Researches concerning the influence of different fertilization systems on the quantity and quality of the production at some table grapes cultivars

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Abstract Viticulture requires the use of fertilizers in order to obtain high yields due to the fact that grapevine generally occupies terrains with low fertility. In the present paper we studied the influence of different variants of fertilization on growth vigor and production quality at the cultivars Victoria and Muscat Hamburg. In addition to the fertilization variants commonly used in viticulture, we also tried other fertilizing systems: organic fertilizing with manure and green fertilizer, fertilization with foliar fertilizers and various combinations between organic and chemical fertilization.

All variants of fertilization had a positive influence on production. In addition, organic fertilization and fertilization with green fertilizers have a major influence on improving the characteristics of soil and reducing the degree of environmental pollution, having at the same time reasonable costs.

Key words

fertilization systems, production, quality, green fertilizers

Grapevines are grown in different pedological and climatic conditions, which is why the fertilization of the vineyards posses a number of issues, which makes almost impossible for an unique system of fertilization on grapevines to be developed.

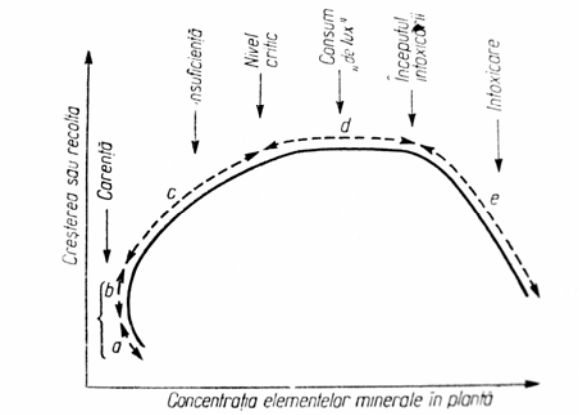

Fig 1.Correlation between plant growth (harvest) and the concentration of the elements

The culture of grapevine has different requirements regarding the nutrients depending on the biological material (cultivar, variety, and local population), the phases of vegetation, environmental conditions and the technology of cultivation. Under the same conditions of cultivation, the requirements to the nutrients differ with respect to the two fundamental processes of life cycle: growth and development.

During the biological cycle there are several phases of vegetation (phenophases), in which plants have different requirements to the nutrients and other vegetation factors.

It is important to know the supply level of the soil with nutrients in order to adopt a system of rational fertilization, leading to a balance between growth and fructification, between quantity and quality.

In what regards the supply level of the plants with nutrients, the following states of nutrition are distinguished: normal, deficiency, insufficiency, critical level, the level of opulence ("luxury" consumption), excess and toxicity, illustrated in fig.1

Biological Material and Method

Researches have been conducted in 2007 and 2008 in a vineyard located in the heart of wine-growing centre Buzias-Silagiu.

Experimental variants were composed by different types and doses of fertilizers–chemical, organic, mixed, placed as randomized blocks.

V_1 – manure - 40 t/ha

V_2 – green fertilizers - mash

V_3 – foliar fertilization .....

V_4 – nitrogen fertilization -150 kg / ha a.s.

V_5 - complex fertilizers (MT) – N 50, P 100, K 100 Kg/ha a.s.

V_6 – foliar fertilization + nitrogen ... + N 80 Kg/ha a.s.
V_7 – foliar fertilization + complex fertilizers.... + N 50; P 80; K 80 Kg/ha a.s.
V_8 – foliar fertilization + organic....+ 30 t/ha
The manure was applied at the beginning of the experiment only once, fertilizers with phosphorus and potassium were administered in the fall after the grape harvest and have been incorporated into the soil with the fall plowing, nitrogen fertilizers were applied in the spring before the spring plowing and foliar fertilizers were applied during the period of intensive shoot growth.By selecting these variants we tried to find a suitable variant for the conditions of the wine-growing centre Buzias-Silagiu, which will reduce the quantities of chemical fertilizers without diminishing the production and quality in terms of improving the characteristics of soil and reduction of polluting effects on the environment and on wine products. We considered as witness the variant V5, in which we used complex fertilizers because it is most used in viticulture.The cultivars which have been the subject of research were two cultivars of table grapes - Victoria and Muscat Hamburg. Planting distances are 2.2 meters between rows and 1 meter between the logs on the row and the type of cut is Cazenave cordon.
In vegetation were carried out observations and measurements on the foliar surface, total annual growth and matured growth, sugar content and acidity.

Results and Discussions

Results on the influence of the fertilization variants on the foliar surface, on the total annual growth and matured growth are presented in Tables 1 and 2.
At the Victoria cultivar, the foliar area ranged between 7.6 m^2 per log at variant V_1 and 10.5 m^2 per log at variant V_6.Generally the variants that have benefited from a surplus of nitrogen (V_4 and V_6) have registered as compared to the witness, the greatest values of foliar areas and total annual growth, also representing the only differences with positive significance.
Regarding the matured growth expressed in m/log or as a percentage of total growth, the way of categorizing the variants was different, higher values giving V_8, V_7 and V_1 variants.

Table 1

The influence of fertilization variants on logs' vigor at the Victoria cultivar, the average of the years 2007-2008

Fertilization variant	Foliar surface (m^2/log)	Annual total growth (m/log)	Matured growth		Difference from the witness (m^2/log)	Significance
			(m/log)	%		
V_1	7,6	12,5	9,8	79	-1,2	0
V_2	8,1	13,2	9,5	72	-0,7	-
V_3	8,7	13,6	10,2	75	-0,1	-
V_4	9,7	14,9	10,2	69	+0,9	*
V_5 (C)	8,8	14,1	10,7	76	-	-
V_6	10,5	15,8	11,2	71	+1,7	**
V_7	9,1	14,8	11,6	79	+0,3	-
V_8	8,3	13,6	11,1	82	-0,5	-

DL5%=0,72 DL1%=1,31 DL0,1%=2,21

In the case of the Muscat Hamburg cultivar the foliar surface value, the annual total growth and matured growth values were lower compared to the Victoria cultivar but the way of categorizing the variants was almost identical. Under the circumstances of some weather conditions increasingly changing it is very important to keep track of the fertilization effect on the wood maturation percentage that has a major influence on resistance to frost of the logs and implicitly on the production. This aspect is more important as the genetic resistance of the cultivar to frost is lower.
Since the ultimate goal of any technology is to achieve high and qualitative productions, in Tables 3 and 4 we present the results on the influence of the fertilization variants on production and quality.

For both cultivars the echeloning of the variants was almost identical, variants which had the largest productions being V_7 and V_8 variants. They registered, as compared to the witness, an increase of 895 respectively 500 kg/ha at the Victoria cultivar and 1007, respectively 857 kg / ha at the Muscat Hamburg cultivar.In terms of production quality judged on the basis of sugar content and acidity, at both cultivars the variants with the best results were V_1 and V_8.
In the case of variant V_1 we believe that the results are less obvious being aware that the maximum effect of the manure is recorded in years 2 and 3 after the application.
It can be noticed that on both cultivars productions obtained for all variants were high even in years with not so very favorable weather conditions for the culture of grapevine.

Table 2

The influence of fertilization variants on logs' vigor at the Muscat Hamburg cultivar, the average of the years 2007-2008

Fertilization variant	Foliar surface (m^2/log)	Annual total growth (m/log)	Matured growth		Difference from the witness (m^2/log)	Significance
			(m/log)	%		
V_1	6,5	11,6	8,2	71	-1,6	00
V_2	7,2	12,3	8,3	68	-0,9	0
V_3	7,5	12,7	8,8	70	-0,6	-
V_4	8,6	13,6	8,2	61	+0,5	-
V_5 (C)	8,1	12,9	9,0	70	-	-
V_6	9,6	14,3	9,4	66	+1,5	**
V_7	8,3	13,6	9,7	72	+0,2	-
V_8	7,5	12,8	9,3	73	-0,6	-

DL5%= 0,68 DL1%=1,23 DL0,1%=2,07

Table 3

The influence of fertilization variants on production and quality at the Victoria cultivar, the average of the years 2007-2008

Fertilization variant	Production		Sugar content (g/l)	Acidity (g/l H_2SO_4)	Difference from the witness (kg/ha)	Significance
	Kg/ha	%				
V_1	12950	95	147	3,5	-775	0
V_2	13075	96	139	3,7	-550	0
V_3	13110	96,2	142	3,6	-515	0
V_4	13380	98,2	135	4,0	-245	-
V_5 (C)	13625	100	146	3,5	-	-
V_6	13975	102,5	141	3,6	+350	*
V_7	14520	106,5	144	3,5	+895	**
V_8	14125	103,6	149	3,4	+500	*

DL5%= 348 DL1%= 768 DL0,1%=1378

Table 4

The influence of fertilization variants on production and quality at the Muscat Hamburg cultivar, the average of the years 2007-2008

Varianta de fertilizare	Producția		Conținutul în zahăr (g/l)	Conținutul în aciditate (g/l H_2SO_4)	Diferența față de martor (kg/ha)	Semnificația
	Kg/ha	%				
V_1	12070	94,5	175	4,2	-698	00
V_2	12135	95	170	4,5	-633	0
V_3	12175	95,3	173	4,4	-593	0
V_4	12436	97,4	168	4,7	-332	0
V_5 (C)	12768	100	173	4,3	-	-
V_6	13075	102,4	170	4,5	+307	*
V_7	13775	107,8	164	4,9	+1007	**
V_8	13625	106,7	177	4,1	+857	**

DL5%=298 DL1%=652 DL0,1%=1125

Conclusions

In terms of some terrains with a lower natural fertility as most of the terrains cultivated with grapevines it is very important to use fertilizers in order to increase the productive potential of grapevines cultivars.

Due to the increasingly high cost of fertilizers mainly the synthesized ones, it is necessary to use alternative fertilization systems by which to reduce the effect of pollution while maintaining the production potential of

cultivars.In the Buzias environment, the foliar fertilization combined with organic fertilization gave very good results both from the obtained production as well as from the point of view of the biological concept more and more present in viticulture.
Foliar fertilization combined with chemical fertilizers also gave good results, since we have reduced the quantities of chemical fertilizer per hectare and implicit the degree of pollution on the environment.
In what concerns the use of green fertilizers, the obtained productions were lower as compared to the witness variant, but the favorable effect on soil and environment is very important.

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