THE USAGE OF SMALL VOLUME FERTILIZERS AND BIOSTIMULATORS FOR INCREASING THE BIOPRODUCTIVITY OF THE VINE GROWING SYSTEM

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Abstract: *The large production of biomass which is harvested every year from the vine growing soils requires finding some modern methods, as less pollutant as possible, which would give back to the soil at least a part of the substances which the grape vine has extracted from it. he necessity of obtaining profit constrains the vine growing exploitations to permanently improve their technologies, but at the same time to take into consideration also the concept of durable vine growing. The purpose of the present research was to identify modern methods of fertilization which use chemical products in as small amounts as possible, but which at the same time assure the growing or maintaining the bioproductivity of the vine growing system at an appropriate level of efficiency.The experimental variants have consisted in using different combinations of three types of foliar chemical fertilizers and biostimulators which have replaced the classical chemical fertilizers frequently used in vine growing. These fertilizers can't permanently replace the classical fertilizers, but used temporarily they assure a series of advantages, not only of economic nature, but also regarding the reduction of soil contamination and of vineyard products by the chemical compounds. he research has been carried out in the vineyard and ampelografic collection of S.D. Timişoara, on some breeds of table grapes in the case of which the commercial aspect is an essential factor regarding the consumer's choice. We were mainly interested in observing the influence of these experimental variants on some quantitative but mostly qualitative aspects of production, and also their influence on the endurance of the breeds at low temperatures and freeze.*

Key words**:** *fertilisation, foliar fertilisers, biostimulators, quantity, quality, table grapes*

INTRODUCTION

Due to their gradual period of maturation, table grapes varieties are an important source of incomes for farmers from July to October; thus they can partially finance table grapes harvesting and wine making.

Since table grapes are first "eaten with the eyes", their commercial aspect is very important and it can be improved through fertilisation. On the other hand, sustainable viticulture supposes limiting pesticide amounts to be introduced into the viticultural ecosystem.

In this respect, foliar fertilisers and biostimulators used in smaller amounts and with lower costs per area unit are viable alternatives to the classical chemical fertilisation.

MATERIALS AND METHODS

Research was carried out in 2008 and 2009 in the viticultural plantation of the Didactic Station in Timişoara, on the following table grape cultivars: Muscat de Hamburg, Victoria, and Silvania.

The viticultural plantation is 16 years old, and is now at its full maturity. Experimental variants concerned the use of foliar fertilisers Fertiactyl GZ, Basfoliar Extra, Microfert-Fer, and biostimulators Berelex and ProGibb, compared to classical chemical fertilisation. Depending on the variants, experimental rates were as follows:

$V_1 - N_{100}P_{100}K_{100}$ (MT)

V_2 – Fertiactyl GZ – 10 l/ha
V_3 – Basfoliar Extra – 10 l/ha
V_4 – Microfert-Fer – 3 l/ha
V_5 – ProGibb – 30 g/ha in 1,000 l of water
V_6 – Berelex – 30 g/ha in 1,000 l of water

The fertilisers were applied according to instructions, i.e. phosphorus and potassium in the fall, before tillage, and nitrogen in the spring, and foliar fertilisers and biostimulators before flowering.

During vegetation, we made observations and measurements concerning total and mature growths; bud viability was examined in the winter following application; yield per ha and yield quality were estimated depending on sugar content, on acid content, on the mean weight of a cluster and on the marketing yield in percentiles.

RESULTS AND DISCUSSION

Table 1 presents data concerning the impact of biostimulators and of foliar fertilisers on total and mature annual growths. Foliar fertilisers in all the varieties led to an intensification of the annual growths compared to the classical variant of fertilisation V_1-$N_{100}P_{100}K_{100}$ (MT).

The highest differences were in the varieties Muscat de Hamburg and Victoria in the variant V 2, in which we used Fertiactyl GZ. Biostimulators had values close to those of the control or even slightly inferior.

As for the annual mature growths expressed as shares of the total annual growths we can notice a positive impact of foliar fertilisers in the variants V2 Fertiactyl GZ – 10 l/ha and V4 Microfert-Fer – 3 l/ha, with statistically ensured differences compared to the control.

Table 1

Impact of foliar fertilisers and of biostimulators on total and mature annual growths (average for the period 2008-2009)

Variants	Variety	Total annual growths (m/vine)	Maturated annual growths (% from total)	Different to the control	Significance
V_1- $N_{100}P_{100}K_{100}$ (MT)	Muscat de Hamburg	17,2	62	-	-
	Victoria	18,95	78	-	-
	Silvania	14,3	75	-	-
V_2- Fertiactyl GZ	Muscat de Hamburg	18,6	70	+8	**
	Victoria	20,3	85	+7	**
	Silvania	16,1	81	+6	**
V_3- Basfoliar-extra	Muscat de Hamburg	17,7	64	+2	-
	Victoria	19,4	81	+3	-
	Silvania	14,9	78	+3	-
V_4- Microfert-Fer	Muscat de Hamburg	18,2	67	+5	*
	Victoria	20,1	83	+5	*
	Silvania	15,8	79	+4	*
V_5 - ProGibb	Muscat de Hamburg	17,1	60	-2	-
	Victoria	18,5	76	-2	-
	Silvania	14,1	72	-3	-
V_6- Berelex	Muscat de Hamburg	16,9	59	-3	-
	Victoria	18,1	74	-4	0
	Silvania	13,9	70	-5	0

Muscat de Hamburg	DL 5% 4,25	DL 1% 7,92	DL 0,1% 12,26
Victoria	DL 5% 3,78	DL 1% 6,58	DL 0,1% 11,10
Silvania	DL 5% 3,27	DL 1% 5,95	DL 0,1% 10,0

Obtaining high shares of matured cords is particularly important in table grapes: since they are very sensitive particularly to frost, in winters with negative temperatures below -18^{0}C, they can become a problem.

Biostimulators Pro-Gibb and Berelex recorded slightly inferior shares of annual mature cords compared to the control.

Table 2

Impact of foliar fertilisers and of biostimulators on bud viability
(average of the years 2008-2009)

Variants	Variety	Buds viability (% from total)	Different to the control	Significance
V_1-$N_{100}P_{100}K_{100}$ (MT)	Muscat de Hamburg	60,2	-	-
	Victoria	73,1	-	-
	Silvania	78,6	-	-
V_2- Fertiactyl	Muscat de Hamburg	68,5	+8,3	**
	Victoria	79,2	+6,1	*
	Silvania	83,1	+4,5	*
V_3- Basfoliar	Muscat de Hamburg	64,2	+4,0	*
	Victoria	76,1	+3,0	-
	Silvania	75,2	-3,4	-
V_4- Microfert-Fer	Muscat de Hamburg	65,8	+5,6	*
	Victoria	73,5	+0,4	-
	Silvania	79,2	+0,6	-
V_5 - ProGibb	Muscat de Hamburg	57,3	-2,9	-
	Victoria	68,4	-4,7	0
	Silvania	75,2	-3,4	-
V_6- Berelex	Muscat de Hamburg	56,2	-4,0	-
	Victoria	69,0	-4,1	0
	Silvania	73,5	-5,1	0

Muscat de Hamburg	DL 5% 4,0	DL 1% 7,8	DL 0,1% 12,1
Victoria	DL 5% 3,92	DL 1% 6,83	DL 0,1% 11,02
Silvania	DL 5% 3,74	DL 1% 6,12	DL 0,1% 10,83

In table grape varieties, bud resistance to frost is lower compared to wine grape varieties; this is why it is important to know the impact of foliar fertilisers and of biostimulators on bud frost resistance.

The three varieties studied in our research have different resistance to frost: thus, Muscat de Hamburg is a sensitive variety, Victoria is a medium-resistance variety, and Silvania is a more frost-resistant variety. Results from this point of view speak for themselves.

Foliar fertilisers had a positive impact on bud frost resistance due to the intensification of the photo-synthesising capacity that led to the accumulation of large amounts of sugars.

The impact was more obvious in the variety Muscat de Hamburg, a variety with higher sensitivity to frost. Differences compared to the control in this variety are distinctly significant in the variant V2 Fertiactyl GZ, significant in the variants V3 Basfoliar Extra and V4 Microfert-Fer. The variants V5 and V6, in which we used the biostimulators ProGibb and Berelex, resulted in slightly lower results compared to the control, but with no statistical significance.

In the variety Victoria, the differences compared to the control were significant only in the variant V2 Fertiactyl GZ, while in the variants V3 Basfoliar Extra and V4 Microfert-Fer, they were slightly to the control, but with no statistical significance. Biostimulators yielded lower results in this variety, significantly negative.

In the variety Silvania, the differences between the experimental variants and the control variant were less obvious; foliar fertilisers yielded results superior to those of the control, results statistically covered only in the variant V2 Fertiactyl GZ.

Table 3

Impact of foliar fertilisers and of biostimulators on yield (average of the period 2008-2009)

Variants	Variety	Production		Different to the control	Significance
		Kg/vine	Kg/ ha		
V_1- $N_{100}P_{100}K_{100}$ (MT)	Muscat de Hamburg	2,00	9125	-	-
	Victoria	2,79	12710	-	-
	Silvania	2,47	11230	-	-
V_2- Fertiactyl	Muscat de Hamburg	2,19	9975	+850	**
	Victoria	2,97	13520	+810	**
	Silvania	2,67	12175	+945	**
V_3- Basfoliar	Muscat de Hamburg	2,04	9279	+154	-
	Victoria	2,85	12985	+275	-
	Silvania	2,58	11760	+530	*
V_4- Microfert-Fer	Muscat de Hamburg	2,11	9625	+500	*
	Victoria	2,89	13179	+469	*
	Silvania	2,63	11980	+750	*
V_5 - ProGibb	Muscat de Hamburg	1,96	8930	-195	-
	Victoria	2,75	12530	-180	-
	Silvania	2,41	10995	-235	-
V_6- Berelex	Muscat de Hamburg	1,95	8885	-240	-
	Victoria	2,74	12475	-235	-
	Silvania	2,42	11015	-215	-

Muscat de Hamburg	DL 5% 375	DL 1% 623	DL 0,1% 1173
Victoria	DL 5% 368	DL 1% 597	DL 0,1% 1072
Silvania	DL 5% 432	DL 1% 751	DL 0,1% 1283

Grape yields per plant and per ha were also influenced by foliar fertilisers and biostimulators.

The variants V2, V3, and V4 in which we used foliar fertilisers yielded results superior to those of the control, most of which were statistically covered.

The highest values were recorded in all the varieties in the variety V2 Fertiactyl GZ, which yielded increases in yield between 810 Kg/ha in the variety Victoria and 945 Kg/ha in the variety Silvania.

In the variant V2 Fertiactyl GZ, all the differences are distinctly significant compared to the control variant. In the variant V4 Microfert-Fer, the differences compared to the control variant were superior, statistically significant. The fertiliser Basfoliar extra recorded, compared to the control, higher yield differences which, except for the variety Silvania, are not statistically ensured.

The variants treated with biostimulators yielded, compared to the control variant, slightly lower yields, without statistical significance.

In table grape varieties, beside quantity, quality and commercial aspect are other main criteria in determining the purchasing decision of the consumers.

In table grape varieties, beside classical quality elements, sugar and acid contents are particularly important, as well as mean weight of a grape cluster and marketable weight expressed as percentile of the total yield.

Foliar fertilisers yielded, compared to the control, small positive differences from the point of view of the sugar and acid contents. In exchange, results are more obvious from the point of view of the mean weight of a cluster and of the marketable yield.

Table 4

Impact of foliar fertilisers and of biostimulators on yield quality

Variants	Variety	Sugar content (g/l)	Acidity (g/l H_2SO_4)	Mean bunch weight (g)	Commodity production (% from total)
V_1- $N_{100}P_{100}K_{100}$ (MT)	Muscat de Hamburg	175	4,3	280	70
	Victoria	150	3,6	420	80
	Silvania	170	4,5	185	73
V_2- Fertiactyl	Muscat de Hamburg	179	4,1	298	81
	Victoria	152	3,5	450	88
	Silvania	172	4,3	193	85
V_3- Basfoliar	Muscat de Hamburg	175	4,3	282	75
	Victoria	150	3,6	438	83
	Silvania	170	4,5	190	81
V_4- Microfert-Fer	Muscat de Hamburg	176	4,2	290	76
	Victoria	153	3,5	440	82
	Silvania	176	4,2	192	80
V_5 - ProGibb	Muscat de Hamburg	175	4,3	289	75
	Victoria	149	3,9	439	81
	Silvania	168	4,6	191	80
V_6- Berelex	Muscat de Hamburg	176	4,2	290	74
	Victoria	149	3,9	440	83
	Silvania	167	4,6	190	82

In the variety Muscat de Hamburg, all the variants yielded superior results compared to the control variant from the point of view of the mean weight of a grape cluster. The best behaviour was in the variant V2 Fertiactyl GZ which yielded a surplus of 19 g compared to the control, followed by the variants V4 Microfert-Fer and V6 Berelex.

In the varieties Victoria and Silvania, results concerning the mean weight of a cluster yielded almost the same results as the variety Muscat de Hamburg.

As for the marketable yield, all the experimental variants yielded superior yields compared to the control variant.

CONCLUSIONS

Foliar fertilisers and biostimulators applied at much smaller rates compared to classical fertilisers can be temporarily alternative variants to classical fertilisation which limits the amount of fertilisers introduced into the ecosystem.

As for mature growths and wintering resistance, foliar fertilisers yielded superior results compared to both the control variant and to biostimulator-treated variants.

Commercial aspect of table grapes is much improved through the use of foliar fertilisers and of biostimulators which means more chances to valorise the grapes as quick as possible.

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