, mixture 1:1; F-*Flamenco White;*
S3-peat + sand + garden soil, mixture 1:1:1; M-*Mirage Pastel Pink*

From the table it can be seen that the highest percentage of rooting was obtained in hybrid *Mirage Pink Pastel* on sand and peat substrate mixed 1:1 with 26%, followed by hybrid *Echo Lavender* on the same substrate, 16%. A small percentage of rooting was recorded and the substrate composed of soil-peat-sand in a ratio of 1:1:1. *Pastel Pink Mirage* hybrid resulted in a 13% and other hybrids with a percentage of 10%. If the substrate consists of river sand has no rooted cuttings.

CONCLUSIONS

Based on the experiences made the following conclusions are:

Data obtained shows that the seeds size and ecological conditions influenced negatively the germination percentage, registering an average of only 65% for the analyzed hybrids.

The experiments conducted shows that species *Lisianthus russelianus* Hook. is quite recalcitrant to conventional vegetative propagation, by cuttings, regardless of the substrate used.

The small percentage of rooting, probably due to the fact that greenhouse facility was not equipped with 'mist system' that does not ensure a high air humidity nor stimulators were used rootedness.

We recommend the promoting culture in our country, of the species *Lisianthus russelianus* Hook., by enriching assortment with new cultivars.

Biological material obtained by applying conventional propagation methods lead to obtaining parent plants which can be used as a basis for *in vitro* multiplication that will produce an unlimited number of plants in a relatively short time.

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THE INFLUENCE OF FERTILIZERS APPLIED ON CONTAINERIZED CULTURE OF THUJA OCCIDENTALIS COLUMNA

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Abstract

The containerized culture of the ornamental plants has an increasing importance for producers. These are interested in finding the proper solutions for the insurance of the best growth conditions for the plants. Fertilizers are indispensable for success of the type of culture at high parameters. Researches have been done at the Fruit Research Development Constanta between 2004-2006.The biological material used for studies was represented by plants of Thuja Occidentalis Columna. Substratum for culture, resulted by mixing some compounds, were represented by: Substratum 1 made by: ground celery, ground leaf, peat and sand 1:1:1:0,5; Substratum 2 made by: forest compost and perlit 3:1. Experimental scheme included 6 variants: 2 controls unfertilized, with plants cultivated in the two substratum; 2 variants with substratum fertilized with forest compost NPK 15:15:15; 2 variants fertilized during vegetation with Coïc nutritive solution. There were organized (6) six variants with four (4) replications. During the three years of studies has been done agrochemical analysis of substratum from containers, in May and in September, to establish: pH; total nitrogen; humus %,; organic substance; phosphorus; potassium. The observations made on the plants consisted in: biometric measurements of the plants in May and September regarding: height of plants (cm), trunk thickness diameter (mm), number of offshoots; agrochemical analysis for finding the provisioning level in nutritive elements of the plants. The best substratum for Thuja Occidentalis "Columna" was represented by substratum 1 with complex fertilizer (NPK) 15:15:15 applied 5 kg/mc before planting in containers. Substratum 1, fertilized before planting in containers leaded to significant growth. Coïc solution applied during vegetation had also considerable influence on plants growth.

Key words: *complex fertilizer, nutritive solution, substratum.*

INTRODUCTION

The containerized culture of the ornamental plants has an increasing importance for producers. These are interested in finding the proper solutions for the insurance of the best growth conditions for the plants.
Fertilizers are indispensable for success of the type of culture at high parameters, so that it is necessary to solve the aspects of using them.

MATERIALS AND METHODS

Researches have been made at the Fruit Research Development Constanta between 2004-2006. The biological material used for studies was represented by plants of Thuja Occidentalis Columna, multiplied before by cuttings. Substratum for culture, resulted by mixing some compounds, were represented by: -Substratum 1 made by: ground celery, ground leaf, peat and sand 1:1:1:0,5.-Substratum 2 made by: forest compost and perlit 3:1. Experimental scheme included 6 variants: -2 controls unfertilized, with plants cultivated in the two substratum; -2 variants with substratum fertilized with forest compost NPK 15:15:15; -2 variants fertilized during vegetation with Coïc nutritive solution. There were organized (6) six variants with four (4) replications. Each replication included three plants. Plants of Thuja were planted in containers with 12 cm diameters.
Analyses and observationsSubstratum.
During the three years of studies has been done agrochemical analysis of substratum from containers, in May and in September, to establish the following parameters: pH (in water) – potentiometer; total nitrogen (N), by Kjeldhal method; humus%, by Walklay Black method (modified by Gogoaşa); organic substance%, by wet combustion method; phosphorus (P), ppm in Al, by Egner – Rhiem Domingo method; potassium, ppm in Al, by flame photometry. Biological material. The

observations made on the plants of Thuja from containers consisted in: -biometric measurements of the plants in May and September, for every vegetation cycle, regarding:-height of plants (cm) -trunk thickness diameter (mm) -number of offshoots-agrochemical analysis for finding the provisioning level in nutritive elements of the plants which were made in May and September to determine:-N%, by Kjeldhal method-P%, by wet mineralization and colorimetric dosage-K%, by wet mineralization and flame photometry

RESULTS AND DISCUSSIONS

In table 1 are presented the effects of different nutrition of the plants about the height, trunk thickness diameter and number of offshoots.

Table 1. Biometric determinations of Thuja occidentalis " Columna"

Nr. crt.	Variant	Average data on :								
		High (cm)			Trunck thickness (mm)			Number offshoots		
		May 2004	Sept. 2006	Increase growth	May 2004	Sept. 2006	Increase growth	May 2004	Sept. 2006	Increase growth
1	V1 Substratum 1 - control	20,2	35,0	14,8	5,2	5,4	0,2	12	20	8
2	V2 Substratum 1 + NPK	30,2	52,8	22,6	5,8	6,1	0,3	15	25	10
3	V3 Substratum 1 + nutritive solution	27,2	49,1	21,9	5,1	5,3	0,2	17	28	11
4	V4 Substratum 2 - control	27,8	39,4	11,6	6,2	6,3	0,1	12	19	7
5	V5 Substratum 2 + NPK	30,1	45,3	15,2	5,8	6,1	0,3	15	22	7
6	V6 Substratum 2 + nutritive solution	26,1	42,3	16,2	4,8	5,0	0,2	18	26	8

Substratum 1 made by: ground celery, ground leaf, peat and sand 1:1:1:0,5
Substratum 2 made by: forest compost, perlit 3:1

Table 1 shows that the best results were registered at fertilized variants, in substratum 1: 22,6 cm increase growth for fertilizing with NPK and 2,9 cm for nutritive solution.
Number of offshoots was also bigger in these variants towards of unfertilized control and variant from substratum 2, with light composition.
Statistic interpretation of the results of the biometric measurements are included in table 2 and figure 1.

Table 2. Statistical interpretation of the growth increase at Thuja Occidentalis " Columna"

Variant	**Height in 2004 (cm)**	**Height in 2006 (cm)**	**Increase growth**		**Difference**	**Signification**
			(cm)	%		
V1 Substratum 1- control	20,2	35,0	14,8	100	-	-
V2 Substratum 1 + NPK	30,2	52,8	22,6	152,7	+7,8	*
V3 Substratum 1 + nutritive solution	27,2	49,1	21,9	147,9	+7,1	*
V4 Substratum 2- control	27,8	39,4	11,6	100	-	-
V5 Substratum 2 + NPK	30,1	45,3	15,2	131,0	+3,6	-
V6 Substratum 2 + nutritive solution	26,1	42,3	16,2	139,6	+4,6	-
x= 17,05; DL 5% = 6.39; 1% = 10,03; 0,1% = 17,08						

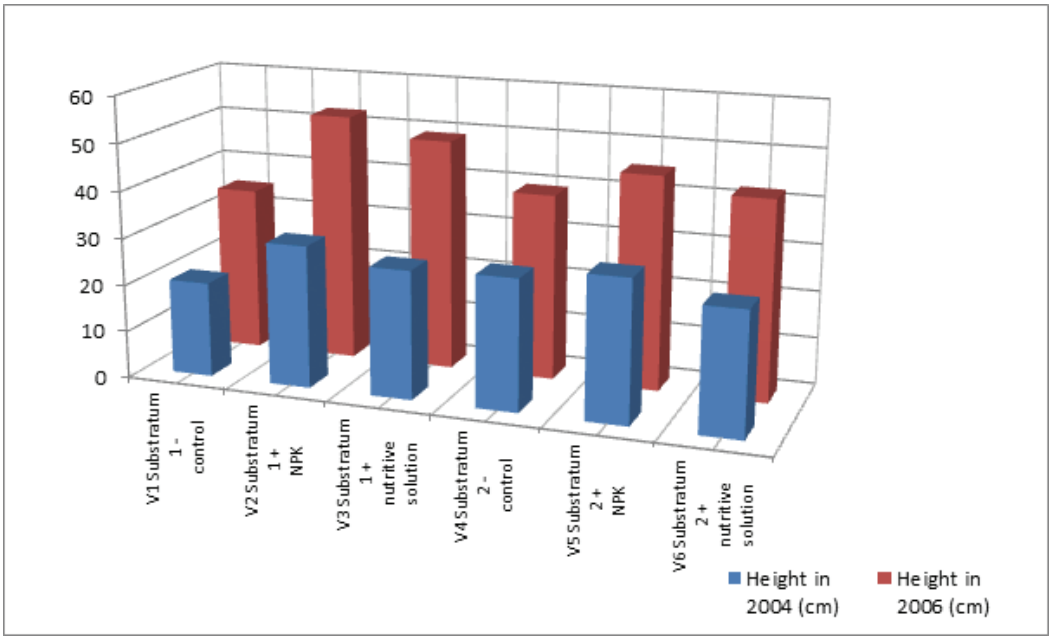

Figure 1. The dynamic height growing of the plants

Plants of Thuja occidentalis "Columna" from substratum 1 fertilized with NPK had a progress of growth with 52,7% bigger than the unfertilized control.

Fertilization of plants from substratum 1 with Coïc solution during the vegetation determined a growth of 47,9 cm towards the control (table 3).

The analysis of the results shows the following provisioning of plants in N, P, K.

Table 3. Average content in nutritive elements from plants at Thuja Occidentalis " Columna"

				2004-2006		
Variant		N%		P%		K%
	May	Sept.	May	Sept.	May	Sept.
	2,37	2,56	1,48	1,63	0,34	0,40
	2,81	3,08	1,69	1,89	0,42	0,48
	2,69	2,93	1,59	1,78	0,37	0,43
	2,05	2,36	1,40	1,57	0,32	0,37
	2,28	2,53	1,54	1,70	0,38	0,44
	2,36	2,62	1,49	1,66	0,36	0,41

The best provisioning was founded at V2, fertilized with NPK (3,08% N in September, 1,89% for P and 0,48% for K).

Nutritive solution (Coïc solution) applied during the vegetation, had also a good influence for plants provisioning at V3 2,93% N in September, 1,78 P% and 0,43% K. Both variants (V2 and V3) content plants from substratum 1, with peat.

Results of agrochemical analysis of substratum are included in table 4.

Table 4

Variant	pH		Content in soluble salts %		N total %	P %		K %	
	May 2004	Sept. 2006	Sept. 2004	Sept. 2006	Sept. 2006	May 2004	Sept. 2006	May 2004	Sept. 2006
V1 Substratum 1 - control	8.1	7	0.12	0.12	0.159	139	7	347	299
V2 Substratum 1 + NPK	7.4	6.1	0.22	0.23	0.175	175	88	432	378
V3 Substratum 1 + nutritive solution	8.1	6.8	0.16	0.19	0.162	139	73	347	296
V4 Substratum 2 - control	6.9	6.1	0.17	0.18	0.145	124	70	225	181
V5 Substratum 2 + NPK	6.5	5.8	0.27	0.29	0.158	159	85	273	226
V6 Substratum 2 + nutritive solution	6.9	6.2	0.23	0.27	0.147	124	71	225	179

The values of pH diminished in all variants, being 5,8 at V5. Total content of soluble salts was situated in normal limits between 0,12% at V1 and 0,29% at V5. Phosphorus (P) from substratum diminished, the value being at inferior limit of a temperate provisioning.

Potassium had the biggest value at V2, fertilized with NPK (378 ppm).

Evolution of content in P and K from substratum is underlined by graphs 2 and 3.

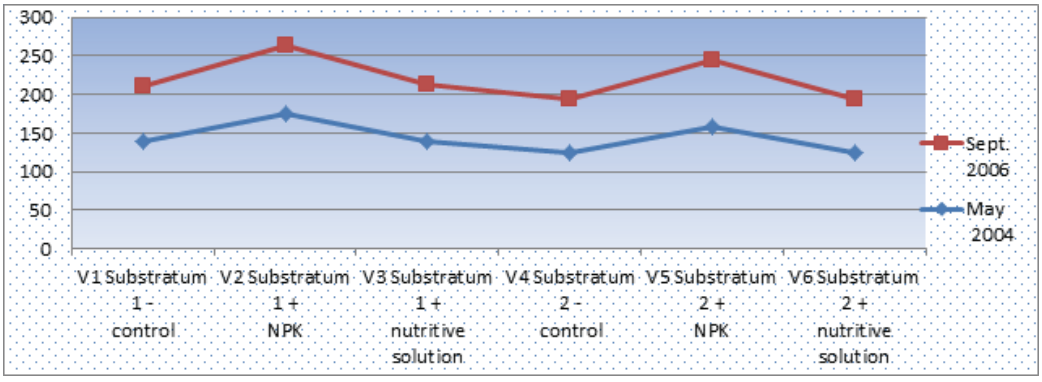

Figure 2. Content of P

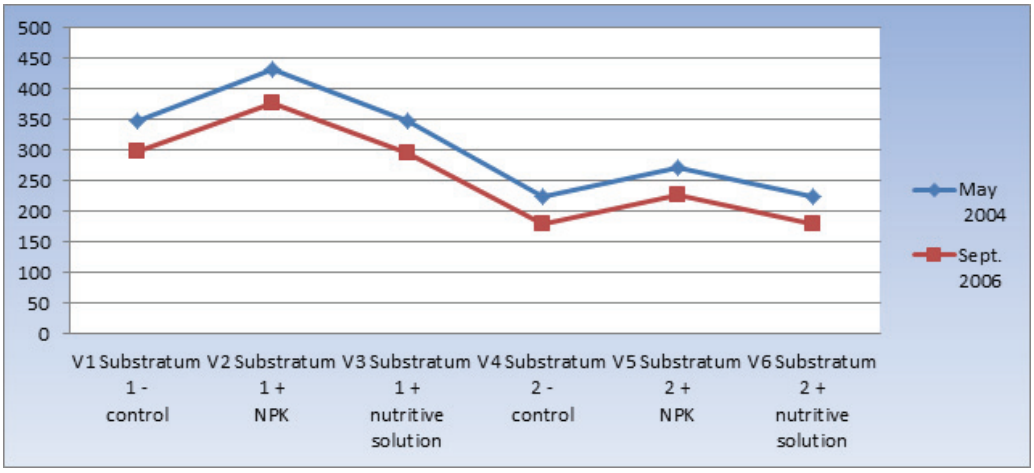

Figure 3. Content of K

Variation of pH of substratum and total content in soluble salts is indicated by graphs 4 and 5.

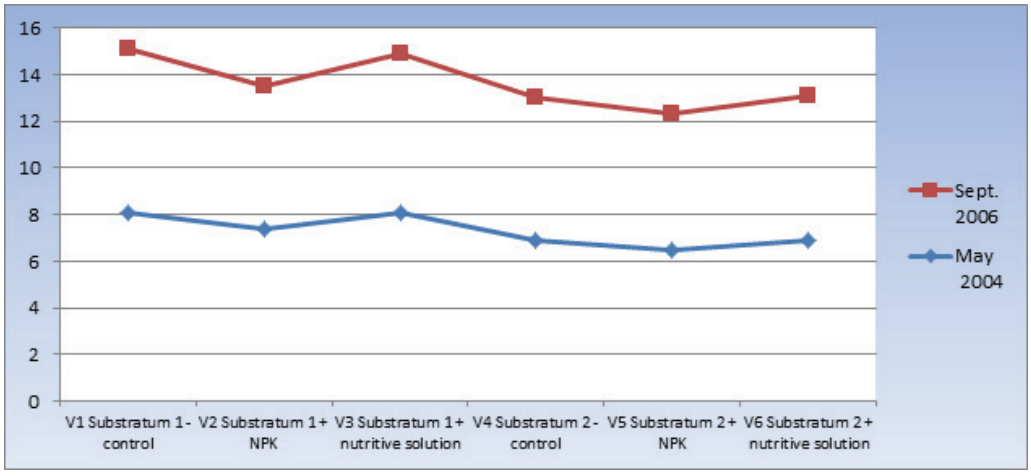

Figure 4. Variation of pH

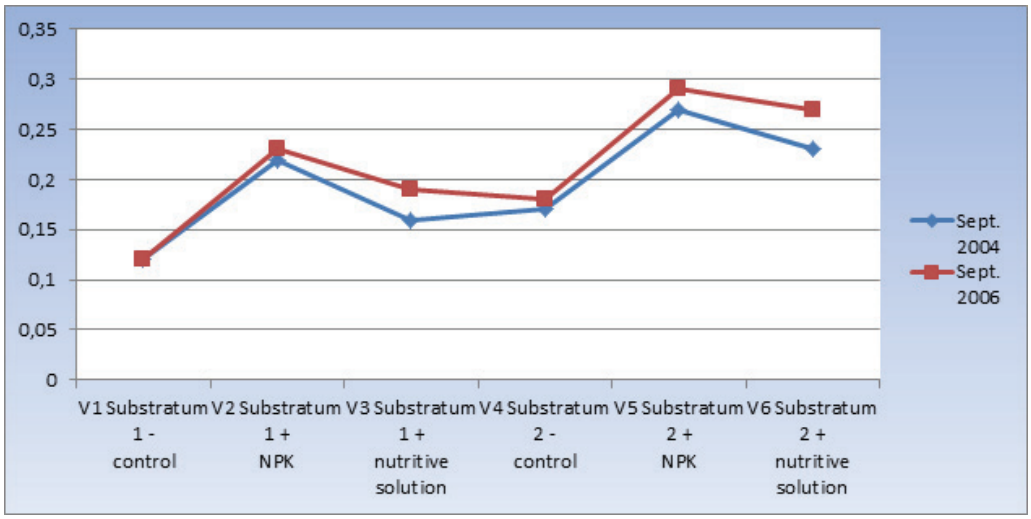

Figure 5. Content of total soluble salts

CONCLUSIONS

The best substratum for Thuja Occidentalis "Columna" was represented by ground celery, ground leaf, peat and sand 1:1:1:0,5 (substratum 1) with complex fertilizer (NPK) 15:15:15 applied 5 kg/mc before planting in containers.

Substratum 1, fertilized before planting in containers leaded to significant growth. Coïc solution applied during vegetation had also considerable influence on plants growth.

Substratum and fertilization didn't have an important influence on trunk thickness of plants, these being dependent on morphological characteristics of the variety.

The best behavior of the plants was at pH=7,4 in substratum 1. The total content of salts increase in both substratum, because of fertilization but remains in normal limits.

Total content in nitrogen (N) showed a good provisioning of substratum. The values of phosphor (P) were temperate and potassium (K) diminished by plants consumption, but remained at good and very good values.

The biggest values of nitrogen (N) from leafs had a considerable correlation with the biggest height of plants.

The values of P and K showed a good provisioning of plants, the biggest values registered at plants from substratum 1 fertilized with NPK before planting.

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HISTORICAL ANALYSIS AND STUDY OF CURRENT STATE OF BRAN CASTLE DOMAIN, INORDER TO RESTORE THE HISTORIC LANDSCAPE ESEMBLE – FORMER ROYAL RESIDENCE

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Abstract

National landscape needs to create benchmarks for national identity, especially because it is just beginning. In fact, if a historic landscape path could no longer be restored, then landscapers will need to refer to the tradition of a foreign nation. The smaller the funds for management, the greater it's importance. Assessment of impacts on historic gardens and parks refer to their condition at the time of the study. Due to maintenance deficiencies, management, financing and lack of a national strategy for the conservation, improvement and use of historical monuments with landscape interest, we are currently witnessing rapid degradation of the few landmarks that nation-wide landscape holds. Most restorations were aimed at construction areas, the domains of gardens and parks, sometimes with surfaces of tens of hectares, are not at all addressed, or addressed only theoretically. This study will explore in a historical and landscape point of view, the Bran Castle Park, as well as make an analysis of the current status, necessary studies in order to professionally restore the historic area.Knowing the main aspects of accounting and inventory of historical components assembly also includes a range of information that help sustainable management strategy in the future. Preservation, conservation,but also restoration and revitalization of cultural heritage landscape is a core concern in the development of a cultural society. These testimonies of the past are very important milestones, necessary in order to understand the historical context of the evolution of society. Maintenance and development of the historical monument landscape values, in conjunction with the architectural may lead in the future to a sustainable development of the monument, a concept that can be incorporated into future marketing strategies.

Key words: *Historical garden, historical identity, restoration, revitalization, landscaping herritage.*

INTRODUCTION

Awareness on knowing the cultural heritage, instilling respect for national identity for the appropriation inherited values as elements of national identity and continuity are values that can be inspired only knowing the history and successive transformations undergone by a monument over time until now.

In complex analysis of domain structure, in-depth historical study of the assembly and the current state of the monument are the essential points of any debut in a professional study of a landscape restoration assembly.

Like any restoration, the main objective is the development of new concepts in terms of preservation and conservation of the site of the old structures of historical value. This objective can be achieved through a multidisciplinary approach and inventory analysis studies by adopting optimal solutions, introducing new functions needed by society, by engaging appropriate techniques and materials used.

Knowledge, investigation and preservation or restoration of these gardens is perhaps just as important as other cultural values that are part of the heritage of a country and, in many cases, the World Heritage (Law no 451, 2002).

Any intervention will be recorded in an analytical and chronological order to follow the time evolution and sequence of works performed, but also to allow the retrospective control of the procedure and to ensure consistency of subsequent interventions.

MATERIALS AND METHODS

Bran Castle was built as a royal fortress through the privilege signed by the Hungarian king Louis I of Anjou on November 19th, 1377. It is the oldest building-the royal residence, preferred especially the second Romanian queen, Queen Maria.

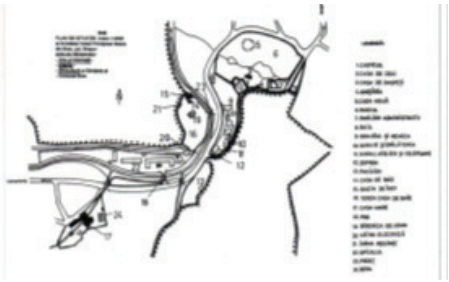

Figure 1. Plan of Bran domain (Ion N.D., 2003)

Built by the inhabitants of Brasov since 1378, it was in the successive possession of ruler Mircea cel Bătrân (between 1412 to 1418) and then Iancu de Hunedoara who made the first interventions on the city, ordering repair and strengthening works. From the late fifteenth century (1498) and by the middle of the eighteenth century is used as the customs, providing management functions of the royal domain. The architecture of the castle is enriched in 1593 with a round tower added to the southwest corner of the building, and between 1622-1625 with a gate tower, built after a rectangular plan.

As part of administration and customs control, there are no records on the presence of gardens, at that time they probably had utility role.

Between 1883-1886, the area was turned over to the inhabitants of Brasov, the castle received the second intervention, restoration required after employment of an Austrian regiment. In 1916 is offered as a gift on the occasion of the coronation of Emperor Charles I of Austria-Hungary. He is forced to decline due to collapse of the monarchy and creation of Romania Mare, on 1 December 1918.

Figure 2. Bran Castle seen from Măgura Branului (Ion N.D., 2003)

The same intention of giving the Castle was once again two years later, this time to the new sovereign of Romania Mare.

For the fate of the castle, it was its chance to return to life, the passion of Queen Maria, who transformed the city into a welcoming lovely summer residence of the royal family. Without restorations made by order of the Queen, by architect Karel Liman, with money provided by the domain administrator Crown Prince Barbu Ştirbey, the castle would probably have been affected by indifference and degradation that led to the disappearance of many medieval monuments.

Until 1920, when it is donated to Queen Maria of Romania, the castle was owned by Forestry Office in Brasov. But starting this year (1920), the castle and its fields will enter a complex process of restoration and renovation.

Figure 3. Queen Maria in the park near Măgura Branului (Ion N.D., 2003)

Figure 4. Interior courtyard of Bran Castle (Ion N.D., 2003)

Early interventions focused on transforming the medieval castle with its sober and unwelcoming style into a modern and comfortable home, without harming its originality, as shown in the Queens memoirs: 'I did nothing which would take away the feudal appearance, I didn′t transform the quickness of the stairs, I didn′t raise the roofs nor did I straighten the crooked rooms'. Under the guidance of Czech architect Karel Liman Qeen Maria brought improvements for 18 years (1920-1938) in the comfort of housing, water and electricity connected the whole assembly, introduced telephony and the lift serving the castle with its four floors and also created the link between the castle and the park.

In the period 1920-1922 the first references to the Bran Castle gardens appear. Creating a pictorial, free style garden, the architect Karel Liman, followed valuing dominant architectural elements, a unique way of undermining the green area to the adjacent construction. Bran domain was expanded, encompassing meadows around the castle.

In the composition appeared construction facilities completed to the requirements of the passionate queen: *Tea house*, built from wooden beams (144m.p.), Guest house, built from raw stone (78 m.p.), Princess Ileana′s Children house (43 m.p.), New personal house (176 m.p.), Staff housing (378 m.p.), Horse stables, Hunting house, Wooden church, two huts and six garages.

Figure 5. The tea house and maintenance people in the Bran Castle Parc (Ion N.D., 2003)

In the year 1922 modern greenhouses were commissioned, heated by radiators and a plan was made by the royal house architect (Karel Liman) for a rose garden. The garden had special care, by the chief gardener of the castle, Petre Conrad, under the guidance of the royal parc chief, Constantin Pamula.

Figure 6. Queen Maria in the garden (Ion N.D., 2003)

The Palace Parc was enriched with ″fourty apple trees, twenty trees, fifty cherry trees, twenty five prune trees and seventy blueberry shrubs″ brought by the royal garden direction in Cotroceni. Also, the park lake was populated with 1000 trouts and a few swans.

Figure 7. Queen Maria by the swan lake in Bran Castle Parc (Ion N.D., 2003)

Unfortunately, on 18th July 1938, Queen Maria dies. The Bran estate becomes the property of princess Ileana, the restorations and maintenance go on for nine more years. The first years of this period (1938-1943) are dedicated specially to the current repairs of the castle, which due to rare inhabitation suffered (princess Ileana lived there six months a year, respecting the condition imposed by King

Carol the second, her brother, on her marriage to the archduke Anton of Habsurg) Due to the Princesses marriage with Prince Anton of Habsurg, she was revoked and forced to live in Sonnberg castle, Austria. Starting with 1943, the princess will permanently live in the country, living in the castle only in the summer months and tending more to charity works.

The magnitude of the domain transformations was greatly diminished, this period overlapping with that of the war, when all the country was going through rough social, material and economical times.

Still, Princes Ileana inherited the spirit and charitable soul of Queen Maria, throughout her stay in Romania, looking toward helping and supporting the nearby residents and the war casualties. In this purpose she built with great sacrifice and calling to many acquaintances who could help her, a hospital on an estate close to the Castle. By doing this, she could express the great love and consideration which she had for her mother, naming the hospital "Queens Heart".

The abdication of King Mihai I, on 30th of December 1947, releases the domain in the possession of the Romanian government. Princess Ileana is forced to leave the country the political conditions allowing her to return to the Castle only in 1990.

Figure 8. Queen's Heart" Hospital in Bran (Ion N.D., 2003)

In the year 1957, 10 years after the instauration of People's republic of Romania, the Bran Castle became a museum, the communist regime starting a long period of degradation and estrangement of the wealth of the royal family, which although were not Romanian born, protected, contributed and cherished the Romanian cultural legacy. Today only three sections function: Castle Section – with pieces of the royal family patrimony (many of them disappeared in the communist regime period), Medieval Customs Section – in process of restoration and Ethnography Section – in the park near the Castle.

RESULTS AND DISCUSSIONS

Current state

The expansion which the domain had during the time of Queen Maria is no longer valid.

Figure 9. Guest house in the natural park (Dobrescu E. 2009)

Of the total surface "233 acres to which 183 forest acres (fir and beech), 93 acres of meadow and 2 acres of grasslands are added" (Ion N.D., 2003) accessible and arranged for touristic purpose are just the spaces around the castle.

Figure 10. Lake landscape park (Dobrescu E., 2009)

In development is the Medieval customs area. Many of the buildings, surrounded by their

respective terrains, are now out of the touristic route of the Bran estate. The surface of the Park holds the Castle area, the park area to the former garage workshops and the ethnographic area in the park. The other areas are not presented, some of them being the property of other institutions.

The Palace Park is precarious maintained, the lake is clogged, the mature vegetation needs regeneration works and the young vegetation is abusively and wrongly added. The bath house with the swimming basin, placed beyond the river are not on the touristic route. The same for the wooden Church, the Big House, the Hospital and the cript where Queen Maria′s heart was placed until 1970.

Figure 11. Thuja Occidentalis in a degraded state (Dobrescu E., 2009)

Note that the park had, during the Queen, a strong direction for natural landscape design, the grasslands and the lake shores were designed to be natural, free, the meadow was mowed manually, without o special concern for accuracy and minute details. The flowers were natural, wild species and they gave the place the charm sought by the Queen and the cultivated species were only to be found near the castle. Fruit bearing trees only completed the already present masses of trees resembling those found in the nearby forests, thus showing the pragmatism of the natural style and the desire to be close to nature.

We cannot ignore the fact that, currently, the landscape is not in accord with it′s original style and does not respect the romantic character created in it′s glory days.

Figure 12. Wrong approach in the context of a natural style park (Dobrescu E., 2009)

Figure 13. Inner courtyard of Bran Castle (Dobrescu E., 2008)

The Bran Monument did not reveal any documentation regarding the garden surrounding the castle, not until it entered the possession of the royal court. The wish of Queen Maria, to be surrounded by a landscape fitting her passion for nature, gave birth to the design which we can analyze today (with a bit of imagination). Let us not forget that then, the young sovereign came from a country with a strong landscaping tradition (England), with very refined tastes and an inclination towards the romantic style. All the transformations made to the castle and the estate were grafted on the old structure of the domain, under the needs identified at that time.

Figure 14. Tea house in the natural park (Dobrescu E., 2008)

Figure 15. Guest house in the natural park (Dobrescu E., 2008)

CONCLUSIONS

Following the historical review no documents were found regarding restorations previous to the ones made by the royal house architect, Karel Liman. All the transformations following 1938 have no value from a historical or stylish points of views. As such we can consider that future restorations have to keep in mind the historical moment marked by Queen Maria and the aspect of the landscape created in that period. All the restoration interventions have to have as a historic mark the period between 1920 and 1938, taking in consideration the current necessity to adapt the historical monument to the touristic functionality and not as a housing facility. Also we have to reclaim the domains belonging to the Queen which have a strong historical hold.

The new functions have to keep account of the original atmosphere without major alterations to the whole image.

Restoration, as an actualization of a work of art, is included just to this filtration and accumulation of data; it is thus natural to identify two stages: the first is the reconstruction of the authentic text of the work, the second intervention over the matter from which the work is composed.

This study is not only a research theme, but also an action to induce or recover the respect towards the history and national values of patrimony, without which a true restoration could not take place.

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OBJECTIVE NECESSITY OF STUDY AND PROFESSIONAL APPROACH TO RESTORATION OF HISTORICAL LANDSCAPE ENSAMBLES IN ROMANIA

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Abstract

Major concerns for preserving the national cultural identity are timid in regards to the landscape, perhaps a lack of funding and focus on other areas of interest. Architecture has received greater concern, but even here the situation was not very happy. All the restoration / revitalization interventions are spread, there is no coherent approach to the works, based on priorities for action which result from the analysis of degradation, vulnerability, and overall value of monuments.Therefore study and research for the restoration of parks and historic gardens should be thorough, currently lacking a methodology for analysis and evaluation of historical monuments adapted to the specific landscape that is different from architectural specifics. Studies for a professional approach to historic landscape restoration assemblies could be a starting point in developing the methodology for the restoration of historic parks and gardens in Romania.

Key words: *Historical identity, cultural landmarks, restoration, the actual functionality, historical garden.*

INTRODUCTION

Keeping and preserving the cultural heritage is a necessity in the context of recognizing the historic, architectural and artistic inheritance of Romania, but also for understanding the stages of social, political and cultural development of the Romanian territories. The gardens and parks that belong to the historic edifices, as monuments of the past, represent testimonies of certain stages of civilization and culture of a people, of the way in which historical, economical, social factors as well as the beliefs, the scientific and technical knowledge of the time determined certain shapes for the space of human living.

Knowing, investigating and conserving or restoring these gardens could prove to be as important as doing so with any of the other cultural values that make up the historical heritage of a country and, in many case, on the world (Legea 451/2002).

In the case of gardens, the effect of the exterior climate conditions on the specific constructions and mostly on the vegetation, correlated with the potential life span of the botanic species, determines the degradation over time of the general aspect of the landscape and often leads to important losses. Preserving the landscape in such cases means defending them from physical destruction, maintaining the basic, original characteristics of the shapes and the composing elements that lasted through time.

The importance given to restoration and conservation of the historical heritage of landscape architecture in different European countries reflects in putting in the general attention, inclusion in the touristic circuit, publishing of specially magazines, formation of professional associations, and especially in allocating funds and attracting sponsors for financing studies and restoration projects.

MATERIALS AND METHODS

In Romania there are over 29.000 historical monuments, of which over 4.000 are in a state of advanced degradation, collapse and pre-collapse.

Historical monuments, according to the definition accepted by the National Ministry of Historical Monuments and of Cultures and

Cults, and in conformity with the current laws, are estate goods, constructions and land situated on the territory of Romania, or outside the borders, properties of the Romanian state, significant for the history, culture and national and universal civilization.
All mentioned above belong to the national cultural heritage and are protected by laws specific to historical sites.
The list of the monuments is pretty vast, yet many of the aforementioned are already physically gone (like the Văcărești Estate, in Dambovita county), and most didn′t benefit from studies or conservation and restoration interventions.The few restorations undergone lately did not made themselves remarked for professionalism.

Figure 1. Văcăreşti Mansion, in Văcăreşti, Dâmboviţa county (vanished since the comunist period) (Ion N.D., 2008)

A professional approach of the historical monuments, as it is viewed by the last international conventions concerning cultural heritage, landscape, monuments and sites, show the importance that these have in the cultural heritage of a community (Florence cart).
The process of professional restoration of the historical gardens involves an inventory of its comprising elements and specialized interventions considering their restoration, conservation and up-keeping, obtaining and maintaining a high degree of authenticity.

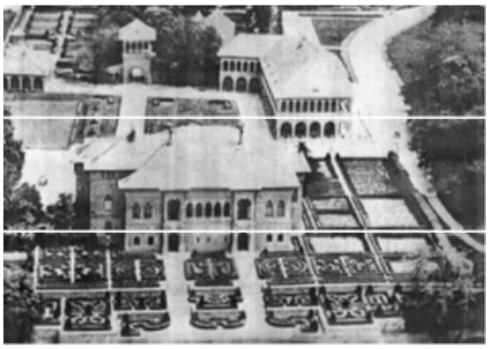

Figure 2. Image from the restauration of the Venetian terraces, done in the time of Martha Bibescu (Chiliman A., 2000)

Figure 3. Planting on the venetian terrace, at the last restauration of the parc palace Brâncovenesc in Mogoşoaia, restauration of a poor quality

The authenticity of the site refers at the flat drawing, the volume of the constituent elements as well as all the other vegetal or mineral details that it encompasses. Any attempt to conserve or restore it assumes a simultaneous intervention on all the parts of the ensemble, in order not to affect the structure of the initial composition.
Restoring and conserving the historical gardens involves not only the comprising elements but also the general context, defined by the exterior environment in which these exist. All the changes that happen in the physical environment endanger the ecological equilibrium of the site.
Intervention done on the historical monuments are made only by respecting the Agreement of the Culture and Cults Ministry; the force majeure events are an exception, but with the condition that the changes are reversible.

According to the current laws, the interventions on any historical monument are represented by all the research endeavors, construction, extension, repair, consolidation, restoration, conservation, landscape setups, as well as any other involvements that modify the aspect of the monument, including current repairs, maintenance work, exterior illumination, safety measures or decorative efforts.
In the same set of interventions done on the monument are the temporary or permanent placements of physical boundaries, protection structures, pieces of fixed furniture, advertising signs, signage or any kind of markings on the monument, movement of the entire construction, setting up means of access, pedestrian and non-pedestrian, other utilities, indicators, including the ones in the protection areas of the monument.

Figure 4. „An amusement parc" created on the spot in the honor Court of the Brâncovenesc Palace in Mogoşoaia, image which alters the character of the monument (Dobrescu E.)

All the interventions that affect the monument, other that the ones concerning changing destination, maintenance or current repairs, no matter what their source of finance and the nature of the property, are done under the inspection and control of the Culture and Cults Ministry, of the Directions for Culture, Cults and National County Cultural Heritage and of the Municipality of Bucharest.
Conservation and maintenance interventions that are permitted must respect a series of ethical principles without which the project would not be subject to a certain quality of restoration (AIC, 1976).

One of the core ethical principles is that the restorator must have the necessary qualification for conservation and restauration activities.
The conservers and restaurateurs specialized in certain sectors of activity should *limit themselves only at the activities specific* to their field of study and should not consider themselves specialists in other domains connected to their own (for example painting restorators reconstituting statues)
The quality of restorations is the defining element of a specialist, *not the quantity* or the value of the restored object.
A vast professional experience is necessary, gained through continuous formation, through collaboration with other specialists from connected domains, for a full knowledge of the qualities and abilities of a specialist in restoration works.
Maintaining a critical attitude regarding the *traditional materials and methods* used in conservation and restoration of the degraded elements is a necessity, considering that all the manufacturers promote their own materials and work methods.
Any specialist activating in this field is obliged to demonstrate a profound respect for *the aesthetic, historic and physical integrity of the restored object.*
Any investigation or treatment applied on a historical piece must be made within *the limits of the competency* of the restorator.
For each oeuvre that has a historical or artistic characteristic the specialist must use the highest and most exact *standard of treatment.* Certain opportune treatments will be preferred to others, any other type of treatment that is considered unfit for the conservation or restoration of the piece being damaging.
The materials used for restoring the monuments will have the quality of being *reversible*, so that their potential removal in the future won't affect the physical integrity of the restored *object*. The changes brought though the works of restoration must be made to the step that the original object remains recognizable.
This creates a *limitation of aesthetically reintegration*.
The quality of the restorer's labour is given by his capacity to keep up with the latest developments of the technology involved in this field. For this, the specialist is forced to

consult the *scientific novelties* and develop his aptitudes so that he can offer the best treatment in a diverse range of situations.
The responsible restorer has the obligation to coordinate the activity of the auxiliary personnel, so that the protection and integrity of the cultural good is assured. A series of actions which might degrade the site over time are forbidden. Such actions include the execution of alleys with paved concrete, any attempts to mask the lower part of the buildings, painting with synthetic substances or replacing covers. It is also forbidden to plant any large scale trees at less than 15m from the monument or the execution of burials at a distance that's less than 6m from the church walls. Depositing, even temporary, of chemical substances or flammable products, solvents or other dangerous substances inside or near the monument are sanctioned according to the local laws (Legea 41/1995; Legea 50/1991; Legea 10/1995).
Neither is depositing of construction materials, utilitary materials or household items near of inside the monument allowed. The change of usage for the historical monument, digging, erecting new edifices without specialist archeological assistance or executing constructions for new buildings in the functional area or the protection area of the monument also enters under the rule of law (Legea 11/1994).

RESULTS AND DISCUSSIONS

For the professional approach of the restoration process for historical gardens and parks, the specialist must also have knowledge of the Cultural heritage, the Natural Heritage and implicitly the Historical garden, how the historical monument classification works, and which are the main characteristics needed for an edifice to be declared a historical monument.
Another important issue to be aware of is the juristic regime of the monuments, what is there are of protection and what the protected area is comprised of, as well as the interventions that are permitted on a historical monument.
The Venetian Carta (1964) gave a wider interpretation to the notion of "historic monument", introducing new concepts as "historic ensemble", "monumental center", "urban reservation", "area of cultural and natural protection" etc.
So, the notion of "historic monument" encompasses the isolated architectural creation, the urban and rural settlement, as well as the domains that surround it, parks and gardens, which, together, bring the testimony of a civilization representative of a historical period. Any historical monument has available, from its setup in the territory, a protective space, which gives its individuality among the surrounding edifices.

Figure 5. Creation of a protection zone for monuments in a rural area

The specific protection areas (established through the urbanism documentations approved by the Historical Monuments Committee), the artistically components of the areas, the comprising elements of the area and the interior and exterior furnishing elements, as they are defined by the application set of rules, are considered part of the historical monument.
The research regarding the inventory of the *landscape heritage* is an indispensable step in the restoration study, as picturing the current picture can establish the necessity and the urgency of the conservation and restoration interventions.
In this context, every historical monument must dispose of an inventory of its composing elements (done by the owner or the administrator).
This inventory is made up of:

-constructions – buildings with main functions, household side buildings, property walls, towers, living spaces, religious edifices, altars etc.;
-exterior arrangements – access roads, stairs, walk paths, roads, parks, plantations, basins, statues, lakes, exterior installations, fences;
-other elements – graveyards, archeological elements;
-mobile cultural goods;
This data is gathered in the **Analytic paper of the monument**, which also includes details regarding the official denomination, address, short description, date of construction, history and state of conservation, sketches and photos of the property, juristic regime, cadastral survey, urbanistic reglementations, building founder, prior restoration workings.
To be able to make an objective decision regarding the restoration or revitalization of a historical monument, we must know its origin, the influences that determined the choice for a certain style of architecture, the factors that contributed to its changes over time. A professional approach of restoration must lead to the establishment of the global value of the historic monument and to planning the interventions that must be done, depending of the degree of vulnerability and the historic and aesthetically importance of the composing elements.

CONCLUSIONS

The existence of many gardens in Romania, which, even though appear on the List of historical monuments, are little or not known at all, some in state of forgetfulness, pray to natural or anthropic degradation, some *arranged* through interventions unfit for their initial value, constitute a compelling argument for the professional approach of the process of restoration.

„... Through restoration we understand any intervention aimed to bring to its efficiency a product of human activity" (Brandi C., 1996).

Figure 6. The ruins of the Cantacuzino palace from Floreşti, jud. Prahova, foto 2007 (Dobrescu E.)

Figure 7. The Istrate Micescu mansion from Miceşti – jud. Argeş (Ion N.D., 2008)

Sadly, we can observe that in the very important publication that catalogues historical gardens in the world, *The Oxford Companionto gardens 2,* Romania is only mentioned a few times, for the Golescu family and baron Bruckental from Avrig gardens (page 475-476), the Brâncuşi sculptural site from Tg.Jiu, informations offered by Maria Golescu in the XX century. In the same volume, Bulgaria has a 2,5 page synthesis, Hungary around 2 pages (Oxford Companion to Gardens, 1986).

In order to be considered a piece of art, the garden must benefit from objective recognition, it must recreate the artistic sensation every time it's visited, it must represent beauty by itself, like a painting, it must allow for "the play of imagination in contemplation".

Any intervention done to work of art depends on this recognition by its state: "a work of art, no matter how old or classic it is, actually comes into being and not only for the potential as a work of art, when it lives in a certain individualistic experience" (Dewey, 1951).

„The restoration is the methodologic moment of recognition of the work on art in its physical consistency and in its double aesthetic polarity, that aims to transfer it in the future." (Brandi C., 1996)

In the case of gardens which do not have a historical documentation which can certify the initial image of the monument before restoration, it can come to interpreting data from similar monuments from the same period or to an innovative or eclectic approach to the process. In this case valuable elements from a historical point of view are kept and new functions can be introduced according to the neccesities of the space utilization.

The newly introduced functions must take into account the original atmosphere of the monument without altering the image as a whole.

The analysis criteria are utilized when reaching a diagnostic and constructing a plan of restoration, as a revival, as a reconstitution of the authenticity of the work of art:„Restoration, as an actualization of the work of art, is included in this filtration and accumulation of data; so it is natural to identify two stages: first, of reconstitution of the authentic text, second, of intervention upon the matter that makes up the piece" (Brandi C., 1996).

The insufficient preoccupation in the domain of restoration and revitalization of landscape monuments, the lack of specialty studies and documents of evidence, which may bring into the attention of the Culture and Cults Ministry the imperative of restoration based on scientific basis of historical parks and gardens, is the main argument for getting back the cultural and historical identity. Currently, in the archives of the Culture and Cults Ministry as well as the achives of the Town Halls that act as owners of the landscape monuments, there are no complete documents that present a clear and up to date inventory and also a timeline of prior restoration work.

All of these recordings, previous to the professional restoration process, must make up the primary data base which will enable a qualified approach in restoring the important landscape monuments from Romania

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SPONTANEOUS SPECIES WITH ORNAMENTAL POTENTIAL: *ASTER OLEIFOLIUS* (LAM.) WAGENITZ (I) - MORPHOLOGY, ECOLOGY, CHOROLOGY

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Abstract

Morphological characters and environmental factors requirements for Aster oleifolius (Lam.) Wagenitz [syn. A. villosus (L.) Sch.Bip; Linosyris villosa (L.)DC.] (Asteraceae) are presented as arguments to introduce this species among the ornamental plants. A chorology map, based on the original or collected data from different herbaria from Romania and references, gives the country spread of this species.

Key words: *Aster oleifolius, Asteraceae, morphology, ecology, chorology.*

INTRODUCTION

Aster oleifolius (Lam.) Wagenitz [syn. *A. villosus* (L.) Sch.-Bip., non Thunb.; *Galatella villosa* (L.) Rchb.f.; *Linosyris villosa* (L.) DC.; *A. cinereus* Korsh.; *Chrysocoma villosa* L. ; *Crinitaria villosa* (L.) Grossh.; *Conyza oleifolia* Lam.] from *Asteraceae* is a perennial herb, 13-35 cm, stem is ascending to erect, densely hairy, leaves alternate, simple, lanceolate to oblanceolate, 15-40cm/10mm; soon leafless and glabrous below, with oblanceolate, greish-white-tomentose leaves above. Capitula shortly pedunculate, narrowly infundibuliform, in dense corymbus. Involucral bracts is several rows, subacute to subobtuse, long-ciliate, the outer tomentose, the inner somewhat lanate at the apex; ligules absent; papus-hairs inequal (Merxmuller and Schreiber, 1976). *A. oleifolius* is a xeric steppe species on calcareous soils (in the nemoral areas and in the forest-steppe only on sunny steep clines) with continental Eurasian distribution (Badarau, 2006).

Some species of *Aster* L. are cultivated and sold in the horticultural trade. Some of these species are widely distributed and have been known in cultivation for a long time. Due to the general aspect of plant and the greish-white-tomentose leaves above, *A. oleifolius* may be used as ornamental plant with a longer flowering period between July-September, sometimes till October (Figure 1). *A. oleifolius* has an excellent potential as ornamental plant in gardens.

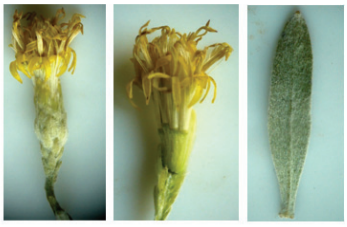

Figure 1. The capitula and leaf morphology in Aster oleifolius (orig.)

The species *A. oleifolius* was described by Linnaeus with syn. *Chrysocoma villosa* L. in Linnean Herbarium [S-LINN], in Sweden (http://linnaeus.nrm.se/botany/fbo/c/chrys/chryvil.html.en) (Figure 2).

Figure 2. Chrysocoma villosa L. in Linnean Herbarium [Microfiche number: IDC 337.19]

MATERIALS AND METHODS

The chorology map and details of distribution of *Aster oleifolius* are based on collections from Herbaria: BCHM, BRHM, BUAG, BVHU, CL, I, IASI, PLHM, SIB, SVHU (according codes to P.K. Holmgren from *Index Herbariorum*). The chorological map of *A. oleifolius* is based on the cited sources above plus new records obtained during research, or different databases / scientific publications where this species was referred. The chorological map of *A. oleifolius* included in this work was made by taking in account the principles of the GEOCOD System (Oltean and Stefanut 2002), which ensures an exact localization of villages, communes and towns where this species was found. The main objective of the present study is to document the geographic distribution of the *A. oleifolius* species in Romania using Universal Transverse Mercator (UTM) system. The chorological red points on the distribution map are represented by data from cited Herbaria and former citations from literature, and original data from the field (Figure 7). The material used for morphological descriptions was collected from Alah Bair Hill, Constanta County. The species was naturalized in "I. Todor" Botanical Garden, on Dobrodjan Colline in USAMV Bucharest (Figure 3).

RESULTS AND DISCUSSIONS

Aster oleifolius is a calcareous species and the coenotaxonomic framing of this newly proposed vegetal subassociation is following: Cl. *Puccinellio-Salicornietea* Topa 1939, Ord. *Puccinellietalia* Soo 1940, Al. *Puccinellion limosae* (Klika 1937) Wendelbg, 1943, 1950, As. *Staticeto-Artemisietum santonicae* Topa 1939 and subass. *asteretosum oleifolii* subass. nova (Stefan et al., 2009) or As. *Staticeto-Artemisietum monogynae (santonicum)* Topa 1939 (Lupascu et al, 2005)

The species was collected from Alah Bair and transplanted in "I. Todor" Botanical Garden for acclimatization and naturalization regarding the morphological and anatomical studies, cultivation aspects and interest for phytodiversity preservation (Figure 3).

Figure 3. A. oleifolius on Dobrodjan Colline in "I. Todor" Botanical Garden, Bucharest (orig.)

Aster oleifolius is xeric species with a rare distribution in Romania. The image presented bellow (Figure 4) is a comparison between *A. linosyris* (left) and *A. oleifolius* (right). Though congeneric and sharing the same character-the lack of the ligulae-the two species are not immediate and not even closely related in the context of the genus *Aster*. The differences between the two, especially in concerning the structure of the capitula (Badarau, 2006), leaf nervation and the colour of plants.

Figure 4. Two species of Aster in Alba County (photo Badarau)

The species is well-represented in Fantanita-Murfatlar, Basarabi (Constanta County). It is preserved indirectly due to another rare species of Romania, like *Nepeta parviflora*, *Paeonia peregrina, P. tenuifolia, Adonis vernalis, Helianthemum salicifolium, Trigonella gladiata, Stipa lessingiana*, *Crocus pallasii, Euphorbia dobrogensis, Linum borzeanum, Buffonia tenuifolia, Aster oleifolius, Scutellaria orientalis* (Figures 5 and 6).

Figure 5. A. oleifolius in Fantanita-Murfatlar Reserve, Constanta County (Padure, 2005)

Figure 6. A. oleifolius in Fantanita-Murfatlar Reserve, Constanta County (Pădure, 2005)

The authors were made an important revision of *A. oleifolius* herbal specimens from different Herbaria (data sheets specimens) to realize a partial monographic study on genus *A. oleifolius* in Romania. We finally realized for the first time a chorological map of this species. The partial chorological data are presented in following section:

Alba County: Rosia de Secas [GS20] (Badarau, 2006).

Arad County: Sânmartin [ES24] (Merce, 2011), Pilu [ES25] (Merce, 2011), Varasand (Merce, 2011), Şiclău [ES24] (Merce, 2011), Graniceri [ES25] (Merce, 2011), Socodor [ES35] (Merce, 2011).

Bihor County: Cefa [ES59] (Merce, 2011).

Botosani County: Râsca (I 29490) [NP10], Tataraseni (I 29491) [MP72], Botosani [MN78] (Oprea, 2005; Nyárády and Morariu, 1964), Calarasi [NN17/27] (Oprea, 2005), Valea Bahluiului-V. Ilenii (Lupascu et al., 2005), Frumusica [MN96] (SVHU), Ştefanesti [NN19] (Nyárády and Morariu, 1964).

Braila County: Jirlau [NL10] (Merce, 2011).

Buzau County: Râmnicu Sarat [NL02], Boldu (I 65546) (Nyárády and Morariu, 1964), Buzau [MK89] (Oprea, 2005), Pâclele Mari and Pâclele Mici (Merce, 2011), (BUAG 18412).

Cluj County: Cluj [FS97/97] (Oprea, 2005), Agârbiciu [FS78] (Dragulescu, 2003), Sic [GS29] (Merce, 2011), Micesti (Nyárády and Morariu, 1964).

Constanta County: Basarabi in Fantanita-Murfatlar Reserve (Figures 5 and 6) [PJ19] (Padure, 2005) (CL 430995, CL 432191), Agigea (Burduja et al., 1969; Burduja and Horeanu, 1970; Oprea, 2005; Nyárády and Morariu, 1964) [PJ28], Cheia [PK12] (BRHM), Medgidia (Nyárády and Morariu, 1964), Adamclisi (I 24298), Eforie [PJ37] (BCHM), Hagieni (CL 661984) (Cristurean and Ionescu–Teculescu, 1970; Ionescu-Teculescu and Cristurean, 1967), Capul Midia (Nyárády and Morariu, 1964) and Grindul Chituc, Baltagesti [NK92] on Alah-Bair Hill (Oprea, 2005), (Ciocârlan and Costea, 1996), Horia [NK84] (BRHM), Dobrogea (Brandza, 1898), Coroana [PJ14] (Sârbu et al., 2009), Vama Veche [PJ24] (SIB), Techirghiol [PJ27] (PLHM), Vânatori [PJ25] (Sârbu et al., 2009), between Vasile Roaita and Eforie (BUAG 4770).

Dolj County: Desa [PP65/66] (Merce, 2011).

Galati County: Gârboavele (Mititelu et al., 1968; Nyárády and Morariu, 1964) (I 39100), Foltesti (I 39101) [NL86] (Nyárády and Morariu, 1964), Barbosi (I 39103) [NM74] (Nyárády and Morariu, 1964), Galati (I 39104) [NL73] (Nyárády and Morariu, 1964), Vasile Roaita [NL36] (BVHU), Radesti (I 55985) [NM60], Cuca (I 65545) [NL66], Sârbi [NL28] (Oprea, 2005).

Giurgiu County: Comana [MJ39] (Merce, 2011; Nyárády and Morariu, 1964).

Ialomita County: Slobozia (I 65547) [NK23], Amara [NK23/24] (Merce, 2011).

Iasi County: Mârzesti (I 4809, I 76515, IASI 3188, IASI 3191, IASI 3193, IASI 3194. IASI 3196, CL 216511, CL 580006) (Nyárády and Morariu, 1964), Iasi (I 22637, I 22638, I 45308, I 58766) [NN41/41], Bratuleni (I 24297) [NN32] (Nyárády and Morariu, 1964), Hodora (I 24299) [NN04], Mânzatesti (I 24300, I 24301) [NN52], Sorogari (I 24302) [NN42], Cotnari (I 60702) [MN94] (Nyárády and Morariu, 1964), Valea lui David (Stefan et al., 2008; Zamfirescu and Zamfirescu, 2008;

Merce, 2011; Zamfirescu, 2010) (IASI 3187, Cl 216638), Rediu [NN02], (BUAG 20869), Cîrlig (IASI 3190, IASI 3192), (Stefan et al., 2009; Nyárády and Morariu, 1964), Aroneanu [NN42] (Nyárády and Morariu, 1964), Vânatori [NN84] (Nyárády and Morariu, 1964), Cucuteni (I 24296) [MN93] (Nyárády and Morariu, 1964), Brazu [NN32] (BUAG), Ţigănasi [NN3] (Nyárády and Morariu, 1964), Fântânele [NN15] (Nyárády and Morariu, 1964), Fântânele [NN15] (Nyárády and and Morariu, 1964), Focuri [NN15] (Nyárády and Morariu, 1964).

Ilfov County: Lehliu (I 137312, I 137313) [MK82].

Sibiu County: Sura Mare [KL78] (I 33186, CL 27881, CL 86933), (Dragulescu, 2003), Micasasa [KM70] (CL 98798), (Dragulescu, 2003), Seica Mare (Dragulescu, 2003) [KL79], Sibiu [KL 77/87] (Oprea, 2005), Rusi [KL79] (Dragulescu, 2003), Slimnic [KL78] (Dragulescu, 2003), Târnava [KM81] (Dragulescu, 2003), Târnavioara (Dragulescu, 2003).

Suceava County: Radauti (I 39117, I 39118), (Tomescu and Chifu, 2009; Nyárády and Morariu, 1964; Tomescu, 2006), Boldu (I 39119), Botosana [MN18/28] (Tomescu and Chifu, 2009), Ciprian Porumbescu [MN27] (Tomescu and Chifu, 2009).

Tulcea County: Ciucurova [PK17] (Oprea, 2005; Nyárády and Morariu, 1964), Sulina [QL10] (TMMJ), Greci [NL90] (CL 430994) (Marin and Cristurean: *Flora din Parcul Naţional Munţii Macinului*, www.parcmacin.ro/c/document.library; Nyárády and Morariu, 1964), Macin [NL80] (Oprea, 2005; Nyárády and Morariu, 1964), Babadag (Dihoru and Doniţă 1970), Sarighiol [PK25] (SVHU), Vasile Alecsandri [PK16] (SVHU).

Vaslui County: Sasova (I 69056) [NM49], Bolati (I 69062) [NM48], Ratesu Cuzei (I 77552) [NM48], Bolati (I 77554), Todiereni (Oprea, 2005), Oltenesti [NM65] (SVHU).

The chorogical map using GEOCOD coordinates of *Aster oleifolius* is presented in Figure 7.

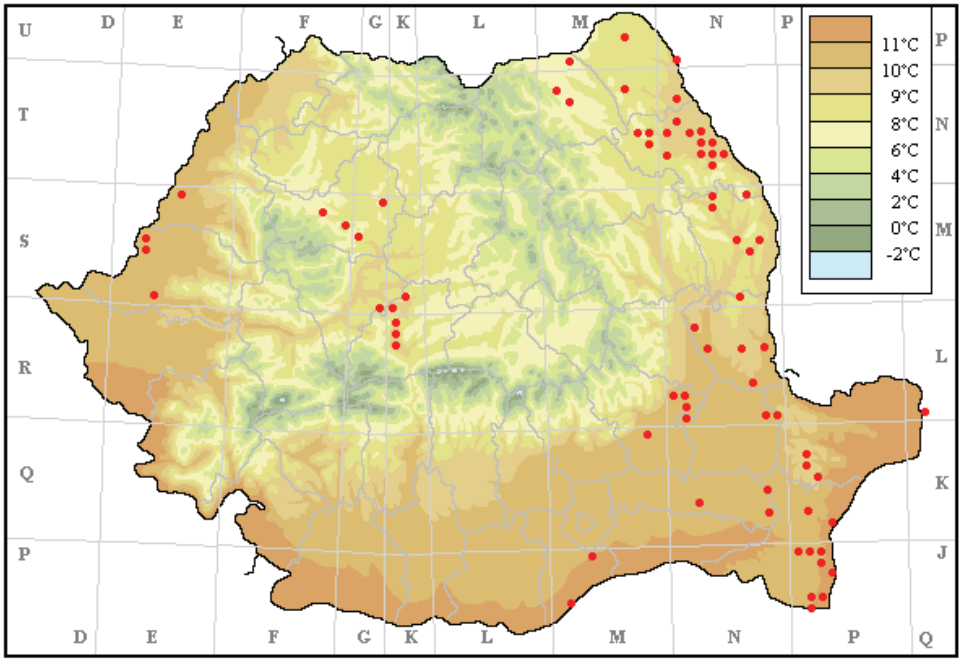

Figure 7. Chorological map of A. oleifolius in Romania using GEOCOD coordinates

CONCLUSIONS

Aster oleifolius is a perennial herb growing in full-sun calcareous soils, drought resistant plant, sometimes on halomorphic soils in our country (see the map above). There are lots of references from different scientific publications, monographic studies and un-reviewed voucher specimens from different Herbaria, which will be study in the future. We are going to add new and interesting information about *A. oleifolius* chorology in Romania. It is necessary to complete our partial study with investigations in other regions in Romania. We are going to propose using *A. oleifolius* as an ornamental plant in gardens due to: morphological aspects of stem and leaves (grey-tomentose, short habitus and perennial beauty), high resistance to drought, full-sun growing and long term flowering species.

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The author warmly thanks to Dr. Sorin Stefanut for his great help regarding chorological data and chorology map, also to all curators from the mentioned Herbaria for use of *Aster oleifolius* data specimens and original photos of Herbaria sheets to complete our chorological and morphological studies.

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STUDY OF APPLYING DIFFERENT TREATMENTS ON CUT *ALSTROEMERIA* AND THEIR INFLUENCE ON THE SHELF LIFE

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Abstract

The importance of cut flowers and flower arrangements vary according to the standard of living. If the standard increases, the demand for beautiful, more expensive flower arrangements grows as well. At low standard of living, the costumers give up on, or reduce the acquisition of flowers considered, in this particular case, a luxury. Thus it is essential to know how long the flower can be a decoration, for how many days it stays fresh and beautiful, because it takes time to get the flowers from the grower to the shops and in our vase, which shortens their lifespan considerably. Another important aspect is the way in which we handle the flowers wilted during transportation and not recovered even after putting them into fresh water. What does salt, sugar or grandma's copper penny have to do with?
Objectives: The purpose of my thesis is the prolongation of the lifespan of the cut Alstroemeria. During our experiment we'll analyze the effect of some Hungarian and Dutch floral preservatives on the Alstroemeria. The results will then be compared while monitoring the life processes of the flowers in question.

Key words: *cut flowers, Alstroemeria, vase life, Bioplant, Chrysal, Oasis.*

INTRODUCTION

It is vital to consider the prolongation of the life of cut flowers when harvesting, transporting, storing, handling them in the flower shop, during work with flower arrangements or even putting them in a vase in our home. For the prolongation of its vase life, it is essential to know the life conditions and the life process relevant to the plant. Inorganic nutrients, water, light, air – carbon-dioxide and oxygen in particular – and the right temperature are absolutely essential to the growth and development of the plant.
The organic materials thus produced during the transformation – assimilation-in the leaf, are partly used for the plant structure, another part is dissolved during breathing and internal energy producing, then eliminated (as water, oxygen, carbon-dioxide, ethylene, etc.), or stored. From our point of view the stored organic materials are the most important (Szabó and Hegyi, 2005).
As soon as the cut flower runs out of one of the two substances it starts to fade immediately. First the water is consumed. If put in water in time the flower uses its sugar supplies in order to live (Schmidt, 2001).
We can assure the undisturbed life process of the cut flower by means of floral preservatives and salts (Klincsek, 1990).
Basically any preservative should have the following ingredients: nutrients (proteins, mainly simple sugars),disinfectants against micro-organisms, growth regulator substances, surface tension reducing substances (increases water absorption) (Schmidt, 2001).
Lack of hygiene causes development of micro-organisms leading to water turbidity and bad smell (The Beauty of Chrysal, 2009).

MATERIALS AND METHODS

The experiment took place at the University Sapientia, the Faculty of Technical and Human Sciences in Târgu Mures in the laboratory of ornamental plants.
Altroemeria aurantiaca „Virginia" was cut on 30th October 2011 and arrived from the Netherlands on November 4. Following the preparation of the solution and the cut, we put 10 threads in each vase. They faded on November 22, so the experiment lasted 19 days.
During the experiment we used three of the best known solutions used for conservation,

control water and a solution developed by own recipes (sucrose and chlorine). The different solutions in the vases were carefully labeled.

Floral preservatives used in the experiment:

- Chrysal Clear Rosa-Dutch liquid product,
- Chrysal Clear *Lilium* & *Alstroemeria*-Dutch granular product,
- Floralife Fresh Oasis-Dutch granular product-contains 94% sugar (dextrose), 3,8% citric acid, 1,7% of different salts and 0,5% preservation solution,
- Bioplant-Hungarian product in granular form containing mineral salts and disinfectant agents against decay.

Content of the other two vases:

- Sapientia-own recipe containing 50 ml of chloride and 30 g of sugar
- Control-tap water.

The equipment used.

1. Phyto-monitoring (PhyTech) system is a modern observation tool which recorded the following data throughout the experiment: air humidity (%) – Inp9 – RHS-2, air temperature (C°) – Inp8 – AT1, temperature of the water in the vase (C°) – Inp7 – ST-22.

We chose a leaf from each vase, put a plastic sensor on them for 9 minutes/day which helped us measure the temperature of the leaf, so we recieved data in every 3 minutes for each given solution. (C°) – Inp1 – LT1.

We used the same procedure for measuring the quantity of water flowing through the strain: using a device attached to the strain we measured this quantity (units) Inp12 – SF-5.

2. Digital caliper (Mitutoyo). Diameter measurement was carried out daily with a digital caliper (Mitutoyo) taking into account the influence of preservatives (in mm) on blooming. In case of the hydrangea we chose one flower from each vase and measured 3 flowers every day. From the *Alstroemeria* we measured one thread from each vase with all the flowers on it (5 paces).

3. Hansatech Fluorescence Monitoring System. Currently this is one of the most modern procedures for real time monitoring which does not affect or destroy the plant; the procedure can be applied on the plant in its natural environment with a test-retest reliability within a short period of time and high sensitivity changes in photosynthesis.

The method shows high sensitivity to functional changes of the photosynthetic device as well as how and where the different physical and chemical factors act (Fodorpataki, 2010).

We selected a leaf from each vase, applied the clips and allowed them to stay in dark for 15 minutes. Meanwhile the process of photosynthesis in the selected samples stopped, they had become dark-adapted. After applying the measuring device on the clips we read the data on the display.

F_o – minimal level of fluorescence

F_m – temporary maximum fluorescence

F_v/F_m – maximum or potential quantum performance

F_s – steady state chloro-fluorescence

F_m' – modulated maximum fluorescence

PS II – actual or effective quantum performance

4. GTH 2 device. These parameters were measured twice a day: in the morning at the beginning of the program and in the afternoon at to end of it. We used the GTH 2 device, which makes it possible to measure the three parameters simultaneously.

5. Ciras 2 – Measuring stomatal conductance. Ciras 2 is a system which measures leaf gas exchange, evaporation (E) and stomatal conductance (GS).

Evaporation is a phase transition from liquid to gas (water vapors) usually occurring on the surface. In case of the living organisms this phenomenon is called evaporation, transpiration. A gas analyzer consists of a digital monitoring unit and a unit of measurement. The most important part of the unit of measurement is a particle which can be sealed and measures the evaporation on the leaf surface. This part of the analyzer contains sensors which measure temperature, humidity inside as well as photon flux density on the leaf surface (light intensity).

So we chose an adequate leaf from each vase, placed the particle sensors on the leaf and read the data on the display after the values were stabilized: E (Transpiration Rate) refers to evaporation, GS refers to stomata conductance (Fodorpataki, 2010).

6. Video camera. Using the Sony Steady Shot Camera DCR VX 2000 PAL we could record daily, hour by hour the changes occurring in alstroemeria the data being processed later. The video camera is an important part of the

experiment because it shows and illustrates the results spectacularly.
Measurement of water consumption. Each vase was labeled indicating the type of preservatives used and also used a scale on the vase, so we could see the daily water consumption. In order to avoid evaporation respectively to reduce evaporation to the minimum we wrapped the vases in a double layer of foil.

RESULTS AND DISCUSSIONS

The laboratory was monitored by the Phyto-monitoring system and GTH 2, so the humidity of the laboratory varied between 13,5 – 46%. Water temperature shows a close correlation with the values recorded in air, ranging from 22 – 22,75°C. Leaf temperature started being lower than the air temperature (0,5°C), but gradually increased towards the end along the wilting process.

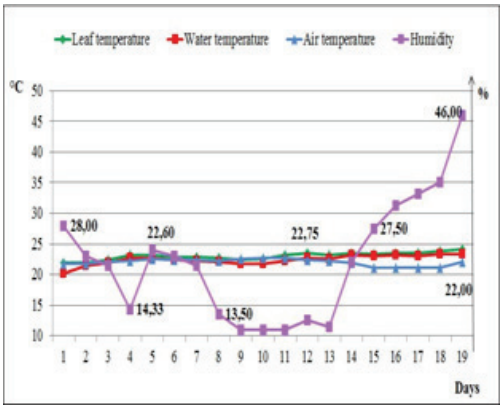

Figure 1. Ambient conditions during the experiment

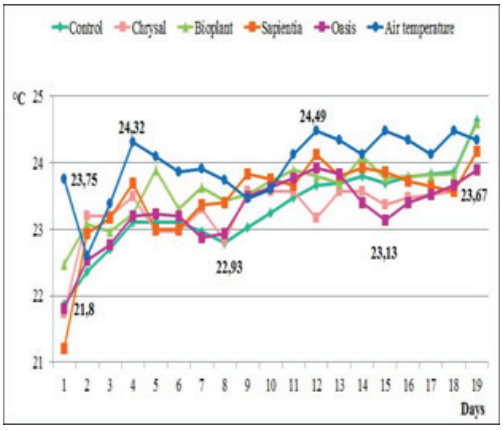

Figure 2. Leaf temperature

Leaf temperature was recorded and measured by the Phyto-monitoring system. The values of the administrated solutions tend to be close. Air temperature ranges from 22,5 – to 24,4°C and leaf temperature gradually approach air temperature values.

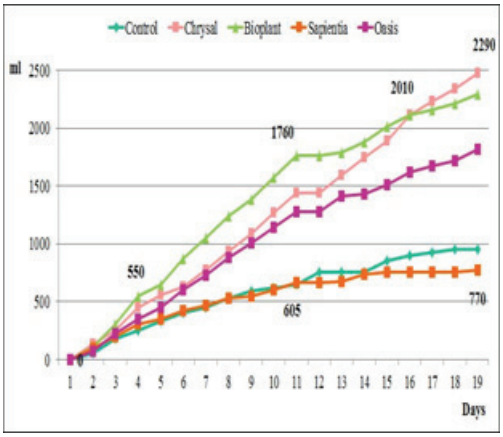

Figure 3. Water consumption dynamics

We noticed an increased water consumption in the case of the *Alstroemeria* as well, especially with Chrysal and Bioplant. Chrysal consumed 2470 ml of water in 19 days, Bioplant 2290 ml. Oasis consumed 1820 ml, Control 950 ml and Sapientia 770 ml of water.

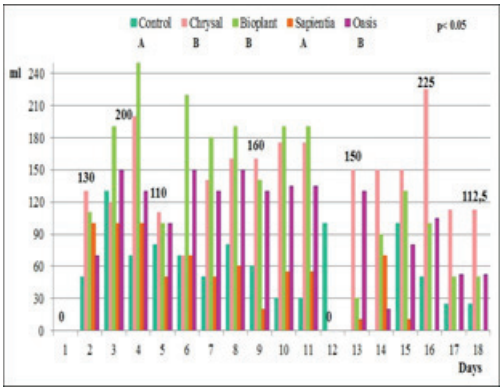

Figure 4. Daily water consumption

We filled the vases on the first day of the experiment, so we did not register any water consumption on that day. Bioplant was in the first place with a daily water consumption of 30-250, the highest daily intake was recorded on the fourth day (250 ml). It is followed by

Chrysal where daily consumption ranges from 110-225 ml. Control consumed between 30-150 ml, Sapientia between 10-100 ml and Oasis between 20-150 ml of water. We noticed a dramatic increase in water consumption in the last day before wilting.
By applying Games-Howell test we found significant differences between Chrysal, Bioplant, Oasis and Control, Sapientia.

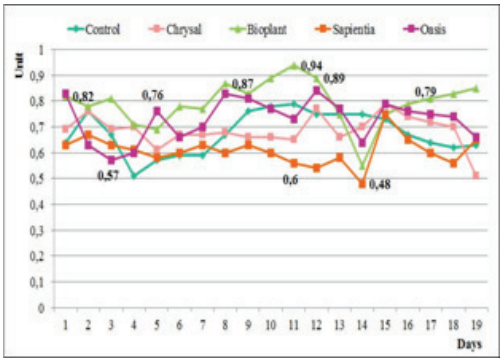

Figure 5. Water quantity in the stem

The water amount in the stem was measured by the Phyto-monitoring system. Figure 5. refers to water quantity values and they show significant variations among the different solutions.

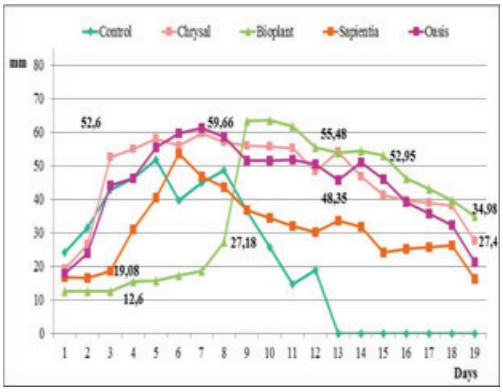

Figure 6. Flower diameter measured in Alstroemeria

We measured flower blooming on a daily basis. This procedure is to indicate the extent of and the pace (speed) of blooming. In case of Chrysal and Oasis the flowers started blossoming going through its every stage, Control on the other started the wilting process prematurely. Bioplant had difficulties in blossoming but eventually did bloom.

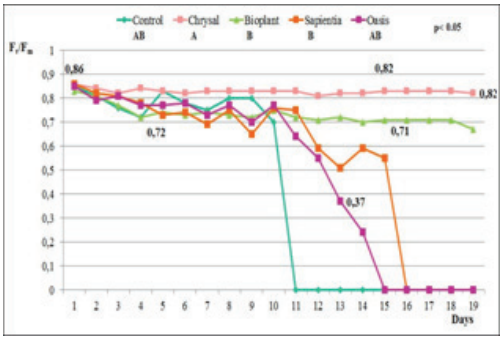

Figure 7. The potential quantum effect of the leaf

Ratio Fv/Fm indicates the maximum degree of use of light in photosynthesis. Values below 0,75 in this report indicate disturbances in the use of light. The graphic shows that this ratio remains constant only in the case of Bioplant and Chrysal. On day 11 Control drops below this value, Oasis on the 12th day and Sapientia on the13th.
Games-Howell test shows significant differences between Chrysal, Bioplant and Sapientia.

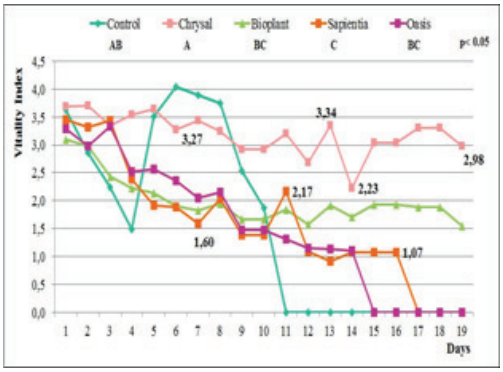

Figure 8. Vitality index

Vitality index of the photosynthesis is the parameter most sensitive to variations in environmental factors. Photosynthetic devices stop measuring when close to value 0 (zero). This happened on day 11 in the case of Control, then on day 15 in the case of Oasis, and on day 17 in the case of Sapientia. Using the Games-Howell test we found significant differences

among all the administrations, except for Oasis and Bioplant.

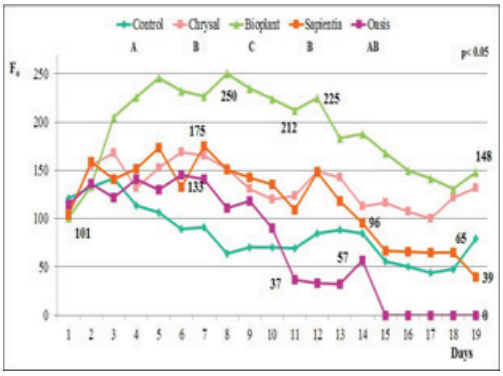

Figure 9. Basic fluorescence

Basic florescence shows the degree of organization of the antennae pigments in the tilacoide membranes in the chloroplasts of the leaves and the degree of energy transfer between the antennae. If there is a deficiency in the energy assimilation, the plant tries to compensate by the growth of rearranging pigments antennae. The phenomenon was evident in all three samples: Bioplant, Sapientia and Oasis. Chrysal and Control showed balanced behavior.

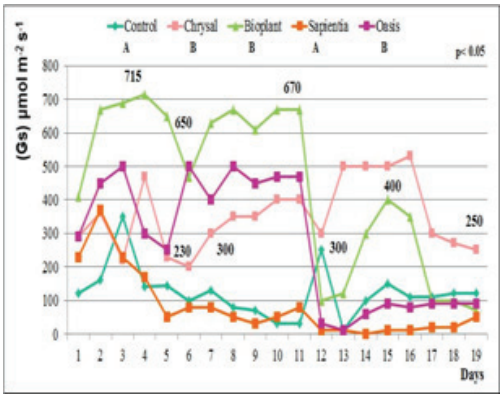

Figure 10. Stomatal conductance

Stomatal conductance indicates the operation of the stomata. Measurements were made by the Ciras 2 system.

Values are consistent with water consumption and the values measured in the strain Bioplant singles out in this respect followed by Oasis and Chrysal. Sapientia and Control show weak results. After applying the Games-Howell test results show major differences between Chrysal, Bioplant and Oasis, respectively the Control and Sapientia solutions.

CONCLUSIONS

From flowering point of view in the case of the, *Alstroemeria* we have reached the best results with the help of the Bioplant preservatives, closely followed by the Chrysal and then Oasis.

The physiological aspect of the flowers in the Bioplant treatment were better than that of other flowers. At the end of the experiment these flowers were still alive, so their vase life got 12 days longer. The Chrysal prolonged the vase life with 9 days, and the Oasis with 6 days.

Expenditures for the purchase of these solutions are worth all she money because the effects are clearly visible. Compared to the control, Bioplant and Chrysal solution have almost doubled durability of cut flowers in a vase.

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STUDY OF APPLYING DIFFERENT TREATMENTS ON CUT *HYDRANGEA* AND THEIR INFLUENCE ON THE SHELF LIFE

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Abstract

Flowers have an important role in our lives. They have been part of our celebrations since the beginning of time. Being associated to many occasions and events, they express a range of feelings and atmosphere. Flowers give us joy, they fill us with a sense of peace and purity, and in time of sorrow they bring comfort and relief. Their beauty can light up our darkest days. Our ancestors used flowers as the symbol of fertility and renewal. Flowers can be given as a gift almost any time and to anyone. Most people, women in particular, have a special talent in choosing flowers and offering them as a gift. In any culture or civilization flowers have always been a comforting presence for mankind. Objectives: The purpose of my thesis is the prolongation of the lifespan of the cut Hydrangea. During our experiment we'll analyze the effect of some Hungarian and Dutch floral preservatives on the Hydrangeas. The results will then be compared, while monitoring the life processes of the flowers in question.

Key words: *cut flowers, Hydrangea, vase life, Bioplant, Chrysal, Oasis.*

INTRODUCTION

The lifespan of the cut flowers is a genetic endowment, a feature specific to the species (Horváth, 2001). Scientific knowledge offers the possibility to prolong the lifespan of the cut flower. We can assure the undisturbed life process of the cut flower by means of floral preservatives and salts (Klincsek, 1990).

Basically any preservative should have the following ingredients: nutrients (proteins, mainly simple sugars), disinfectants against micro-organisms, growth regulator substances, surface tension reducing substances (increases water absorption) (Schmidt, 2001).

The organic materials thus produced during the transformation − assimilation-in the leaf, are partly used for the plant structure, another part is dissolved during breathing and internal energy producing, then eliminated (as water, oxygen, carbon-dioxide, ethylene, etc.), or stored. From our point of view the stored organic materials are the most important (Szabó and Hegyi, 2005).

Basically any preservative should have the following ingredients: nutrients (proteins, mainly simple sugars), disinfectants against micro-organisms, growth regulator substances, surface tension reducing substances (increases water absorption) (Schmidt, 2001).

The proper nutrient for cut flowers contains the following: water softener, pH regulator, water absorption increaser, nutrient (The Beauty of Chrysal, 2009).

Different bacteria and fungi can quickly spread in the water of cut flowers. The greatest damage caused by them is the clogging of the wood tissue, but they also present other risk factors such as the production of toxins and ethylene. Most disinfectant products on the market contain 8-hydroxy (8-HQ) or its salts. Silver salts have also a bactericidal effect.

The features of silver thiosulphate (STS) are more favorable: it successfully prevents the formation of ethylene and its bactericidal effect operates within the tissues. Of all the compounds, the most often used in floral preservatives are organic acids (citric acid, ascorbic acid, tartaric acid). Citric acid reduces the pH of water, improves water absorption and reduce, the risk of clogging of wood tissue. Floral preservatives contain mineral salts, often in the form of KCl, NaCl, Ca $(NO_3)_2$. Na and Cl have toxic effects on cells, therefore we use them only in low concentrations. Various metal salts (Mg, Cu, Al) significantly improve cut flower longevity. The simplest preservative is a

solution known as AKN. Content: potassium-ammonium sulfate, or alum (A), potassium (K) and sodium chloride, or table salt (N). Preparation: Dissolve in 1 l of water 0.8 g of alum, 0.3 g of 40% potassium and 0.2 g table salt, add 10 to 15 g of sugar beet (Schmidt, 2001).

MATERIALS AND METHODS

The experiment took place at the University Sapientia, the Faculty of Technical and Human Sciences in Târgu Mures in the laboratory of ornamental plants.

On 18th May 2011 we received 14 pots of *Hydrangea macrophylla* from the local greenhouse. On the same day we cut them. After preparing the solutions we put 7 of the flowers in each vase. They faded on June 2nd, so the experiment lasted 16 days.

During the experiment we used three of the best known solutions used for conservation, control water and a solution developed by own recipes (sucrose and chlorine). The different solutions in the vases were carefully labeled.

Floral preservatives used in the experiment:

-Chrysal Clear Rosa-Dutch liquid product,

-Floralife Fresh Oasis-Dutch granular product-contains 94% sugar (dextrose), 3,8% citric acid, 1,7% of different salts and 0,5% preservation solution,

-Bioplant-Hungarian product in granular form containing mineral salts and disinfectant agents against decay.

Content of the other two vases:

-Sapientia-own recipe containing 50 ml of chloride and 30 g of sugar,

-Control-tap water.

The equipment used.

1. Phyto-monitoring (PhyTech) system is a modern observation tool which recorded the following data throughout the experiment: air humidity (%) – Inp9 – RHS-2, air temperature (°C) – Inp8 – AT1, temperature of the water in the vase (°C) – Inp7 – ST-22.

We chose a leaf from each vase, put a plastic sensor on them for 9 minutes/day which helped us measure the temperature of the leaf, so we received data in every 3 minutes for each given solution. (°C) – Inp1 – LT1.

We used the same procedure for measuring the quantity of water flowing through the strain: using a device attached to the strain we measured this quantity (units) Inp12 – SF-5.

2. Digital caliper (Mitutoyo). Diameter measurement was carried out daily with a digital caliper (Mitutoyo) taking into account the influence of preservatives (in mm) on blooming. We chose one flower from each vase and measured 3 flowers every day.

3. Hansatech Fluorescence Monitoring System. The induction of chloro-florescence signals emitted depends on the vegetative state of the plant, so that gives information about the effects of different environmental factors on plants (Fodorpataki, 2010).

We selected a leaf from each vase, applied the clips and allowed them to stay in dark for 15 minutes. Meanwhile the process of photosynthesis in the selected samples stopped, they had become dark-adapted.

After applying the measuring device on the clips we read the data on the display:

-F_o – minimal level of fluorescence,

-F_m – temporary maximum fluorescence,

-F_v/F_m – maximum or potential quantum performance,

-F_s – steady state chloro-fluorescence,

-F_m' – modulated maximum fluorescence, PS II – actual or effective quantum performance.

4. GTH 2 device. Carbon-dioxide, relative humidity, temperature parameters were measured twice a day: in the morning at the beginning of the program and in the afternoon at to end of it. We used the GTH 2 device, which makes it possible to measure the three parameters simultaneously.

5. Ciras 2-Measuring stomatal conductance is a system which measures leaf gas exchange, evaporation (E) and stomatal conductance (GS). So we chose an adequate leaf from each vase, placed the particle sensors on the leaf and read the data on the display after the values were stabilized: E (Transpiration Rate) refers to evaporation, GS refers to stomata conductance (Fodorpataki, 2010).

6. Video camera. Using the Sony Steady Shot Camera DCR VX 2000 PAL we could record daily, hour by hour the changes occurring in *Hydrangea* the data being processed later. The video camera is an important part of the experiment because it shows and illustrates the results spectacularly.

Measurement of water consumption. Each vase was labeled indicating the type of preservatives used and also used a scale on the vase, so we could see the daily water consumption. In order to avoid evaporation respectively to reduce evaporation to the minimum, we wrapped the vases in a double layer of foil.

RESULTS AND DISCUSSIONS

Humidity in the lab was monitored by the Phyto-monitoring system and GTH 2, so it varied between 43-52%. Water temperature showed a close correlation with the values recorded in air, ranging from 22 to 25°C. Leaf temperature started as being lower than air temperature (by 0,5 to 1,5°C), but gradually increased towards the end of the experiment as withering set in.

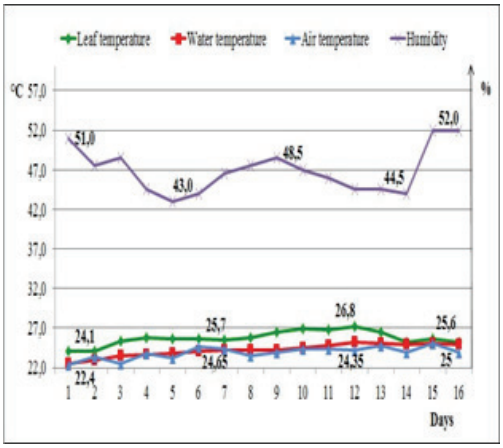

Figure 1. Ambient conditions during the experiment

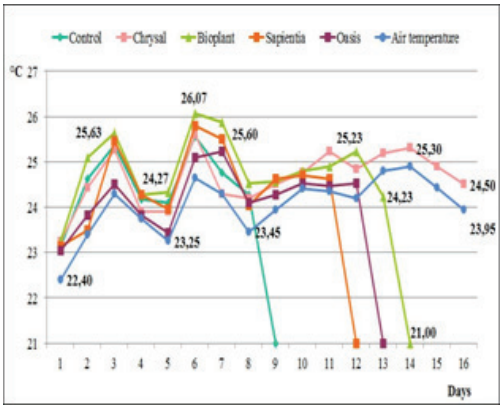

Figure 2. Leaf temperature

Leaf temperature was recorded and measured by the Phyto-monitoring system. There seems to be a similar tendency among the floral preservatives applied. Nevertheless, we noticed differences in the order of wilting: first, on the 9th day sample Control took ambiental temperature (21°C), then on the 12th day sample Sapientia and on 13th sample Oasis followed. Bioplant withers after 14 days. Only sample Chrysal maintains its beauty throughout the experiment.

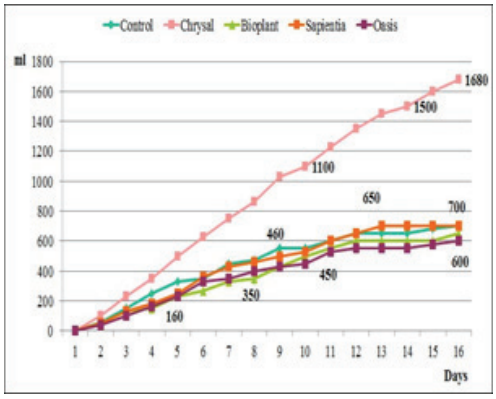

Figure 3. Water consumption dynamics

The highest water consumption was recorded in the experiment especially with Chrysal which consumed 1680 ml of water in 16 days. Then followed Sapientia and Control with a consumption of 700 ml of water and finally Bioplant consumed 650 ml and Oasis 600 ml of water.

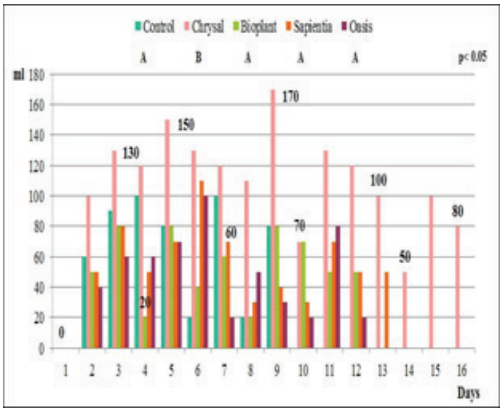

Figure 4. Daily water consumption

As shown in the figure, Chrysal is on the top with the highest values indicating daily water consumption: from 80-150 ml. Using the SPSS statistical program, the Games-Howell post hoc test showed that water consumption significantly increased in case of Chrysal in relation with the other solutions. The highest amount was recorded on the ninth day, when it was 170 ml. Control consumed daily from 20 to 100 ml of water, Sapientia between 30 to 110 ml, Bioplant between 20-80 ml, and Oasis between 20-100 ml.

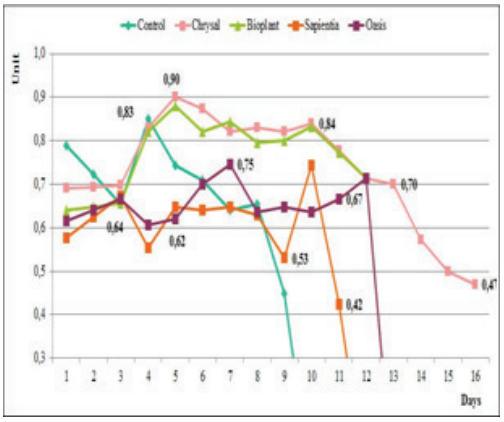

Figure 5. Water quantity in stems

In this process there is a general tendency among the solutions applied and the order of wilt: on the 9th day-Control, on the 12th day-Sapientia, then after on the 13th day Bioplant and Oasis.

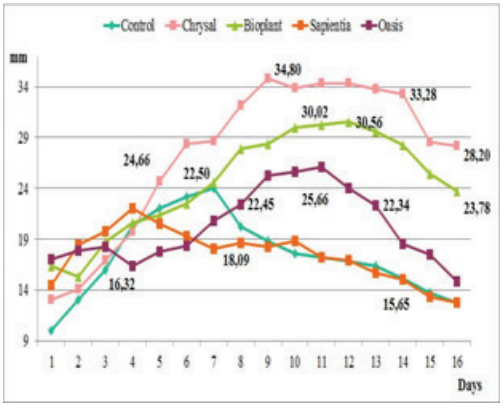

Figure 6. Flower diameter

Hydrangeas treated with Chrysal, Bioplant and Oasis opened quicker and fully to 8-9 days. Instead, those in Control and Sapientia had a slow opening.

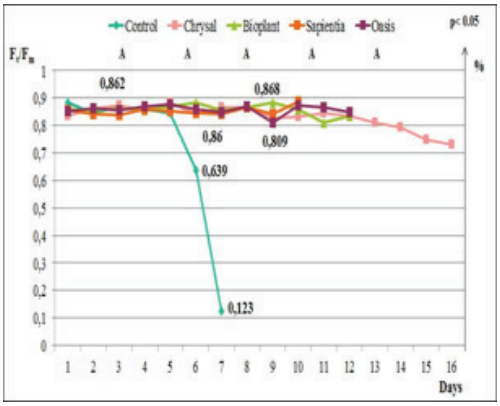

Figure 7. The potential quantum effect of the leaf

The relation between Fv/Fm stands for the maximum degree of use of light in photosynthesis. Values below 0,75 in this report indicate shortcomings in the use of light. The graphic shows that the quantity of light used remains almost constant throughout the experiment. Only values from sample Control drop below the average on day 6. In this case the Games-Howell test does not show significant differences between solutions.

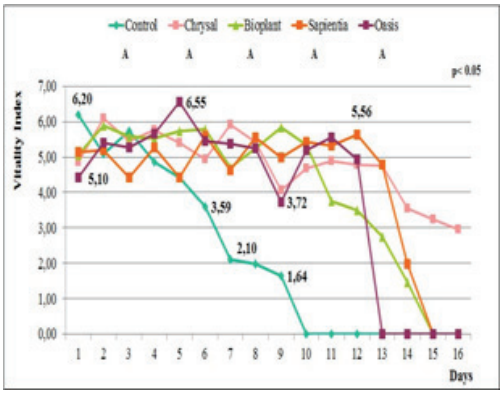

Figure 8. Vitality index

Comparing Control with the other solutions applied we found that all of them have higher vitality indices.

Photosynthetic devices stop when the values are close to 0 (zero). So it happened on day 10 in the case of Control, then on day 13 in the case of Oasis, and on day 15 in the case of Bioplant and Sapientia. Using the Games-

Howell test we did not find significant differences between the administrations.

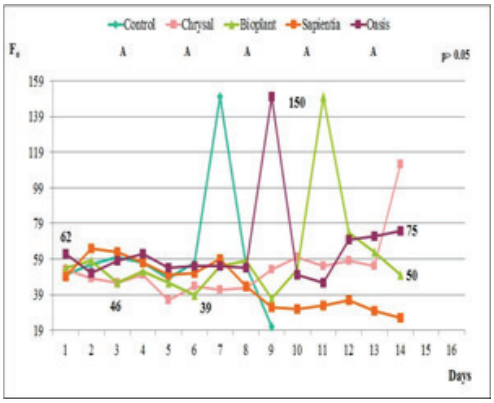

Figure 9. Basic fluorescence

On the 6th day Control, on the 8th Oasis, and on the 10th Bioplant values show a sudden increase, then fall dramatically. It senses deficiency in energy assimilation, thus trying to compensate by increasing the antennae pigment organization. Chrysal and Sapientia did not indicate such a deficiency. This time we applied the SPSS Tukey test which revealed no differences between doses.

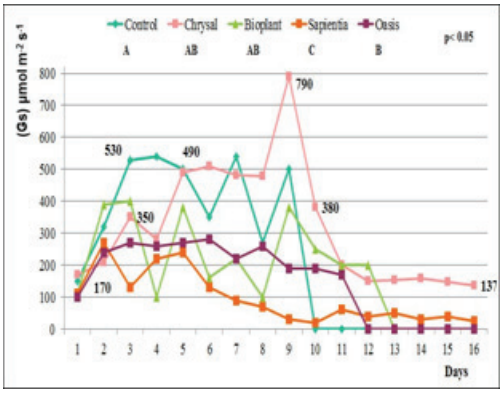

Figure 10. Stomatal conductance

Stomatal conductance indicates the way the stomata operate. Measurements were made using the Ciras 2 system. Values tend to be consistent with water consumption and the values measured in the stem. Chrysal stands out in this respect, followed by Control, but the latter gives up after the 9th day. Bioplant also shows potential till day 13. Oasis lasts until day 12. After applying the Games-Howell test the results show major differences between the solutions especially with Sapientia, however Chrysal and Bioplant show similar results.

CONCLUSIONS

From flowering point of view in the case of the, *Hydrangea* we have reached the best results with the help of the Chrysal preservatives, closely followed by the Bioplant and then Oasis.

The physiological aspect of the flowers in the Chrysal treatment were better than that of other flowers. At the end of the experiment these flowers were still alive, so their vase life got 10 days longer. The Bioplant prolonged the vase life with 8 days, and the Oasis with 6 days.

Expenditures for the purchase of these solutions are worth all she money because the effects are clearly visible. Compared to the control, Chrysal and Bioplant solution have almost doubled durability of cut flowers in a vase.

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PLANNING A LOW COST LANDSCAPING STUDIO AS A CAREER START FOR YOUNG PROFESSIONALS

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Abstract

Despite the market opportunities, dramatically low ratios of the Romanian landscape architecture graduates choose to start private businesses in their professional field. In an attempt to improve these facts, the present paper provides some of the start-up data required for any business plan. Following a brief market analysis there are identified the main design and counseling jobs that a small landscape studio should be able to perform. The personnel requirements, the IT infrastructure (hardware and software) as well as miscellaneous equipment scheme are configured for minimum start-up costs. The medium financial indicator of the landscaping specialist work-hour is calculated after integrating the liquidation period of the studio assets at 1/3 of their usage expectancy and the general benefit ratio at 10%. In conclusion, the landscape architecture students are advised to gather up the start-up sum for the rewarding business that they are preparing for.

Key words: *business management, landscape venture, residential landscaping, Romanian market, studio infrastructure.*

INTRODUCTION

This paper addresses the landscape architecture graduates that are looking to develop independent careers in their area of expertise in Romanian market context, in support of their business plan building effort (Stark, 2003).

Romanian landscaping market, 10 years after the field professionalization start, still has together the goods and the bads of the new-found niches:

For landscape design, the customers are few but generally wealthy these days, as it was the case 10 years ago;

The landscape architecture and planning branches target the public sector, but this is hardly a feasible choice for a start-up venture, since abusive national regulations favour new-comers exclusion from public auctions; private enterprises occasionally require landscape expertise for marketing purposes, but occasions are few and inexperienced small firms involvement are rarely accepted;

Landscape restoration is a shallow niche to point at, since historic gardens and parks are scarce in this country.

This state of facts leaves the new businesses with the small to medium sized residential landscaping opportunities, extended at best with consultancy services targeted at public administrators or public services contractors that might require landscape marketing expertise (Russel, 2010), mainly for commercial or political-aimed manipulation efficiency (Lazar-Bâra, 2011, 2012).

The mass group of the residential services consumers consist of several market segments (Thilmany, 2008) by demographic and cultural considerations, but they share common lifestyle features and buying behaviour. They are usually people between their 30′s to 50′s, socially active, living in suburbs, strongly connected with city life, travelling abroad on a regular basis, having above average self-image standard, highly vulnerable to marketing techniques but also relying on their friend′s advice, they would rather go for top advertised products than investigate proposals based on quality assessments. Their culture concerning environmental and landscape substance is not above the general society′s level – unsustainably low – while their formal expectations concerning the gardens they pay for are high, since their landscape quality bench marks are built mostly on short exotic escapades or based upon soft media′s visual marketing. They pay for landscape services rather for social image or property value

improvement, since they rarely can appreciate the intimate garden living.
Unlike the case in western cultures, they are rarely willing to sacrifice personal comfort or change lifestyle in support of social or environmental sustainability, since they rarely pay for anything that fails to provide immediate benefits.
Despite the narrow opportunities it offers these days to new-comers, landscaping market generally follows social development, and Romania is slowly but steadily going west with consumer behaviours′ changing under the model′s pressure. In Sweden for example, the concern for climate change is increasingly determining common people counteracting attitudes, up to lifestyle changes (van Borgstede et al., 2013). It can be presumed this is also a predictable trend for Romania, just as it is right to anticipate civic and social responsibility increases in the following decades.
As a well organized western landscape market reference, the USA case is well illustrated in the book of Walter Rogers – *The Professional Practice of Landscape Architecture: a complete guide to starting and running your own firm*. The national context presented in the book should a bench mark for many European countries in terms of professional regulations, prospects, responsibility and revenue as compared to the incomes in other professional fields. In the USA, just as in the other old landscaping tradition countries, the private-sector clients are more diverse than in Romania, ranging between private companies, NGO-s and individuals with various social and cultural backgrounds (Rogers, 2011). The landscape business usually don′t limit to these, approaching most of the areas that a landscape architect is prepared to cope with – according to Walter Rogers, in 2011 there were 12 main categories: sustainability-targeted projects; international projects; community development – that used to be a niche in Romania until the 2008 real estate market collapse; streetscape contracts – also a declining market, but owing mostly to the EU financing changes (Lazar-Bâra, 2012); parks and leisure; private businesses site developments; urban and regional planning – still unavailable to most landscape professionals
Compared to constructions, real estate, architecture or public services, this is a small sector in economy considering the financial and human resource requirements, but the market potential on middle to long term perspective is high.

MATERIALS AND METHODS

In order to plan a sustainable start kit for a small residential landscaping studio, the paper will rely on a synthetic market analysis – focusing on present state, but also depicting tendencies.
Based on landscape practitioners′ empirical observations, the Romanian landscape consumer′s buying behaviour will be analyzed using the SWOT framework (Russel, 2010) (Table 1).
The market analysis shows several niche features (Stark, 2003) : the low customer and subject diversity define an easy targetable market for residential landscaping, with accessible clients; the business growth potential is only restricted by the national economic backward state – while global perspectives are quite positive, considering the expertise requirements to mitigate at least the environmental threats (Heinberg, 2011); there is no established market leader and the ways are open to new comers.
To sustainably approach this design and counseling niche, the landscape architecture graduate′s competencies should be solid in the fields of landscape composition, environmental sciences, plants and planting design, building materials, garden history and design, visual and computer representations, project management, small business marketing and management. Further knowledge is required for the entrepreneur to be able to cut costs on transportation, IT, legal and accounting services to fulfill the client′s price expectation: driving license, building and ensuring basic maintenance to the IT infrastructure, basic knowledge of market, environmental, building and urban development regulations, trademark issues as well as basic accounting skills.

Table 1. Buying behaviour of the Romanian single family residential landscaping customers

	Strengths (favouring quality / competition)	Weaknesses (unsustainable)	Opportunities	Threats
Motivations	Personal (species aesthetic preference / nostalgia); functional (sanity/ security/ healthy food/ privacy)	Economic (property value investment); social status; fashion; keeping family busy at home	Western culture offensive; middle class protection and development policies	Consumerism; General and environmental culture decline
Offer prospecting	Internet; friends; garden fairs and cultural events; university and professional body recommendations	Glossy media and books; highway and mall advertising; contractor′s and reseller′s recommendations	Foreign fairs and public competitions; national market transparency increase	Decrease of foreign pressures toward the opening of the market would consecrate landscape formalism and mediocrity
Customer bench-marks	Instinct and logics (rare); local/ regional aesthetic landmarks; personal experience; professional advice	Tourism promoted landscapes (exotic or national); commercial brochures and advertising induced references; miscellaneous advice	National landscape references – promoted for tourism support; foreign reference aids	Exotic holiday landscapes; foreign landscaping materials advertising
Buying decision	Service reliability; personal connection; design coherence; business portfolio – similar tasks, on similar sites; environmental, social, urban and cultural commitment; price justification	Advertising; graphic quality of the designs; design speed – regardless the subject complexity; business portfolio – public clients; lowest price	Site events (small disasters, sanitary or phytopathological emergencies, various building phases, occasional functional peaks – weddings, receptions, new fauna etc)	Contractor′s preferences; joined commercial proposals of contractors and landscape architecture offices; the businesses′ premises accessibility; seasonal preference (usually on spring, before Easter)

The business plan for a starter – especially on a niche market – is not facultative (Stark, 2003). Written in a synthetic manner, it should contain at least the following (Stark, 3003; Bangs Jr., 2005) : a market analysis – structure, competition, tendencies; marketing strategy – operable niches, business identity, pricing, promotion plan-client reaching, sales potential; a financial analysis – expenses/earning for one year, liabilities/assets′ values; a financial strategy – collections, insurances and back-ups (fundamental for Romanian starters), cash-flow, investments; a general business strategy; the technical operations′ planning – contracts and management, intellectual property protection, licensure (for connected fields), project management and work flow, asset′s maintenance; human resource strategy – skills, tasks and responsibilities need and forecasts, labor costs, performance, team management.

Specific to a small landscaping business is the flexibility requirement – since design offices should capitalize on the larger projects′ collaboration opportunities.

To build the minimum asset list needed in a residential landscaping studio, the paper analyses the firm tasks that require most of the businesses′ resources in Romanian context, as requirement drivers:

- Marketing: market identity – management decision followed by promotional material′s production; advertising and contact maintenance – web page construction and maintenance, paper and social media presence, public events presence – physical presence mobile assets (banners, roll-ups, kiosks and business fair stalls, mobile multimedia assets); business headquarters (the design of the work spaces and of the reception areas, architectural signaling)
- Landscape studio work (production) : documentation, base plan assembly, analysis, general proposal – blue-print production and client presentation material (Cantrell et al., 2010), opinion documentation and contractor required blue-prints, product specifications and technical memorandums.

- Field work: documentation visits – site measurements, picture taking / movie capturing, soil and plant identification and/or sample collection; client interviews – command outlines formulation, contract discussions, proposal blue-print discussions; set-up assistance – plan picketing / on-site blue-print adaptation, input material quality control, subcontractor's monitoring – irrigation (Smith et al., 2010), field works coordination; field monitoring.

To fulfill these tasks, the basic productivity assets are computers – hardware and software infrastructure.

A starting venture with the minimum personnel scheme should provide each of its employees independent working conditions to maximize flexibility.

The following IT asset categories were identified:

1. Operating and security systems
   - Linux / Windows + antivirus
2. Productivity tools (*office*)
   - Text processors, spreadsheet tools, slide-show editing
3. Data and management tools
   - data base tools, encryption and cloud access
4. Communication and multimedia tools
5. Computer aided design (CAD) tools
6. 2d graphics and interactive design tools
7. 3d presentation tools
8. Project management and field works assistance tools.

For each of these categories there were analyzed the possible options according to the following criteria: price, real-life productiveness (following empirical analysis carried out on professional Romanian landscape architects) and flexibility.

RESULTS AND DISCUSSIONS

The work-hour cost estimations following the IT infrastructure analysis reveals that public-license software solutions approach is more efficient on the short term, but it lacks flexibility.

Start-up investment estimation for the lowest budget would basically approach the GNU licensed software (GNU Operating System, 2013), with minimum software investments for CAD and graphics stations:

-The 1st station: management, accounting, estimating, print server, business archive, back-upGNU Linux based Hardware – HP Pro P3500 MT Sandy Bridge G550 2.6GHz 4GB 500GB GMA HD Free Dos + Monitor HP 20 inch W2072a: 1800 RON (price.ro, 2013)

-The 2nd station: CAD, graphic design, 3d presentations, data storage Windows based-OS=650 RON, antivirus=400 RONHardware-HP Pro 6300 MT Intel Core i5-3570 3.4GHz 4GB 500GB AMD Radeon HD 7450 1 GB: 3500 RON (ibd.) + monitor LED DELL UltraSharp U2713HM 27 inch: 2500 RON (ibd.) Commercial licenses: Brics Cad Pro – all in one, v. 12: 600 euro; Corel Graphics Suite X5: 180 RON (ibd.); 3d studio max: 3500 $; GNU licensed software: Open Office Suite, Dryad (Plant Generation Software packages, 2013)

-The 3rd station: CAD, graphic design, data storageGNU Linux basedHardware-HP Pro 6300 MT Intel Core i5-3570 3.4GHz 4GB 500GB AMD Radeon HD 7450 1 GB: 3500 RON (ibd.) + monitor LED DELL UltraSharp U2713HM 27 inch: 2500 RON (ibd.) GNU software: Open Office Suite, Gimp etcCommercial licenses: Brics Cad Pro linux – all in one, v. 12: 600 euro-The 4th station – mobile: field work CAD, graphic design, basic 3d presentationsLinux based Hardware-Laptop Asus 17.3" K73SD-TY047D Core i5 2450M 2.5GHz 4GB 750GB GeForce GT 610M 1GB: 2500 RON (price.ro, 2013) GNU software: Open Office Suite, Gimp etc Commercial licenses: Brics Cad Pro linux – all in one, v. 12: 600 euroConsidering the general lifetime of the equipment at 3 years and the desired liquidation at 1/3 of this time span, the IT investments should ideally generate incomes to cover all business investments in the first year. The work-hour fee of a landscape studio could therefore be found using the following formula: (IT + I+X+W) / 2320

-Where IT is the IT total investment – equivalent to ~ 31000 RON in the present case-I represents current office expenses (rent, maintenance, utilities, consumables) -X stands for unexpected expenses-W are the company's wage expenses-2320 represents the number of work hours for an employee in one year. To

conclude the presented case, with known yearly and unpredicted expenses of 18000 RON and 4 people working – involving 24000 RON / year wage expenses, the work-hour reference price for landscape architecture services reference should be 31.47 RON.Printing and presentation documents as well as transportation and field-related expenses, just as documentation costs were not included. They should be counted separately in the deals closed by the starting venture.Despite appearances, landscaping business is tricky considering the complexity of the market features, the human and technical issues, the home trade opacity and the hostile legal and administrative environment. Previous experience in the business that graduates are venturing into is a way of painlessly anticipating the specific challenges, know competition and build key-connections with potential clients and promoters, lawyers, accountants, even bankers, public administration, potential partners, contractors, materials purveyors – especially plants and stone, potential employees, architects, engineers and various specialists. Branch experience as employees before turning into employers is otherwise recommended in various industries (King, 2005; Thilmany, 2008), considering that cumulated bankruptcy risks of small business start and that of the niche market approach.

CONCLUSIONS

The shallow client profile diversity shows the deep gap between the Romanian and the western landscape markets, and the long way that lays ahead the new ventures.

The complex professional grounding that landscaping students acquire in college might be considered excessive when the business target is individual private landscaping – the prevalent employment niche – but it should provide the graduates enough flexibility to handle exceptional contracts thus ensuring business′s sustainability (King, 2005; Stark, 2003). Furthermore, the landscaping market will hopefully approach the western diversity soon enough, which will make human resources a major national issue.

Landscaping studio infrastructure is the easiest issue, even for a small business. Business connections and basic experience are required to minimize start-up risks. Technical competence and professional ethics are basic sustainability conditions.

The work-hour reference price for landscape architecture services should stand as a guide-mark for clients looking for a fair business.

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POLITICAL LANDSCAPES AND URBAN IDENTITY. BUCHAREST'S DEMOLITIONS AND WORLDWIDE CORRESPONDENCES

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Abstract

A city is made up by its people and by its architectural, urban characteristics. Bucharest lost most of its central historical sites during the last decade of communism. The shifts of paradigm of those days shift the entire history of a city, ripping away the historical, cultural and social center of a European capital. Even if the turnovers in Bucharest are never to be seen elsewhere in the world, the political decisions and expression that lead to a new urban landscape construction have correspondences in many other cities of the world, most of them marked by a similar history, thus totalitarian systems. In order to better understand the scale of what J.B. Jackson called the Second Landscape, at its most extreme expression, our paper will present the effects of totalitarian political systems on various urban landscape in the modern period, comparing the scale of the communist demolitions in Bucharest and the corresponding urban tragedies in cities like Berlin, Rome, Paris, or Pyongyang. The study reveals similarities between cities like those mentioned earlier and Bucharest in terms of political construction of the urban landscape, the landscape as a political tool, the impact of these politics on historical cities and their "absorption" by the daily life landscape. In order to understand the scale of the tragedy and its consequences in the future it is important to look for examples similar to the one given and to search for answers that may solve the problems that the ruins of the late communism era left to the capital-city of Romania. It is also important to understand how the daily spatial practices (de Certeau) are finally engulfing and integrating the political landscape from the collective memory.

Key words: *demolitions, corresponding urban tragedies, ruins, turnovers, urban identity.*

INTRODUCTION

A city represents a series of layers of people that lived there. All those layers brought significant changes in the way the city transformed over the years, but few of them left scars as deep as the ones found in Bucharest. Many old tourist guides and historical albums show images of buildings or places that you will never find today. Though they don't exist anymore, they are part of the city's collective memory. When the generation that has seen those places in reality is gone, those pieces of urban history will remain present only in books and some filmed images, but they will cease to speak to common city dwellers.

The human memory associates feelings with places and this is why everyone remembers a moment and the place where it took place. However, if such places disappear, what is to happen with both one's memory and with the urban-collective memory?

Ones of the most aggressive interventions on the urban tissues were made in various capital-cities under totalitarian political systems. In the frame of this article we will try to observe similarities and regularities of these totalitarian landscapes, the outmost expressions of the "Landscape Two", not in terms of aesthetics and order but in terms of imposition on a specific site (Jackson, 1984).

We also try to further analyse these integration of huge urban ruptures in the collective mental landscapes and memory by daily practices, tactics and rhetoric (de Certeau M., 1990).

MATERIALS AND METHODS

The research was conducted in the central area of Bucharest, in the new "civic centre" of the communist era and within the places nearby. A series of short questionnaires are revealing the variations in the collective memory of Bucharest dwellers and the manner of collective memory-erasing by time.

Also, comparative studies, concerning other capitals that submitted under totalitarian regimes and the modification in the urban landscapes imposed by political systems as well as similarities and differences of space-scale and style between these projects. The study was based on a number of historical descriptions and plans, some *in situ* observations and other previous analyses concerning the different cities.

BUCHAREST'S DRAMA

The House of the Republic was the result of the fear that Ceauşescu felt over the 1977 earthquake, or so it is presented in the urban mythology. Even if related to the 1977 and subsequent studies on Bucharest, the project is a prolongation of the old – interwar period – for the new Senate House on Dambovița River (the ancient Senate Place). The development of the entire project during the time was exhaustively presented in an exhibition organized in 1991 at Dalles Hall.

As any other dictator, hoping to forever be present in history, he wanted to build something monumental – a new political centre capable of holding huge masses of people that he could control. After a series of seismic and topographic studies he decided to build his new centre not on the Dambovița benches (as the old Senate was foreseen) but upwards, on the safest ground of the capital – Arsenalului Hill, on the southern cornice of the river.

The project, started with some modernist style proposals for the Republic House, developed, with the willing participation of some of the architects involved in the project, towards a huge urban-scale project as a new "civic centre". It has to be said that the "civic centre" idea is neither a communist one. As was largely demonstrated by Radu Alexandru Rauță the civic centre originates in the American City Beautiful Movement (Rauță, 2012). Nor in Romania it was a communist idea. The first civic centres were proposed in the interwar period by architects or planners that studied abroad, as Cincinat Sfințescu who studied in Germany. Sfințescu developed the idea of civic centre and proposed a series of projects for Bucharest, including the one on Senate Place on Dambovița River (Figure 1 - Sfințescu, 1932). The civic centre was not initially seen as a concentration of official buildings (as showed by part of the proposal for Bucharest or other cities realised by Sfințescu and others), but slowly evolved towards a civic centre as a political and administrative centre (Rauță, 2012).

Figure 1. Sfințescu's drawing about a separate location for the Senate Palace (Rauță, 2012 p. 24)

The evolution of the house of the People and the Civic Centre during the 1980es was of such kind and scale that offered a good reason for Ceauşescu to demolish, in the most chaotically manner the most part of the city centre and to erase some of the most important and emblematic buildings and landmarks, counting lot of Bucharest's old churches, the Mihai Vodă Monastery and the State Archives within it, the entire Unirii Place area – the very generator centre of the city and many others. The eagerness of these demolishing was explained by the awkward relation of the Dictator with the city. As "simple peasant, Nicolae Ceauşescu admired and hated the capital. The city was overwhelming. Though he became absolute leader of Romania, he felt as a stranger in Bucharest and worthless in the face of the city, a city he felt somehow hostile. The House of the Republic [...] was his revenge and a fortress for him to hide against a city he could not understand (Pandele, 2009).

Demolitions are usually considered as normal acts, absolutely necessary in any urban society. They are the premises of new, modernising urban and architectural development. Although Françoise Choay presents demolitions as a necessity, one must well analyse the situation before the demolishing being done. "On the other hand, following another type of logics, but of a similar violence, they [demolitions] never stopped destroying their own patrimony. They destroyed it considering it was of no further use, old, malfunctioning, no longer up-to-date, lack progress, lack of comfort, and, in positive terms – standing in the way of modernization." (Choay, 2011)

But in Bucharest's case "many demolitions were conducted without any project, based only on hand gestures made by The Great Leader. His gestures were firm and clear either nervous and panicked. Projects were made after the demolitions, only to fill the empty spaces. Their role was to create a scenario – it did not matter what was left behind." (Pandele, 2009)

Figure 2. The historical city and the area demolished in order to build the House and Axis (Harhoiu, 1997, p.14)

As a result of this "monumental bricolages" a quarter of the historical city disappeared and another part of it rest mutilated (Figure 2). A huge urban fracture was thus created, separating the north form the south and generating a sort of "two cities in one" that doesn't give any sign of reweaving in the last 20 years.

What makes The House of the People and the Civic Centre the most dramatic project of the Romanian communist era is not just its out-of-scale dimension but also the different logic from what was done before. Up to the 1980es the entire city was already transformed by the communist regime. During the '50es, in the Stalinist period, the Soviet model didn't create impressive landscapes. Some new, relatively small neighbourhoods were built and the only emblematic building that was erected was the Scânteia House (the centre or the communist press – figure 3), a small Lomonosov University-like that somehow succeed to integrate in the 19th century urban frame without any disruption.

Figure 3. Scânteia House 1952–1957 (Google images)

In the next two decades huge avenues and boulevards were built, thus creating an entirely new urban landscape. But these interventions were done mostly along the ancient urban axis, in the well-known plating manner or the huge new assemblies were built on almost empty lands, so, hidden behind the new city, the old, historical one was still surviving even if in a somehow scattered way (Figure 4).

Figure 4. Griviţei Avenue and Balta Albă Assembly (Locuinta urbana 1961-1964)

So, the massive demolitions of the '80es represented a shock, something that never been

done before. Also the speed of the demolishing and mostly the lack of any urban logic (that previously was quite clear) generated a sort of paralyse and awe. We can consider the building of civic centre project like a Shock and Awe urban strategy, in the perfect logic of Blank is Beautiful („Shock and Awe are actions that create fears, dangers, and destruction that are incomprehensible to the people at large..." Klein, 2007).

worldwide correspondences

Though the Romanian communist demolitions represent the biggest European urban drama since the last world war, this is not unique, and, in the course of history, many large scale, dramatic demolitions took place in many other countries and in all types of totalitarian political regimes. The study is to reveal, through the following examples that, the urban-collective memory was seriously affected not only in Romania, but also in other cities and countries of the world.

Haussmann's Paris

The 19th century Paris was almost completely transformed, following the Napoleon III's London-like dream and due to the prefect Baron Haussmann relentless works of demolition and reconstruction (Figure 5).

Figure 5. Demolition of Butte des Moulins for Avenue de l

"The city of lights inherited a medieval structure, one that did not faced the needs of the 19th century. Baron Haussmann proposed a series of principles that were approved by the mayors. He founded specialized services that were later used with success. Haussmann asked for the measurement and the photographing of the buildings that were to be demolished. He chose the best professionals of each domain and asked for the pragmatic solutions." (Pandele, 2009)

Unlike Ceauşescu's demolitions, Haussmann's were based on principles. All the buildings that were to disappear were carefully photographed and measured in detail in order not to be forgotten, while on the area of the new civic centre, photographing was forbidden. Also, Haussmann had motives for his actions and he began his demolitions by founding specialized services at first. Baron Haussmann became, from a destroyer a praised person. "And Haussmann – without question, the greatest destroyer of our capital, as, unlike the case that he would have made a "historical centre" *avant la lettre* and a museum, there was no alternative to this violence – he had to continue Paris as Philippe-August, Charles V, Francis I, Louis XIV and their contemporaries done before him." (Choay, 2011)

Figure 6. The achievement of Boulevard Haussmann (www.gutenberg.org)

As Françoise Choay presents it, Haussmann's demolitions are not singular in Paris. The previous debatable disencumbering works destroyed part of picturesque sceneries of the city in order to reveal some monuments. However, though Francoise Choay critics are well funded, the demolished spaces were rebuilt in a most coherent way and they contribute to the heritage of the urban memory, representing – back then and today – one of the most admired urban development models. Napoleon III's vision, accomplished by Haussmann was such a success partly because he proposed a functional urban system, one that still works (figure 6). "Haussmann's changes find theirs most complete form in the public squares, gardens and parks that articulates the

old and the new parts of the city." (Choay, 2011)

The success of Paris's destruction and reconstruction is related to the respect due to major buildings of the city. Although that Haussmann demolished some 4300 houses and made major urban surgery, he called his critics to name "even a single monument worthy of interest, one building precious for its arts, curious by its memories." (apud Kostof, 2005).

Today Paris is considered the most beautiful city in the world and the old pre-19th century city is almost completely forgotten. The entire urban culture of 19th and beginning of 20th century Paris replaced the past, creating the new world-wide landmark and generating entire new layers of urban memory. And mostly, Paris proposed a new urban culture: a public space, one thus integrating the overwhelming Napoleon project in the city life.

Rome – Antiquity and Fascism

In a city as Rome almost any demolition supposes a destruction of history and heritage. "The reference western example is the one of the Constantine Basilica of St. Peter in Rome, the most precious monument of Christianity, demolished in the 16th century by the will of Pope Leon the 10th and Julius the 2nd." (Choay, 2011)

The example of the Basilica is not singular in Rome. In the fascist regime of Benito Mussolini, he considers that the true heritage of Rome is its antic city form and structure. Obsessed by his idea that "Rome, will again, rule the world!" it was absolutely normal that he would want to bring Rome to its empire glory. In order to do this, he had to bring back to surface the ancient city. All the relics could now be used as propaganda as well.

Though he destroyed a large part of Rome and thus affected the collective-urban memory, ripping out memories and landmarks but also Renaissance or Baroque period monuments, Mussolini brought back into the public eye and memory, the old urban tissue of Rome and did not left behind an empty area (Figure 7).

Figure 7. Via dei Fori Imperiali making (Google images)

Somehow *Il Duce* cannot easily be condemned, at least not in its own time paradigm, for those actions because, in the logics of that period of time, his actions were justified, and he did nothing else but brought to light what it was seen as heritage by demolishing "unimportant" and "ordinary" buildings, also in order to highlight Rome's monuments, continuing, among others Michelangelo's dreams of Spina dei Borghi (Figure 8). If monuments and sacred buildings were to be considered the expression of the past periods of history the common houses were profane, unimportant and almost "silent" documents so Mussolini states that: "The millennial monuments of our history must loom gigantic in their necessary solitude", a vision well integrated in the generalised disencumbering acts all around the European big cities of the time (Kostof, 2005)

Figure 8. Spina dei Borghi before demolitions (Google images)

On another hand it should be observed that what was considered as the "liberation" of the antic area, in order to put forward monuments

as Marcellus theatre or Trajan forum was doubled by a real development of Rome as a polycentric city, with new avenues and neighbourhoods but without any strong de-structuration of the urban organism. It is also important to mention that all these visions were developed by a commission formed of specialists like Manfredi, Giovannoni, Piacentini, Gerola and others, thus guarantying the quality of the future city (Vasilescu, 2011).
As a result, today's Rome, a result of the confrontation between Mussolini's totalitarian vision and the Citta Eterna, gained its past while forging its future, both of them melted in an emblematic, unitary image (Vasilescu, 2011). Rome cannot be imagined anymore without its antic monuments and noisy Vespas running in-between.

Berlin, post-war and post-wall

Berlin is a city that, despite its dramatic history, has reborn and despite the destructions he faced, he became a blooming city, one that is appreciated both by its inhabitants, and by foreigners. The city's memory was seriously affected, not only once but by several huge political projects that changed it forever.

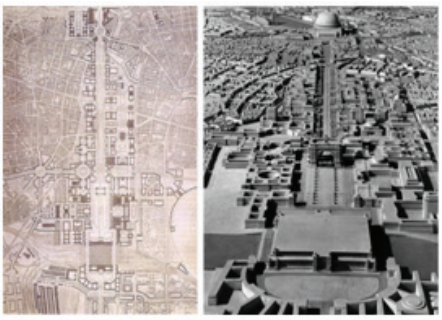

Figure 9. The Albert Speer Plan" - Hitler

One of the most important reconstruction projects for Berlin, in order to transform it in a symbol of power, was lead by Hitler, together with his "personal architect" Albert Speer. Hitler wanted the destruction of a vast part of the historical Berlin in order to build his centre. "Hitler never appreciated Berlin, he saw the city as dirty and too liberal, and he was disgusted by the political orientation of its inhabitants. In consequence, trough Speer, the fuehrer wanted to transform the capital in his vision and he estimated that he will finish by 1950, when he also estimated that he will win the war (Figure 9). In the centre, partially over the river Spree, an impressive dome would have been built, and it would have been named Volkshalle, that in an approximate translation means *The House of the People*. The monumental building, measuring 290 meters high would have made the Reichstag a toy house, and it would have been used by Hitler to hold his speeches in front of more than 180.000 people." (Bisky, 2006)
The project was however seized in 1943 due to Ally bombings. Thus, Berlin escaped from the "architectural demolition" just in order to be erased by the heavily bombardments.
Another wave of demolition was deployed, in Eastern Berlin, during the communist regime. The emblematic Berlin – Alexanderplatz (transformed in an international symbol by Alfred Döblin's novel and mostly by Rainer Werner Fassbinder's film) was one of the most swarming and fashionable urban spaces of the 19th century Berlin (Figure 10). The day-life, around the Hermann Teitz commercial centre, and the night life, around the restaurants and bars, was equalled only by the Potsdamer Platz (another space that was wiped off and replaced with a sort of mall-complex).

Figure 10. Alexanderplatz in 1906, foto: Max Missmann

During the 1960es Alexanderplatz was rebuilt in the new, modern but socialist-realist style. Thus it was transformed in a huge – out of scale – pedestrian area, seen by the communist regime as the new, modern, ideologically adapted city heart (Figure 11).
After the unification a new reconfiguration of the space was proposed. Some skyscrapers are still waiting for the construction while a new

commercial centre was built, knowingly an electronics megastore (Figure 12).

Figure 11. Berlin-Mitte, Alexanderplatz, 1966, Dick-Foto-Verlag

Figure 12. Berlin-Mitte, Alexanderplatz, 2006 http://www.stadtentwicklung.berlin.de

At the other end of the former East-Berlin centre a new step in the city's demolishing took place: the intensively debated destruction of the *Palast der Republik*, the communist parliament (Figure 13).

Figure 13. Palast der Republik last traces (Google images)

This late demolition raised huge protest of the younger and older generations that were asking for the communist memory comprehension. And while we are just finishing this paper another Berlin tragically demolition is taking place: the Berlin wall, the historical, collective city-scar is removed in order to give place to commercial, private "beautification".

But, despite the destructions, Berlin demonstrates an incomparable aptitude to integrate its scars and transform them in new life-generator places. Thus it still stays as the cultural capital of 21th century Europe.

Moscow and the stylistic indecisions

In "Project Russia – Architecture after communism" we found a very interesting, although exaggerated, quote that describes most of the Russian cities as being totally synonym with soviet or communist cities: "Russian city = soviet city. There are huge differences between Russian cities and European cities. Excepting Sankt Petersburg, the Russian cities of the 19th century were mostly made out of wooden houses and only a handful of houses, government buildings, churches and monasteries were made out of stone. This meant that, in time, very few traces of the past will survive, even in cities with a history of over a thousand years old. But while communism first appeared in Russia before entering Europe, so did the industrialization began in Europe and then extended to Russia. During the civil war, while the middle class stated in Central Europe, Russia was evolving in the form of dictatorial proletarian. This means that the industrialization process in Russia took place exclusively during the soviet regime. The Russian city is thus the soviet city." (Goldhoorn, 2002)

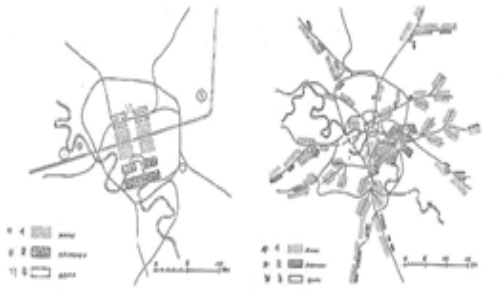

Figure 14. Development plans for Moscow proposed by Le Corbusier and E. May (Quilici, 1976, p. 269)

Moscow development, much older than the communist era, was marked, during the totalita-

rian regime, by huge contradictions between two main trends in architecture and planning. On one hand the raise of the Soviet Union was marked by the modernist avant-garde, on another, retrograde visions were seeking for more monumental expressions, paradoxically inspired by the European classic architecture (Figures 14, 15).

In 1931 the Direction of the Office for Moscow Plan created the Project Brigades in order to define the future development plans for the city. Three of the Brigades were formatted by foreigner technicians (E. May, H.Meyer and K. Meyer) but the rest of them were soviet associations. The projects were considered insufficiently adapted to the Party′s directives being not-realistically or not enough revolutionary (figure 14), mostly May′s project that tried to keep the central historical structure of the city (Quilici, 1976).

In the same time classicising forms of urban spaces were chosen to express the new Soviet power and the Red Square (Figure 15) became the prime model of the Socialist square.

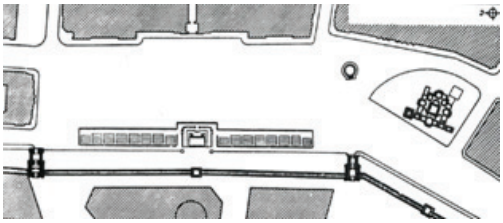

Figure 15. Red Square plan - 1932 (Quilici, 1976, p. 265)

At architecture abject level the same struggle between modernist and classicist form is to be observed. While some of the architects were seeking for simple, modern forms, not belonging to any passed times; the politicians, as Ščusev did in 1933, were asking for more classicising forms as ″indicated solution, better solution for the form and the idea, solution that express the ideology in the most adapted form″ (apud Quilici, 1976)

Stalin wanted, alike Ceauşescu, to create mega structures. He decided to destroy the Cathedral of Jesus the Saviour, in order to build a future administrative and political centre of the country - the ″House of the People″ or the ″House of the Soviets″. The House of the People was never realized. This incredible host for the party members would have been taller than the Empire State Building and it would have had a statue of Lenin on top. Only the statue was taller than the Statue of Liberty.

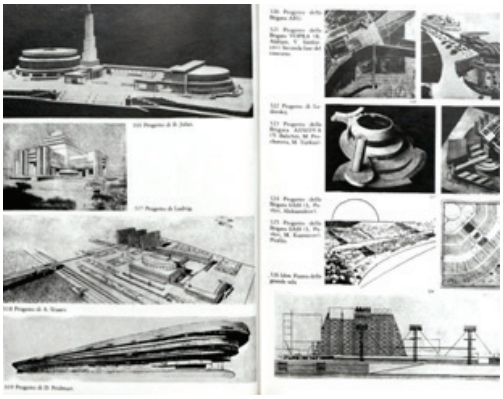

Figure 16. Proposals for the Soviet Palace - the wining, Jofan′s project proposed a 50-70m tall Lenin statue in the top of the building (Quilici, 1976, pp. 258-259)

The most impressive classic architecture was also used for the Moscow subway while the entire city was wiped off in order to make place to huge neighbourhoods and huge official buildings (Figure 18).

Figure 17. Komsomolskaya station, New Arbat Street, Lomonosov University (Google images)

But the new, capitalist Moscow, even if is still facing totalitarian politics, became one of the most dynamic cities of the world and now tries, with the help of Jan Gehl′s methods, to re-humanise its gigantic scaled spaces.

Beijing and the Chinese urban landscape

Beijing, the last imperial capital of China is a city with a fascinating history. However, the city went through a series of successive waves of demolitions and reconstructions. With the proclamation of The Democratic Republic of China in 1949, the city suffers numerous mutilations that can be even seen today. One of the most controversial destructions was of the Legation historical district (1856) and of several nearby districts in order to re-plan the

huge square Tiananmen. In order to transform The Tiananmen square event the Gate of China was demolished in order to enlarge the plaza (and afterward replaced by the Mao's mausoleum in 1976). During the 50es the expansion of the place continued, following Mao Zedong's vision who wanted to make place for huge and enthusiastic popular manifestation of some half of million people. New symbols are scattered around the place as the Monument of the People's Heroes, the Great Hall of People or the National Museum of China. "In 1958-1959, the square was expanded from 29 to 98 acres (11 to 40 hectares). The great Hall of the People occupied the west side, a building one quarter of a mile (400 m.) long; the Historical Museum occupied the east side. The Monument of the People's Heroes is now overshadowed by Mao's tomb." (Kostof, 2005).

Figure 18. Tiananmen Square (Google images)

After Mao's death the plaza was further enlarged in order to gain a perfect shape but also to increase the number of public manifestations participants. Thus Tiananmen became the absolute symbol of the communist power, practically erasing the hole (glorious) Chinese (un-communist) past and staying as a vainglorious, overwhelming space (Figure 19).
Tiananmen Square is not a singular example; it is known that Beijing is facing a series of frequent demolitions of historical buildings and neighbourhoods in order to make room for unrealistic constructions such as highways, huge block of flats, office buildings and malls. Just these new demolitions are not made in the name of the communist ideology but in the name of the new development toward an original social-democracy (Figure 20).

Figure 19. Beijing demolitions (Google images)

In an article by Octavian Ciupitu in Curierul Românesc, the author asks: "who will benefit from all those concrete and glass structures that seem to continuously rise from the earth. At their feet, you can still be able to see remains of the old city, now on the edge of extinction." (Ciupitu, 2006)
Somehow Beijing succeed in illustrating an apparent "harmless" political system and to put capitalism (in its wilder but, paradoxically, extremely state-controlled form) in the list of political systems that are mutilating cities and history in order to express its own power.
Chaotic demolitions occur in all Chinese cities; traditions and culture are lost in the new urban landscape. The population thus loses its identities and landmarks. Françoise Choay askes herself if these new cities, without a past will they ever became cities? "They rather risk ending up at the museum under the *20th century heritage* label to illustrate a moment of decisive rupture, although no responsibility was assumed, with the urban tradition. [...] For the urban, today so largely used, is no longer something more than a place in a state of general confusion, waiting for the "post-urban" term, yet absent from the dictionary to take its place and be recognized." (Choay, 2011)
The new Beijing, still growing fastly, already shows its failures but it is also developing new social and environmental politics. It is so difficult to say now how its public space will be lived in the comming years. Today it's public life still rest confined in the old, traditional neighbourhoods, but new landscape and urban design projects are indicating another possible future for the city.

Pyongyang, the hidden city

The capital of the North Korean Republic is a city that suffered a series of important destructions and a city that has lost its past in favour of its present, a past that was abandoned by the nowadays society. The city was seriously damaged during the Korean War, being estimated that 90% of the city was destroyed (Joinau, 2012). From this point of view the new established regime found the urban past already obliterated.

Figure 20. The Triumph Arch in Moranbong Place (Google images)

The civic centre model seems to be used by the Korean architect. Moranbong hill (legendary place of the city) became the favourite site for most of the new, emblematic buildings: the first History Museum, Kim Il Sung University, Liberation Tower, the Moranbong Theatre, the Kim Il Sung Stadium and the Triumph Arch (Figure 21).

Figure 21. 22 Kim Il Sung Place, dominated by his huge statue (Google images)

Following the new monumental axis are developed – the Yonggwang and Sungri avenues are connecting the historical centre with the Moranbong hill, while the new Kim Il Sung Square is built to became the political centre and emblem of the city (Figure 22).

During the 1950-60es the rebuilding of Pyongyang was mostly focused on new monumental plazas and official buildings while the whole city was forming from little shacks scattered along the avenues.

Figure 22. Pyongyang avenue and the reality behind (google images)

Afterword new blocks of flats, or, it is said, just block facades were built along the un-scaled large avenues, hiding the ever-unfinished neighbourhoods, lacking streets or any other public amenities (Figure 23). These huge avenues plated with dull structures, specific to most communist cities, cannot hide the improvisation and dummy-air of the buildings as "you don't have to stand very close to buildings to see that balconies, tiling, vertical and horizontal joints often depart from the plumb-line. Interesting concave and convex patterns appear in prefabricated, hand-finished concrete walls. Windows panes have bubbles, bands, fish-eye and bottle-glass effects. Spaces exist under doors and their frames." (Willoughby, 2008)

This plating logic seems to be the inspiration for Ceauşescu's dreams for Bucharest, or so it stays in our urban mythology. It is still believed that Ceauşescu's visit, in 1971, was the trigger for the further development of Romania, Bucharest as well as his own personality cult.

necessarily successfully done neither. Among them the emblematic Ryugyong Hotel (Figure 24), was erected between 1987 and 1992 when the financial difficulties put the construction at a halt. It was planned to be finished in 1989 and

to be the tallest building in the world, but when it was finally done (on the outside), in 2012 but now it is only the 47th tallest one.

Figure 23. Ryugyong Hotel (Google images)

Meanwhile the city, as the entire country struggle with the famine, but Pyongyang is maybe the outmost political landscape. As Philipp Meuser describes Pyongyang, the North Korean psycho regime's capital, as "arguably the world's best-preserved open-air museum of socialist architecture" (Meuser, 2102)

RESULTS AND DISCUSSIONS

As we stated in the previous chapters, cities all over the world have lost or have never had a kind of urban memory. Either it's about demolitions, reconstructions, wars or any other kind of events that triggered urban traumas, many cities have lost parts of their culture, traditions and memory. "All cultures and all societies have built and developed themselves through demolitions." (Choay, 2011)

But what are the similarities or the differences of this destruction and rebuilding cycling acts?

The most clear and common feature of all this reconfiguration of historical cities in order to became political statements is the "bigness". We don't refer only the impressive dimensions and richness in decoration of the buildings, but also the inhuman scale of the urban spaces – plazas and avenues – that were created. What stays as the common tool for the totalitarian landscapes is the presence of huge urban voids, conceived as parade spaces and calculated to contain impressive parades and popular, more or less enthusiastic, gatherings.

On another hand the obliteration of an "embarrassing" past was hidden under the new monumentality. In order to create this new spaces the old cities' cores, layered expressions of the previous political periods and social values, were wiped out. It was not only imposing a new political landscape but also it was all about erasing the old ones. It is like all the dictators were trying to stay as unique, solitary figures of their national histories. It was an entire history rewriting in stone.

Also it is quite similar that it was one person's vision that was imposed over the city. Even though sometimes specialists were consulted, the vision was clearly imposed by the political leader(s) and the technical advice was necessary just in order to find the best solutions for that visions *mise-en-place*.

What differ the political landscape is the architectural language that was chosen in order to express the political new values. Even if we can find a strong penchant for the classical expression, modernism was also part of the game.

We can witness a subtle balance between the ruptures with the past, sustained by the new architectural expressions, and the need of historical quotations as legitimation tools. Also the classical architecture seem to be more fitted for the monumental expressions while the modernist forms are staying insufficiently rich in expression means and less sumptuous and impressive. And impression is all it is about the political landscapes. Out of this balance between modernity and classic result the originality (or the lack of it) in the analysed urban totalitarian landscapes. Also it is their historical and aesthetical value. If Napoleon III's urban order, the Russian modernist avant-garde and Mussolini's fascism have their unchallenged places in the architecture and arts history it is difficult to imagine the Romanian, Chinese or Korean edifications entering the aesthetical history but as sort of freak expressions of political regimes, sort of power-story-tellers architectural Disneylands.

Another difference to be noticed is the balance between monumental buildings erecting and the more social-oriented projects. Thus, in Haussmann's project the rebuilding of Paris took in charge equally the monumental buildings, boulevards and places but the entire coherence of the project was realised using

"ordinary" buildings as the general background of the new political scenery. Mussolini's projects were more clearly separated – the centre was the ground of the new monumentality while the new, modern neighbourhoods, without lacking their own monumental places, were more peripheral. In Romanian and Korean case we can witness a time-splitting between monumental and regular buildings. While Bucharest was submitted first to a social revision as huge new residential assemblies were built and while the outmost expression of the communist era was also its last project, in Korean case the timeline was inversed. The social projects were started just after the accomplishment of the new "sacred places" of the city.

CONCLUSIONS

Bucharest case is neither new and neither unique if we look at the destructions that it suffered. On another hand some features of these destructions are strikingly different.

On one hand is the further continuation of demolishing after the fall of the communist regime. If we could expect a revalorisation of the old city after 1990, this change of perspective never came. The only noticeable act of promoting the past is the skin-deep refurbish of the Lipscani area. But it was done just in order to transform it in a tourists-trap, a historical Disneyland out-door mall that is not appealing neither to locals nor to foreigners.

On another hand, even if we somehow accept now the House of the People, or at least the idea that it can't be demolishes, but what can strike one visiting the city is the incapacity of reweaving it, of occupying and transform its scars. It is like, behind the huge boulevards' facades, the time stopped. We are neither able to recover the past of the city, as the harm done is way too big, neither to integrate its present and to recover the urban space.

Though the city fascinated due to its particular culture, traditions and heritage, the modern project (although heavily imposed by the communist era and strongly refused at that time) still haunts Bucharest. It seems that we are not able to learn neither form our own, past mistakes nor form the others'.

After 20 years of democracy we still wander what to do about the city, still expect for one's alone idea instead to try, as Germans did for an example, to take the space in our own hands. The political projects are clearly oriented towards further destructions and while we are fighting to save what is still standing we forget about our scares. As a result we risk facing, in some time, a totally mutilated city that we are no more able to cope with. Or, as it started to happen, if we will let it go, the nature will succeed to bring the life back in the forgotten fractured spaces. But nature is so "unmodern"...

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RESTAURATION OF THE ROMANIAN WRITER'S ROTUNDA – CISMIGIU GARDEN

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Abstract

Cismigiu Garden is a part of our national heritage and it is almost lost in favour of kitsch and ugliness. As a consequence of the lack of experience and professionalism of interest and as well of public income, this garden becomes a shadow of its old glory. One of the most important architectural and landscaping compositions in Cismigiu Historical Garden is the Writers' Rotunda. Focusing only on the Rotunda, the study was based on "in situ" research and on historical documents research. The study revealed a series of inconsistencies and discrepancies between historical text description and historical images as well. Also, our paper lead to showing different patterns on which the Rotunda was designed and it also reveals patrimony objects that seemed to be lost.The aim of this case study is to emphasise the Rotunda image created by Friedrich Rebhun and how should it look like after a much-needed restoration. In order for a city that lost most of its history and patrimony, attention should be accorded to the built heritage including historical gardens and parks and especially to their most important features. One of them is the Writer's Rotunda.

Key words: *heritage, history, patterns, patrimony, restoration.*

INTRODUCTION

A city's patrimony consists in buildings and monuments, as well as in gardens and parks. One such part of Bucharest's patrimony is the Cismigiu Garden. Designed by Karl Friedrich Wilhelm Meyer in 1845, the garden was designed over an old puddle flooded frequently by the Dambovita River crossing Bucharest (Panoiu A., 2011). Cismigiu was a romantic garden, designed according to the 19th century's citizens of Bucharest personal desires and way of life. The garden went through a series of successive changes that brought new zones of interest in the garden. One such newly created zone of interest is the Writer's Rotunda. This rotunda is part of this garden's history and also it is part of Bucharest patrimony. The actual state of preservation of this part of history is very low and special assistance is needed in order for the Rotunda to be conserved in the future.

MATERIALS AND METHODS

The research was led in the Romanian's Writer's Rotunda during a period of several months, in seasons of autumn and winter. Special attention was accorded to details, planning sequences, and to the grade of deterioration. Our study was based on historical descriptions, images and plans. Most of our work was to compare text descriptions with images and plans because there were a lot of inconsistencies and discrepancies between them. The study reveals how the Rotunda was mainly designed and how it should be restored.

- **Cismigiu Garden – Short History**

Cismigiu garden respresents, chronologically, the second public garden of Romania. Designed after Karl Friedrich Wilhelm Meyer's plans, Cismigiu garden was designed as a romantic green space, but it was also designed according to the desires and to the way of life of the citizens of Bucharest of the XIXth century.

The garden went through a series of successive changes, the last of them being the most important. This way, Cismigiu was redesigned by Wilhelm Knetchel in 1882-1883 and by Friedrich Rebhun in 1910-1943.

Along with the new transformations, newly added zones contributed to the improvement of the garden, and, despite its low surface, it became a complex garden, all of the three stages of design bringing new valuable elements to the garden.

- **The Writer's Rotunda**

"The construction of the Gheorghe Lazar high school in 1890, meant that the main entrance to the garden had to be moved on to the Queen Elisabeth boulevard and it also meant giving up the elm round-point. Those works preceded the drastic redesign by the German architect, Friedrich Rebhun in the years 1899-1910, when a new, classical style, opposite to Meyer's concept was imposed. This transformation can be seen in many of the garden's subspaces(the roses terrace, the alley with pergolas, the Romanian Round). The decommissioning of the Music and the Semicircular pavilions meant a radical change of the aspect on the Schitu Magureanu street side of the garden. By creating the Romanian Round and the nearby spaces, easy terms of accessing those spaces and the garden as well, were created." (El-Shamali S., 2011).

Rica Marcus, in "Parks and Gardens of Romania" is offering a series of information about this newly created space: "it is placed over what used to be a restaurant that left behind a circular platform with a diameter of about 20 m. According to the English traditions, this forms a bulingrin from all four access points, that descends on a few steps to the circular alley paved with stone that stands between the central round and the surrounding plantation. On the rounds perimeter there were planted cone-shaped yews, and groups of Forsythia in between, in contrast of color and form. On the bordure were perennials such as Sedum, Stochis, Cerasium, Campanula etc. Parallel to the alley a similar bordure can be found, followed by a lawn with 16 statues of the most valuable Romanian writers. The silhouettes of the statues of white marble, placed on high stone pedestal were in contrast with the green background of the compact vegetation. The bulingrin was separated by the rest of the garden through a a row of niches formed by walls of vegetation that stand to represent the lodges from where you can admire the center of the composition: the yew round. The niches are formed by iron grids and are climbed by lianas and forsythias. At two of the entrances in this garden were placed columns with pedestals surrounded by groups of Cotoneaster horizontalis." (Marcus R., 1958).

The description made by Rica Marcus is one that presents numerous elements that made up the Writer's Rotunda. However, a few discrepancies appear between the text descriptions and the images posted in the same book. Though being described as having 16 statues, photographs posted in the book to emphasize the description show that there were actually 12 statues, three on each quarter of the rotunda. The text description mentions two entries with columns while the plan shows that all four entries had columns, and one image that reveals the fact that the entrance from the main axis had no columns at all. Though the description made by Rica Marcus is one of the oldest and most trustful, the discrepancies between text and images do not reveal how the Rotunda was originally designed by Rebhun.

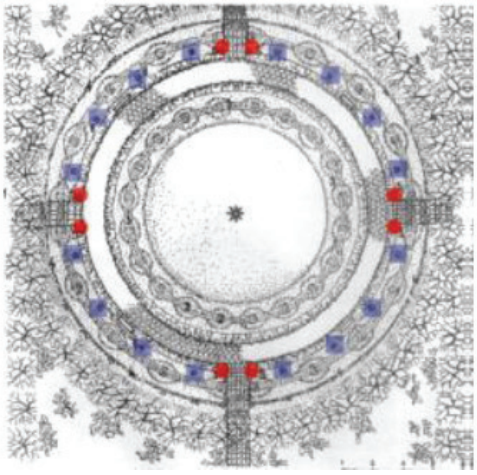

Figure 1. Plan of the Rotunda – 16 statues a 8 columns appearing on the plan (Marcus R., 1958)

Another description of the Rotunda and of its components appears in "Bucharest's gardens": "[...] the marble columns from the Rotunda were taken from the Royal Palace during a fire. The iron pergolas, [...] were initially placed in the palace garden, placed by Carol I while Queen Elisabeth was in a foreign visit, to make the queen a surprise. When the palace garden was disbanded, Rebhun asked for them and brought them in Cismigiu. The pavement is part of the pavement that was disbanded from the Rondul I de la Sosea." (Lancuzov Al., 2007). Though interesting details were offered

by this description, those information could not be yet verified.

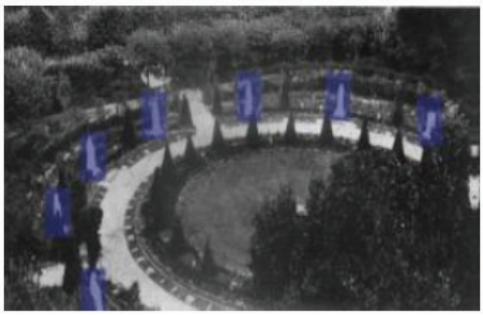

Figure 2. Entrace from the main axis – sequence of 3 statues on a quarter (Marcus R., 1958)

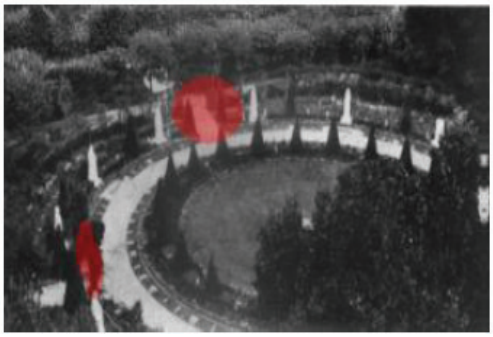

Figure 3. Entrace from the main axis – entrances and columns – columns do not appear at the entrance from the main axis (Marcus R., 1958)

One more interesting description helped us to make an impression of what used to be The Writer's Rotunda: "But the most interesting intervention that Rebhun had in this part of the garden was the so-called Romanian Round, designed in 1942-1943 over an old restaurant. A scientifically distribution of trees, shrubs and flowers make up, on a circular platform of over 20 m length diameter, a spatial framework rhythm by the 16th statues of the most important Romanian writers and by coned-shaped yews, placed along a circular stone brick paved alley. Coned-shaped yews are planted on the perimeter on the round as well. The space is separated from the garden through a series of niches made up by walls of shrubs(lianas and forsythias), placed on metal grills and with a circular row of regular pruned linden tree in behind. The statues were made by some of the most important Romanian sculptors: Mihai Eminescu, Al. Odobescu, Titu Maiorescu, I.L. Caragiale, G. Cosbuc, St. O. Iosif, Ion Creanga, Al. Vlahuta, Duliu Zamfirescu, M. Onofrei, C. Baraschi, Th. Burca, B.P. Hasdeu, N. Balcescu and V. Alecsandri are the work of Ion Jalea, Militia Patrascu, D. Barlad, Oscar Spaethe, Iona Popovici, Cornel Medrea, I.G. Jinga, Oscar Han and Al. Calinescu." (Raducan V.) The text refers to 16 statues but enumerates only 15. However, out of those 15 statues, only 12 really exists, while the rest of the three statues (M. Onofrei, C. Baraschi and Th. Burca) are only mentioned in documents but do not appear in any visual documents.

RESULTS AND DISCUSSIONS

In situ observations and old document research made us get an idea of how the Rotunda must have been designed. We started focusing on each component of the Rotunda and we discovered elements that seemed to be lost, planning sequences that were altered in time and evidences that supported parts of the old text or image descriptions.

Vegetation

The Writer's Rotunda vegetal design is made up by a handful of plants that are described in historical documents and also, partially appear in old images as well.

Yew trees are the most common trees in the rotunda, and they were placed in sequences, according to the symmetrical design that characterizes the entire composition. Those trees are mostly in a advanced state of deterioration, having lost their original cone-shaped form. According to the Florence Charta (Charte de Florence, 1981), we decided to keep the original image of the Rotunda, this way being obliged to eliminate all the yews and plant new ones. The new yews have to be cone-shaped and have approximately 2.5 m high and 1.2 to 1.5 m in diameter. Those dimensions were approximated after scaling several historical images.

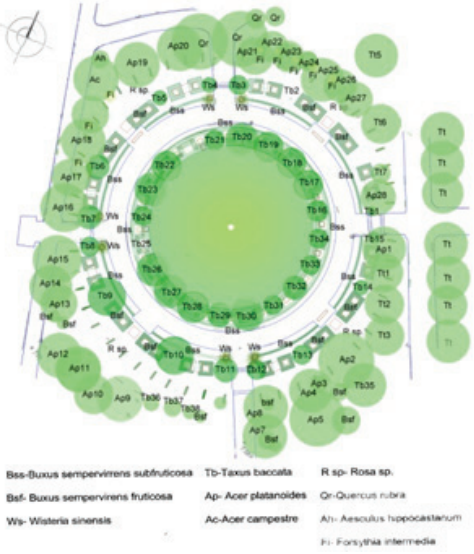

Figure 4. Vegetation plan

Regarding other species of trees such as Tilia, Acer or Quercus, we decided to keep them in their actual status considering that they are not major elements of design in the Rotunda, and that they are, generally in a good state of preservation.

Gradina Cismigiu - Releveu Rotonda Scriitorilor	Fisa nr. A 2
Denumire stiintifica	Taxus baccata
Denumire populara	Tisa
Diametrul coroanei(m)	0
Inaltimea(m)	1
Varsta aproximativa	1
Stare fizica	Proasta
Gradul de deteriorare/ garnisire (%)	5%
Tipul degradarii	Degarnisit
Valoare istorica	-
Valoare estetica	Mica
Valoare horticola	Mica
Valoare ecologica	Mica
Alte observatii	Plantata recent. Nu respecta forma conica a tisilor adulte.

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Figure 5. Vegetation data sheet, yew no. 2

Gradina Cismigiu - Releveu Rotonda Scriitorilor	Fisa nr. A 9
Denumire stiintifica	Taxus baccata
Denumire populara	Tisa
Diametrul coroanei(m)	4
Inaltimea(m)	5
Varsta aproximativa	69
Stare fizica	Foarte buna
Gradul de deteriorare/ garnisire (%)	95%
Tipul degradarii	
Valoare istorica	Mare
Valoare estetica	Mare
Valoare horticola	Mare
Valoare ecologica	Mare
Alte observatii	

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Figure 6. Vegetation data sheet, yew no. 9

In what concerns low vegetation such as shrubs, lianas or erennials we considered replanting roses, in groups of two, in between pergolas, such as texts and images suggested and replanting Wisteria sinensis nearby columns, mentioning that this liana must be kept under control in order not to fully cover the columns. Though historical texts mention Forsythia, Sedum, Campanula, Stochis, Crasium etc. we weren't able to pinpoint their exact planting location. Neither plans nor old images show those plants appearing in the Rotunda, so we decided to fully give up on planting those plants.

Architectural components

- **Statues**

Although text descriptions mention more than 12 statues, we found no evidence that there really used to be more that 12 statues in the Rotunda. We recommend that the actual statues be preserved and no additional changes are to be made.

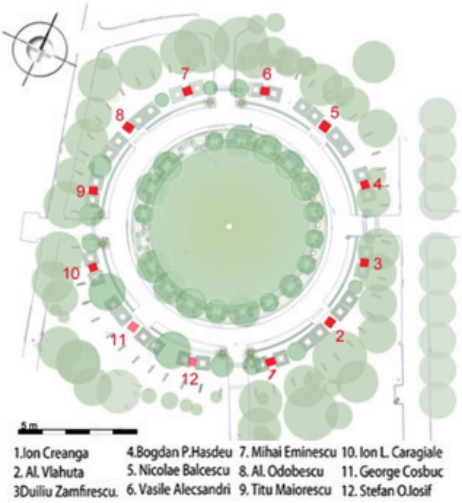

Figure 7. Statues

- **Columns**

We came to the conclusion that the northern and southern entrances to the Rotunda have columns with Corinthian capitals, while only the western entrance had two columns with Ionic capitals. The entrance from the main axis had no columns, as it can be seen on old images as well. However two out of six columns are covered by lianas and one is represented only by its pedestal. Thus we propose to restore the ones that are left and to make two copies of the columns with the ionic capitals in order to place them at the east entrance, following Rica Marcus′s plans and the Rotunda′s logics of symmetry.

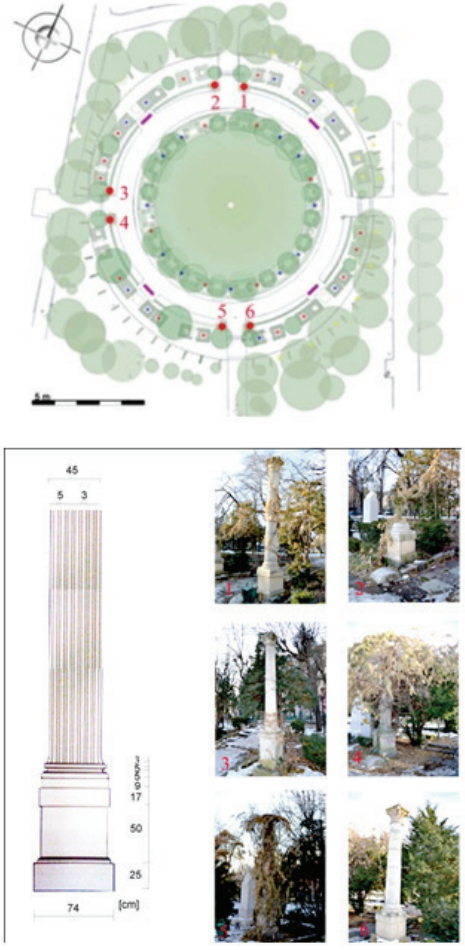

Figure 8. Columns

- **Benches**

The Rotunda was designed with 4 stone benches. All of those benches are in a advanced state of deterioration, thus we advice that all of them be restored, if possible, if not, than they must be replicated and placed according to their original location.

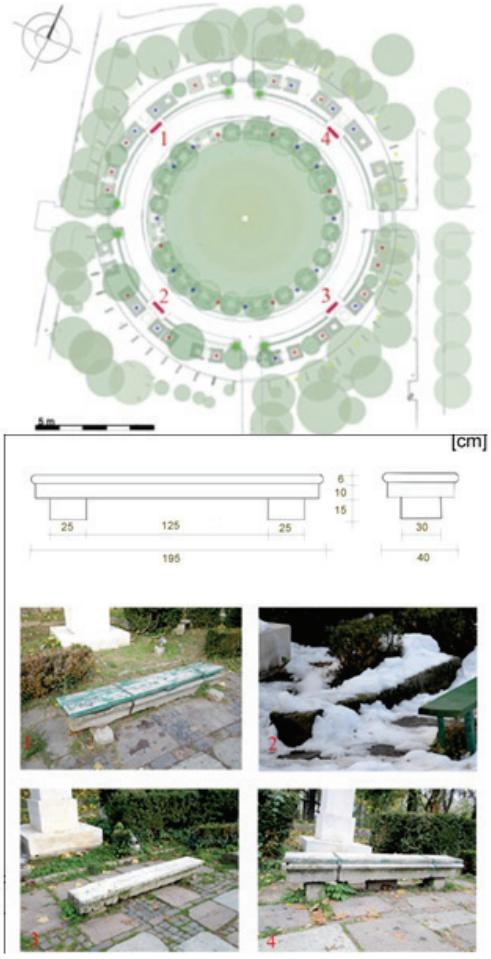

Figure 9. Benches

Vases

There are 4 kinds of vases, that were originally placed in sequences according to a logic of symmetry that characterizes the entire Round. The largest type of vase is made out of reinforced concrete and it is placed in the center of the composition.

Another kind of vase is a plate-like concrete vase that it is placed in sequences and in between pergolas. The other two kinds of vases are made out of stone and are placed in sequences in between statues and yews and on both sides of the circular alley. Most of the vases are in a advanced stage of deterioration. We propose that the vases be restored or replicated and placed replaced according to their original position.

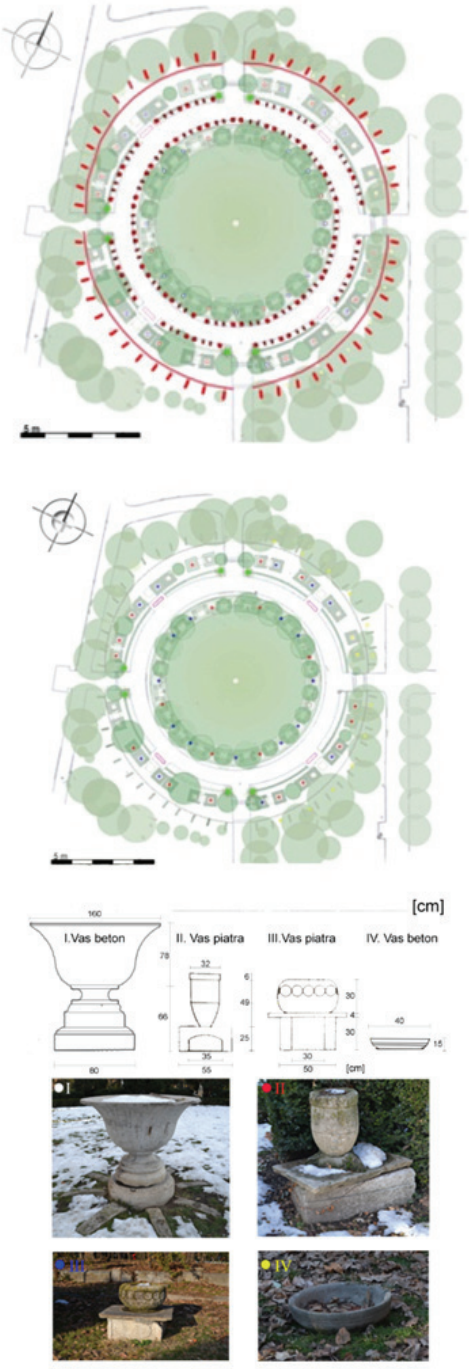

Figure 10. Vases

The pergolas are preserved in a relatively good condition and they have not been moved or replaced. We propose that the pergolas be conserved in the future and only minor repairs be conducted at this moment.
On both sides of the circular alley are placed 2 kind of stone slabs, also arranged in sequences according to the symmetry design of the Rotunda. Alike pergolas, the stone slabs are in a good condition so we consider that only minor repairs are to be conducted at this moment and conservation over time is needed.

- **Wrought iron pergolas and stone slabs**

Figure 11. Pergolas and stone slabs

Damages/Deteriorations

Either it came to damages or deteriorations, lack of experience and lack of concern made the Rotunda to degrade over time. New installations were added without approval from specialists and thus they destroyed the image of the composition. While new elements were added, old ones were left to deteriorate and panels with messages for preserving the garden were just placed to hide the true nature of the damages, as shown in the pictures below.

Figure 12. Please protect the Rotunda!

Figure 13. Framing damages

CONCLUSIONS

Our research revealed the way the Rotunda was designed by Friedrich Rebhun and how it presents itself today. Lack of interest and of experience, combined with uninspired measures taken inside the Rotunda badly deteriorated most of this composition. However, the fact that there are still numerous elements that have not yet been damaged beyond repair give a chance for specialists to restore the Writer's Rotunda.

Immediate actions are needed in order to save not only this composition, but the entire Cismigiu Garden.

Our own restoration proposal is based on a minimum of actions, but all of them are necessary in order to bring back the old image and atmosphere in this part of the garden.

Beside the proposals we made for every element of the Rotunda we emphasize that it is totally necessary to remove all the new elements that do not belong to the original design, and we recommend, according to the Florence Charta, that the entire garden to benefit from a special visiting program.

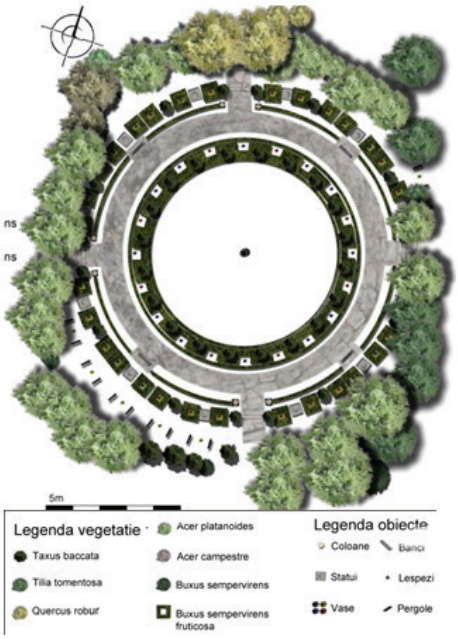

Figure 14. Proposed plan for restoration

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PHENOLOGICAL STUDIES ON SOME VARIETIES OF ROSES FROM THE COLLECTION IN THE "DIMITRIE BRANDZA" BOTANICAL GARDEN IN BUCHAREST

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Abstract

The study shows the influence of climate changes, which are more and more present, especially on the differences of temperatures recorded in short periods of time as well as similar periods of time throughout the years, in the development of roses. This study of the influence of temperatures on roses was conducted in the Bucharest area. This particular research was done by observing the behaviour of 10 varieties of roses from "Dimitrie Brandza" Botanical Garden's rose collection, between the years of 2011 and 2012. The main aspects of the study were: the growth rate and phenological phases, in correlation with the changes in the atmospheric temperature.

Key words: *roses, phenological phases, climate changes.*

INTRODUCTION

Climate changes are more and more evident, which affect all living creatures in different ways, causing behavior changes. On roses, these changes determine a change in growth rhythm, an offset in phenological phases and are a big influence on the lifespan of open flowers

A study on the effect of negative temperatures on roses from the Botanical Garden collection in Iasi was made by Ostaciuc in 1987. He followed, during the winters of 1981 to 1986, rose varieties from the following groups: hybrid tea, polyantha, polyantha hybrids, floribunda, floribunda grandiflora, climbers and park roses**.** The research showed that the polyantha, polyantha hybrids and floribunda have their biological threshold at 10°C, hybrid tea at 8°C and climbers and park ones at-15°C (Ostaciuc I., 1987). The present study aims to conduct collection on ten varieties from the Botanical Garden 'Dimitrie Brandza' in Bucharest, during their growing season, between the months of May and November 2011 and 2012. In the two growing seasons, the study followed and compared growth rhythm, the phonological phases and power of growth (the length of the shoots) in correlation with temperature fluctuations. Data collected from this study is part of the PhD thesis.

MATERIALS AND METHODS

The biological material that was used for determination came from 10 varieties planted during 2008 to 2009 in the 'Dimitrie Brandza' Botanical Garden Rose Collection (‘Abraham Darby’, ‘Acapella’, ‘Angela’, ‘Caprice de Meilland’, ‘Christoph Columbus’, ‘Forever Young’, ‘Heritage’, ‘Ingrid Bergman’, ‘Rapsody in Blue’, ‘Red Berlin’).

Temperature data was taken from the NIMH-Bucharest Centre and recorded in tables.

The culture technology was used under normal conditions, with cuts during the spring and in the growing seasons, to stimulate a new wave of blooming.

Hydric regime was also similar in the two years, without performing additional irrigation.

Biodynamic growth rate was determined at an interval of 4 weeks by measuring and calculating the average growth of shoots during May to November in each of the two years. Important phenophases (budding, leafing and blooming) were determined visually when at least 80% of the plants showed characteristic phenological aspects.

RESULTS AND DISCUSSIONS

Results of the phenophases.

Regarding phenophases, there were significant differences in blooming for up to 3 weeks between the two years, for the 'Rhapsody in Blue' variety, which in 2011 was the most tardy of all, at the opposite pole being the 'Forever Young' variety which has even shown earliness in blooming in 2012.

Also, in the case of leaves, between the two years there were differences of up to a week in most varieties. (Table 1, 2)

Table 1. Phenological phases for researched varieties in 2011

Variety	Budding	Leafing	Blooming
Abraham Darby	March 15	March 29	May 24
Acapella	March 15	March 29	May 30
Angela	March 15	March 29	May 23
Caprice de Meilland	March 14	March 29	May 24
Christoph Columbus	March 16	March 31	May 30
Forever Young	March 15	March 29	May 19
Heritage	March 15	March 29	May 25
Ingrid Bergman	March 15	March 29	May 26
Red Berlin	March 15	March 31	May 26
Rhapsody In Blue	March 15	March 31	June 7

Table 2. Phenological phases for researched varieties in 2012

Variety	Budding	Leafing	Blooming
Abraham Darby	March 26	April 5	May 13
Acapella	March 26	April 5	May 18
Angela	March 24	April 4	May 13
Caprice de Meilland	March 26	April 5	May 14
Christoph Columbus	March 26	April 5	May 20
Forever Young	March 24	April 5	May 5
Heritage	March 26	April 5	May 15
Ingrid Bergman	March 25	April 5	May 16
Red Berlin	March 24	April 4	May 13
Rhapsody In Blue	March 24	April 4	May 13

Results of the growth rate study exhibit growth averaged during the months of May to November.

The majority of the varieties showed differences in growth between the two years, with some similarities during the spring, when a more intense growth rate was recorded.

This growth rate was correlated with temperatures recorded during the months of April and December. (Table 3, Figure 1-11)

Table 3. Growth rate in 2011 and 2012

Variety	Group	May	June	July	Aug	Sept	Oct	Nov
Angela 2011	park rose	37,5	79,3	80	101	132	130,7	135
Angela 2012	park rose	46,7	44	68	53,3	77,3	128,6	122,7
Abraham Darby 2011	English rose	36,6	48,2	73	43,4	20,6	25,1	69
Abraham Darby 2012	English rose	50	55,5	19	27,9	47	60,5	67,2
Heritage 2011	English rose	14,7	45,7	79	117	99,1	37,6	97,6
Heritage 2012	English rose	43,2	63,8	69	65,1	83	84,9	91,4
Forever Young 2011	floribunda	27,1	35,9	38	10,1	5,3	16	22,4
Forever Young 2012	floribunda	18	26,4	6,2	5,6	7,9	7,8	11,5
Rhapsody In Blue 2011	floribunda	34,4	80,3	85	85	96,7	49,7	80,7
Rhapsody In Blue 2012	floribunda	35,7	38,2	27	15,7	25,9	21,3	41,3
Acapella 2011	hybrid tea	38,5	45,4	54	76,7	72,2	20,8	111
Acapella 2012	hybrid tea	47,3	54,2	74	22,8	61,6	79,2	76,5
Caprice de Meilland 2011	hybrid tea	22,6	45	67	28,1	72,2	39,6	81,7
Caprice de Meilland 2012	hybrid tea	36,4	60,8	77	22,5	68,5	84,5	81,5
Christoph Columbus 2011	hybrid tea	26,5	55	83	41,2	33,4	19,5	93,8
Christoph Columbus 2012	hybrid tea	33,6	74,7	62	37,5	38,8	116,1	122,2
Ingrid Bergman 2011	hybrid tea	22,8	50,8	58	23,2	19,8	9,7	79,6
Ingrid Bergman 2012	hybrid tea	32,8	45,4	14	16,3	30,7	24,3	36,8
Red Berlin 2011	hybrid tea	21	45,1	50	29,4	19,9	11,2	60,6
Red Berlin 2012	hybrid tea	65,4	65,6	20	48,7	59,2	59,3	31,8

On the 'Angela' variety, significant growth differences were registered between July and October (Figure 1).

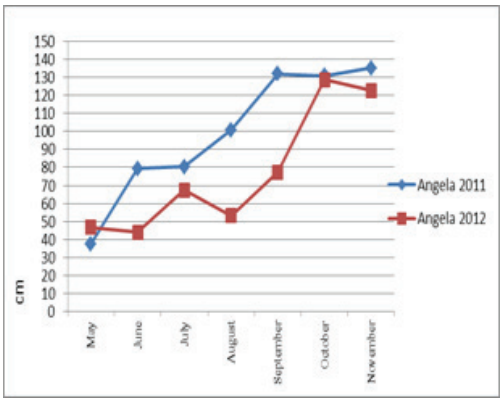

Figure 1. Average growth rate of 'Angela' variety from the park rose group

In the English roses group, major differences in the two years of study were present only in the month of July on the 'Abraham Darby' variety (Figure 2).

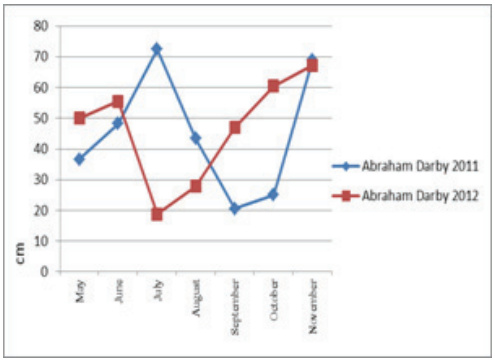

Figure 2. Average growth rate of 'Abraham Darby' variety from the English rose group

The 'Heritage' variety showed an even growth rate in 2011, but in 2012 it presented important differences in growth, with a maximum recording in August, followed by a minimum one in October (Figure 3).

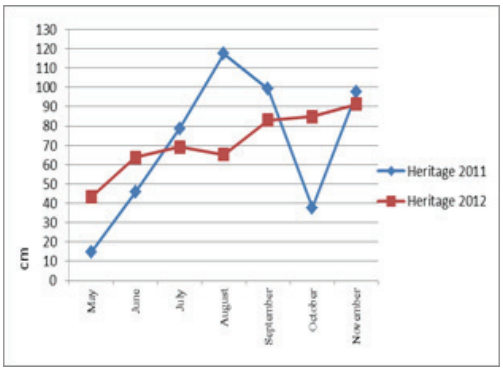

Figure 3. Average growth rate of 'Heritage' variety from the English rose group

'Forever Young ' was the variety who showed an uneven growth rate between June and October, in the floribunda group (Figure 4),

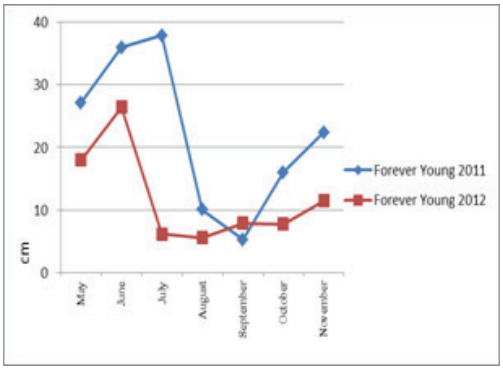

Figure 4. Average growth rate of 'Forever Young' variety from the floribunda group

'Rhapsody in Blue' presented the highest growth rate in 2011, with a maximum recording in September and with the month of November showing significant increased rates for 2012 (Figure 5).

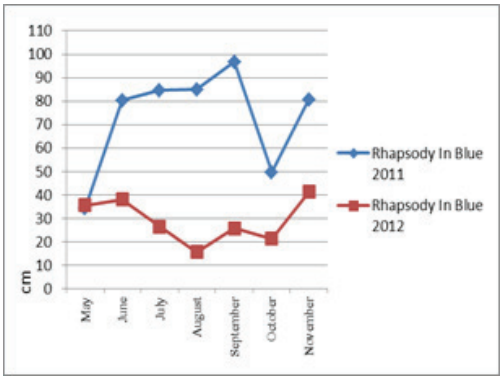

Figure 5. Average growth rate of 'Rhapsody in Blue' variety from the floribunda group

In 2011, the 'Acapella' variety presented the best growth rate in growing seasons, between the 2 years of study, with a maximum recording in November (Figure 6).

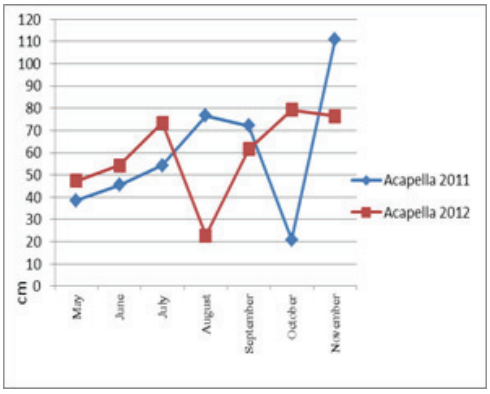

Figure 6. Average growth rate of 'Acapella' variety from the hybrid tea group

The growth rate for the 'Caprice de Meilland' was relatively even during the 2 years of study, with a significant difference recorded in the month of October (Figure 7).

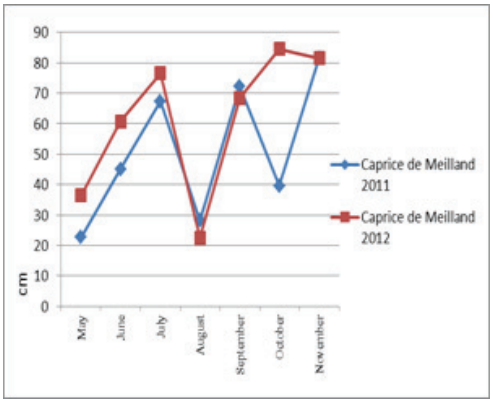

Figure 7. Average growth rate of 'Caprice de Meilland' from the hybrid tea group

November was accounted for significant increases in the 'Christoph Columbus' variety in the two years of study (Figure 8).

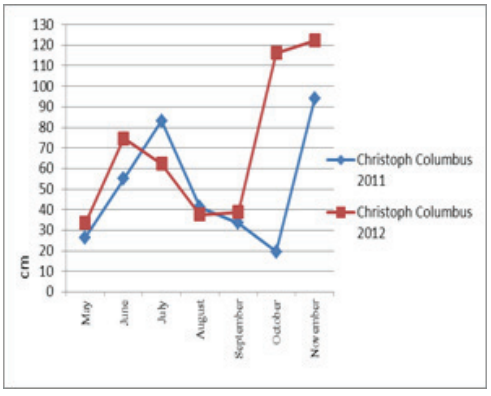

Figure 8. Average growth rate of 'Christoph Columbus' variety from the hybrid tea group

The 'Ingrid Bergman' variety showed a maximum recording in November for 2011 and in June for 2012 (Figure 9).

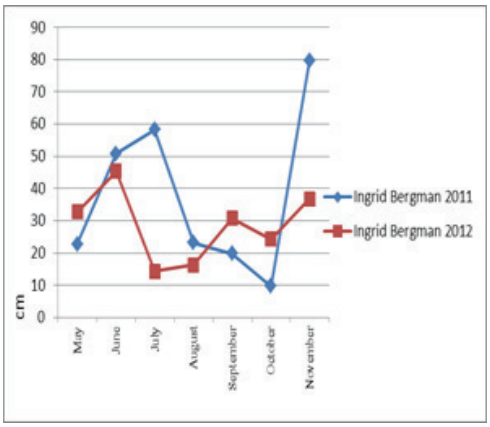

Figure 9. Average growth rate of 'Ingrid Bergman' variety from the hybrid tea group

"Red Berlin's" growth was uneven during the growing season in the two years of study, with a peak in 2012 during May-June and a minimum in July; as for 2011, the maximum was recorded in November and the minimum in October (Figure 10).

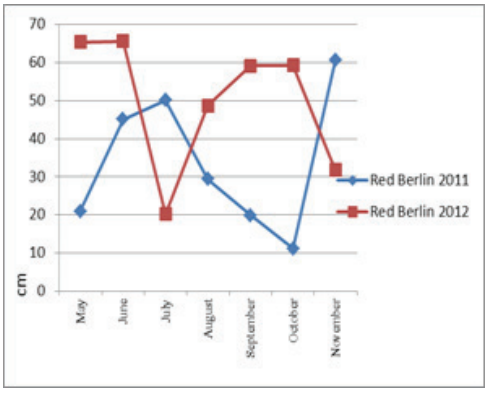

Figure 10. Average growth rate of 'Red Berlin' variety from the hybrid tea group

All of these differences in growth rate are correlated with the average temperatures recorded during the months of April and December, between the years of 2011 and 2012. In 2011 we can clearly see how temperature uniformity caused a stable increase in the growing season for the majority of varieties studied. The graphs presented above show how the cuts performed after the first wave of blooming, which were different every year, did not influence the growth rhythm on the majority of the varieties studied, with only the high temperatures recorded during the summer, being a determinate factor in the decrease of growth rate (Figure 11).

The evolution of average temperatures recorded was relatively even between the 2 years of study, with differences of only 5 degrees being recorded in similar timeframes of the year.

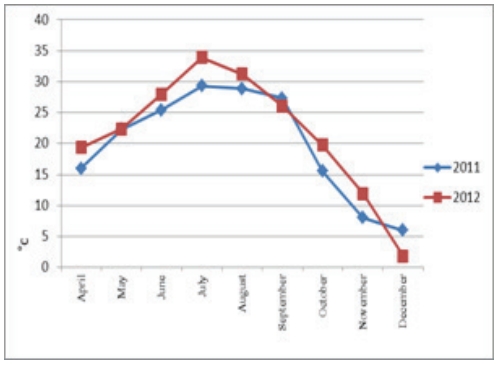

Figure 11. Average temperature recorded at 14.00 during the growth season in 2011 and 2012

CONCLUSIONS

The majority of the varieties studied showed significant differences in growth rate during the growing seasons of the 2 years of study, the only exception being the 'Caprice de Meilland' variety which showed growth rate differences in the month of October.

Climatic conditions in spring resulted in the earliness of blooming in 2012, in comparison to the same period of 2011.

Differences in growth were not affected by maintenance cuts, but with the advent of high temperatures during the summer, it caused a reduction in growth rate, which only returned to normal once the drop in temperatures appeared along with the autumn season.

The variety with the most significant increase was 'Angela', which is a park variety and has shown an average increase of 135 cm maximum in November 2011. At the opposite pole is the variety with the lowest growth, which is 'Forever Young' from the floribunda group with a maximum of 35.9 cm in July 2011.

In 2012 there were higher onset temperatures during the spring, which caused a greater increase in shoots length in the month of May.

ACKNOWLEDGEMENTS

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WINTERING RESISTANCE OF ORNAMENTAL WOODY PLANTS IN CONTAINERIZED CULTURE

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Abstract

*The target of the experience consists in establishing the level critical temperatures and the mode preservation during cold period of the year for the species and cultivars of conifers in containerized culture. Because of at the plants are fortified in container conditions, frequently occurs the phenomenon of spiraling root system, standing at the periphery of the substrate, endangered by frost and, proceeding from the need of protection during the winter, we suggest the following objectives: * the comparative comportment of the species and cultivars during the cold season, depending on the way of storage; * the species and cultivars resistance at low temperatures, depending on the ecological requirements of plants. For containerized culture of ornamental species and cultivars were established following conservation cold season: V_1 – protected plants displayed in greenhouse; V_2 – protected plants and exposed outdoor but covered with protective acrylic cloth; V_3 – plants unprotected and exposed outdoors throughout the cold period. As a result of the study it was found that the species and cultivars of conifers remarked the highest coefficient – 100% resistance at low temperatures, where all three variants of wintering (V_1, V_2, V_3), at the end of the cold period the plants were started in vegetation and there were no damages caused by the frost.*

Key words: *resistance wintering, containerized culture, preservation variants and cultivars.*

INTRODUCTION

Roots of the plants in the open field are protected from the soil mass and penetrates deeper, thus preserving it from the excess of high and reduced temperatures. At the fall of frost, the temperature sometimes decreases more than a few degrees below the critical point, except the portion from the soil surface. Different behaviors have the plants roots in containerized culture from the temperate and sub temperate zone, where the freezing point is not lethal, comparatively with the temperate-continental climate in the Republic of Moldova. In temperate zone, the aerial part of the majority of species possesses the ability of increasing their resistance to wintering, from the moment of reducing the duration of the day and the decreasing of fall temperatures. On the contrary, the containerized plant roots in local conditions have a reduced capacity for resistance to wintering or even are missing. At the plants grown in the cylindrical shape containers is often the phenomenon of spiraling of the roots, so the young roots are much more vulnerable to the injuries caused by the low temperatures. In that case, the container thickness of the wall performs the duties of the protector of roots to lethal temperatures. If the temperatures, fall below the critical point for some time, the roots, coming in contact with the interior surface of the container, freezes. In such cases, the roots regenerate from the remaining who survived inside the culture substrate and from the base of the plant. Therefore, if the temperature persists at or below the lethal point then the temperature of the culture substratum integral mass also reaches the lethal temperatures, thus completely destroying the root system. The degree of deterioration of the root system is difficult to determine until start the vegetation season and only when takes place the desiccation we can establish the full effect of the damage state (Rosca, 2003). From a technological point of view is recommended the transferring of suspicious moderately affected plants in greenhouses heated (Gouin, 1973; Rosca, 2003). More authors attest the

fact that root injuries is the major factor which limits the containerized culture in the northern countries and was established that *Taxus* x *media* 'Hatfieldi' young white roots freezes at the temperature of − 3°C, those secondary red-maroon at − 7°C and the mature stem from the base does not freeze until − 19°C (Mityga et al., 1971; Rosca, 2009).

MATERIALS AND METHODS

For containerized culture of ornamental coniferous species and cultivars such as: *Abies concolor* Lindl. et Gord., *Abies nordmanniana* (Stev.) Spach., *Juniperus communis* 'Meyer', *Picea glauca* 'Conica', *Picea pungens* f. *glauca* (Reg.) Beissn, *Taxus baccata* L., *Taxus* x *media* 'Hatfieldii', *Taxus* x *media* 'Wojtec', *Thuja occidentalis* 'Danica', *Thuja occidentalis* 'Fastigiata', *Thuja occidentalis* 'Holmstrup', *Thuja occidentalis* 'Smaragd', *Thuja orientalis* 'Aurea Nana' following variants of preservation for the cold period of year have been established: **V_1** − protected plants displayed in greenhouse; **V_2** − protected plants and exposed outdoor but covered with protective acrylic cloth; **V_3** −unprotected plants and exposed outdoors throughout the cold period. In the experience were involved by 20 units / cultivar for each variant of preservation and was carried out between 1.XI.2007-15.IV.2008. Meteorological data on the period XI.2007-IV.2008 were registered in Chisinau and taken from State Hydrometeorological Service (Table 1).

Table 1. Containerized plant resistance at low temperatures.

Species and cultivars	Number of plants exposed on 15.11.07., units $t^o = +11^oC;-4,9^oC$			Number of plants preserved on 15.04.08., units		
	Wintering variants					
	greenhouses	protected	unprotected	greenhouses	protected	unprotected
Abies concolor Lindl. et Gord.	20	20	20	20	20	20
Abies nordmanniana (Stev.) Spach.	20	20	20	20	20	20
Juniperus communis 'Meyer'.	20	20	20	20	20	20
Picea glauca 'Conica'	20	20	20	20	20	20
Picea pungens f. *glauca* (Reg.) Beissn.	20	20	20	20	20	20
Taxus baccata L.	20	20	20	20	20	20
Taxus x *media.* 'Hatfieldii'	20	20	20	20	20	20
Taxus x *media* 'Wojtec'	20	20	20	20	20	20
Thuja occidentalis 'Danica'	20	20	20	20	20	20
Thuja occidentalis 'Fastigiata'	20	20	20	20	20	20
Thuja occidentalis 'Holmstrup'	20	20	20	20	20	20
Thuja occidentalis 'Smaragd'	20	20	20	20	20	20
Thuja orientalis 'Aurea Nana'	20	20	20	20	20	20

RESULTS AND DISCUSSIONS

The plants experimented concerning the resistance to low temperatures, depending on the three types of wintering it consists of species and cultivars of conifers. The obtained results on wintering containerized conifer yield are shown in Figures 1-5, Table 1.

On the basis of investigations regarding the behavior of species and cultivars under the conditions of containerized culture, their resistance to low temperatures, depending on the mode of conservation, we obtained the following results:

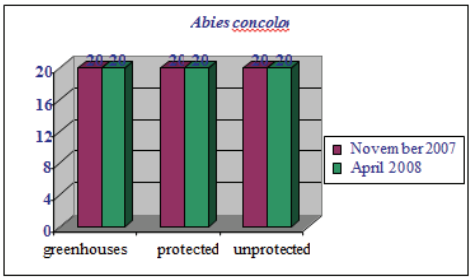


Figure 1. Number of plants preserved after wintering at the species Abies concolor Lindl. et Gord.

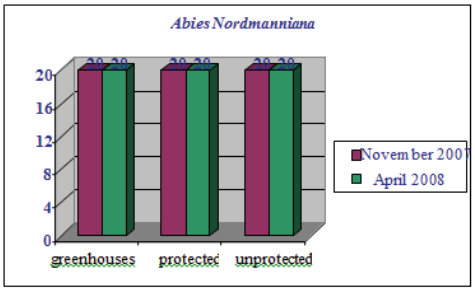


Figure 2. Number of plants preserved after wintering at the species Abies nordmanniana (Stev.) Spach.

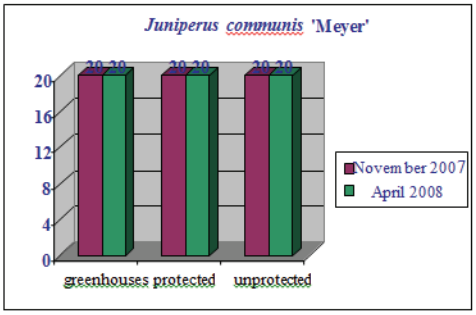
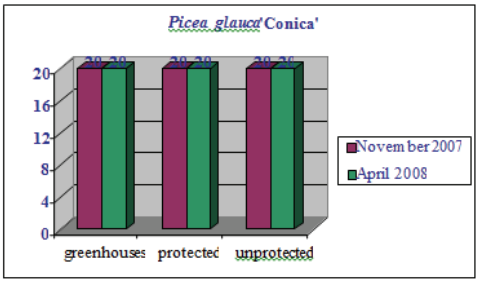


Figure 3. Number of plants preserved after wintering at the cultivar Juniperus communis



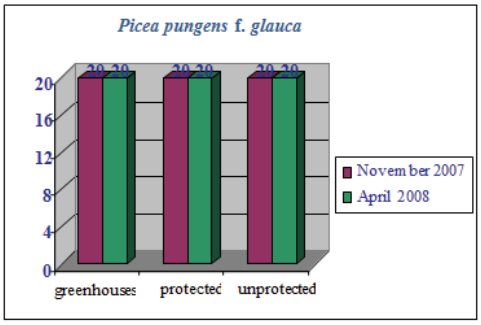


Figure 4. Number of plants preserved after wintering at the species Picea pungens f. glauca (Reg.) Beissn.

Figure 5. Outdoor wintering mode.

Figure 6. Plants coated with protective acrylic cloth.

Figure 7. Plants placed in the greenhouse for wintering.

CONCLUSIONS

As a result of the study it was established that the species and cultivars ***of conifers*** have remarked the highest ratio-**100%** of resistance at low temperatures, in all three types of wintering (**V_1**, **V_2**, **V_3**), which started at the end of the cold vegetation and there were does not injuries caused by the frost.

We recommend that the species and cultivars of ornamental woody plants in conditions of containerized culture must be maintained during the cold season of the year, with the *fast rhythm* of growing – in conditions of greenhouses – **V_1**, those with *slowrhythm* of growth, protected with acrylic cloth, and exposed outdoors – **V_2**.

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QUALITY PARAMETERS OF URBAN GREEN SPACES

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Abstract

The study approaches the problem of urban green space quality by relating the classic functional-aesthetic binomial with the ecological aspects of quality; the work analyzes the implication of ecological factors in the ensemble of urban green quality, considering that the green space is a fundamental component of the urban ecosystem and vegetation is one of the components of this interactive system which includes the socio-economic system with all its functional and spatial structures, urban biotope and biocenosis.

Key words: *aesthetic functions, quality, urban green space.*

INTRODUCTION

The urban green space can be defined as the part of the urban territory which is composed of organized (and unorganized) vegetal mass, and which′s character results from the interaction of several factors: human, socio-economical, cultural and environmental. Starting from this definition, one can assert that the quality of the urban green space is the ensemble of positive response effects to the biological and socio-economical needs of urban existence, but also to the need of urban ambience defined by the psyche-social needs of spatial identity and affiliation to the cultural landscape.

MATERIALS AND METHODS

The quality of urban green space is assigned the meaning of quality-value as a positive characteristic which results from two types of measurable and immeasurable characteristics:

1. Primary qualities which respond to biological and socio-economical needs by direct effects in the general state of health, of the environment and of micro-climate.
2. Secondary qualities which respond to the psyche-social needs through indirect effects on the psychological plan

The quality of the urban green is directly and mandatory involved in the quality state of the urban environment through its positive and effects in the different areas of interest: spatial planning, functional, aesthetic-ambient and ecological, having unchallenged effects in the ensemble of life quality.

The environmental factors which affect the urban space (climate, soil, landscape, biological and anthropical) also influence the quality of the green spaces, through a multitude of components (social, physical-chemical, inorganic and organic) which affect the state of balance of the urban ecosystem and thus the quality of the green infrastructure from the city. There can be made the assertion that the ecological field related to the quality of urban green is far more ample in proportion to the classical approach − through the functional-aesthetic binomial − and that it presumes interdependency relations between the fields of spatial-functional, aesthetic and ecological. The classical approach of quality by means of the functional-aesthetical binomial and the implication of the ecological factor conduce to the idea that the parameters of functionality represent criteria for evaluating the quality of urban green spaces, having as the result the efficiency in using the planted areas of the city (by enhancing the degree of socialization).

RESULTS AND DISCUSSIONS

The synthesis of the criteria and determinant factors of the urban green quality (Table 1) will take into consideration 4 levels of approach: physical, functional, aesthetical and ecological. Each of these approach levels is determined by a series of components, significance, criteria

and parameters of quality. The physical approach level primarily includes components which relate to the emplacement inside the city, localization through the relation green space – site, dimensioning, mean and duration of usage, shape. The functional approach level includes the following components: the functional character and the functional profile. The aesthetic approach level includes three components: stylistic composition, principles of composition and composition elements. The level of ecological approach takes into consideration the fact that the urban green system is an essential component of the urban ecosystem and also the ecological impact generated by the urban green system on the city. All these components, along with the significances, criteria, parameters and quantitative and qualitative determinations are integrated in the table 1.

CONCLUSIONS

The features and components of the overall urban green space quality are determined by the different types of approach:

-spatial-functional structure defined by the location inside the city and the relationship with it, dimensioning, shape, character and profile of functionality; all these have quantitative determinations and qualitative expression through effects: superior exploitation of the natural potential, percentages and proportions of the green texture and of the built texture, orientation, information, significance, accessibility, comfort in usage, multi-functionality through the recreational links, complexity and efficiency through spatial-functional diversity (Figure 1)

-the aesthetic approach defines the qualitative components which can be expressed through significance, semantics, aesthetical diversity, participation in the creation of urban ambiance and contribution to the forming of the cultural landscape (Figure 2)

-the ecologic approach includes components and features of quality which are expressed through efficiency in social and human plan: urban comfort, life quality, efficiency in the micro-climate plan, with positive effects in the improvement of urban environment conditions (Figure 3).

Table 1. Factors of the urban green quality

LEVEL OF APPROACH	COMPONENTS	SIGNIFICANCE ASSIGNED	QUALITY – CRITERIA, PARAMETERS, FACTORS		
			QUANTITATIVE DETERMINATION	QUALITATIVE DETERMINATION	STATEMENT
PHYSICAL LEVEL OF APPROACH	EMPLACEMENT - inside the city as an urban ensemble - the relation city - green structure	- compared to the residence areas - compared to the working areas - compared to endowments - compared to traffic	- distances	- zonation (areas, bands, points) - direction	- urban comfort - exploitation of natural potential
	- positioning inside the urban GS system - relation GS – system of GS	- in proportion to the same type of GS units - in proportion to different types of GS units	- distances	- personalization element of the green ensemble	- orientation (guiding marks) - information - significance
	- localization: relation GS – site	- in proportion to the proximities - in proportion to natural elements - in proportion to built areas		- accordance with the natural character of the site - harmony - contrast - neutrality	- decrease in time and distances to cover - accessibility - major influence on proximities
	DIMENSIONING - influence range	- surfaces - time for transiting	- ha (m2) of GS - minutes (hours)		- accessibility - comfort
	- serviced population	- users - number of	- indexes m2 of GS/user		- facility of usage - accessibility

		inhabitants from the serviced area - surface serviced	- m2 GS/inhabitant - m2 GS/ha (urban surface)		
	- means of usage	- individual - group	- number of users	- organized - unorganized - mixed	- social efficiency
	COMPONENTS	**SIGNIFICANCE ASSIGNED**	**QUALITY – CRITERIA, PARAMETERS, FACTORS**		
			QUANTITATIVE DETERMINATION	**QUALITATIVE DETERMINATION**	**STATEMENT**
	- usage span	- mean period of usage	- usage mean (hours) - maximum and minimum period of usage	- differential usage on categories of users	- comfort degree
	SHAPE	- point-like (spots)	- surface (m2/ha)	- diversification	- major influence on proximities - accessibility
		- linear	- length (m, km)	- direction - orientation	- decrease in physical discomfort on urban arteries
		- bands	- surface (m2, ha)	- contribution to physical structure of urban areas	- creation of urban green corridors - chain of recreational links
		- plasmatic	- surface (m2, ha) - perimeters (m, km)	- repartition and diffusive form	- beneficial effects in the urban microclimate - variety of the urban texture
FUNCTIONAL LEVEL OF APPROACH	FUNCTIONALITY CHARACTER	- integrated	- number of unites of GS - types of endowments - equipment, installations - functioning capacities	- inclusion in other urban functions (residence, commerce, culture, traffic, industry)	- mono-functionality - specialization
	COMPONENTS	**SIGNIFICANCE ASSIGNED**	**QUALITY – CRITERIA, PARAMETERS, FACTORS**		
			QUANTITATIVE DETERMINATION	**QUALITATIVE DETERMINATION**	**STATEMENT**
	FUNCTIONALITY CHARACTER	- integrator	- balance of GS functions in proportion to other integrated urban functions (percentages) - types of GS specific and complex endowments	- complexity of integrated functions - functional hierarchy	- multi-functionality - variety - complexity - superior functional integration at urban level - socialization
	FUNCTIONAL PROFILE	- mono-functional	- profile specific endowments - equipment, installations - arranged spaces (plantations and constructions)	- specificity of arrangements in proportion to users profiles and categories	- specialization - increased activity for distinct categories of users
		- multi-functional	- complex endowments, equipments, installations and	- balance of functional elements in relation to: - importance	- functional efficiency - functional diversity

			arrangements - plantation surfaces (m2, ha) - proportions, percentages	- users (percentages)	- increased degree of activity for all users categories - socialization
AESTHETICAL LEVEL OF APPROACH	STYLISTIC COMPOSITION	- architectural-geometric - free-landscape - mixed	- usage of style in different proportions (total, partial) - proportions, percentages	- unit - variety - conformism - nonconformism	- contribution to defining the cultural landscape
	COMPONENTS	**SIGNIFICANCE ASSIGNED**	**QUALITY – CRITERIA, PARAMETERS, FACTORS**		
			QUANTITATIVE DETERMINATION	**QUALITATIVE DETERMINATION**	**STATEMENT**
	COMPOSITION PRINCIPLES	- symmetry, asymmetry - axis - perspective - dominant - compositional centre - focal point - rhythm - harmony - contrast - accent - graduation	- proportion of usage in the compositional ensemble	- compositional character and anticipated effects: - dynamic - static - exuberant, sad - order, equilibrium - stringency - hierarchy - cohesion - diffuse - highlighting	- semantic significance: - grandeur - monumental - uniformity - variety - variety - illustrative - eloquence - plasticity
	COMPOSITION ELEMENTS	- landscape	- volume	- texture - proportion vegetal-mineral - shape, contour - symbolic language elements	- creation of specific and general ambiance - aesthetic diversity
		- waters			- surface
		- vegetation			- species
		- traffics			- construction and decorative materials
					- decorative objects
		- colour	- different rates and proportions in the colour spectrum	- base colours (primary and secondary)	- significance: symbol of the physical or functional character
		- light and shade	- brightness, penumbra, shade (rates and percentages)	- natural - artificial	- opportunity of character expression - visual and functional variety - comfort
LEVEL OF APPROACH	**COMPONENTS**	**SIGNIFICANCE ASSIGNED**	**QUALITY – CRITERIA, PARAMETERS, FACTORS**		
			QUANTITATIVE DETERMINATION	**QUALITATIVE DETERMINATION**	**STATEMENT**
ECOLOGICAL	THE URBAN GREEN SPACE SYSTEM – COMPONENT OF THE URBAN ECOSYSTEM	- presence in the urban area: - zoning - disseminated - concentrated - linear - punctual	- positioning - distances - influence range - plantations density - dominant species (percentages)	- amelioration of urban environmental conditions in grounds of: - sanitary - psychological - microclimatic	- diversity of urban texture - urban comfort - life quality - biodiversity - cultural landscape
	ECOLOGICAL IMPACT	- square - garden - park	- amelioration indexes of noxae and pollution (air, water,	- influence on proximities: - maximum	- efficiency in socio-human plan:

		- street bands and alignments	soil, dust, noise) - state of vegetation (percentages of ageing) - resistant/non-resistant species	- medium - minimum	- diversification of recreational activities - culture - education - efficiency in microclimate plan

Figure 1. Expo 2002 – Swiss National Expo – Yverdon-les-Bains, Switzerland. Image from inside the exhibition.

Figure 2. Image from Foggy Bottom, Norfolk, England. The vegetal element dominates through the composition of herbs and conifers.

Figure 3. Image from Tineretului Park, Bucharest.

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DENDROLOGIC SPECIES IN STREET PLANTATIONS WITH SOUND-INSULATING ROLE

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Abstract

The study analyses the capacity of different dendrologic species to diminish noise and also considers optimum varieties of urban street plantations composition with the scope of noise reduction. Optimization restrictions will be analyzed – especially extreme restrictions – along with optimization factors which depend on the dendrologic species assortment and the quality of the architectural-landscape composition of the plantation; these aspects concord with some spatial decree restrictions which the landscape specialist must provide for when completing the sound-insulating street plantations.

Key words: *arbours, scrubs, sound-insulating, street plantation.*

INTRODUCTION

Street plantations are urban green spaces of general usage which accompany (border) the traffic arteries of the city; these plantations are subjected to pollution aggression and noxae generated by traffic. Phonic pollution is one of the aspects of urban environmental pollution, which leads to the necessity of studying optimization versions of noise reduction.

The capacity of alignment plantations to decrease sound depends on the dendrological species assortment, but also on their means of arrangement by composition manner and spatial-volumetric association of the species.

MATERIALS AND METHODS

The optimization of street alignments compositions for noise reduction purposes is based on extreme conditions: dense and small leafage, dense ramifications and small intervals between leaf nodes.

Noise attenuation differs according to species: *Acer pseudoplatanus* reduces noise by 10-12 dB, *Tilia platyphilos* and *Viburnum lantana* reduce noise by 8-10 dB, while *Carpinus betulus*, *Quercus robur*, *Ilex aquifolium* and *Syringa vulgaris* reduce noise by 6-8 dB.

Considering that noise is reduced by propagation (at the distance d) with 5 dB in the absence of plantations, the same noise (with the value of N dB) will be reduced by 5 dB at half the distance (d/2) when plantations are encountered; in the case of an optimized plantation with dense leafage, the decrease in noise at the distance d/2 is even greater: NdB – 5dB – (10+6) dB (Figure 1).

Distribution manner and spatial-volumetric association of species from street plantations may be accomplished by complex composition of alignments; the composition of complex alignments may include deciduous or rasineferous arbors and scrubs and hedges.

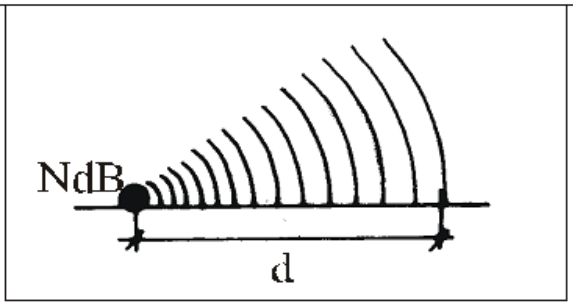
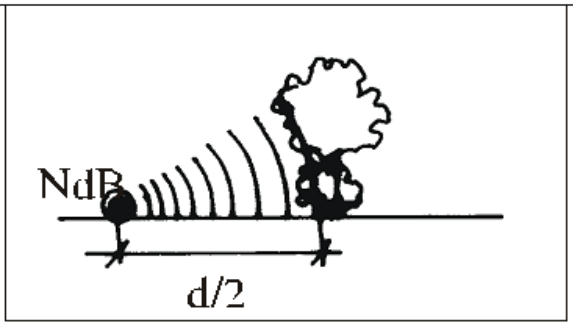
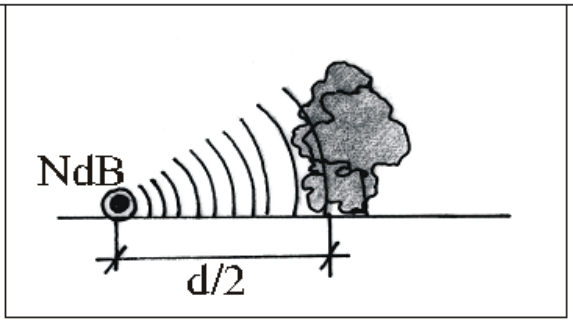
Version without plantation		At distance d, noise is reduced by 5 dB NdB-5dBB
Un-optimized version – regular plantation		Noise is reduced at the distance d/2 NdB-5dB
Optimized version – plantation with dense leafage and large leafs ACER PSEUDOPLATANUS ILEX AQUIFOLIUM		Noise is reduced at the distance d/2 and also with the value of (10+6)dB NdB-5dB-16dB

Figure 1. Optimized version of complex alignments

RESULTS AND DISCUSSIONS

Analyzing some solution versions (Figure 2, 3, 4) for some complex alignments, one can understand the aesthetic diversity given by rhythm elements (1-4 individuals which form the cadence of the rhythm), the alternation of deciduous species (as repeatability elements) with the rasineferous species (as rhythm elements), or the alternation of arbor species with scrub species (hedges or un-pared scrubs). The arrangement of these samples on several height registries (on foreground the short or medium vegetation and on background the tall vegetation) has as aesthetic role as well as an utilitarian one – noise and noxae reduction, achieving an optimal effect of encapsulation from noise, dust and noxae. Therefore, a qualitative-cumulative effects are obtained through the simultaneous presence of qualities and aesthetical effects, and also of those with protection roles against noise and various noxae.

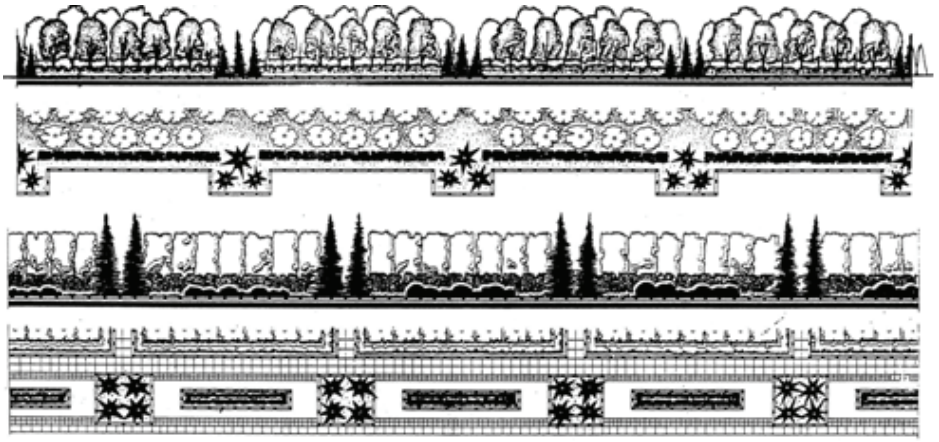


Figure 2. Version 1 of complex alignments

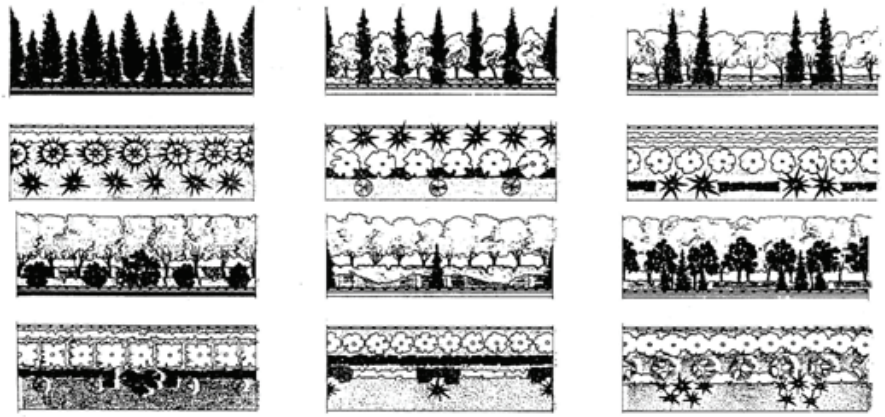


Figure 3. Version 2 of complex alignments

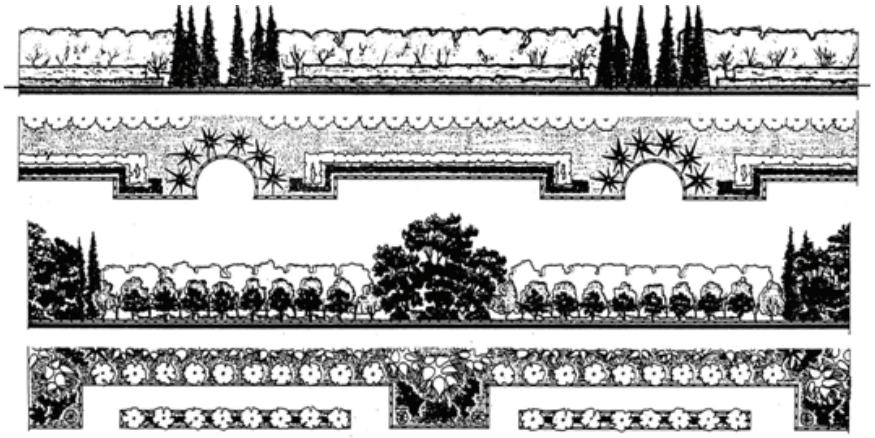


Figure 4. Version 3 of complex alignments

CONCLUSIONS

The optimized version (Figure 1) of completing complex alignments has a series of optimization restrictions: extremal conditions (dense leafage, small leafs, dense ramifications and small intervals between leaf nodes), spatial restrictions which refer to distances and available spaces for planting great numbers of arbors and scrubs, and alternative distribution of species.

In conclusion, optimization is achieved through quantity (large number of plants) and quality (adequate species according to the stated criteria).

In order to create optimum street alignments, the aesthetic aspect must also be taken account (Figure 2, 3, 4), which is realized through the combination of deciduous and rasineferous species of arbors and scrubs.

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MISCELLANEOUS


EX·TERRA·AVRVM

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THE INFLUENCE OF CLIMATIC CONDITIONS ON THE GRAPE QUALITY IN THE WINE CENTER OF MURFATLAR IN 2012

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Abstract

The overall climatic conditions, through the main three factors (temperature, sunlight and humidity), exert a major influence on the quality and quantity of the grapes produced during a particular year. For this work, studies were performed on several white and black grape varieties authorized for culture in the vineyards of Murfatlar, by following the parameters that define the grape maturation (evolution of sugar accumulation, decrease of acids concentration and evolution of berry weight) and the grape quality at the harvest time. The studies showed that the year 2012 was a hot one, with a period of sunshine recorded during the grapevine vegetation exceeding normal value (average of 50 years) by 173.4 hours. The quantity of precipitations was similar to the level recorded as the multiannual average, but the rain distribution was not uniform during the vegetation period. These particularities led to an unsatisfactory development of the berries and lower yield. Due to the longer period with higher temperatures the ripening was premature, with a certain benefit in favour of sugar accumulation, while the must acidity was insufficient, due to a more intense catabolism at these temperatures. The harvest time started earlier for all the varieties, the recorded yields were much lower, but the grapes were not affected by rot or other diseases. Due to the fact that the grape ripening depends on the climate parameters of the year and on the region, in order to decide the optimum harvest period for a certain type of wine the evolution of the grape maturity parameters should be determined each year and the change in climatic influences should be systematically recorded.

Key words: *climatic, grape, Murfatlar.*

INTRODUCTION

The influence of climate on agriculture and especially on viticulture and wine production has never been more obvious than today. What remains to be argued is the critical aspect regarding the optimal maturation time of grapes, so that the wine obtained could acquire the characteristics of a quality wine (Tate, 2001; Bisson *et al*., 2002; Schultz and Jones, 2010).

History has shown that winegrape growing regions developed when the climate was most conducive and that shifts in viable wine-producing regions have occurred due to climate changes in the past (Le Roy Ladurie, 1971; Pfister, 1988; Jones, 2006).

For example, in any viticultural region, the accumulation of sugars in grapes in optimal concentrations now happens in a shorter time than before. Same is true about total acidity and the aromatic profile optimal for winemaking. In a warmer-than-normal environment, the grapevine passes through the various phenological phases faster, reaching technological maturity sooner and accumulating higher concentrations of sugars in the berries. While the grower or the winemaker awaits for the grapes to gather aroma compounds, the acidity is lost by respiration and the resulted wines lack balance and need corrections in the cellar. As a result of the warming of climate, in various regions a higher concentration of alcohol in wines was observed (Jones, 2007).

MATERIALS AND METHODS

The study was carried out in the Murfatlar viticultural center and was aimed at both renowned grape varieties for white and red wines (Chardonnay, Riesling Italian, Sauvignon blanc, Feteasca regala, Cabernet Sauvignon, Pinot noir, Merlot, Feteasca neagra) as well as varieties obtained by researchers

from SCDVV Murfatlar (Columna and Mamaia) from the 2012 harvest.
The data regarding climate were recorded using the weather station of the research station, model Weather Master 2000.
The dynamics of grape maturation for the studied varieties was monitored by following the accumulation of sugars and the decrease of acidity. At the same time, the evolution of the weight of the berries was also monitored.
The determinations were made every 7 days, on dates established in advance. A number of 5 berries were harvested from each grape, as follows: one berry from the left side, one from the right side, one from center-front, one from center-back and one from the basis of the grape. The 5 berries each were harvested from 60 grapes (thus giving a total of 300 berries to analyze). The 60 grapes were made of 10 grapes chosen from each of the 6 rows selected at random, and the location of each grape on the rows was chosen in zig-zag. The harvested berries were put in labeled plastic bags and transported to the laboratory in a cooler box, avoiding their crushing and heating.
The determination of sugars was done using a Smart electronic refractometer, on the basis of the percentage of dry matter in the grapes. The read values were adjusted for temperature and the value of the sugar content of the must was derived using data tables.
The acidity of the must was measured by titrimetry by neutralizing the acids in a determined amount of must using a solution of NaOH of known factor. Based on the amount of base solution used during the titration, the total acidity of the must can be calculated.
The total acidity was expressed in g/l H_2SO_4.
The determination of the weight of the berries was done using a laboratory technical scale, taking data on the weight of 100 berries.

RESULTS AND DISCUSSIONS

The climatic conditions of the year, namely the main three factors (heat, light, humidity) exercise an important influence on the process of grape maturation. This influence can actually decide the yield and the quality of that year′s crop. In Table 1, the data on the three climate factors of 2012 are compared to the multi-year averages recorded during the last 50 years in the viticultural center of Murfatlar, which are considered ″normal″.
The sum of temperature degrees in the period of vegetation of 2012 was 4100.8°C, compared to the average value of 3449°C. That is 651.8°C more than what is considered the normal value.
The maximum temperature recorded in this period was 39.8ºC (in August), and the lowest temperature recorded was-2ºC (in April).
Regarding the precipitations, the sum of rainfall was 246.4 mm, compared to the average value of 245.7 mm. So the difference was very small, but the distribution in time of the rainfall was not uniform.
The total sunshine time was 1780.6 hours, compared to the average of 1587.2 hours (see Table 1).

Table 1. Evolution of air temperature, precipitations and sunshine time during the growth season 2012, compared to the multi-year averages

Month	Air temperature				Precipitations		Duration of sunshine	
	T avg (50 years average)	T avg (°C)	Average T min (°C)	Average T max (°C)	Multi-year average	(mm)	Multi-year average	hours
April	10.2	14.5	-2.0	28.6	33.5	44.5	160.7	210.1
May	16.2	19.8	8.4	31.0	50.2	145	261.8	281.1
June	20.4	21.2	12.6	37.2	53.2	7.4	314.5	314.0
July	22.6	28.0	13.1	38.2	35.6	33.2	323.7	341.6
August	22.6	26.1	10.7	39.8	31.6	8.8	305.5	345.6
September	17.6	20.7	7.8	36.0	41.6	5.6	221.0	288.2

The accumulation of sugars in the berries, between the beginning of ripening and full maturity, happens quickly and in large concentrations. The increase is faster in the first 2-4 weeks at the beginning of the process, and later slows down and even stagnates for a period of 3-5 days (Cotea, 1985).
The concentration of accumulated sugars in the white varieties at full maturity (Figure 1) was

between 182-212 g/l, the lowest value being measured for the variety Feteasca regala and the highest value been seen in Italian Riesling.

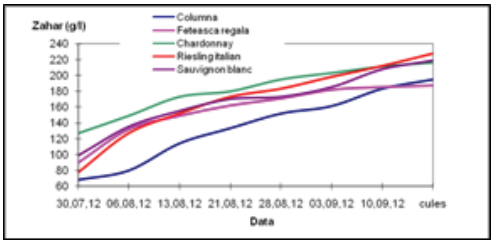

Figure 1. Evolution of the concentration of sugar for the varieties for white wines

In case of the red varieties (Figure 2) the concentration of sugars at full maturity varied between 192 and 219 g/l, the lowest value being seen in Cabernet Sauvignon and the highest value measured for Merlot and Pinot noir.

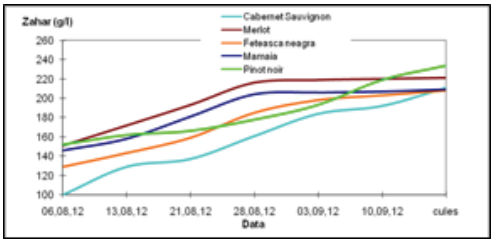

Figure 2. Evolution of the concentration of sugar in the varieties for red wines

The maximum weight of 100 berries of white varieties (Figure 3) was attained in grapes of Columna variety (163 g on September 10). That means that from the beginning of ripening to full maturity the weight of 100 berries increased with 94 g. Afterwards, until harvesting, the grapes lost some weight so that 100 berries weighed 7 g less than at full maturity.

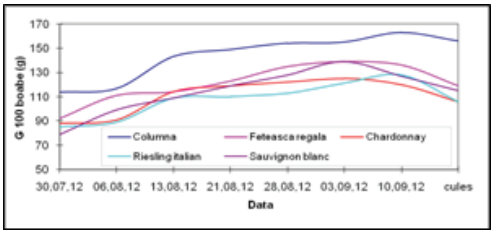

Figure 3. Evolution of the weight of 100 berries for the varieties for white wines

In case of the varieties for red wines the maximum weight of 100 berries was reached by the grapes of Mamaia variety, which weighed 220 g at September 10 (Figure 4). From the beginning of ripening to full maturity the 100 berries gained 64 g, and after that, until the harvesting date (September 18) they lost a mere 2 g.

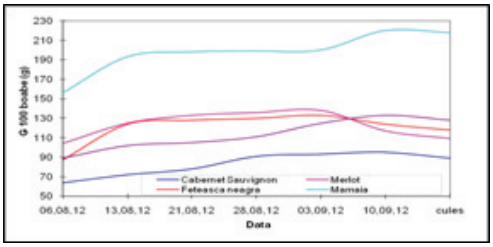

Figure 4. Evolution of the weight of 100 berries for the varieties for red wines

Under the conditions of the Murfatlar viticultural center the fastest decrease of acidity (the steepest slope on the graph) was observed at the white varieties for the variety Italian Riesling – from 23.7 g/l to 5.2 g/l (Figure 5). The mildest slope (the slowest decrease) was recorded for the variety Feteasca regala, from 14.0 g/l to 5.0 g/l.

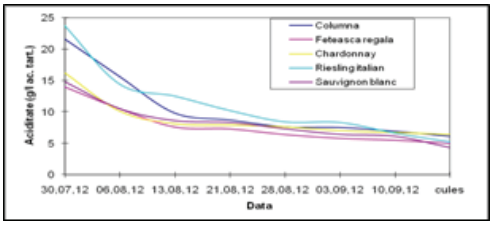

Figure 5. Evolution of total acidity for the varieties for white wines

In case of the varieties for red wines (Figure 6), the steeps slope of the graph of acidity was observed for Cabernet Sauvignon, from 20.3 g/l to 5.5 g/l, and the mildest slope was recorded for the Mamaia variety, from 8.5 g/l to 5.6 g/l.

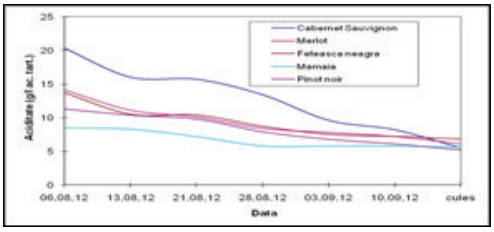

Figure 6. Evolution of total acidity for the varieties for red wines

The rate of accumulation of sugar in the varieties for white wines was between 1.96 and 3.12 g/day, with the lowest value in case of Chardonnay and the highest value for Italian Riesling. As for the varieties for red wines, the rate of accumulation of sugars was between 2.13 g/day (Cabernet Sauvignon) and 1.42 g/day (Mamaia) (see Table 2).

Table 2. Rate of accumulation of sugars

Variety	Sugar (g/day)
-for white wines	
Chardonnay	1.96
Columna	2.66
Feteasca regala	2.22
Italian Riesling	3.12
Sauvignon blanc	2.53
-for red wines	
Cabernet Sauvignon	2.13
Merlot	1.60
Feteasca neagra	1.72
Mamaia	1.42
Pinot noir	1.56

The rate of decrease of total acidity for the varieties for white wines was between 0.83 and 1.03 g/day, with the lowest value observed for Columna variety and the highest rate in Italian Riesling. As regards the varieties for red wines, the highest rate of decrease in total acidity was observed for the variety Pinot noir (0.80 g/day) and the lowest rate of decrease was seen in Cabernet Sauvignon and Mamaia (0.66 g/day, Table 3).

Table 3. Rate of decrease in total acidity

Variety	Metabolisation of acids (g/l/day)
-for white wines	
Chardonnay	0.84
Columna	0.83
Feteasca regala	0.97
Riesling Italian	1.03
Sauvignon blanc	0.97
-for red wines	
Cabernet Sauvignon	0.66
Merlot	0.71
Feteasca neagra	0.67
Mamaia	0.66
Pinot noir	0.80

All the grape varieties registered sugar concentrations between 195 and 234 g/l which alows them to be used for the production of wines with controlled denomination of origin, with the exception of the variety Feteasca regala which met the conditions for the Geographical Indication "Colinele Dobrogei" (Table 4.)

Table 4. Physico-chemical characteristics of the grapes obtained in the Murfatlar viticultural center, 2012 harvest

Variety	Date	Physico-chemical characteristics			Quality level*		
		Sugar (g/l)	Acidity (g/l ac. tartric)	Weight 100 grains (g)	Table wines	Wines with Geographical Indication	Wines with Controlled Denomination of Origin
					144.6-178.5	178.6-187.0	> 187.1
Varieties for white wines							
Chardonnay	14.09.2012	216	6.12	106			x
Columna	19.09.2012	195	5.05	156			x
Feteasca regala	15.09.2012	187	6.43	119		x	
Riesling Italian	20.09.2012	228	5.20	106			x
Sauvignon blanc	21.09.2012	219	4.28	139			x
Varieties for red wines							
Cabernet Sauvignon	25.09.2012	211	5.51	95			x
Merlot	17.09.2012	221	6.12	109			x
Feteasca neagra	13.09.2012	208	6.89	118			x
Mamaia	18.09.2012	209	5.66	218			x
Pinot noir	24.09.2012	234	5.20	133			x

CONCLUSIONS

This study showed that 2012 was a hot year, with a total sunshine duration in the vegetation period that was 173.4 hours longer than normal. The level of precipitations in the same period remained similar to the multi-year average, but rainfall was not distributed uniformly. These factors led to an early development of the grape berries, the rise in temperature having a positive impact on the accumulation of sugars in the grapes. The acidity of must at harvest time showed lower than optimal values, due to the early arrival of the ripening phase and to a highest rate of metabolisation of organic acids at higher temperatures.

The unusual aspect of the 2012 harvest was that some of the varieties for red wines reached full maturity at the same time with certain varieties for white wines. This phenomenon occurs only in dry years with hot summers, when the maturation of grapes is forced and most varieties mature at the same time.

The ripening of grapes differs from one year to another and from one vineyard to another, according to climate conditions, and therefore every year every grower must carefully monitor the ripening of each variety.

The harvesting of the grapes is a very important operation which must be done at the right time, since it has a major influence on the yield and quality of the harvest.

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RESEARCHES REGARDING THE INFLUENCE OF APPLE FRUIT SORTING UPON THE ECONOMIC EFFICIENCY IN THE COMMERCIALISATION PROCESS

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Abstract

Very often, the fruit tree- growing exploitations sell their gross production directly from the unit immediately after harvesting, without storing it. The present paper aims at printing out the economic differences in apple within the fruit tree-growing area of Voinesti –Dambivita country, comparing the gross selling of the quality – classified harvest. The higher economic efficiency, calculated for the Redix and Ariwa varieties in comparison with the Jonathan and Golden Delicious varieties is also due to the fact that for the first two varieties the production costs were lower, thanks to the smaller number of phytosanitary treatments, since these have genetic endurance to the scab disease.

Key words: *average quality coefficient, quality variation index.*

INTRODUCTION

In Romania, agricultural exploitations more and more market-oriented, becoming increasingly commercial. In the traditionally fruit tree-, grapevine – and vegetable – growing areas, the commercial feature is even more obvious, as production always exceeds consumption and the surplus is destined to market. Nevertheless, the economic results of the production activities are influenced by several factors such as: the exploitation size, average productions, product quality, available financial resources, the exploitation manager's experience, pedoclimatic factors, etc. Production commercialisation also plays an important part. Very often, the furuit tree-growing exploitations sell their gross production directly from the unit immediately after harvesting, without storing it. This commercialisation method is determined by various factors, among which: insufficient or improper storage space; the need to obtain immediate financial resources for starting the production cycle again; difficulties in the retail selling system (particularly the reduced time budget of the producer – the only of the producer – the only or the main working force of the exploitation, additional expenses resulting from going to the market, etc).

More, this commercialisation method may derive the producer of an important share of the profit which is transferred to the commercial link. Fruit quality influences the valorization price directly (Stoian et al., 2002). The large fruit supply compared with the reduced demand results is unique – price selling, neglecting the advantages of previous merchandise classification according to quality.

The present paper aims at printing out the economic differences in apple within the fruit tree-growing area of Voinesti, Dâmbovita, comparing the gross selling for a unique price per kilogram with the retail selling of the quality – classified harvest.

MATERIALS AND METHODS

The data resulted from the actual results of apple production in a family exploitation located in the fruit-tree growing area of Voinesti, Dâmbovita. The varieties grown were Jonathan, Golden Delicious, Redix, Ariwa. The data analysis was performed by calculating some technical and economic indicators (income, expenses, profit), while the variety quality assessment was made by determining the quality variation indices and the average quality coefficient of the variety and the group of varieties (Pana et al., 1983).

RESULTS AND DISCUSSIONS

For this purpose, the production results refer to the average production per hectare in the four varieties, out of which two (Redix and Ariwa) are genetically resistant to scab and powdery mildew, while the others are considered the standard for the winter – stored varieties.

The fruit quality classification was based on the standard diameter: 66 mm – Extra quality, 60 mm – first quality, 55 mm – second quality; the fruit has fallen prematurely from the trees improper for consumption were used for distillation. The prices of the area in 2001 were different, according to quality class: 1,8 Lei/kg – Extra quality; 1,5Lei/kg – first quality; 1,1Lei/kg second quality; 0,4 Lei/kg for industrial processing. For the gross selling, the price in the area was 1 Leu/kg. Table 1 presents the production results obtained and the income from the two commercialisation methods.

The average production per hectare and its structure according to quality classes were different from one variety to another, according to the variety potential and the weather conditions of the year.

The production selling according to quality classes may result in an income increase varying according to variety from 2850 Lei/ha to 5066 Lei/ha, which corresponds to an increase of 21,9%-41,3%, compared with the retail commercialisation**.** The share of the various quality classes in the variety structure indicates that the first and second quality class fruit exceed the Extra quality and industrial processing fruit.

The production expenses were higher in the Jonathan and Golden Delicious varieties, compared with the Redix and Ariwa, as the latter recorded less expense for phytosanitary protection due to their genetic resistance to scab and powdery mildew (Table 2).

Moreover, when production is aimed at commercialisation according to quality class, the production unit cost increases by 0,2 lei/kg as a result of fruit classification.

The profit was calculated as difference between the selling income and the total expenses, and varied from one variety to another. The analysis of the profit obtained from the two commercialisation methods pointed out to the following:

-the producer would be more economically advantaged if selling occurred according to quality criteria;

-the additional profit per hectare might vary between 272 lei (Jonathan) and 2766 lei (Redix), which means an increase in the profit of 6,2-43,5%, compared with the gross selling;

-the additional profits per hectare were almost from 4-7 times higher in the genetically – resistant varieties, compared with the standard ones (Jonathan, Golden, etc).

Table 1. Production and income obtained from gross and quality – class apple selling

Variety	Average production t/ha	Production according to quality class		Price Lei/t	Income from valorisation according to quality class		Income from gross valorization Lei/ha	Selling income difference according to quality class	
		tons	%		Lei	%		Lei	%
Jonathan	13,7	E 1,80	13,1	1800	3240	19,4	13700	+3012	+21,9
		I 5,12	37,4	1500	7680	45,9			
		II 4,40	32,1	1100	4840	29,0			
		Ind 2,38	17,4	400	952	5,7			
	Total	13,70	100	(1220)	16712	100			+22,6
Golden delicious	12,6	E 2,20	17,5	1800	3960		12600	+2850	25,6
		I 3,80	30,1	1500	5700				36,9
		II 4,50	35,7	1100	4950				32,0
		Ind 2,1	16,7	400	840				5,5
	Total	12,6	100	(1226)	15450	100			+44,0
Redix	11,5	E 2,90	25,2	1800	5220		11500	+5066	31,5
		I 5,45	47,4	1500	8175				49,3
		II 2,73	23,7	1100	3003				18,1
		Ind 0,42	3,7	400	168				1,1
	Total	11,5	100	(1441)	16566	100	10600	+4382	+41,3

Ariwa	10,6	E 2,45	23,1	1800	4410				29,4
		I 5,12	48,3	1500	7680				51,3
		II 2,40	22,6	1100	2640				17,6
		Ind 0,63	6,0	400	252				1,7
	Total	10,6	100	(1413)	14982	100			

Table 2. Profit from gross and quality – class selling

Variety	Gross selling			Quality – class selling			Profit difference	
	Income lei/ha	Production expenses lei/ha	Profit lei /ha	Income lei/ha	Production expenses lei/ha	Profit lei/ha	lei/ha	%
Jonathan	13700	9316	4384	E 3240	1579,3	1660,7	272	6,2
				I 7680	4508,9	3171,1		
				II 4840	3869,9	970,1		
				Ind 952	2097,9	-1145,9		
Total	13700	9316	4384	16712	12056	4656		
Golden Delicious	12600	9324	3276	E 3960	2072,7	1887,3	330	10,1
				I 5700	3565,0	2135		
				II 4950	4228,3	721,7		
				Ind 840	1978,0	-1138		
Total	12600	9324	3276	15450	11844	3606		
Redix	11500	5140	6360	E 5220	1874,9	3345,1	2766	43,5
				I 8175	3526,5	4648,5		
				II 3003	1763,3	1239,7		
				Ind 168	275,3	-107,3		
Total	11500	5140	6360	16566	7440,0	9126		
Ariwa	10600	5300	5300	E 4410	1714,0	2696	2262	42,6
				I 7680	3583,9	4096,1		
				II 2640	1676,9	963,1		
				Ind 252	445,2	-193,2		
Total	10600	5300	5300	14982	7420	7562		

The following emphases the influence of fruit quality in the two groups – standard and genetically – resistant upon the economic results obtained from commercialisation according the quality class.

The I_q variation index of quality according to variety groups was calculated by the formula:

$$I_q = \frac{Q_1}{Q_0}$$

Where: Q1 = average production of genetically – resistant varieties according to quality classQ0 = average production of standard varieties according to quality classThe values obtained were Iq Extra = 1.34; Iq I-st quality = 1.18; Iq II quality = 0.57; Iq ind = 0.23.Calculated for variety groups, the same index was Iq = 0.84. The values of the variation index show that, in both variety groups, the Extra and first quality fruit number was higher than the second – quality and industrial processing. Nevertheless, per total, the production of genetically – resistant varieties, even if lower, has higher quality compared with the standard group, particularly as a result in the increase in the Extra and first – quality categories. The same is illustrated by the average quality coefficient Kri, calculated for each variety and

each group, according to the formula:

$$K_{ri} = \frac{\sum qi\, xR_i}{\sum qi} \quad \text{sau} \quad K_{ri} = \frac{\sum gixRi}{100}$$

Where: qi = product quality according to quality class; gi = production share according to quality class; Ri = quality group coefficientThe average quality coefficient measures the quality of a product or group of products when production is delivered

according to quality class.The calculated values were: Kri Jonathan = 2.54; Kri Golden = 2.51; Kri Redix = 2.06; Kri Ariwa =2.11. The value of the coefficient is inversely related to the variety quality; therefore, the order of the varieties from the view-point of quality is: Ariwa, Redix, Jonathan, Golden Delicious (also see their correspondence with total and additional profits from quality-class selling).The calculation of Kri for variety groups resulted in the value of 2.08 for the genetically-resistant varieties, and 2.52 for the standard varieties. This shows that the former record productions of superior average quality, compared with the latter, while the deviation of 2.52-2.08=0.44 is the expression of this difference.

CONCLUSIONS

The current practice of production valorization in gross system is economically disadvantageous for the fruit producers.

This results in profit loss which can reach more than 40% of the total.

It is necessary for the producers to become familiar with the advantages and to turn them to better account.

The establishment of some associative forms of commercialisation (cooperatives) would facilitate quality – class selling.

The apple varieties which are genetically resistant to some diseases have superior productions of average quality compared with the standard varieties, and their commercialisation according to quality class can increase profits for the producers.

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STUDIES REGARDING THE E.U. STRATEGY IN THE FIELD OF AGRO-FOOD PRODUCT' S QUALITY

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Abstract

Both basic agricultural products and those with an added value are confronted with an ever increasing competition on the E.U. market due to the pressure carried out by the products originated in non- E.U. countries, where production charges are lower. Therefore, this being the case, the main success recipe for farmers and processors remains the promotion of quality. The E.U.'s agricultural policy aims at bear up their efforts through community systems and regulations along two main guidelines: basic standards and measures for quality promotion. Over the last years the consumers' demand for ecological products has increased. To this effect since 1991 the E.U. has been applying a standard which provides laws regarding the ecological agriculture both for European producers and processors and for the exporters which come from non-E.U. countries and who want to commercialize ecological products on the E.U. market. The basic principles of the ecological agro-food production have to comply with the requirements of the 834/2007 E.U Regulation which also makes mention of the method of labeling and certifying used for ecological products. Obtaining qualitative products which also correspond to the requirements of the retail chains presupposes the conformation to a set of standards, known worldwide under the name of Global G.A.P. rules, according to which farmers and processors can become certified , thus obtaining the statute of the market's preferred provider.

Key words: *certification, farmers, labelling, quality, requirements.*

INTRODUCTION

Taking into consideration the fact that at the moment Earth's population consists of over 7 billion inhabitants and in the near future a more substantial increase is foreseen it can be inferred that the demand for agro-food products will raise rapidly. Vegetables, fruit, grapes, wine and all the other horticultural by-products have always been highly valued by consumers all over the globe, playing an important role in nutrition (Dejeu et al., 1997). The considerable increase of the horticultural production has to comply with the ever rising standards and demands imposed by the consumers.

The E.U.'s agricultural policy has to bear up the farmers' efforts in occupying the first positions in the quest for quality. The first steps for that purpose have already been taken through community systems and regulations along two main guidelines: basic standards and measures for quality promotion.

E.U's merchandising standards are regulations which imply definitions of products, basic/ minimal standards and labeling requirements for customers' information for a large number of agricultural products and for some finite food products. Their aim is that of helping farmers deliver qualitative products that meet the consumers' expectations, avoid disappointing the latter and facilitate the comparison of prices regarding different classes of product quality (Banu et al., 2007).

Merchandising standards have been adopted in order to replace the various national standards and to thus facilitate the commercial trades on the exclusive market.

Consumers' request for ecological food products has risen constantly over the last years, demand exceeding supply. The community market of agro-food ecological products continues to be fragmented at a national level.

Since 1991 the E.U. has been applying a standard that implies rules concerning ecological agriculture for European producers and processors and for the exporters from the

third party countries who wish to bring ecological products into the community market. The community standard strictly observes the rules regarding ecological agriculture which have been established within the international standard adopted through Codex Alimentarius, which facilitates the recognition of community ecological products that are exported to other countries.

The goals of strategy and policy for the branch of the ecological agriculture were established in 2004 and defined in ″The European Action Plan for Food Products and Ecological Agriculture″. The most important legislative process consisted of the framing of a new regulation regarding ecological agriculture, enacted in June 2007.

The certification systems can enable retailers to assure or to impose conformation to certain production and delivery constraints. The emergence of these systems along the years is the result of the assessments performed by the retailers which have highlighted the consumers′ wish of knowing more details about the food products they are purchasing. The main aspects the consumers are concerned of are hygiene (sanitation), safety and the price.

Agricultural product qualities includes both product characteristics (physical, chemical, microbiological and organoleptic features – size, appearance, taste, look, ingredients, etc.) and farming attributes (production method, type of animal husbandry, use of processing techniques, place of farming and of production, etc.).

The quest for quality is a vital part of the EU agro-food sector′s strategy in the global marketplace. The EU remains an important producer of basic agricultural products.

Buying food and drink produced in the EU means buying quality, chosen from a rich diversity of products reflecting the different traditions and regions in the Community. Consumers around the world know this: the EU′s agro-food sector has a reputation for high quality thanks to decades or even centuries of hard work, investment, innovation and attention to excellence.

This tradition of high quality operates in several ways. At a basic level, all farmers in the EU are legally bound to respect some of the most stringent farming requirements in the world. Among other things, these relate to environmental protection, animal welfare and the use of pesticides and veterinary products. Beyond these basic requirements, farmers and food producers use their expertise and imagination to give their products other, individual qualities valued by consumers.

MATERIALS AND METHODS

In order to be able to perform this study concerning the E.U. strategy regarding the quality increase of the agri food products we have used a series of present-day standards, norms and legal requirements as our source of information, among which I mention:

- The E.U. Regulation 834/2007 regarding the obtainment, labeling and certification of ecologic products,
- The GlobalGAP Standard regarding the implementation of good agricultural practices for the obtainment of the farm certification according to the norms,
- The Green Paper on agricultural product quality.

As a result of these materials and of some research papers or specialized publications we have carried out a synthesis which shows the current situation and the E.U. tendencies regarding the production and commercialization of quality agri food products.

RESULTS AND DISCUSSIONS

The results of the study which was carried out were structured in such a manner so as to enable the presentation of the aspects regarding the production, labeling and certification of the ecologic products, of the geographical indications products and of that of traditional products.

THE CURRENT STATE WITH REFERENCE TO THE LABELING AND THE CERTIFICATION OF AGRO-FOOD PRODUCTS

An essential goal of agricultural quality policy is to inform buyers and consumers about product characteristics and farming attributes. Unless buyers and consumers have accurate, useful and guaranteed information about these characteristics and attributes, they cannot be expected to pay a fair price.

Agricultural quality policy has evolved over time. However, this evolution has taken place on a piecemeal basis — instrument by instrument, sector by sector. Combining the various instruments into a more coherent whole and developing the overall policy would help it to deliver even stronger results. This further development must be sufficiently flexible, take account of the private and national schemes that dominate the market and ensure innovation. The full picture is shown in Figure 1.

Schemes can be either **'certification**-type' or '**labelling**-type'. Certification is best when the undertakings made are complex; these are usually laid down in a detailed specification and checked periodically (e.g. annually), for example by a certifying body. Labelling measures are best for relatively straightforward claims that are normally self-declared by producers and subject to official controls.

Both certification and labelling can show that a product meets baseline standards. They can also both be used to indicate value-adding qualities beyond baseline standards — either product characteristics or farming attributes.

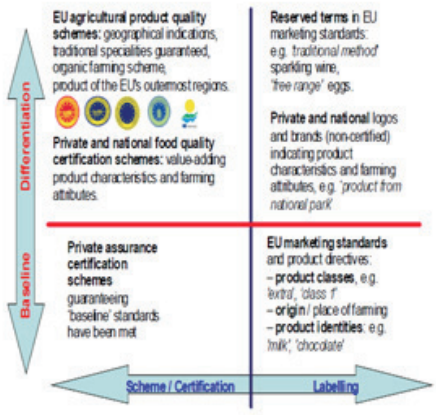

Figure 1. Quality and assurance certification schemes and marketing standards (http://ec.eur-lex.europa.eu/.)

Consultations on the development of agricultural product quality policy began in 2006 with a stakeholder hearing , followed by a conference in Brussels on 5-6 February 2007 (Codex Alimentarius Commission and the UN Economic Commission for Europe). The Commission also launched policy reviews of the schemes for geographical indications for agricultural products and foodstuffs and for traditional specialities guaranteed. This work culminated in the Green Paper consultation and the High Level Conference on Agricultural Product Quality held in Prague on 12-13 March 2009 (Green Paper on agricultural product quality-COM 2008 641).

The main messages from stakeholders included strong support for the E.U's main quality schemes (geographical indications and organic farming) and marketing standards, but also called for simplification and streamlining. Farmers, producers and consumers urged greater use of place of farming labelling. On the other hand, processors and retailers warned that it can be difficult to track the farming origins of ingredients in processed foodstuffs.

As a result of these consultations and examination of the current measures, the Commission has identified three main issues to be addressed in developing agricultural product quality policy, namely:

– ***Information:***to improve communication between farmers, buyers and consumers about agricultural product qualities;

– ***Coherence*****:** to increase the coherence of EU agricultural product quality policy instruments;

– ***Complexity*****:** to make it easier for farmers, producers and consumers to use and understand the various schemes and labelling terms.

Agricultural product quality policy should contribute to achievement of the objectives of the CAP. In particular, sustainability of farming systems should be further enhanced through quality policy, and the farming attributes of products of such systems should be better known and communicated to citizens and consumers.

Against this background, it is proposed to develop agricultural product quality policy through a structured approach, comprising:

– For certification-type schemes, the development of guidelines for good functioning of certification schemes, and ensuring coherence of any new E.U. schemes.

– For labelling-type measures, development of E.U.marketing standards within the single Common Market Organisation.

In addition, existing EU schemes and marketing standards should be simplified and clarified wherever possible.

Stakeholder comments concerned notably the introduction of the *Ecolabel* and its potential overlap with the existing organic scheme.

AIMS REGARDING THE PROMOTION OF AGRO-FOOD PRODUCTS' QUALITY

E.U. farming requirements

The Green Paper asked how farmers can best show that they have complied with basic EU requirements, such as environmental rules, animal welfare standards, and strict controls on use of pesticides and animal health products. Two possibilities were raised: an 'EU requirements' label or logo, or obligatory place-of-farming labelling. An 'E.U. requirements' label would be shown on all products (EU or imported) that had been farmed in line with EU minimum requirements. In the Green Paper responses, the overwhelming view from consumers, farmers, processors and retailers and others, was opposed to such a label. On the other hand, many respondents supported greater use of place-of-farming labelling as giving useful basic information about agricultural products.

Marketing standards

Marketing standards and product directives contain technical descriptions of agricultural products, their composition, characteristics and the production methods used. Fisheries products are also covered by a specific marketing regime. They have been adopted not only by the EU, but also by multilateral bodies (Food Quality Schemes). There are four types of information contained in marketing standards (Table 1).

Table 1. Types of marketing standard (http://ec.eur-lex.europa.eu/.).

RESERVED TERMS	Examples: „free range, eggs: „barn" egs, „first cold pressed", extra virgin and virgin olive oil, „traditional method", sparkling wine
PRODUCT CLASSIFICATION	Examples: friut: extra, class 1, class 2 Eggs: large, medium, small
PRODUCT IDENTITY	Examples: definition of butter, fruit juice, chocolate, wine, extra virgin olive oil
ORIGIN OR PLACE OF FARMING LABELLING	Examples:fruit and vegetables: place of harvest Olive oil: place of harvest and of presiing

In their responses to the Green Paper, farmers and producers, processors, traders and retailers supported marketing standards, saying they are needed for sellers to demonstrate the quality of product they offer, and for purchasers to know what they are buying. However, there were also calls for simplification. EU marketing standards were criticised for being too detailed, too prescriptive ― relying on compulsory rules when voluntary rules would suffice ― and for being too cumbersome to adapt quickly to changing market circumstances.

Many respondents to the Green Paper also wanted „optional reserved terms" to be developed, for example to define what can be called „mountain product" and „low carbon". „Optional" reserved terms do not have to be used to describe product in commerce or on labels, but if they are used, the product must correspond to the definition laid down.

In addition, consumers and farmers called for greater use of „place of farming" labelling (Table 2).

The Commission intends to address the following aspects of marketing standards:

– need for general basic standard**:**

Compulsory rules could be laid out in a general basic marketing standard. This would cover those matters where a voluntary approach might distort the single market or compulsory labelling is necessary to provide consumers with basic information about products.

– place-of-farming labelling:

To respond to many consumers' and farmers' preferences for labelling that identifies the place where agricultural product was farmed, the Commission will consider appropriate labelling within marketing standards for agricultural products, while taking into account the specificities of some sectors, in particular concerning processed agricultural products.

Table 2. Demand for place of farming labelling (http://ec.eur-lex.europa.eu/.).

Place of farming labelling	Obligatory country of origin labelling and/or place of farming labelling has been introduced in Australia (all agricultural products and foodstuffs) and the US (selected agricultural product sectors), among other countries. In the EU, obligatory place of farming labelling applies to beef and veal, fruit and vegetables, eggs, poultry meat, wine,

	honey, olive oil (from 2009) and EU organic products (from 2010). Origin labelling also applies to aquaculture products.
	„Place of farming" in the context of marketing standards refers to the place of harvest of crop products, birth and raising of livestock, the place of milking for dairy cows, and so on.
	„Origin" may refer, in the case of a processed product, to the place of last substantial transformation, and therefore not necessarily to the „place of farming" of the agricultural product.

Optional reserved terms

Optional reserved terms should be used where it is necessary to define information about product qualities for consumers (e.g. „first cold pressed" extra virgin and virgin olive oil). As a possible alternative to EU legislation, the Commission will investigate further the option of using CEN, the European Committee for Standardisation, for detailed rules of this type. In addition, the Commission will examine the feasibility of laying down specific optional reserved terms for „product of mountain farming" and „traditional product".

One way of setting more appropriate marketing standards could be to ask stakeholders to develop the rules themselves. This is already done for the development of industrial standards under CEN (Table 3).

Table 3. CEN (http://ec.eur-lex.europa.eu/.).

The European Committee for Standardisation (CEN)	CEN is a private entity with 30 national members, from EU Member States, and EFTA countries. CEN activities are the result of collective activities of stakeholders, manufacturers, users, research organizations, government departments, and consumers.
	CEN develops voluntary European Standards (ENs). These become the single common standard in all 30 countries. ENs help build a European Internal Market for goods and services and assist international trade.

– international standards:

The Commission will continue to refer to and contribute actively to the development of international standards.

Geographical indications

Geographical indications are names that identify products as originating in a territory where a given quality, reputation or other characteristic of the product is essentially attributable to its geographical origin (ec.europa.eu). The geographical indications schemes provide protection of intellectual property rights for products described by registered geographical indications; and marketing assistance, primarily by conveying information as to compliance with the geographical indication system. The schemes enhance the credibility of products in the eyes of consumers and enable fair competition between producers.

Representatives of producers of geographical indication products have called for greater rights and control over their use ― for example, to control production (using quotas), and to control the use of geographical indication names on the packaging of processed products.

In the international context, the geographical indications system is well established in the EU and in many non-EU countries. However, in some trading partners, specific legislation does not exist or EU names are not widely protected within the non-EU-country systems.

Organic farming

Since 1991, the E.U. organic farming regulation has protected the identity and the added value of the *„organic"*, *„biologica"*, *„ecologica"*, *„eco"* and *„bio"* labels. Organic farming is defined in EU legislation and at international level in a *Codex Alimentarius* guideline. This means consumers can be confident of the quality of organic products and it facilitates trade in the single market and with non-EU countries.

In order to foster trade in organic products, the Commission will seek mutual recognition of organic standards with non-EU countries and will contribute to the development of the *Codex Alimentarius* organic guideline.

Beginning with 2010, the label of the organic products obtained in E.U. feature the new eco-leaf logo, as shown in Figure 2.

Figure 2. The „Eco-leaf" logo of E.U

Traditional specialities

The EU scheme for registration of „traditional specialities guaranteed" was intended to identify and protect the names of traditional products.

The Commission proposes to investigate the feasibility of introducing the term „traditional product" as a reserved term defined within marketing standards and abolishing the current scheme.

CONCLUSIONS

Practical steps should improve communication between farmers, buyers and consumers on the quality of agricultural products, unify rules on agricultural products quality, and simplify schemes and labels.

The main aims the E.U. farmers should be in route for in order to obtain higher-ranking product exploitation and a raise of the income are:

-obtaining ecological products;

-promoting products with geographical indications;

-certifying the production systems according to the ISO, quality and food product safety standards.

The certifying of producers and processors of agro-food products according to the standards (example Global G.A.P etc) determines their statute as the market's preferred provider.

The raise of the level of the consumers' education determines their purchasing of the agro-cultural products according to the relation between quality and price, which favors those producers and processors which have been certified according certain laws and standards (for example Codex Alimentarius, etc).

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A PRACTICAL APPROACH OF TRACEABILITY IN THE WINE INDUSTRY

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Abstract

Traceability in the wine industry has an undeniable role in a quality assurance management system. It ensures that all manipulations of raw materials, ingredients and final products are recorded on specific documents, created especially to allow a rapid retrieval of the product history. The wine supply chain requires traceability from grape production to processing and wine distribution. Maintaining traceability records on specific documents has many benefits for both producers and consumers. A practical traceability system ensures: efficient process logistics, rapid decision making by the producers, but also provides the consumer confidence in the authenticity of wines and proper usage of approved oenological practices and safety procedures during production. In spite of the legal requirements for traceability systems, they are not widely applied in our wine industry and the documents involved are difficult to be maintained and updated. This paper proposes a series of specific documents to be used for a more efficient and practical system of traceability in the wine industry.

Key words: *traceability, wine, quality assurance management system.*

INTRODUCTION

Traceability is regulated by national law no. 150/2004 on food safety and feed, modified and completed by law no. 412/2004 and by Regulation (EC) no. 178/2002 of the European Parliament and of the Council of 28 January 2002, laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down the procedures regarding food safety. In accordance to legislation, operators must apply the food legal regulation at all stages of the wine supply chain, from the production and processing to transportation and distribution stages. Thus, operators are responsible by law for ensuring the traceability of products at all stages of the production, processing and distribution, including raw and auxiliary materials packaging materials and operating materials. Moreover, materials and oenological practices are specified by Commission Regulation (EC) no. 606/2009 of 10 July 2009 laying down certain detailed rules for implementing Council Regulation (EC) no. 479/2008 as regards the categories of grapevine products, oenological practices and the applicable restrictions.

However, "traceability means the ability to trace and follow a food, feed, food-producing animal or substance intended to be, or expected to be incorporated into a food or feed, through all stages of production, processing and distribution" (Legea nr 150/2004 si Legea 412/2004). Article 18 of Regulation (EC) no. 178/2002 refers explicitly to tasks of operators regarding traceability. According to Article 18 of Regulation (EC) no. 178/2002, winemaking operators must comply with the following rules:-traceability shall be established at all stages of production, processing and distribution.-winemaking operators shall be able to identify any person from whom they have been supplied with grapes, must, wine, or any oenological substance intended to be, or expected to be, incorporated into grapes, must or wines. -winemaking operators shall have in place systems and procedures which allow for this information to be made available to the competent authorities on demand.-winemaking operators shall have in place systems and procedures to identify the other businesses to which their products have been supplied. This information shall be made available to the competent authorities on demand.-winemaking products shall be adequately labeled or

identified to facilitate its traceability, through relevant documentation or information in accordance with the relevant requirements of more specific provisions.

MATERIALS AND METHODS

Implementation of traceability in wine industry implies the existence of correlated registration documents for each stage of production and distribution. For this reason all processes and technological operations must be recorded in specified documents, corresponding to each product stage.

Based on the specific technology of grape production to distribution it was considered necessary to create specific documents to achieve total traceability.

This tracking system was developed for a winery located in southern Romania, in the wine region 'Terasele Dunarii' where 500 tonnes of grapes of various varieties are processed yearly.

In order to implement a traceability system, the first issue to be resolved concerns the division of the entire surface in farms, physical blocks and parcels. It is also necessary that the division of the total area takes into account the grape varieties grown and specific climatic and edaphic conditions because the grapes are harvested and wine batches are formed based on the grape quality and characteristics. If the surfaces are not divided properly, the quality of the final products may be affected.

The specific documents deemed necessary to maintain a robust traceability system are hereafter presented.

Vineyard Record Keeping File. Necessary to record data from vineyard parcels, this document is a table that contains the following columns:

- **Date**;
- **Farm / Physical Block / Parcel (F/PB/P)** , same with batch of grapes and containing the number of a parcel from specified physical block and farm (eg. 1/221/4, which means F/PB/P); this is the most important key link for history retrieval;
- **Area (ha)** , referring to parcel;
- **Preformed works**, a column where specific operations performed in the vineyard are described;
- **Auxiliary materials** used, referring to fertilizers, pesticides and herbicides;
- **Dose**, referring to dose of the treatment material used;
- **Responsible**, who is the person who performed the work;
- **Observations**, another notes.

Grape Maturation Report. Necessary to record grape maturation evolution data from vineyard parcels, this document is helping to determine the optimal time to harvest; is the most critical decision of the grower and winemaker. Good quality of the grapes at harvest allows for a maximum potential in wine quality. Incomplete ripen grapes contain less sugar, very high acidity, harsh tannins and 'green' aromas. Overripen grapes may also lead to uncharacteristic flavor and low acidity. If the assessment is not done properly and harvest decision is not appropriate, wine quality may be affected (Zoecklein B.W., 2001).

Unfortunately, grape maturity assessment is difficult to perform, due to the involvement of several factors and the necessity to measure several physico-chemical parameters, that are not always directly correlated (Coombe B.G., 1992; Robinson S.P. and Davies C., 2000).

This document is kept for each parcel and contains the following identification elements:

- **Variety**;
- **Vintage**;
- **Farm / Physical Block / Parcel**, a code which is linked with Vineyard Record Keeping and Harvest Delivery records.

In addition to the identification elements, this document contains sets of analyzes of grapes from that parcel (**Date**; **Sugars**, in g/l; **Total Acidity**, in g/100 ml tartaric acid, **pH**, **Brix**, **Brix*pH²** index, **Brix/TA** index and% v/v **estimated alcohol**).

Harvest Delivery Note. It is a document that must contain the following identification elements: **Document number**; **Variety**; **Farm / Physical Block / Parcel**; **Estimated quantity (kg)** ; **Real quantity (kg)** . This document accompanies the grapes to the wine cellar and used for tracking and accounting records. The estimated quantity is evaluated at the flowering stage and is used for planning in the cellar ahead of harvest.

Quantitative Grape Receiving Report. It is a tracking document used to link the small grape

batches delivered to the winery with full batches of grapes resulted from several small grape baches and used for a batch of wine. The report contains the following columns:

- **Date/Time**;
- **No. of Delivery note**;
- **Variety**;
- **Harvest mode**;
- **Grape batches** (F/ PB/P);
- **Variety purity (%)** ;
- **Sanitary state of the grapes** (% of the sane and affected grapes);
- **Quantity of small batch** (kg);
- **Total amount per full batch** (kg);
- **Full batch code**. It is used to determine the quantity of grapes used per batch of must/wine.

Qualitative Grape Receiving Report. It is a quality control document for full batches. It contains the following identification elements:

- **No. of document / Date;**
- **Variety / Assortment**;
- **Vintage**;
- **Full batch code**;
- **Total amount of grapes (kg)** ;
- **Variety purity (%)** ;
- **Sanitary state of grapes (%)** ;
- **Harvest method**;

This document is drawn up after cold settling occurs and should contain almost all analyses which can be made. Basic analyses are grouped as following:

- **Sensory analysis of must** (Appearance; Color; Odor; Taste;).
- **Physico-chemical analysis of must** (Yeast Assimilable Nitrogen; Total acidity, g/l tartaric acid (pH=7); Sugars; Density; pH; Brix; Index Brix*pH^2; Index Brix/Ta; Turbidity;).
- **Analysis performed after corrections** (Acidification; Enrichment of sugar; Total acidity, g/l tartaric acid (pH=7); Sugars, refractometrically; Density; pH; Brix; Index Brix*pH^2; Index Brix/Ta;).

Winemaking Batch Sheet. This is the main document that includes the process interventions performed during all stages of winemaking. The document contains the **full batch** code and the following columns:

- **Process / Technological operation;**
- **Date and time;**
- **Inputs;**
- **Outputs;**
- **Differences;**
- **Measurement unit;**
- **Initial tank no.;**
- **Final tank no.;**
- **Lees tank no.;**
- **Oenological materials used, concentrations, parameters, analyses, etc**.

This document shows the history of any wine and allows the oenologist to find at any moment each stage of the applied technology.

Blending Report. It is a document that is drawn when the oenologist wants to make a blend. This document serves both as tracking sheet and a file for the accounting department. It includes the following identification elements:

- **No. of document / date;**
- **New batch code;**
- **Variety / Assortment;**
- Initial **Quantities** and **Batches** from which the blend was formed.

Additional information may be **tank numbers** of the used batches and **alcohol concentration** (v/v) of the blend.

Bottling Report. This documents is filled when wine is ready for bottling. It contains the following identification elements:

- **Internal batch number;**
- **External batch:**No. of document / date;
- **Variety / Assortment;**
- **Vintage.**

Contains two tables. First table contains: Input quantity (liters); Effective quantity (liters); Loss (liters); Bottling recipient capacity (litri); No. of bottling recipients used; No. of Samples; The second table contain: Materials used; Manufacturer; Batches; Quantity of materials (in pieces); Outgoing finished products (pieces); Loss (pieces); Samples materials (pieces).

This report may contain a section for comments.

Declaration of conformity. It is the document that accompanies the delivered goods Mandatory information which appears on this document is:

- No. of document / date;
- Beneficiary;
- Invoice / Delivery note no. / date;
- Brand / Class of quality / Variety / Assortment;
- Batches of wines delivered;

- Analysis reports;

This document may contain a text by the manufacturer assumes the responsibility that the products comply with the law.

Delivery Note or/ with Invoice. Proof of sales and purchases of goods.

RESULTS AND DISCUSSIONS

The result of wine traceability chain is drawn through a flow chart in figure 1.

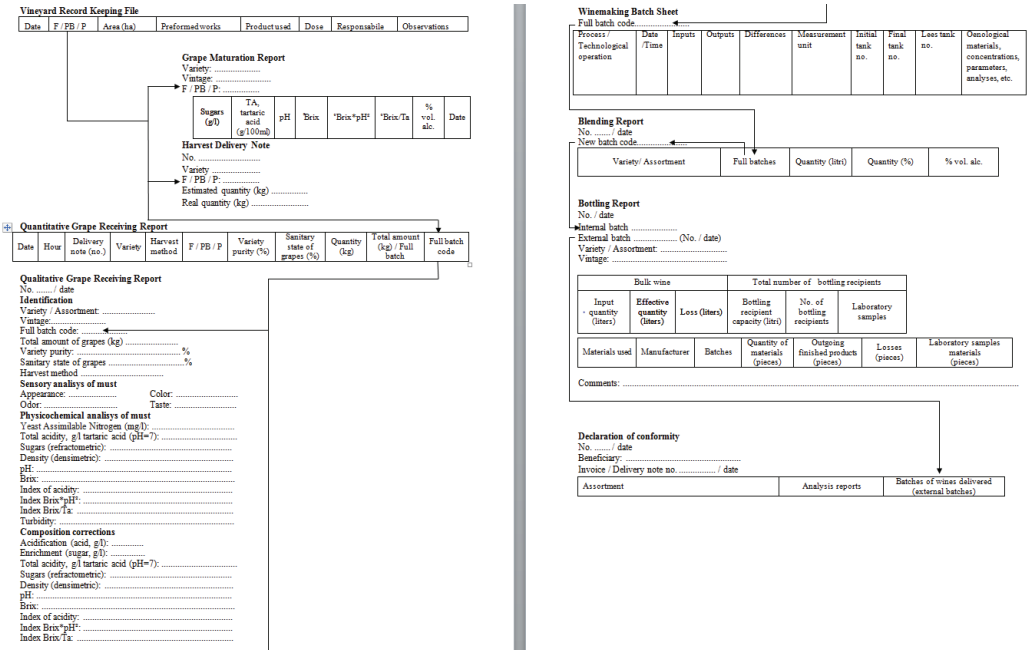

Figure 1. Flow chart of traceability at all stages of the production, processing and distribution.

CONCLUSIONS

A traceability system for a medium-size cellar was proposed and the system documents were drawn and presented. The system improves the management in vineyards and cellars, by retrieval history of a parcel and / or a product.

The usage of these system documents to maintain traceability in wine production units improves the quality management, by ensuring that the raw and auxiliary materials are of quality, the practices are also recorded and controlled, so that the resulted wines are safe and of the expected level of the designed quality.

Also, traceability documents are and important part of the product recall procedure. They contain information which allows us to detect certain deviations from the normal process which may make the final product unsafe or of a lower quality than the one expected by the consumer. In case of identifying any safety or quality issue during the process of winemaking, storage or bottling, based on these easy-to-use documents we can quickly and surely withdraw from the market that particular batches, with minimal financial effort.

This model has the advantage against tracking computer programs, that enables centralized view of history on winemaking batch sheet which is displayed directly on the wine container. So the oenologists can find out at any time the wine history.

Another advantage is that the operations performed are written in winemaking batch sheet by the cellar foremen at the moment of operation performing and thus is not possible to forget to update the winemaking batch sheet. In the case of a software, updates can be forgotten with major consequences.

Also, these winemaking sheets posted on the tanks provide quick information and allow for

an efficient decision making. Viewing the results of regular analyses on these records gives the oenologists valuable information regarding the stability of wine, for example, or what wines to take for more detailed tests in the view of creating commercial blends.

These documents can also be maintained and updated by using software programs that works with sheets and can create databases (i.e. Excel software). Such documents can be updated in real time or weekly, so that, all the information appearing on tanks, can also be maintained on computer.

This type of tracking also provides information to be used to establish the cost of wine and the price. Accountants can use these data to calculate prices and to classify in accordance to the price each batch of wine.

Last but not least, the fact that the team leaders is required to write down all the technological operations performed, makes them more quality oriented and responsible for the work done.

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Commission Regulation (EC) no. 606/2009 of 10 July 2009 laying down certain detailed rules for implementing Council Regulation (EC) no. 479/2008 as regards the categories of grapevine products, oenological practices and the applicable restrictions


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SAMPLING PROCEDURES APPLICABLE FOR THE QUALITY ASSURANCE SYSTEMS IN THE STARCH INDUSTRY

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Abstract

Sampling is one of the most important factors influencing the analysis results. When the results of several analyses are used to develop and implement a monitoring system which must assure the product quality and food-safety, this becomes a primary element. As an analysis result can be used in the development of such system, the sampling should be as accurate as possible. The sampling methods are various and depend in principal by the sampled material, the material state of aggregation, physical and chemical properties and last but not least, by the presentation mode. At this moment, the sampling procedures applicable in the starch industry are presented in several standards and have a general description based on product categories (e.g.: ISO 24333:2009 Cereals and cereal products − Sampling). For the industry, however, these general guidelines are sometimes difficult to apply as such. This paper aims to review the sampling procedures applicable in the starch industry and to create specific sampling method guidelines developed for a starch factory in order to create an optimal monitoring system capable to assure the quality and food-safety for products and by-products.

Key words: *food-safety, quality, sampling, starch.*

INTRODUCTION

Sampling is one of the most important factors influencing the analysis results (Alexander *et al.* 2007; Thomas *et al*., 2012). The sample has to be big enough and representative for whole batch. The sample size is proportional to the batch size and depends, in principal on the material type and analysis type (Paakkunainen *et al*., 2009; Tokman N., 2007).

For the development of a monitoring system capable to assure the product quality and food safety the most important step is fixing the optimal and specific sampling procedure.

For the starch industry, excepting intermediary products, there are three types of materials: grains (corn and corn germs), milled products (starch, corn gluten feed and corn gluten meal) and viscous liquids (glucose syrups).

Taking into account all these aspects, this paper presents and compares all the international sampling instructions applicable for the cereals and cereals products in order to establish the specific optimal sampling procedure for the final products in a starch factory.

MATERIALS AND METHODS

In order to establish a specific optimal sampling procedure for the starch industry, we identified the main international sampling instructions included in various standards and regulations as follows: SR EN ISO 24333:2009 Cereals and cereal products − Sampling, Commission regulation (EC) No 401/2006 of 23 February 2006 laying down the methods of sampling and analysis for the official control of the levels of mycotoxins in foodstuffs, Commission Regulation (EU) No 836/2011 of 19 August 2011 amending Regulation (EC) No 333/2007 laying down the methods of sampling and analysis for the official control of the levels of lead, cadmium, mercury, inorganic tin, 3-MCPD and benzo (a) pyrene in foodstuffs, Commission Regulation (EC) No 152/2009 of 27 January 2009 laying down the methods of sampling and analysis for the official control of feed, Commission Directive 2002/63/EC of 11 July 2002 establishing Community methods of sampling for the official control of pesticide residues in and on products of plant and animal origin and repealing Directive 79/700/EEC, Decree ANSVSA No. 27 of 06.06.2011 regarding the approval of hygiene and

microbiological criteria for foodstuffs other than those mentioned in Regulation (EC) no. 2.073/2005 of 15 November 2005 on microbiological criteria for foodstuffs, Commission Regulation (EU) No 619/2011 of 24 June 2011 laying down the methods of sampling and analysis for the official control of feed as regards the presence of genetically modified material for which an authorisation procedure is pending or the authorisation of which has expired.

The international standard SR EN ISO 24333:2009 Cereals and cereal products − Sampling was the starting point and it was adapted by other relevant sampling documents to be found in EU-regulation or specific literature. SR EN ISO 24333:2009 is applicable "for the dynamic or static sampling, by manual or mechanical means, of cereals and cereal products, for assessment of their quality and condition" (SR EN ISO 24333:2009). It is not appropriate for the determination of the presence of adventitious genetically modified material in non-GM products and for microbiological criteria. These omissions would be dealt with only the EU-regulation and specific literature.

The information contained in these documents were interpreted, adapted for the intended use and transposed into a centralised, specific and optimal sampling procedure.

RESULTS AND DISCUSSIONS

For cereals and cereal products we identified seven referential documents which are applicable for the starch industry.

Taking into account the instructions mentioned in these documents and the specific of the starch factory took for example, we centralized the information and issued a single sampling procedure for raw material and final products.

There were identified four categories of analyses: specific for product quality determination, for contaminants identification and determination, microbiological analyses and analyses for non-GMO products.

For contaminants the sampling procedures depend on the type of the contaminant, being different for mycotoxins, heavy metals and pesticides.

In Table 1, we present the documents where sampling instruction can be found. It can be seen that for specific quality analysis the only harmonized and internationally recognized sampling procedure is SR EN ISO 24333:2009. This standard indicates a single sample size (1 to 3 kg) depending on various criteria like the batch size, the minimum number of elementary samples and its size, the sampling method (mechanical or manual) or the packaged unit weight.

The minimum sample size is indicated also for contaminants like ochratoxin A (10 kg), pesticides, heavy metals, dioxin (1 kg), other contaminants (3 kg). To complete these values, the EU regulations establish the sample size depending on the batch size and packaging mode (bulk or packed).

Taking into account the product categories presented in these documents, we split starch products as follows:

- Grains:
  - in bulk:
    - corn
  - corn germs
  - packed:
    - corn germs:
      - in big-bags
- Milled products:
  - in bulk:
    - corn starch
    - corn gluten feed
    - corn gluten meal
  - packed:
    - corn starch:
      - in paper bags of 25 kilos
      - in big-bags
    - corn gluten feed:
      - in big-bags
    - corn gluten meal:
      - in big-bags
- Liquid products:
  - in bulk:
    - glucose syrup
  - packed:
    - glucose syrup:
      - in recipients of 45 and 150 kilos
      - in recipients of 1100 kilos

Table 1. Sampling procedures applicable for starch industry

Product category	**Analysis category**	**Sampling procedures applicable**	
		International standards	**Legislation (EU / RO) in force**
Food products	Specific for quality	SR EN ISO 24333:2009	-
	Contaminants		
	mycotoxins	SR EN ISO 24333:2009	Commission Regulation (EC) No 401/2006
	heavy metals	SR EN ISO 24333:2009	Regulation (EC) No 333/2007
	pesticides	SR EN ISO 24333:2009	Commission Directive 2002/63/EC
	Microbiological	-	Decree ANSVSA 27/2011
	non-GMO	-	2004/787/EC: Commission Recommendation
Feed products	Specific for quality	SR EN ISO 24333:2009	-
	Contaminants		
	mycotoxins	SR EN ISO 24333:2009	Commission Regulation (EC) No 152/2009
	heavy metals	SR EN ISO 24333:2009	Commission Regulation (EC) No 152/2009
	pesticides	SR EN ISO 24333:2009	Commission Directive 2002/63/EC
	dioxine	SR EN ISO 24333:2009	Commission Directive 2002/70/EC
	other contaminants	SR EN ISO 24333:2009	Commission Regulation (EC) No 152/2009; Commission Directive 2002/63/EC
	Microbiological	-	-
	non-GMO	-	2004/787/EC: Commission Recommendation

The analysis categories were split in six categories:
- specific for quality
- mycotoxins
- heavy metals
- pesticides
- microbiological
- non-GMO

For each product and analysis category we established the specific sampling procedure, taking into account the batch size, the minimum number of elementary samples and quantity of the total sample.

For an easier application of this procedure we used an excel file which calculated the sampling frequency depending on the number of packaging units and pallets.

An example for a batch of an approx. 25000 kilos is presented in Tables 2 and 3 for food products and in Tables 4 and 5 for feed products.

The types of analyses performed were grouped in accordance to the sampling procedure similarities, so that the analyses specific for quality and those for mycotoxins and heavy metals were presented together (Tables 2 and 4), while the analyses for the detection of pesticides, microbial contamination and the presence of genetically modified organisms were grouped and included in Tables 3 and 5.

In all these tables the abbreviations mean:

-parameters measured for all types of sampling procedures except those involving microbiological analyses:
- CP: product code
- DA: packed unit weight (kg)
- DP: number of packed units in a pallet
- DL: batch size (kg)
- NP: number of pallets in a batch
- NA: number of packed units in a batch
- FA: sampling frequency / packed unit
- FP: sampling frequency / pallet unit
- NPE: number of incremental samples
- MPE: size of incremental sample (kg)
- PG: size of global sample (kg)
- PL: size of laboratory sample (kg)

-parameters measured for microbiological analyses:
- FP: sampling frequency / pallet unit
- NPT: number of tested samples
- MPT: tested samples weight

-type of food product:
- PB: corn
- AV: bulk starch
- AS: starch packed in 25 kg bags
- AB: starch packed in big-bags
- GV: bulk glucose syrup

- G45: glucose syrup packed in 45 kg recipients
- G15: glucose syrup packed in 150 kg recipients
- G11: glucose packed in 1100 kg recipients
- GrV: bulk germs
- GB: germs packed in big-bags

-type of feed product:

- TV: bulk corn gluten feed
- TB: corn gluten feed packed in big-bags
- FV – bulk corn gluten meal
- FB – corn gluten meal packed in big-bags

The values in the table that are marked with yellow colour and font italic are fixed values established according to EU regulation and taking into account the factory possibilities. These values should not be changed.

The values coloured in green should be introduced by the operator in order to identify the correct values from the white cells. For example, to identify the sampling procedure for a batch of starch packed to bags of 25 kilos it was established according to SR EN ISO 24333:2009 that the size of incremental sample (MPE) should be 0.1 kg, the size of global sample (PG) and the size of laboratory sample should be 1 kg for each one.

As it is known that a bag has 25 kg and a pallet has 30 bags, it was easy to identify that for a batch of 24750 kg, the number of pallets in a batch (NP) is 33 and the number of packed units in a batch (NA) is 990, using the following formulas:

$$NP = \frac{\bar{D}L}{DA \times DP}; NA = DP \times NP$$

Then it was identified that the sampling frequency / packed unit (FA) should be 99, the sampling frequency / pallet unit (FP) should be 3.3 and the number of incremental samples (NPE) should be 10, using the following formulas:

$$FA = \frac{DL \times MPE}{PG \times DA}; FP = \frac{FA}{DP}; NPE = \frac{NP}{FP}$$

For all packed products, food and feed, the sampling frequency for all analyses types, except non-GMO and microbiological analyses, was calculated following the recommendations given by SR EN ISO 24333:2009, taking into account the possibilities of the starch factory (e.g.: only manual static sampling) and considering that there are no significant differences between the sampling methods used for its (Knight and Wilkin, 2010).

For bulk products, food and feed the sampling procedure is applied as shown in Table 2 and using the rules shown in figure 1.

These rules follows the examples presented in SR EN ISO 24333:2009 for products located in trucks: 3, 5, 8 and 10 sampling points.

For quality analyses, in order to determine the sampling frequency / packed unit (FA), the parameters DL (batch size), MPE (size of incremental sample), PG (size of total sample) and DA (packed unit weight) should be known; for the calculation of FA the formula was used:

$$FA = \frac{DL \times MPE}{PG \times DA}$$

The sampling frequency / pallet unit (FP) was after that calculated by using the following formula:

$$FP = \frac{FA}{DP}$$

For the packed products, the number of incremental samples, NPE value, can be also calculated, based on the number of pallets in a batch (NP) and the above calculated FP value, as follows:

$$NPE = \frac{NP}{FP}$$

Table 2. Example of sampling procedure for a 25000 kilos batch of food products for which analyses of quality, mycotoxins and heavy metals are performed

			FOOD PRODUCTS																			
			DL	NP	NA	QUALITY						MYCOTOXINS						HEAVY METALS					
			CP	DA	DP	FA	FP	NPE	MPE	PG	PL	FA	FP	NPE	MPE	PG	PL	FA	FP	NPE	MPE	PG	PL
PB	-	-	25000	-	-	-	-	*8*	*0.4*	*1*	*1*	-	-	*8*	*1.3*	*10*	*10*	-	-	*8*	*0.4*	*1*	*1*
AV	-	-	25000	-	-	-	-	*3*	*0.4*	*1*	*1*	-	-	*3*	*0.4*	*1*	*1*	-	-	*3*	0.33	*1*	*1*
AS	*25*	*30*	24750	33	990	99.0	3.3	10	*0.1*	*1*	*1*	9.9	0.3	*100*	*0.1*	*10*	*10*	330.0	11.0	*3*	0.33	*1*	*1*
AB	*1000*	*1*	25000	25	25	2.5	2.5	10	*0.1*	*1*	*1*	0.3	0.3	*100*	*0.1*	*10*	*10*	8.3	8.3	*3*	0.33	*1*	*1*
GV	-	-	25000	-	-	-	-	*3*	*0.4*	*1*	*1*	-	-	*3*	*0.4*	*1*	*1*	-	-	*3*	0.33	*1*	*1*
G45	*45*	*12*	24840	46	552	110.4	9.2	5	*0.2*	*1*	*1*	5.5	0.5	*100*	*0.1*	*10*	*10*	184.0	15.3	*3*	0.33	*1*	*1*
G15	*150*	*4*	24600	41	164	32.8	8.2	5	*0.2*	*1*	*1*	1.6	0.4	*100*	*0.1*	*10*	*10*	54.7	13.7	*3*	0.33	*1*	*1*
G11	*1100*	*1*	24200	22	22	2.2	2.2	10	*0.1*	*1*	*1*	0.2	0.2	*100*	*0.1*	*10*	*10*	7.3	7.3	*3*	0.33	*1*	*1*
GrV	-	-	25000	-	-	-	-	*8*	*0.4*	*1*	*1*	-	-	*8*	*0.4*	*3*	*3*	-	-	*3*	0.33	*1*	*1*
GB	*800*	*1*	12000	15	15	1.5	1.5	10	*0.1*	*1*	*1*	0.2	0.2	*100*	*0.1*	*10*	*10*	5.0	5.0	*3*	0.33	*1*	*1*

Table 3. Example of sampling procedure for a 25000 kilos batch of food products for which analyses of pesticides, microbiological contamination and non-GMO content are performed

			FOOD PRODUCTS																		
			DL	NP	NA	PESTICIDES						MICROB.			non-GMO						
			CP	DA	DP	FA	FP	NPE	MPE	PG	PL	FP	NPT	MPT	FA	FP	NPE	MPE	PG	PL
PB	-	-	25000	-	-	-	-	*8*	*0.4*	*1*	*1*	-	-	-	-	-	10	*0,5*	5	2,5
AV	-	-	25000	-	-	-	-	*3*	0.33	*1*	*1*	-	*3*	*0.5*	-	-	10	*0,5*	5	2,5
AS	*25*	*30*	24750	33	990	330.0	11.0	*3*	0.33	*1*	*1*	6.6	*5*	*0.5*	31	1	31	*0,2*	5	2,5
AB	*1000*	*1*	25000	25	25	8.3	8.3	*3*	0.33	*1*	*1*	5.0	*5*	*0.5*	5	5	5	*1,0*	5	2,5
GV	-	-	25000	-	-	-	-	*3*	0.33	*1*	*1*	-	*3*	*0.5*	-	-	10	*0,5*	5	2,5
G45	*45*	*12*	24840	46	552	184.0	15.3	*3*	0.33	*1*	*1*	9.2	*5*	*0.5*	23	2	23	*0,2*	5	2,5
G15	*150*	*4*	24600	41	164	54.7	13.7	*3*	0.33	*1*	*1*	8.2	*5*	*0.5*	13	3	13	*0,4*	5	2,5
G11	*1100*	*1*	24200	22	22	7.3	7.3	*3*	0.33	*1*	*1*	4.4	*5*	*0.5*	5	5	5	*1,1*	5	2,5
GrV	-	-	25000	-	-	-	-	*3*	0.33	*1*	*1*	-	*5*	*0.5*	-	-	10	*0,5*	5	2,5
GB	*800*	*1*	12000	15	15	5.0	5.0	*3*	0.33	*1*	*1*	3.0	*5*	*0.5*	4	4	4	*1,3*	5	2,5

For the determination of mycotoxins level the rules imposed by the EU regulations are stricter, therefore the number of fixed values, marked in the table with font italic and yellow colour is bigger than for the other analyses. In corn, as it is known that there is very heterogeneous distribution of the grains, the Commission Regulation (EC) No 401/2006 recommends a Guidance document for the sampling of cereals for mycotoxins, which specifies the impossibility of static sampling for very large batches stored in closed cylindrical silos (Malone *et al*., 2008). The corn used for the starch production in the factory, taken as reference, is stored in closed cylindrical silos of 5000 tonnes capacity. As a solution to apply sampling rules to specific possibilities, we adapted the instruction presented in the same Guidance for batches with reasonable size, as follows: if for a 25 tonnes batch of grains the sampling procedure requires to release into a recipient a quantity of 50 to 100 kilos and to take the sample in a representative way from this 50-100 kilos (meaning five incremental samples of 2 kilos to obtain a global sample of 10 kilos), then for a 5000 tonnes batch the sampling procedure may require to release into a recipient a quantity of 25 tonnes and to take the sample according to SR EN ISO 24333:2009 (meaning 8 incremental samples of approx. 1.3 kilos to obtain a total sample of 10 kilos) from this quantity located in a truck (Figure 1). The calculation was made by using the rule of three and the real result was between 10 and 20 tones. For this adaptation we consider also the literature. Hallier *et al*. showed in 2011 that the principal source of variability in the mycotoxin analysis result is the grain sampling, due to the heterogeneous repartition in the grain lots. It can decrease with the sample size increasing and can increase proportional with mycotoxin

concentration (Whitaker, 2003; 2006). For the cereal products, food and feed, although the heterogeneity is lower than in the case of grains, it is also very important to collect a representative sample (Duarte *et al*., 2010; Stroka *et al*., 2004). For bulk products (starch, glucose syrup, germs, corn gluten feed and corn gluten meal) we consider only SR EN ISO 24333:2009, but for packed products we take into consideration both Commission Regulation (EC) No 401/2006 (for food products) and Commission Regulation (EC) No 152/2009 (for feed products) regarding the number of elementary samples and the sample size and, according to that, we calculate the sampling frequency given by SR EN ISO 24333:2009 and the number of incremental samples by using the formula:

$$NPE = \sqrt{NA}$$

For heavy metals in food the sampling frequency was established according to SR EN ISO 24333:2009, considering the minimum sample size specified by Regulation (EC) No 333/2007 (1 kilo comprising 3 incremental samples). The formula used is:

$$MPE = \frac{PG}{NPE}$$

For heavy metals in feed it was applied the same sampling procedure as for mycotoxins in feed and in addition MPE was calculated as for heavy metals in food.

The sampling procedure for pesticides was issued considering the sample size and the number of elementary samples specified by Commission Directive 2002/63/EC for bulk and packed batches lower than 50 tonnes and calculating the sampling frequency according to SR EN ISO 24333:200 and MPE according to the formula used for heavy metals in food.

Table 4. Example of sampling procedure for a 25000 kilos batch of feed products for which analyses of quality, mycotoxins and heavy metals are performed

			FEED PRODUCTS																				
			DL	NP	NA	QUALITY						MYCOTOXINS						HEAVY METALS					
			CP	DA	DP	FA	FP	NPE	MPE	PG	PL	FA	FP	NPE	MPE	PG	PL	FA	FP	NPE	MPE	PG	PL
TV	-	-	25000	-	-	-	-	*3*	*0.4*	*1*	*1*	-	-	*8*	*0.5*	*4*	*1*	-	-	*8*	0.5	*4*	*1*
TB	*900*	*1*	24300	27	27	2.7	2.7	10	*0.1*	*1*	*1*	0.7	0.7	*5.2*	*0.1*	*4*	*1*	5.2	5.2	5	0.8	*4*	*1*
FV	-	-	25000	-	-	-	-	*3*	*0.2*	*1*	*1*	-	-	*8*	*0.5*	*4*	*1*	-	-	*8*	0.5	*4*	*1*
FB	*1000*	*1*	4000	4	4	0.8	0.8	5	*0.2*	*1*	*1*	0.1	0.1	*4*	*0.1*	*4*	*1*	1.0	1.0	4	1	*4*	*1*

Table 5. Example of sampling procedure for a 25000 kilos batch of feed products for which analyses of pesticides, microbiological contamination and non-GMO content are performed

			FEED PRODUCTS																		
			DL	NP	NA	PESTICIDES						MICROB.			non-GMO						
			CP	DA	DP	FA	FP	NPE	MPE	PG	PL	FP	NPT	MPT	FA	FP	NPE	MPE	PG	PL	
TV	-	-	25000	-	-	-	-	*3*	0.33	*1*	*1*	-	-	-	-	-	10	*0,5*	5	2,5	
TB	*900*	*1*	24300	27	27	9.0	9.0	*3*	0.33	*1*	*1*	27.0	*1*	*0.5*	5	5	5	*1,0*	5	2,5	
FV	-	-	25000	-	-	-	-	*3*	0.33	*1*	*1*	-	-	-	-	-	10	*0,5*	5	2,5	
FB	*1000*	*1*	4000	4	4	4.0	4.0	*1*	1.00	*1*	*1*	4.0	*1*	*0.5*	2	2	2	*2,5*	5	2,5	

As for microbiology criteria of starch the only reference document is Decree ANSVSA 27/2011 we applied it as sampling instruction for all the products (food and feed) to be applied when required. For the packed products the sampling frequency / pallet unit was calculated with the following equation:

$$FP = \frac{NP}{NPT}$$

For non-GMO analysis we identified the specific sampling procedure taking into account the Commission Recommendation 2004/787/EC which specifies that "In case of lots smaller than 50 tonnes, the size of the bulk sample

should be 5 kg." According to this instruction, we calculate the number of the incremental samples which should be taken from bulk products, as follows:

$$NPE = \frac{PG}{MPE}$$

For packed products CEN/TS 15568:2006 contains relevant information about sampling strategies and it was easy to use, because of the number of incremental samples is given by the square root of total number of packages (Sisea, 2009). According to this indication and considering the global sample to be 5 kg as it is indicated in the Commission Recommendation 2004/787/EC, the values of NPE, MPE, FA, FP were calculated as follows:

$$NPE = \sqrt{NA} \quad ; \quad FA = \frac{NA}{NPE}$$

$$MPE = \frac{PG}{NPE} \quad ; \quad FP = \frac{FA}{DP}$$

For both, bulk and packed products, the laboratory sample (PL) is half of PG.

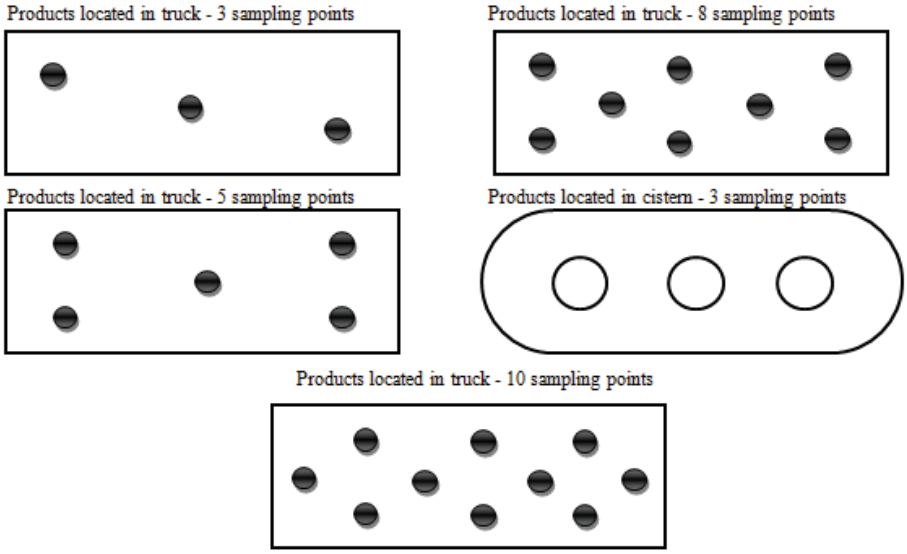

Figure 1. Examples of sampling distribution points

CONCLUSIONS

The development of a specific sampling procedure in the starch industry depends on the factory's specificity, including infrastructure possibilities, activities and analysis type.

Although the standards and legislation offer a general description of the sampling instructions, they can be applied in a harmonized way, on condition that the production process and products characteristics are known very well.

The sampling procedures to be applied for the analyses of pesticides, microbiological contamination and GMO-presence detection for packed products of food and feed are similar. However, differences appear when the analyses of mycotoxin presence should be performed, the rules for sampling for these types of analyses being more strict.

For food and feed bulk products the rules from regulations and standards are more specific and, that for the sampling procedure is simpler than for packed products.

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A BRIEF OVERVIEW OF ETHYLENE MANAGEMENT TO EXTEND THE SHELF LIFE OF TOMATOES

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Abstract

Tomato (Lycopersicon esculentum Mill.) is one of the most important vegetable cropsin the world of horticultural economy, being commercially valuable worldwide, both for fresh and for processing markets. In addition, tomato represent a major research plant material, thus results obtained from its study can be applied to other plants of the Solanaceae family. It is a climacteric fruit, with a respiratory peak during their ripening process. Ethylene is one of the most important natural plant hormonethat regulates fruit ripening. Thus, ethylene biosynthesis management, especially during postharvest period allow producers more time for shipment and increase the shelf life of tomato fruit for consumers. Maximum tomato loss in quality and quantity occurs from harvesting to consumption. The problem of loss can be controlled by adapting suitable scientific methods of packing and storage and by establishment properly postharvest management. One of the first and simplest conditions to influence the postharvest production of ethylene refers to the handling practices and storage temperature. Some classical treatments as for instance, postharvest application of 1-methylcyclopropene (1-MCP) as one of ethylene action inhibitor is also successfully used. There are also recent functional genomic studies in tomato. Integrating molecular approaches with conventional breeding may enhance fruit quality and could significantly improve the postharvest shelf life of tomato.

Key words: *Lycopersicon esculentum, postharvest, ripening, shelf life.*

INTRODUCTION

The postharvest losses of fruits and vegetables in the developing countries account for almost 50% of the production (Meli et al., 2010).

Tomato (*Lycopersicon esculentum* Mill.) is one of the most important vegetable crop in the world of horticultural economy (Upendra et al., 2003), being commercially valuable worldwide (Kimura and Sinha, 2008), both for fresh and for processing markets (Opiyo and Ying, 2005), not only because of its volume, but also because of its overall contribution to nutrition, and its important role in human health (Agraval and Rao, 2000; Martinez-Madrid et al., 2007; Me et al., 2007). The nutrient value of tomato fruit is related to its composition in carbohydrates, organic acids, minerals, vitamins and pigments (Helyes, 1999; Nasrin et al., 2008; Mutari and Debbie, 2011). It is the second most widely grown vegetable crop in the world other than the white potato (Hanson et al., 2001; Panthee and Chen, 2010).

In addition, the tomato belongs to the extremely large family *Solanaceae* and is closely related to many commercially important plants such as potato, eggplant, peppers, tobacco, and petunias. Knowledge obtained from its studies can be easily applied to these plants, which makes tomato important research material. So, tomato serves as a model organism for the family *Solanaceae*, also a model system for studying many aspects of fruit biology, including development and metabolism (Kimura and Sinha, 2008; Okabe et al., 2011; Xu et al., 2012), in part due to the availability of well characterized ripening mutants (Zhang et al., 2009). Tomato is a climacteric, perishable vegetable fruit, with a very short life span, usually 2-3 weeks An increase in the storage life and improvement of tomato fruit quality is really desirable (Sammi and Masud, 2007). Ethylene synthesized by all higher plants tissues is involved in regulating many growth and developmental processes in plants (Yang, 1985; Abeles et al., 1992) and constitute an important regulator of fruit ripening (Behboodian et al., 2012). Delaying the fruit ripening process would allow producers more time for shipment and increase

the shelf life of the fruit for consumers (Opiyo and Ying, 2005).

Even if in the past appearance quality has been emphasized, consumers buy tomatoes on the basis of appearance and firmness, their satisfaction and repeat purchases depend upon good flavor quality (Kader, 1986).

MATERIALS AND METHODS

A literature search strategy was used, mainly on the most recent scientific papers on the relationship between ethylene and fruit quality of tomato, especially during post harvest, using online database Science Direct.

RESULTS AND DISCUSSIONS

GENERAL ASPECTS OF ETHYLENE BIOSYNTHESIS MANAGEMENT DURING FRUIT RIPENING

Fruit ripening has received considerable attention due to its commercial importance (Yokotani et al., 2009).The control of fruits ripening is often achieved through early harvest, by controlling the postharvest storage atmosphere and by genetic selection for slow or late ripening varieties (Oms-Oliu et al., 2011).

It is know that ethylene function to promote many aspects of ripening of many climacteric fruits, including tomato (Abeles et al., 1992; Yokotani et al., 2009; Barry and Giovannoni, 2007) and modulating its levels in the transgenic plants, as regard as many biotic or abiotic stress factor is readily attainable for a variety of plants [(Stearns and Glick, 2003).

Ethylene biosynthesis starts from methionine via S-adenosyl-L-methionine (AdoMet) having as an intermediate the non-protein amino acid 1-aminocyclopropane-1-carboxylic acid (ACC) (Adams and Yang, 1979). The conversion of AdoMet to ACC and of ACC to ethylene is assured by ACC synthase and ACC oxidase, respectively (Kende, 1993).

Ethylene regulation in climacteric and non-climacteric fruits is under control of two distinct ethylene producing system defined by McMurchie et al. (1972): system1 (autoinhibitory) and system 2 (autocatalytic). System 1 control the low ethylene production rate and represent basal ethylene in unripe fruit and vegetative tissues, while system 2 is associated with the autocatalytic rise in ethylene production as is the case of mature climacteric fruits, too (Oetiker and Yang, 1995). Fruit ripening and the role of ethylene in its regulation is complex. Therefore, understanding what controls these processes in non climacteric ripening may prove pertinent to gaining full understanding of climacteric fruit ripening and vice versa (Alexander and Grierson, 2002).

Recently, Yokotani et al. (2009) proposed a model to explain the transition from system 1 to system 2. System 1 is produced via *LeACS1A* and *LeACS6*, which are regulated by a negative feedback system, in the case of absence of exogenous ethylene and stress, via the limited expression of *LeACS2* and *LeACS4, thus registering a* limited increase of ethylene biosynthesis. In a such situation, limited ethylene would play a role as a trigger to stimulate an ethylene burst due to the ethylene-dependent expression of *LeACS2* and *LeACS4*, inducing fruit ripening. System 1 decreases with the onset of system 2, as *LeACS6* is regulated by a negative feedback system; therefore, system 2 in tomato fruit consists of both ethylene-dependent (autocatalytic) and ethylene-independent (non-autocatalytic) systems. Even when the effect of system 1 ethylene is eliminated, fruit can initiate system 2, leading to fruit ripening.

Moreover, responses to this hormone is realized by a signal transduction pathway in which Ethylene Responsive Element Binding Proteins (EREBPs) are transcription factors that help regulate the ethylene response by regulating transcription and gene expression. For example, Zhang et al. (2012) have cloned the gene Tomato LeERF1, indicated its location at the cellular level in the nucleus, nucleolus and plastids, and little signal was detected in the cell wall and vacuole. They have established relationship of LeERF1 with the ripening of tomato fruit.

MEANS TO EXTEND TOMATO SHELF LIFE

Maximum loss in quality and quantity of tomato occurs from harvesting to consumption (Kader, 1986), so, the problem of loss can be controlled by adapting suitable scientific methods of packing and storage and by establishment proper post harvest management (Rahman et al., 2010).

One of the first and simplest conditions to influence ethylene production refers to the handling practices and storage temperature. When matter plants in general are subjected to physical or biological stress the result may be a tissue damage, which implies the production of the ethylene, either as a defense response or to repair the damage tissues. So, an increase of respiration and softening are registered (Mutari and Debbie, 2011). Tomato sealed in plastic films had an extended marketable life and it affects the gaseous atmosphere around the fruit. The use of KMnO4 contributed to the production of CO_2 and water in the package atmosphere which helped in lowering the respiration and ripening processes (Sammi and Masud, 2007). Post-harvest packing methods, such as storage in perforated (0.25%) polythene bags under ambient conditions (temperature of 20^{0}-25^{0} C and relative humidity of 70-90%) extended up to 17 days tomato shelf life without excessive quality decay (Nasrin et al., 2008). The use of black perforated polythene bags (Rahman et al., 2010), treating fruits with chloride and calcium chloride, and treatment of 0.1% gibberellic acid and 0.4 nM salicylic acid (Pila et al., 2010) have been shown to decrease fruit decay and weight loss**.**

There are also used some treatments in relation to ethylene management. For instance, post-harvest application of 1-methylcyclopropene (1-MCP) as one of ethylene action inhibitor (Sisler, 2006) delayed tomato fruit ripening in relation to the used concentration (Moretti et al., 2002). Response of various climacteric species, including tomato is variable and depends also on internal levels of ethylene (Zhang et al., 2009; Zhang et al., 2010). It should be considered that ingress and accumulation in tomato fruit of gaseous 1-MCP applied as gaseous or aqueous formulation is rapidly. The post-exposure fate is due in relation to multiple factors: inherent sorption-capacity, surface properties (e.g., waxes, stoma), volume and continuity of gas-filled intercellular spaces, and tissue hydration (Dong et al., 2013). In addition, Su and Gubler (2012) showed that reducing post-harvest decay by 1-MCP is also associated with a reduction of economic loss caused by diseases.

There is also a positive interaction between jasmonates resulting from treatment with methyl jasmonate (MeJA) and ethylene. MeJA application causes increased jasmonates concentration, which regulate LOX activity associated with the production of superoxide anion, which has an impact on ethylene production (Yu et al., 2009). JA-ethylene cross-talk in the ethylene synthesis pathways is based on their synergistic interaction, as for example the JA-ethylene responsive antifungal defensin *PDF1.2* (Spoel et al., 2003) regulation by the simultaneously activation of JA and ethylene response pathways (Abeles et al., 1992). Kim et al. (2013) obtained contradictory results. They noticed that JA has also an inhibitory effect on ethylene signaling, which may involve an EIN2 (a key protein in ethylene signaling)-independent pathway. JA antagonistic and ethylene independently function was also registered during lycopene biosynthesis in tomato fruits (Liu et al., 2012).

Respiration rate may be also controlled by influence its proper molecular mechanism. Alternative oxidase (AOX) and ethylene mediate fruit ripening of tomato. Xu et al. (2012) used tomato plants with reduced *LeAOX (Le* alternative oxidase) levels and results were retarded ripening; reduced carotenoids, respiration, and ethylene production; and the down-regulation of ripening-associated genes. On the other hand, the fruit that over expressed *LeAOX1a* accumulated more lycopene, and they displayed a similar pattern of ripening to wild-type fruit.

Zhang et al. (2009) described a *relationship between ABA and ethylene* during tomato fruit ripening and senescence as followings: (i) the expression of the ABA biosynthetic gene (*LeNCED1*) (which encode 9-*cis*-epoxy carotenoid dioxygenase (NCED) as a key enzyme in ABA biosynthesis) occurs before that of ethylene biosynthesis genes; (ii) ABA content also preceded the climacteric increase in ethylene production; (iii) ABA may induce ethylene biosynthesis via the regulation of ACS and ACO gene expression; (iv) exogenous ABA accelerates fruit ripening, and fluridone or nordihydroguaiaretic acid treatment delayed fruit ripening by inhibition of ABA; and (v) ethylene plays a key role in the later stages of fruit ripening.

Delaying ripening and enhancing resistance to a post-harvest fungal pathogens can be also assure by NO treatments (Lai et al., 2011)

which suppress ethylene biosynthesis, stimulate the activity of antioxidant enzymes and regulate the expression of age-related genes.

Tomato is a suitable system for studying unique biological phenomena not harbored by *Arabidopsis* (Okabe et al., 2011). As Me et al. (2007) noticed, in molecular technologies, using molecular markers in plants breeding programs is a common procedure. Unfortunately, gene *modification techniques* introduced into tomato crop improvement, greatly altered tomato variety characteristics. Studies performed by Rodríguez et al. (2011) emphasized that polymorphic polipeptides from fruit pericarp associated with quality fruits traits and fruit shelf life can be such useful tomato breeding programs, as protein molecular markers.

The tomato genome was entirely sequenced by The International Solanaceae Genomics Project (SOL), and many of the gene sequences can be retrieved from databases (Mueller et al., 2009). Also, recently (2012) The Tomato Genome Consortium presented a high-quality genome sequence of domesticated tomato, a draft sequence of its closest wild relative, *Solanum-pimpinellifolium*, and compared them to each other and to the potato genome (*Solanum-tuberosum*). Although the tomato is completed sequenced, its genomic resources have not been fully exploited. Few studies have reported the detection of quantitative trait loci (QTLs) using simple sequence repeat (SSR) markers for fruit quality traits in tomato, in the recent studies carried out by Yogendra and Gowda (2013). Xu et al. (2013) presented a complete analysis of the RNA helicases (a class of molecular motor proteins) gene family, including the chromosomal locations, phylogenetic tree, and gene structure analysis and expression profile under various growth conditions.

Twenty years ago Klee (1993) noticed that biochemical analysis of transgenic tomato fruits line expressing 1-aminocyclopropane-1-carboxylic acid (ACC) deaminase enzyme emphasized no significant differences from controls in the levels of ACC oxidase or polygalacturonase. Also, transgenic fruit were significantly firmer than the control, so, the author conclusion was that other enzymes may have a significant role in fruit softening. Meli et al. (2010) identified and targeted two ripening-specific *N*-glycoprotein modifying enzymes (a-mannosidase (a-Man) and ß-D-*N*-acetylhexosaminidase (ß-Hex) and also demonstrated that genetic manipulation of *N*-glycan processing can be of strategic importance to enhance fruit shelf life, without any negative effect on phenotype, including yield.

To accelerate functional genomic research in tomato, Okabe et al. (2011) developed a Micro-Tom TILLING (Targeting Induced Local Lesions In Genomes) platform and to be used for efficient mutant isolation, six ethylene receptor genes in tomato (*SlETR1–SlETR6*) were screened. The identification of two novel *Sletr1* mutant alleles that are distinguished by the level of ethylene sensitivity and the characterization of their associated phenotypes could provide insight into the ethylene-mediated fruit ripening mechanism in tomato.

Behboodian et al. (2012) were employed RNA interference (RNAi) technology to silence the genes involved in ethylene biosynthetic pathway, by blocking the expression of specific gene encoding the ACC oxidase. The obtained results has successfully demonstrated that several transgenic lines of lowland tomato cv. MT1, harboring an hpRNA-ACO1 (ACC oxidase) construct, showed lower ethylene production because the transgenic fruits displayed delayed post-harvest life with no phenotypic changes and similar amounts of soluble solids content, titratable acidity and ascorbic acid as compared to wild type fruits. They proposed that, hpRNAi ACO1 could effectively be used to delay post-harvest damage, especially in climacteric fruits.

Research carried out by Xie et al. (2006) emphasized that Virus-induced gene silencing (VIGS) technology combined with vacuum infiltration can silence *LeACS2* gene function for a certain time and is an efficient way to postpone the post-harvest senescence of tomato fruit. In the same time, vacuum infiltration is an easy and inexpensive method at room temperature, so, a potential method to maintain the quality of detached tomato fruit. The syringe infiltration method of VIGS [tobacco rattle virus (TRV)-LeRIN: the transcription factor RIN (Ripening Inhibitor) belongs to the MADS box family and regulates tomato ripening] was successfully applied to silence the LeRIN, LeACS2, LeACS4 and LeACO1 genes in tomato fruits. There were identified also, the target genes

of RIN transcription factor in ethylene biosynthesis in tomato fruit (Li et al., 2011).

Integrating molecular approaches with conventional breeding to enhance fruit quality could significantly improve the post-harvest shelf life of tomato. Recently, tomato hybrids with enhanced shelf life were developed using ripening mutants and agronomically superior Indian cultivars, and hybrids from all possible line x tester crosses were screened for shelf life, yield, and other fruit qualities (Yogendra and Gowda, 2013).

CONCLUSIONS

Tomatoes are one of the most important vegetables worldwide and are used both for fresh consumption, as well as processed, considering their nutritional value and health benefits to people.

Always, there have been major concerns for the improvement of tomato characteristics feature, including those regarding the ripening dynamics, with a view to reduce the post-harvest loss and to extend shelf life.

Ethylene is one of the most important plant hormone, which regulates tomato ripening. So, ethylene management by integrating molecular approaches with conventional breeding could significantly improve the post-harvest shelf life of tomato.

In addition to breeders focus to increase tomato production and to extend the fruits shelf life, flavor improvement still remains one of the major challenges (Klee and Tieman, 2013).

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PRELIMINARY STUDY RELATED HIGHLIGHTING THE INHIBITORY EFFECT OF *IN VITRO* FUNGUS GROWTH *MYCOSPHAERELLA GROSSULARIAE* (AUERS.) LIND. BY SAPROPHYTIC FUNGI

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Abstract

Mycosphaerella grossulariae (Auers.) Lind., one of the most important pathogenic fungi which affect the black currant ecological crops cultivated for alimentary supplements and phytotherapeutics drugs production. The present study brings the new data related to the possibility of „in vitro" vegetative growth inhibition of fungus mycelium using saprophytic fungi species. The species of fungi used for experimental trials was Trichoderma viride, Trichothecium roseum Link, Epicoccum nigrum Link. and Gliocladium roseum Bainier. The fungus was growth on several culture media for comparative testing and establishment of the most efficient medium for vegetative growth of the fungi. In the study we also follow the comparative approach doing by biometric measurements of the colonies in which work variant the pathogenic fungi had the high rate of growing. After the testing was made the PDA medium was selected for experimentation of inhibitory effect of the saprophytes. The method used for trials was the double cultures technique on the medium of agar which consists in inoculation of one media fragment of mycelium carrier separated from the agar medium of saprophytic fungi on some distance from pathogenic fungi. The study carried out had allowed the highlight of the fact that in all experimental variant used the saprophytic fungi had inhibits the Mycosphaerella grossulariae pathogen growing. The detailed analysis of the results we could reveal that the most inhibitory effect was done by T. viride followed by T. roseum and E.nigrum.

Key words: *blackcurrant crop, inhibitory effect, Mycosphaerella grossulariae, saprophytic fungi.*

INTRODUCTION

The biological resources and the sustainable exploit potential of aromatic and medicinal plants from our country are immense and represent an important sustainable component of Romanian agriculture (Manole, 2008). Romania has in his flora up to 3,600 species of plants and more than 1.000 are considered medicinal plants, spontaneous and cultivated (Alexan et al, 1988; Ardelean and Mohan, 2008; Bojor, 2003; Păun, 1995). In the classification of pharmacological industry are under different forms included − tea, medicinal and cosmetics products − almost 160 medicinal and aromatic species, among 110 are spontaneous collected and up 50 species are cultivated (Păun, 1995).

One of the species introduced in the cropping system, the blackcurrant crop (*Ribes nigrum* L.) are extremely economic important. The extension of ecological crops of this species are imposed the deeply acknowledgement of the pathogens in the purpose of finding rapidly and efficiently ways to biological control.

Mycosphaerella grossulariae (Auers.) Lind. is one of the most important pathogenic fungi which affect the black currant ecological crops cultivated for alimentary supplements and phytotherapeutics drugs production. In plantation of blackcurrant cultivated as medicinal plant in the south of Romania, *Mycosphaerella grossulariae* produces spots with picnidia on the blackcurrant's leaves (Petrescu and Oprea, 2012).

The present study brings the new data related to the possibility of *„in vitro"* vegetative growth inhibition of fungus mycelium using saprophytic fungi species. The fungal saprophytic species used for experimentation are already cited as antagonists of various pathogens of

cultivated plants (Şesan, 1997, Şesan and Oprea, 1995). The *in vitro* antagonistic activity of some fungi against other fungal pathogens of blackcurrant was previously investigated (Petrescu and Şesan, 2012; Petrescu et al., 2012). Biological control with antagonistic strains of fungi is an alternative and non polluting method for control the plant diseases produced by fungal pathogens (Fokkema, 1996).

Related to environmentally friendly alternative control methods of fungal pathogens of blackcurrant, a recent study analyzes the effect of some plant extracts on the development of the blackcurrant′s pathogen *Sphaerotheca mors-uvae* that produces American mildew, and on the pathogenic fungi isolated from phylloplane of blackcurrant in the South Eastern part of Romania, such as *Botrytis cinerea*, *Alternaria tenuissima* and *Fusarium oxysporum* (Enache et al., 2011).

The field experimental plots were located in the blackcurrant crops of S.C. Export-Import Hofigal S.A., which are playing the role of co-financing partner in the research consortium. The mentioned firm is a promoter of the systems for ecological agriculture in the case of some shrubs crops for alimentary supplements production.

MATERIALS AND METHODS

We are using for our study the biological material provided from reference isolate of the *Mycosphaerella grossulariae* (Auers.) Lind. CBS 235.37 pathogen, which was purchased from CBS culture collection of microorganisms, Utrecht, the Netherlands, and another 4 own isolates of saprophytes fungi obtained in 2010 from blackcurrant′s phylloplan, which were tested for their *in vitro* effect on the pathogen. These isolates are four strains of the fungi *Trichothecium roseum, Trichoderma viride, Gliocladiumroseum* and *Epicoccum-nigrum.*

In order to saprophytic fungi isolation the blackcurrant leaves were collected and introduced in plastic bags and brings to the RDIPP (Research Development Institute for Plant Protection) laboratory of Mycology for processing and analysis. In laboratory the leaves were divided into the small pieces with the help of sterile scissors. The leaves pieces were then placed on the water-agar media for sporulating stimulation and also on CGA media and incubated at the room temperature. The spores of different saprophytic fungi were observed and studied at the optical microscope. The saprophytic fungi spores or a little piece of fungi mycelium were being transferred on the culture media in sterile conditions. The culture media used for fungi growth and multiplication were PDA and MEA. The pathogenic strain of *Mycosphaerella grossulariae* was inoculated on different media and the colony diameter and colony characteristics were registereded. Four culture media were used, PDA (potato dextrose agar, MEA (malt extract agar) Czapek-Dox and Czapek). Each variant had 3 repetitions.

The saprophytic fungi and the pathogen were grown on PDA medium. On the specified time intervals biometrics measurements of the reverse side of the diameter of the colonies were performed in view to establish and compare the growing rate of the pathogenic fungus *Mycosphaerella grossulariae* with those of the saprophytic fungi. Looking for *in vitro* testing of the antagonic effect of the four saprophytic fungi against the strain of *Mycosphaerellagrossulariae* the double culture method were performed which mean the inoculation of both pathogen and saprophytic fungi on the same Petri dish at the same distance for the dish centre and the same distance one for another (Juan, 1964, Şesan and Oprea, 1995). The experimental design consists in 5 variant on 3 replicates each. The control medium culture had inoculated only with the saprophytic fungi. The Petri dishes selected for the experiment had a small diameter (60 mm) because of the length rhythm of pathogen growing. The medium used for testing was PDA. The diameter of the fungal inoculum, both pathogenic and saprophytic was of 3 mm and the distance between Petri dish centre and inoculum was of 10 mm, respectively. The distance between the pathogen inoculum and saprophytic one was of 20 mm. The saprophytic fungus was inoculated later, at the 5 days after pathogen inoculation in the moment when the colony characteristics of *Mycosphaerella grossulariae* are ready formed. The incubation was performed at room temperature (±24°C). The periodical measurements of internal radius of pathogen colony (the radius

oriented towards the centre of the Petri dish) on a period of 45 days were made and the values of these measurements were expressed by the media value of each variant. In the control case the internal radius which measures the colony growth was also the media of the periodical measurements values. On the basis of these media values of each variant, an inhibition degree were calculated after the follow relation, adapted and modified after Zivkovici et al. (2010):

$$I\% = \frac{I_C - I_V}{I_C} \quad (1)$$

Where:
I% = percent of growth inhibition;
I_C = internal radius of the colony of the fungus *Mycosphaerellagrossulariae* in control;
I_V = internal radius of the fungus *Mycosphaerellagrossulariae* in variant tested;
The inhibition scale used for values measurements and comparison between variants were adapted and modified after Zivkovici et al. (2010). This scale has 11 levels which permit to appreciate the inhibition degree (Table 1).
Periodically observation connected with colour of the colonies, back view of the colonies, contact line aspect and inhibition zone were made. Where I% <1 was considered 0 inhibition.

Table 1. Inhibition coefficient values and the corresponding inhibition level

Inhibition level	I%
0	0-1
1	1-10
2	11-20
3	21-30
4	31-40
5	41-50
6	51-60
7	61-70
8	71-80
9	81-90
10	91-100

Macroscopically, the relationship between the two fungal strains, a pathogenic one and a saprophytic one was made by the method described by Ana Hulea (1973) by observing the aspect of the contact line between the two colonies. Photos were taken after 7, 10 and 45 days.

RESULTS AND DISCUSSIONS

On the four media tested the colonies were circular, with hairy aspect, white colour and back view light brown (Figure 1).

Figure 1. Macroscopic in vitro aspect of the colony of the fungus M. grossulariae CBS 235.37 on MEA medium

After 45 days the colonies gets a more dark hue and the reverse side became dark brown. This result of the length vegetative growth of the colony was comparable with the observations of Stroe (1988) on the strains of another Mycosphaerella species, such as species *Mycosphaerella mori*, the pathogen which causes the antracnosis of *Morus alba*.
Among the four media tested, on the PDA medium *Mycosphaerella grossulariae* had a significant favorable growth. At 16 days after inoculation, the media value of colony diameter was of 19.3 mm, and the values are decreasing for MEA medium (19 mm), Czapek Dox (16.6 mm), and 15 mm on Czapek, respectively. At 24 day *Mycosphaerella grossulariae* had a better vegetative growth on PDA medium between the other media tested (Figure 2, Table 2).

Table 2. Diameters of the colonies of the fungus Mycosphaerella grossulariae (Auers.) Lind.CBS 235.37 on different culture media

variant	**Culture medium**	**Colony diameter (mm)**		
		after 16 days	after 24 days	after 45 days
1.	PDA	19.3	28.0	38.6
2.	Czapek-Dox	16.6	26.0	33.6
3.	Czapek	15.0	21.6	30.3
4.	MEA (Control)	19.0	26.3	32.3

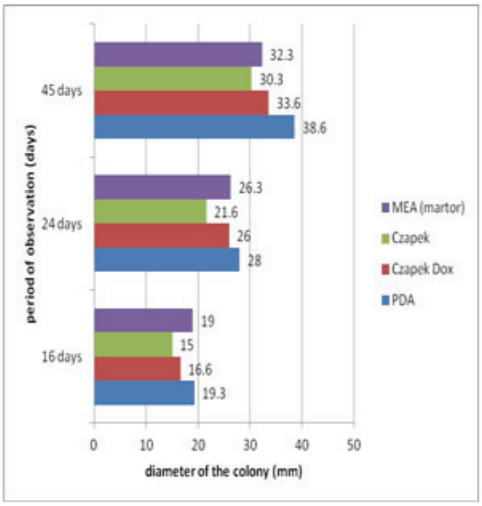

Figure 2. Vegetative growth of the colonies of the fungus Mycosphaerella grossulariae (Auers.) Lind.CBS 235.37 on different culture media

Among the five fungi grown on PDA medium, pathogenic fungi showed a significantly lower growth rate than saprophytic fungus *Trichoderma viride*. The other saprophytic fungi showed also significantly higher growth rates, but lower than *Trichoderma viride* (Figure 3, Table 3).

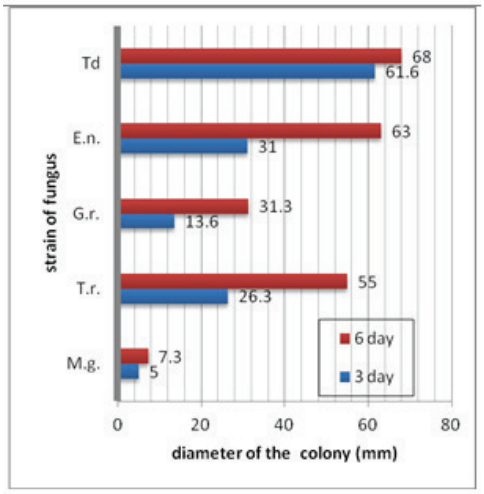

Figure 3. Diameter of the colonies of the strains of the fungi Trichoderma viride (Td), Epicoccum nigrum(E.n.), Gliocladium roseum (G.r.), Trichothecium roseum (T.r.) and the strain of the pathogenic fungus Mycosphaerella grossulariae (Auers.) Lind.CBS 235.37 (M.g.) on PDA medium

Table 3. The vegetative growth of the fungus Mycosphaerella grossulariae (Auers.) Lind.CBS 235.37 and the saprophytic fungi Trichoderma viride, Epicoccum nigrum, Gliocladium roseum and Trichothecium roseum grown on PDA medium

Variant	Colony diameter (mm)	
	after 3 days	after 6 days
Trichoderma viride	61.6	68.0
Epicoccumnigrum	31.0	63.0
Gliocladiumroseum	13.6	31.3
Trichothecium roseum	26.3	55.0
M. grossulariae	5.0	7.3

On the whole period of experimentation, in the control variant, fungus *Mycosphaerellagrossulariae* had a constantly growing rate and reaching a medium value of 5.91 mm after 7 days after inoculation of the saprophytic fungus in variant (Figure 1a), 7.3 mm after 10 days (Figure 1b), 15.8 mm after 30 days, 17.9 mm after 40 days and finally 18.7 mm after 45 days (Figure 1c). The shape of colonies was circular. The colour was white with the reverse of light brown (Figure 4).

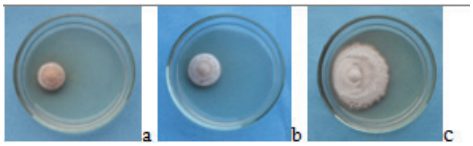

Figure 4. Macroscopic view of the colony of Mycosphaerella grossulariae (Auers.) Lind.CBS 235.37 on PDA medium after 7 days (a), after 10 days (b) and after 45 days (c) from pathogen inoculation in variants

The strain of *Trichothecium roseum* had a fast growth to the pathogen strain of *Mycosphaerellagrossulariae.* After 6 days from its inoculation, the mycelia of *Trichothecium roseum* began to cover all the area around the pathogen and blocked its expansion by the inhibitory effect under the internal radius which pointed the value of 3.95 mm read on the reverse side. After 7 days the *Trichothecium roseum* pink mycelium had developed around the white *Mycosphaerellagrossulariae* colony (Figure 5a). The division line had his concavity to pathogen fungi oriented who had a low rate of growing. The external radius continuosly growing against internal radius, the value registered being of 4.4 mm. After 10 days the mycelium of *T. roseum* had completely covered the pathogen colony which being totally inhibited (Figure 5b, Figure5c).

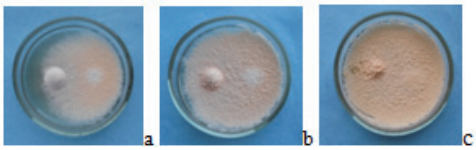

Figure 5. Macroscopic view of the colony of Mycosphaerella grossulariae (Auers.) Lind.CBS 235.37 on PDA medium after 7 days (a), after 10 days (b) and after 45 days (c) from inoculation of the strain of Trichothecium roseum

After 7 days from inoculation of the antagonistic fungus *Gliocladiumroseum*, internal radius of its colony became in the neighborhoods the phytopathogenic fungus colony (Figure 6a). After 10 days the contact line appeared as an obviously curve with the concavity oriented to the pathogen; this is characteristic of the relationship between the two fungal colonies among which there are differences in growth rate (Figure 5b). Between the two colonies being in the same Petri dish appeared a small area of sparse mycelium, which persisted throughout the 45 days of experimentation and it marked a inhibition of the pathogen exercises by saprophytic fungus (Figure 5b, Figure 5c). From this moment, the internal radius of the pathogen was inhibited in its growth and remained at the value of 5.35 mm, while the outer radius continued to grow until the colony of *Mycosphaerellagrossulariae* was completely surrounded by saprophytic fungus colony and the pathogen growth was completely inhibited (Figure 6c).

Figure 6. Macroscopic view of the colony of Mycosphaerella grossulariae (Auers.) Lind.CBS 235.37 on PDA medium after 7 days (a), after 10 days and after 45 days (c) from inoculation of the strain of Gliocladium roseum

After 7 days the contact zone between colony of the fungus *Epicoccumnigrum* and *Mycosphaerellagrossulariae* colony became a curve with the concavity oriented towards pathogen fungus which had a slower growth, and the inner radius was ceased growing (Figure 7a). After 10 days, the white mycelium of the pathogenic fungus was partially surrounded by the colony of the saprophytic fungus and continued to grow only by external radius (Figure 7b.). At the end of the experiment, phytopathogenic colony was covered by that of the antagonistic (Figure 7c).

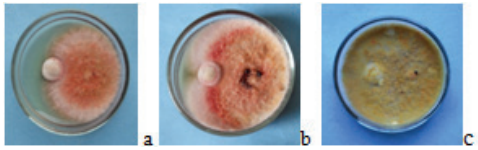

Figure 7. Macroscopic view of the colony of Mycosphaerella grossulariae (Auers.) Lind.CBS 235.37 on PDA medium after 7 days (a), after 10 days and after 45 days (c) from inoculation of the strain of Epicoccum nigrum

Trichoderma viride fungus grew very quickly over phytopathogenic fungus colony, so that at 7 days after inoculation antagonistic fungus invaded the colony, entirely covering the Petri dish and determine to cease growth both internal and external radius (Figure 8a, Figure 8b). Between the two colonies, pathogen′s and antagonist′s, the mycelium of fungus *Trichoderma viride* was sparse, sign that phytopathogenic fungus present in the vicinity may have an inhibitory effect on the fungus . At the end of the experiment, the Petri dish appeared totally covered by mycelium of the fungus *T. viride*, except for those inhibition zones that formed in the right of the two colonies that interacted (Figure 8c).

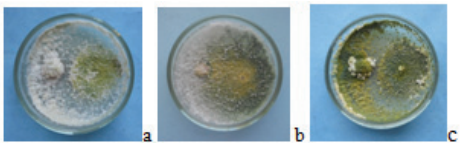

Figure 8. Macroscopic view of the colony of Mycosphaerella grossulariae (Auers.) Lind.CBS 235.37 on PDA medium after 7 days (a), after 10 days and after 45 days (c) from inoculation of the strain of Trichoderma viride

The average values of the percent of growth inhibition calculated after 7 days allowed assessment of inhibition as in the categories 4 for *Trichoderma viride*, 3 level for *Trichothecium roseum* and *Epicoccumnigrum* and only 1 level for the strain of *Gliocladiumroseum* (Table 4, Table 9, Figure 10).

Table 4. The in vitro effect exercised by some saprophytic fungi on M. grossulariae on PDA medium, expressed by inhibition percent (I%) and inhibition level (0-10), after 7 days

Variant	I%	level
M. grossulariae/ T. roseum	27,91	3
M. grossulariae/ G. roseum	9,47	1
M. grossulariae/ E. nigrum	24,53	3
M. grossulariae/ T. viride	30,11	4
Control (*M. grossulariae)*	0	0

At 10 days after inoculation, inhibition coefficient values increased, reaching category 5 for *Trichoderma viride* and *Trichothecium roseum*, 4 for *Epicoccumnigrum* and 3 for *Gliocladiumroseum* (Table 5, Table 9, Figure 10).

Table 5. The in vitro relationships between M. grossulariae and some saprophytic fungi on PDA medium, expressed by inhibition percent (I%) and inhibition level (0-10), after 10 days

Variant	I%	level
M. grossulariae/ T. roseum	41,64	5
M. grossulariae/ G. roseum	26,57	3
M. grossulariae/ E. nigrum	38,9	4
M. grossulariae/ T. viride	43,42	5
Control (*M. grossulariae)*	0	0

After 30 days from the inoculation, the inhibition values were significantly increased for all tested saprophytic fungi, being 73.86% in case of *Trichoderma viride*, 73.03 in case of *Trichothecium roseum*, 71.77 in case of the strain of *Epicoccumnigrum* and only 66.07% in case of *Gliocladiumroseum* (Table 6, Table 8, Figure 9). Inhibition level was 8 on our scale for three saprophytic fungal strains (*Trichoderma viride, Trichothecium roseum, Epicoccumnigrum*) and for one strain (strain of the fungus *Gliocladiumroseum*) the level of inhibition was a little lower, 7 respectively (Table 6, Table 9, Figure 10).

Table 6. The in vitro effect exercised by some saprophytic fungi on M. grossulariae on PDA medium, expressed by inhibition percent (I%) and inhibition level (0-10), after 30 days

Variant	I%	level
M. grossulariae/ T. roseum	73,03	8
M. grossulariae/ G. roseum	66,07	7
M. grossulariae/ E. nigrum	71,77	8
M. grossulariae/ T. viride	73,86	8
Control (*M. grossulariae)*	0	0

At the end of the experimentation, after 45 days of the antagonist inoculation we found that in case of *Trichoderma viride*, inhibition coe was 77.91, followed by *Trichothecium roseum* with 77.21 *Epicoccumnigrum*. *Gliocladiumroseum* showed the lowest coefficient of inhibition of 71.33 (Table 7, Table 8, Figure 9).

Table 7. The in vitro relationships between M. grossulariae and some saprophytic fungi on PDA medium, expressed by inhibition percent (I%) and inhibition level (0-10), after 45 days

Variant	I%	level
M. grossulariae/ T. roseum	77,21	8
M. grossulariae/ G. roseum	71,33	8
M. grossulariae/ E. nigrum	76,14	8
M. grossulariae/ T. viride	77,91	8
Control (*M. grossulariae)*	0	0

Table 8. Inhibition percent (I%) exercited by saprophytic fungi on M. grossulariae in experimentally variants

Variant (saprophytic strain fungus)	after 7 days	After 10 days	after 30 days	after 45 days
Trichothecium roseum	27,91	41,64	73,03	77,21
Gliocladium roseum	9,47	26,57	66,07	71,33
Epicoccum nigrum	24,53	38,9	71,77	76,14
Trichoderma viride	30,11	43,42	73,86	77,91
Control (*M. grossulariae)*	0	0	0	0

Related to degree of inhibition, however, for all saprophytic fungi tested for their inhibitory effect against the strain of phytopathogenic fungus *Mycosphaerella grossulariae*, the inhibition level was placed in category 8 (Table 7, Table 9, Figure 10).

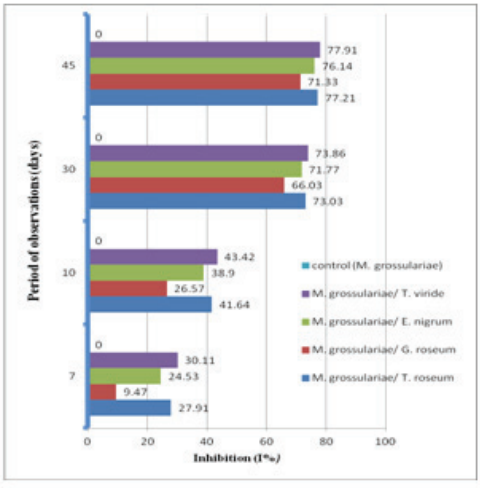

Figure 9. Evolution of inhibition percent (I%) in experimentally variants

Related to the process of the evolution of the inhibition percent values we observed that this is correlated with growth rate of the saprophytic fungi.

The fact the fungus *Trichothecium roseum* showed a higher inhibition than the fungus *E. nigrum* that had a faster growth, is probably due to the capacity of the species *T. roseum* to grow over and hyperparasitize the hyphae of the pathogens, while colony of the fungus *E. nigrum* was slowly surrounding the colony of *Mycosphaerella grossulariae.*

Table 9. Inhibition level exercited by saprophytic fungi on M. grossulariae in experimentally variants

Variant	Inhibition level			
	after 7 days	After 10 days	after 30 days	after 45 days
M. grossulariae/ T. roseum	3	5	8	8
M. grossulariae/ G. roseum	1	3	7	8
M. grossulariae/ E. nigrum	3	4	8	8
M. grossulariae/ T. viride	4	5	8	8
Control (*M. grossulariae)*	0	0	0	0

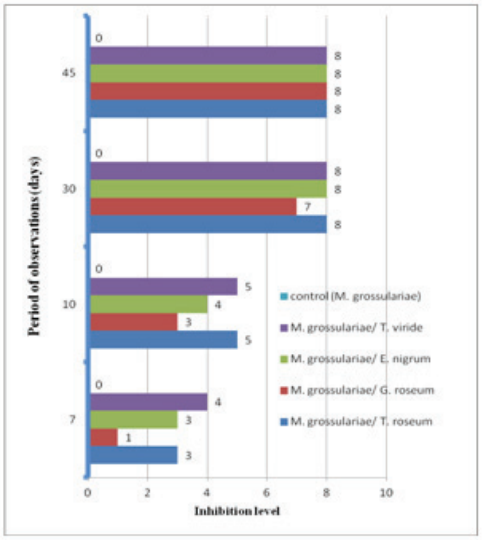

Figure 10. Evolution of inhibition level (0-10) in experimentally variants

CONCLUSIONS

The best vegetative growth of *Mycosphaerella-grossulariae* (Auers.) Lind. CBS 235.37 mycelia was registered on PDA medium, this type of medium being selected for growth fungi estimation used in this study and for inhibition effect of saprophytic fungi evaluation.

Among the 5 species incubated on PDA medium, the fast growing was observed in the case of the strain of *Trichoderma viride*, closely followed by the isolates of *Epicoccumnigrum* and *Trichothecium roseum.* Among saprophytic fungi the length growth was observed in the case of *Gliocladiumroseum* isolate.

The strain of *Mycosphaerellagrossulariae* had the lowest rate of growing, reaching a medium value of 7.3 mm of colony diameter after 6 days in comparison with the saprophytic fungi *Trichoderma viride* which totally covered the Petri dish surface.

All fungi tested related to their inhibitory capacity were influenced significantly the pathogenic fungus growth, but the stronger inhibitory effect was observed in the case of the strain of *Trichoderma viride,* followed by those of *Trichothecium roseum* and *Epicoccumnigrum.* The lowest inhibitory effect in the first 10 days after inoculation was observed in the case of *Gliocladiumroseum* strain, but after 45 days the inhibition value (I%) was closely to the other variants.

The inhibitory effect was direct proportional with the growth rate of both fungi: pathogenic one and the antagonistic with the exception of *Trichothecium roseum* and *Epicoccumnigrum.* Although *Trichothecium roseum* had a more length growth rate in comparison with *Epicoccumnigrum* it expresses a stronger inhibitory effect.

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THE QUALITY TEST OF THE BURNT VETIVER (VETIVERIA ZIZANIOIDES) WASTE UTILIZATION AS AN ECO-FRIENDLY MATERIAL POT

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Abstract

Essential oils of vetiver is an industrial and trading commodities in the international market that plays an important role for the perfume, medicine, and cosmetic industries. But the distillery for 12 hours from 1 ton vetiver produced only 4 liters of essential oil and of course a lot of waste that has accumulated. The purpose of this research are to overcome the industrial waste of vetiver treatment without the continues pollutant, to get the view about the mix pot from the vetiver waste technically and to know the quality of the pot made from vetiver waste. Making the sample is started with the selection between the burnt vetiver waste, cement and sand. Then making sample with the form like a pot that has the up diameter (31,3 cm), the bottom diameter (20,3 cm), highty (30 cm), and the mass of vetiver waste pot (5,52 kg) and the mass of reguler pot (5,36 kg). From the research that has been done, it can to get the conclusion that the vetiver waste pot has better quality than the reguler pot (cement pot). It reviewed from the power of the vetiver waste pot has a power until (583,78 kgf), while the reguler pot has just (410,34 kgf). Besides, this pot can save up to 30% of the cost of production and exactly it eco-friendly.

Key words: *Vetiver waste, pot, commodities, eco-friendly, saved cost.*

INTRODUCTION

Nowadays, West Java agribusiness and agro-industry has not treated optimally, but actually based on natural characteristics and the diversity of natural resources are very supportive. It is not surprising if it is used as a target in the strategic plan of the future development in of West Java province, with the agricultural sector (agribusiness and agro-industry), which became the leading sectors of West Java, especially in increasing revenue. It also wants to be a mainstay of the local government in improving Indonesia Development Index (HDI), especially in overcoming the impact of the prolonged economic crisis today (Kastaman 2003).

Essential oil is a commodity industry and trade in the international market plays an important role, especially as industrial raw materials that can reach billions of U.S. dollars. For instance, the price of 1 ounce of vetiver oil could reach 25.4 U.S. dollars. If the value is in the exchange rate of the rupiah in it, so for 1 ounce oil it can be range on Rp.228.600,-or USD 2,286,000.00 per kilogram of material (Kastaman, 2003).

So many essential oil in Indonesia, such as patchouli oil, clove oil, vetiver oil, lemongrass scented oil, eucalyptus oil, ylang oil and many more. One of the efforts to further develop the potential of essential oils, especially vetiver oil in Garut Regency, this time in the 'Uras' Cooperation in Bayongbong District, Garut Regency, has tried to build centers of production and oil refining vetiver. Product value of Garut Regency vetiver oil. Annually, reach Rp22, 5 billion under management 1508 farmers from an area of 1850 ha with a volume product vetiver 31,450 tons per year and 25 tons of oil per year (Between West Java Magazine March 24, 2009, the value of vetiver oil product in Garut Regency is Rp 22.5 billion, Johny Dody Hidayat). While the distillation process each ton of vetiver for 12 hours only produce 4 liters of oil at a price of Rp 900 thousand per liter and production costs Rp 2, 25 million, making it the benefit of farmers at about Rp 1, 4 million (Haeruman, Head Plantation Office Garut).

However, the processing of waste volume certainly gained considerable refining. Indeed, there are several ways of processing done by

the community, but still very simple. The community make the waste to make the compost mixture, but in the process the waste piled up in advance amounted to much. The impact is make the bad view, and in the accumulation of the highly pungent smell due to the persistence of the essential oils that are not perfectly distils that interfere with the surrounding air. Later, due to of the other accumulation is the water accumulation. Possibly, due to rain water that seeps in landfills vetiver it can seep into the soil and disrupt the existing groundwater conditions which in the beneath. Following the accumulation, the people burn it. Following hoarding, the people and then burn it. Here the problem arises again, the smoke produced disturb the surrounding air and can cause respiratory infection. Therefore, further research is needed to solve these problems with eco-friendly principles.

The purpose of this activity are to overcome the industrial waste of vetiver treatment without the continues pollutant, to get the view about the mix pot from the vetiver waste technically, and know the quality pot that made from waste vetiver

Based on empirical observation we get the information that vetiver waste is still a problem for the environment around them because of the bad smell and bad view. The most simple and quickly done by the most farmers in agro-industrial centers vetiver to handling of vetiver waste is by burning so the smoke that produced make the pollution impact.

One alternative solution to overcome this problem is with analyze the waste material that is used as a raw flower pot material. It is necessary to look at the possibility of waste utilization so that it can overcome the significant environmental issues surrounding the vetiver oil refining industry. In addition, it is expected to add the value of vetiver waste as an additional income for farmers and industrialists vetiver.

MATERIALS AND METHODS

This research were conducted in the centra of vetiver waste production which is manage by Vetiver Uras Cooperation Bayongbong District, Garut Regency during February until May 2012. This research use descriptive method with material characteristic analysis and press testing in Material Test Laboratory Department of Mechanical and Biosystem, and seepage testing in Cikabayan Green House Laboratory. Department of Agronomi and Horticulture Department, Bogor Agricultural University (IPB).

RESULTS AND DISCUSSIONS

Waste handling that conducted in the field is still inadequate and still cause pollution, in connection with the burning of waste after the distillation process is often done by many farmers (Figure 1). Smoke produced still contains essential oils so smell of smoke more pung ent. (Kastaman, 2003).

Figure 1. The Vetiver Waste Management by Burning that Caused a Lot of Negative Impact

The negative impact by (Kastaman, 2003) is that currently felt by the public about waste management with burning among others: air pollution, water pollution by residual materials / waste, plants in around the pile of waste experiencing barriers to growth, need extensive burning land so that the land is less productive.

The Production of Vetiver Waste Pot

The first step in the manufacture of vetiver waste pot is cut the vetiver into small pieces, The materials that is specified the mixture stirring until evenly (for the composition, the main dough: vetiver waste, cement and sand, while the coating dough: white cement, traso, and mil) then Prepare the pot mold and lid the flower pot mold, used motorcycles oil (grease) to lubricate the pot mold that that will be used to make the pot. This is to facilitate the separation of pot from from the mold, the original pot is not sticky Then, put the dough into the mold and trim while holding and rubbing to get a solid pot and a surface flat. The coating dough that contains of mixture water lubricated to the surface of the pot mold, this is to give color to the outer surface of the pot

before it is printed using the main dough The bottom of the mold pot gived the main dough. After the coating dough is evenly, then covered again with the main dough that it mixed with the water as the main ingredient pot. After it spread evenly, sprinkle the main dough without water, to strengthen those pot. When the main dough is evenly distributed on the mold, we sprinkle again with coating dough to give color to the inside of the pot.

After everything is evenly distributed, the inside of the pot must be be smooth using smoother scoop. So do with the mouth of the pot, it also must be smooth using smoother scoop. The thickness of the pot that will be produced is about 5cm. The pot mold left for about 5minutes, then the pot mold reversed slowly to remove the pot from the mold. The bond rubbers is removed one by one from the mold, then the pot is placed in the shade to avoid the direct sunlight.

The Maintenance ProcessMove the vetiver waste pot that printed to the protected place from the sunfor for 12 to 24 hours, until the flower pot come tobe hard.

The placement of flower pot in the shelter should be up and squeezed between the head and the head, so do the leg and the leg of flower pot, so that the surface are ot broken and the placement of the bottom side of the vetiver waste waste should be given as the base. The room should be covered and kept holding the air circulation so that the pot does not stricken direct of the sunlight. The cooling process should be performed by air drying or rather dried. This Drying is carried out for three days o rperceived vetiver waste pot is dry.

Figure 2. Manufacture of vetiver waste process (1) Vetiver waste is cut in to small pieces (2) Vetiver waste is mixed with cement and sand (3) Stir it so that the dough distribute evenly (5) The printing dan (5) And that is teh eco-friendly vetiver waste pot.

The Results of Seepage Test and Pressing Test

1. The Results of Seepage TestThe seepage test is did on the pot by putting water into the pot until it full during 24 hours. When the seepage test, the pot with normal material and the vetiver waste pot are fulfilled with the same water during 24 hours. Start at 08.00 a.m on May 5th 2012 until 08.00 a.m on May 6th 2012.

Table 1. The Seepage Test Result of Vetiver Waste Pot and the Normal Pot

The Repetition	The Reducing Water (cm)	
	Vetiver Waste Pot	Normal Pot
1	3,50	7,50
2	3,50	3,50
3	3,50	3,50
4	3,75	3,50
5	3,50	4,50
6	3,50	3,50
7	3,50	3,50
The Average	3,54	4,21

The vetiver waste can absorb the water 3.54 cm in average and the normal pot can absorb the water 4.21 cm. This indicates both vetiver waste pot and normal pot able to meet one of the requirements of good pots that can absorb the water.

2. The Result of Pressing Test

Table 2. The Data of the Pressing Test Result of Vetiver Waste Pot

The Repetition	Vetiver Waste Pot		Normal Pot	
	Massa (Kg)	The compressive strength (Kgf)	Massa (Kg)	The compressive strength (Kg)
0^0 Position				
1	5,030	430,0	5,867	675,0
2	5,040	307,5	5,420	530,0
3	5,595	497,5	4,957	266,5
4	5,700	515,0	5,250	381,3
5	5,625	502,5	5,625	350,0
6	5,270	745,0	5,200	177,0
7	5,265	500,0	5,130	247,5
8	5,420	425,0	4,945	230,0
9	5,235	447,5	5,630	165,0
10	5,350	725,0	5,050	560,0
11	5,165	442,5	5,670	257,5
12	5,750	327,5	4,680	127,5
Rata-rata	**5,370**	**530,4**	**5,285**	**330,6**
Posisi 180^0				
1	5,180	400,0	5,290	376,0
2	5,685	807,5	4,935	275,0
3	5,830	1015,0	5,025	457,5
4	6,090	632,5	5,495	227,5
5	6,060	1015,0	5,020	352,5
6	5,395	325,0	6,190	1312,5
7	5,435	397,5	4,880	127,5
8	4,945	650,0	6,295	847,5
9	5,280	552,5	5,415	105,5
10	5,395	1251,5	5,620	885,0
11	5,520	501,5	4.410	395,0
12	5,585	826,5	5,591	605,0
Rata-rata	**5,533**	**697,9**	**5,347**	**497,2**
Rata-Rata Total	**5,452**	**614,2**	**5,316**	**413,9**

The waste vetiver flower pot crushed when the weighted average 583.78 kg of 25 experiments. While the normal pot crushed when given load average 410.34 kg of 25 experiments. It can be seen from the graph the test results.

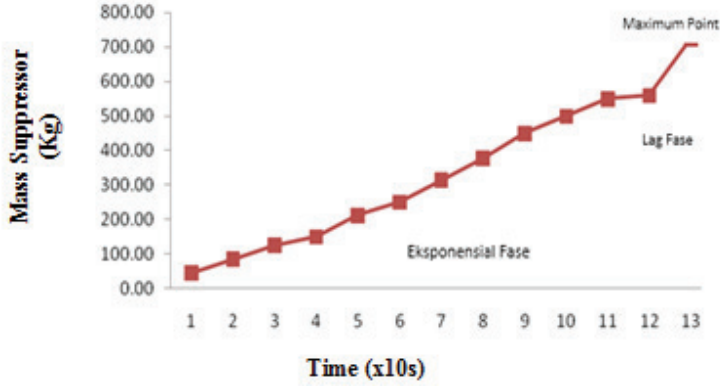

Figure 3. Exponential curve vetiver waste pot endurance per-ten seconds and maximum durability point

Imposition of the pot is done every 10 seconds and the load mass increases (see figure 2) every 10 seconds too. On the curve is seen that exponential phase happen followed by a lag phase that states the force pot threshold and the death phase of pot declared maximum power and started to crack.

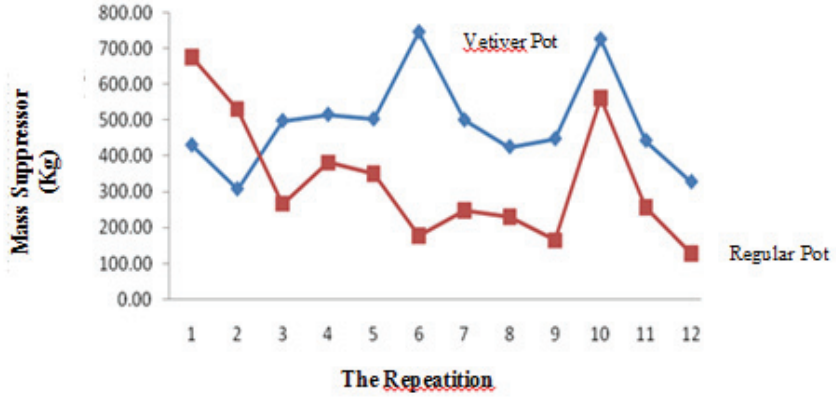

Figure 4. The Durability Comparison Curve against Discounter Mass between Vetiver Pot and Regular Pot at Emphasis on Testing in 0o position

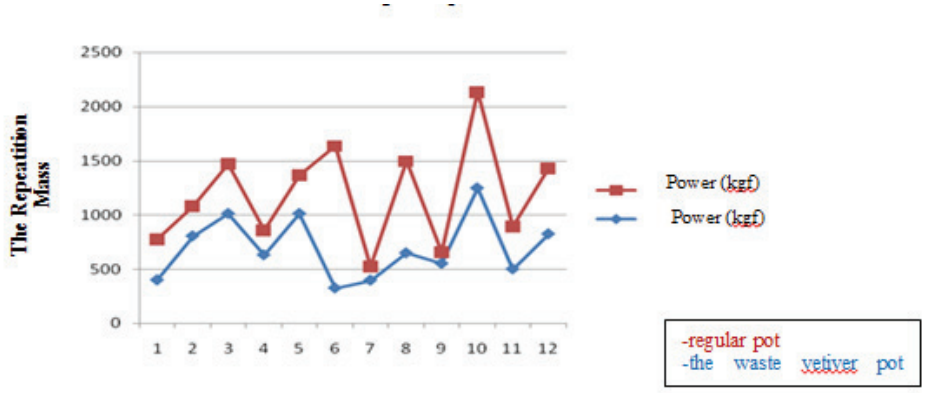

Figure 5. The Durability Comparison Curve against Discounter Mass between Vetiver Pot and Regular Pot at Emphasis on Testing in 180o position

Based on the results of power pot test generated the different crack pot. When the waste vetiver pot given maximum load, pot indirectly cracked. This is caused by the waste burnt vetiver fibers that hold pots. The fibers from waste vetiver dough stronger bond. Unlike regular pots. When the regular pot was given by the maximum load it will instantly crack pot. This is due to there are
nothing material that can resist the crack pot like waste fibers. The fibers in the waste burnt vetiver pot serves as a frame. From the data analisis can conclused that waste vetiver pot stronger than regular pot. Another advantage of pots made from waste burnt vetiver is to reduce the use of sand. The two doughs that is given the same proportion of the cement and the sand, while the other dough is added with the burnt vetiver waste that is used to make two pots whereas the dough just for one pot. In addition, the mixing of waste burnt vetiver as a pot can reduce environmental pollution.

Figure 6. Comparison of Results with Regulat Pot and The Waste Vetiver Pot

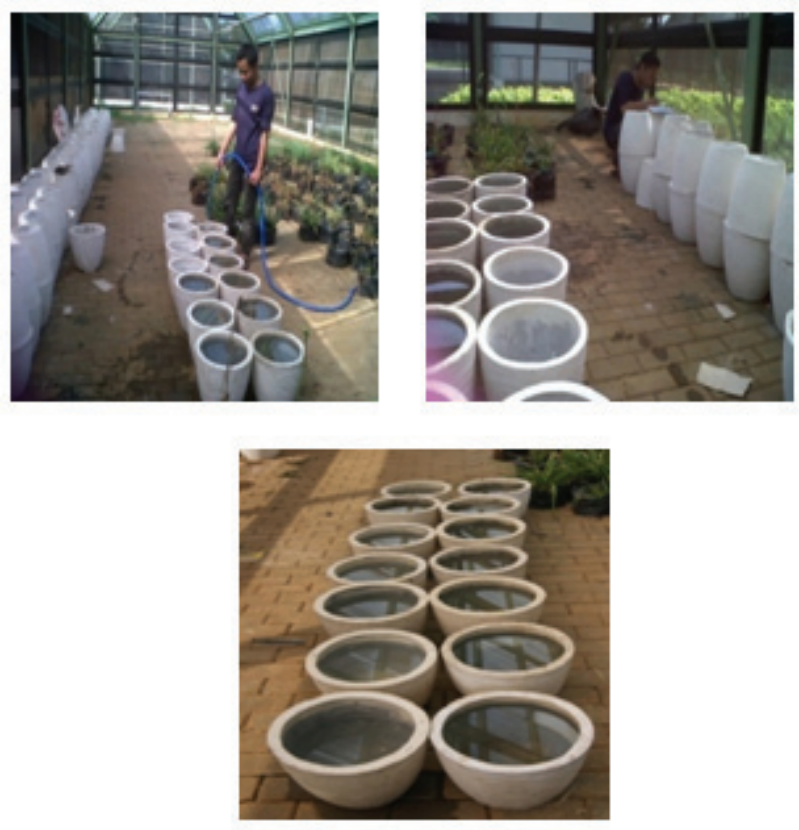

Figure 7. The Seepage Test of Waste Vetiver Pot

Measuring the diameter of pot

Measuring the mass of pot

Ssetting the machine

Figure 8. Test of Strength Vetiver Waste Pot

Figure 9. The Pot Condition After Pressing Test

CONCLUSIONS

Manufacturing the burnt vetiver waste pot same with manufacturing the normal pot (cement pot).

The comparison of the burnt vetiver waste pot is 3:3:2, that is the burnt vetiver waste: sand : cement.

Through the seepage test result between the burnt vetiver waste with the normal pot alike can absorb the water.

The quality of the burnt vetiver waste pot has much better quality than regular pot, it is seen from the press test results of that the burnt vetiver waste pot is stronger than regular pot. Moreover, it can minimize the production cost and certainly eco-friendly.

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TUBER YIELD AND QUALITY OF NINE GENOTYPES YAM BEAN (*PACHYRHIZUS* SPP.) DUE TO SINK-REPRODUCTIVE PRUNING

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Abstract

Yam bean tuber starch extract has been widely used for traditional cosmetics material in Indonesia. This experiment was aimed to acquire yam bean tuber with high yield and starch content. Materials used were 9 yam bean genotypes collection of Agung Karuniawan (Plant Breeding Laboratory, Universitas Padjadjaran) consisted of three genotypes of P. erosus, one genotype of P. ahipa, two genotypes of P. erosus intraspecific crossing and three genotypes resulted from interspecific crossing between P. erosus and P. ahipa. The field trial was conducted at experimental field of Faculty of Agriculture, Universitas Padjadjaran Jatinangor from August 2009 until March 2010. The experiment was arranged in split plot design repeated twice. The main plot consisted of two treatments namely without sink-reproductive pruning and with sink-reproductive pruning. The main plot was divided into nine subplots based on genotypes. Pruning and genotype independently affected tuber fresh weight. The heaviest tuber produced by P. erosus B-1 / EC 033. Genotypes affected on tuber dry matter and tuber starch content. The highest dry matter was contained in interspesific crossing between P. erosus x. P. ahipa EC 550 x AC 208-72h. The highest tuber starch content was resulted by P. ahipa AC 216-139d. Sink-reproductive pruning and genotype interacted in tuber dry matter trait.

Key words: *Sink-reproductive Pruning, Starch, Yam bean, Yield.*

INTRODUCTION

Yam bean or *bengkuang* in Indonesian is actually benefited not only for food but also for medication or cosmetic functions. This crops is widely cultivated in Sumatra, Java, Southeast Nusa, Sulawesi, Bali and Kalimantan (Karuniawan, 2004). At current time, the tuber starch extract used both as traditional and modern cosmetics for brightening skin naturally. In fact, some of modern cosmetics with yam bean starch extract based have won several national and international awards (Ratu, 2012). Therefore the development of yam bean tuber starch production is actually needed.

From the analysis of 100 g of fresh yam bean, starch content is at 2.1 g - 10.7 g (Sorensen, 1996), even in Indonesia the starch content for *P. erosus* is averaged only around 1% (UTP, 2011) The highest dry matter content enclosed in *P. ahipa* that is equal to 26% - 24% then *P. erosus* by 6% - 22%. One disadvantage of starch yam bean tuber use is the high water content, so that although the tuber has great size but still has low starch level due to the low dry matter content. To broaden genetic diversity and increase the amount of dry matter, Plant Breeding Laboratory, Universitas Padjadjaran did intraspecific and interspecific hybridization between *P. erosus* and *P. ahipa*.

Besides plant breeding, the potential of yam can be improved by developing appropriate cultivation techniques. One of the frequent cultivation techniques is sink-reproductive pruning (Sorensen). This technique is done by cutting off reproductive parts of plants, which is begun at the first flower bud emergence. Sink-reproductive pruning aimed to reduce competition of photosynthates distribution between the reproductive and tuber sink parts. Flower bud pruning on the yam bean can increase 30%-70% of tuber fresh weight [6]. Therefore, sink-reproductive pruning will shift assimilate to tuber.

This study aimed to test the simultaneous effect of sink-reproductive pruning on yam bean yield and tuber quality traits namely starch content and dry matter content. Further, expectantly there will be genotypes with high starch content as potential yam bean genotypes especially for cosmetics raw material.

MATERIALS AND METHODS

Materials used in this experiment were nine yam bean genotypes collection of Agung Karuniawan (Plant Breeding Laboratory, Universitas Padjadjaran). It consisted of three *P. erosus*, one *P. ahipa*, two intraspecific crossing of *P. erosus* and three interspecific crossing of *P. erosus* and *P. ahipa*.

The field trial was conducted at experimental field of Faculty of Agriculture, Universitas Padjadjaran Jatinangor located at an altitude of 753 m above sea level with Inceptisols soil type and type C rainfall according to Schmidt-Fergusson. The experiment was conducted from August 2009 until March 2010.

The experiment was arranged in split plot design repeated twice. The main plot consisted of two treatments: without sink-reproductive pruning and with sink-reproductive pruning. The main plot was divided into nine subplots based on genotypes. Each subplot size was 2 m x 3 m with spacing 50 cm x 50 cm between plants and 100 cm between subplots. Fertilizer recommendation given referred to the sweet potato cultivation in dry land.

Sink-reproductive application treatment was carried out after 50% of plants per plot had entered the flowering phase (R5) (Zanklan, 2003), it was done once a week until the harvest time. Harvesting of tuber was approximately 180 days (six months) after planting.

Characters observed were tuber fresh weight (g), tuber dry matter content (%) and tuber starch content (% WB). Yam bean tuber starch content was analyzed using Luff Schoorl method conducted at Yield Physiology Laboratory, Vegetable Research Institute, Lembang West Bandung.

Data were analyzed using statistical analysis of variance (anova) using Statistix 8 program. Comparison of the mean value was done using the least significant difference test (LSD) on the real level 5%.

RESULTS AND DISCUSSIONS

Based on analysis of variance (Table 1), pruning and genotype treatments independently gave significant different on tuber fresh weight character. Genotypes as the subplot factor, gave significant different on all tuber traits observed. Sink-reproductive pruning and genotypes interacted on tuber dry matter trait in highly significant difference.

Table 1. Analysis of Variance for Tuber Fresh Weight, Tuber Dry Matter, Tuber Starch Content of Nine Genotypes Yam Bean

Variables	F		
	Pruning	Genotype	Interaction PxG
TFW (g)	2.51 *	11.7 **	1.9
TDM (%)	1.15	4.90 *	18.05 **
TSC (%)	0.01	20.30 **	2.02

TFW=Tuber Fresh Weight; TDM=Tuber Dry Matter; TSC= Tuber Starch Content; *=significant on α 0,05; **= significant on α 0,01

Table 2 shows least significant difference (LSD) test on tuber fresh weight affected by pruning and genotype In this study, sink-reproductive pruning generated higher tuber fresh weight trait. Non pruning treatment only resulted 122.35 g, whereas, sink-reproductive pruning 371.61 g. Sink-reproductive pruning of flower bud removal diverts assimilate distribution into tuber storage sinks. The increased flow of assimilate to the tuber, consequential on the change in dimensions. In addition, the increased of assimilate flow also affect tuber fresh weight.

The smallest yield result for genotype showed by *P. ahipa* AC 216-139 d that was 86,45 g per tuber, however the other genotypes were in same group ranged from 205,76 g- 342,95 g per tuber. It is mean that even the elder was *P. ahipa* but the crossing with *P. erosus* will increase the yield.

Table 2. Analysis of Variance for Tuber Fresh Weight, Tuber Dry Matter, Tuber Starch Content of Nine Genotypes Yam Bean

Treatments	Tuber fresh weight (g)
Sink-reproductive pruning	
Without	122,35 b
With	371,61 a
Genotypes	
B-10 / EC 550	254,32 a
B-1 / EC 033	342,95 a
B-56 / CJ	297,88 a
AC 216-139 d	86,45 b
B-10 / EC 550 x AC 216-139 d	205,76 a
B-1 / EC 033 x B-56 / CJ	184,99 a
AC 216-139 d x B-56 / CJ	308,46 a
B-10 / EC 550 x B-56 / CJ	308,27 a
B-10 / EC 550 x AC 208-72h	233,76 a

Numbers followed by the same letters are not significantly different on alpha 0.05 LSD test

Table 3 defines LSD test for genotypes effect on tuber dry matter and tuber starch content. EC 550 x AC 208-72h had the highest value on dry matter content. Otherwise, on tuber starch content character the best result was showed by AC 216-139 d, then followed by EC 550 x AC 208-72h. The average tuber starch content of yam bean produced in Indonesia is about 1%, therefore the new genotype resulted from interspesific crossing between *P. erosus* and *P. ahipa* (EC 550 x AC 208-72h) could be considered for further development for cosmetics raw material.

Table 3. Effect of genotypes on yam bean tuber dry matter and total starch content

Genotypes	Tuber Dry Matter	Tuber Starch Content
	%	%
B-10 / EC 550	6,11 de	1,07 c
B-1 / EC 033	5,36 e	1,20 c
B-56 / CJ	7,33 bcde	1,63 c
AC 216-139 d	9,39 abcd	6,71 a
B-10 / EC 550 x AC 216-139 d	7,50 abcde	1,34 c
B-1 / EC 033 x B-56 / CJ	8,82 ab	1,68 bc
AC 216-139 d x B-56 / CJ	6,60 cde	1,45 c
B-10 / EC 550 x B-56 / CJ	8,35 abc	1,76 bc
B-10 / EC 550 x AC 208-72h	10,27 a	2,66 b

Numbers followed by the same letters are not significantly different on alpha 0.05 LSD test

There was interaction between genotypes x sink-reproductive pruning on tuber dry matter content, it is shown on Table 4. On non-pruning treatment, only *P.* ahipa AC 216-139 d gave smallest mean value for tuber dry matter character. While, contrast result was shown on sink-reproductive pruning, AC 216-139 d genotype had the highest value than other genotypes, then followed by interspesific hybrid genotype EC 550 x AC 208-72h.

In this study, pruning did not affect the qualitative traits such dry matter and starch content of tuber. Yam bean production increased as the result of pruning, but this practice did not affect the percentage of soluble sugar content and dry matter percentage. However, there are variations of these traits on genotypes were evaluated caused by genetic factors (Zanklan, 2003). This variation can be seen in the character of dry matter and starch. Tuber dry matter content is a parameter that reflected the extent of how far photosynthesis product is distributed to the tuber. Efficiency of the photosynthetic process is shown in the rate of accumulation of dry matter content (Gardner et al., 2008).

Table 4. Interaction between Genotypes x Sink-Reproductive Pruning on Tuber Dry Matter

Genotypes	Tuber Dry Matter	
	Without Pruning	With Pruning
B-10 / EC 550	8,51 abc A	3,71 B B
B-1 / EC 033	6,04 bcd A	4,68 B A
B-56 / CJ	7,65 abcd A	7,01 B A
AC 216-139 d	1,38 d B	16,34 A A
B-10 / EC 550 x AC 216-139 d	8,78 abc A	6,22 B A
B-1 / EC 033 x B-56 / CJ	10,42 ab A	7,23 B A
AC 216-139 d x B-56 / CJ	9,70 abc A	3,50 B B
B-10 / EC 550 x B-56 / CJ	8,34 abc A	8,37 Ab A
B-10 / EC 550 x AC 208-72h	11,71 a A	8,84 Ab A

Numbers followed by the same letters are not significantly different on alpha 0.05 LSD test Small letter read vertically; Capital letter read horizontally

P. erosus is the most stable species in production, also it produces the prime number for yield (Kale, 2006). *P. ahipa* is known as species with smaller tuber, but higher in dry matter and starch content. Therefore, hybridization using those species is expected to gain the new genotype in high production amount with better quality especially starch content. This study noted that intraspesific and interpesific crosses produced a new genotype with higher production yield with better quality character for dry matter and starch than the elders.

CONCLUSIONS

Pruning and genotype independently affected tuber fresh weight. The heaviest tuber produced by *P. erosus* B-1 / EC 033.

Genotypes affected in tuber dry matter and tuber starch content. The highest dry matter was contained in interspesific crossing between

P. erosus x. *P. ahipa* EC 550 x AC 208-72h. The highest tuber starch content was resulted by *P. ahipa* AC 216-139d.

Sink-reproductive pruning and genotype interacted in tuber dry matter trait.

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