

ECONOMIC AND TECHNOLOGICAL EFFICIENCY OF GIBBERELLIN'S TREATMENT ON SEEDS AND SEEDLESS TABLE GRAPES VARIETIES

EFICIENȚA ECONOMICĂ ȘI TEHNOLOGICĂ A UTILIZĂRII GIBERELINEI LA SOIURILE PENTRU STRUGURI DE MASĂ

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Abstract. Viticulture for the agriculture of Moldova is an important and effective branch, but the table grapes sector is an efficient and more important for small, medium and family business. Increasing the quality of table grapes is a necessity for society and consumers. The purpose of the research from this article is to study the influence of Gobbi Gib 2LG on the quantity, quality and economic efficiency of grapes of Beauty Seedless and Prezentabil varieties. The research was conducted in the vineyards of the „Terra Vitis” LTd, from Southern wine region in Moldova. Research results have shown that the dose of 2.4 l/ha is most useful for conditions by the south part of Moldova, for Beauty seedless variety and the dose of 0,98 l/ha for Prezentabil variety.

Key words: Beauty Seedless, Prezentabil, table grape, growth stimulators.

Rezumat. Viticultura pentru agricultura Moldovei este o ramură importantă și eficientă, dar sectorul strugurilor de masă este un sector mai eficient și mai important pentru businessul mic, mijlociu și cel de familie. Creșterea calității strugurilor de masă este o necesitate pentru societate și consumatori. Scopul cercetării din acest articol este de a studia influența preparatului Gobbi Gib 2LG asupra cantității, calității și eficienței economice a strugurilor de masă la soiurile Beauty Seedless și Prezentabil. Cercetările a fost efectuate în plantațiile viticole întreprinderii "Terra Vitis" SRL, din regiunea vitivinicolă sud din Republica Moldova. Rezultatele cercetării au arătat că doza de 2,4 l/ha este cea mai favorabilă pentru condițiile regiunii de sud a Moldovei, pentru soiul Beauty Seedless și doza de 0,98 l ha - pentru soiul Prezentabil.

Cuvinte cheie: Beauty Seedless, Prezentabil, struguri de masă, stimulatori de creștere.

INTRODUCTION

Viticulture for the agriculture of Moldova is an important and effective branch, but the table grapes sector is an efficient and more important for small, medium and family business. Increasing the quality of table grapes is a necessity

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for society and consumers. A lot of agricultural branches use different growth regulators or biological active substances, but in Moldova we need to research the influence of these substances on quality of table grapes production, because we do not have registered and approved substances, for use.

The role of growth regulators showed many researches (Wear, 1976; Winkler *et al.*, 1997; Smirnov. *et al.*, 1987) and other. The growth regulators in low concentrations are able to cause essential modifications of the growth and development processes in the plant and their regulation. A specific particularity of the regulators action is their capacity to influence on the processes that are not responding on the influence of normal agricultural practices.

The use of gibberellins within table grape variety technology in most of the countries around the world (Japan, USA, Russia, Italy, Ukraine, Bulgaria etc.) is an obligatory agricultural process. Treating the inflorescences (in the blooming period, in the post fecundation period) leads to considerable modifications of the morphological and mechanical bunch particularities and to productivity increase as well as berries quality modifications.

The researches of Smirnov *et al.*, (1998), Batukaev, (1987), Agafonov *et al.*, (2007), Krasohina, (2008), Derendovskaâ *et al.*, (2009, 2013) it was proved that the application of gibberellins to table grapes varieties lead to increased size and weight of grapes and berries; improve the appearance of grapes; grapes and berries structure modification; improving the processes of accumulation of sugars, formation in some varieties of seedless berries

MATERIAL AND METHOD

The purpose of the research was to study the influence of the Gobbi Gib 2LG, produced by „L Gobbi” Ltd., Italy on the table grapes varieties productivity.

To achieve the final purpose it was necessary to resolve the following objectives:

- the action of Gobbi Gib 2LG on the table grapes varieties Beauty seedless and Presentabil, on its berry morphological parameters and mechanical properties;
- the action of Gobbi Gib 2LG on the productivity, quality and economic efficiency of the grapes;
- finding out the optimal concentration of the Gobbi Gib 2LG which has a more efficient action within the table grapes seedless varieties;

The research in the field of studying the action of Gobbi Gib 2LG (active substance GA3, the commercial name for L.Gobbi S.R.L. ITALY, this regulator was accepted in Moldova after our research results) as growth regulator needed to increase the productivity and quality of the grapes was effectuated in “Terra-Vitis” Ltd. located in Burlacu village, Cahul district.

The object of study it was the Beauty seedless and Presentabil a table grapes varieties grafted on the Berlandieri x Riparia SO4 rootstock. Density of plants – 2222 plants/ha (3 x 1,5 m). Training system - horizontal cordon. The soil – ordinary black soil.

The experimental variants for Beauty seedless variety – 1. Control; 2. treatment in different phenological stages: the technology used in Italy (dose 3.6; 4.6 l/ha) – on 8 cm of shoots length; one week before the blossom; while blossoming 30% of the bloom; while

blossoming 50% of the bloom; while blossoming 80% of the bloom; the treatment of Ø 3-4 mm berries; 8-10 days after the last treating; the technology suggested for Moldova (Mihov, 2010) was the treatment of Ø 3-6 mm berries (2,0 and 2,4 l/ha). In this experiment we use variations and 3 repetitions

The experimental variants for Presentabil variety – 1. Control; 2. treatment in different phenological stages: the technology used in Italy (dose 0,65; 0,82 l/ha) –the treatment of Ø 3-4 mm berries; 8-10 days after the last treating; the technology suggested for Moldova (Mihov, 2010) was the treatment of Ø 3-6 mm berries (0,98 and 1,3 l/ha). In this experiment we use variations and 3 repetitions

RESULTS AND DISCUSSIONS

Presentabil table grape variety.

The usage of Gobbi Gib 2LG following the Italian technology.

Table 1

The reaction of the Presentabil variety to the Gobbi Gib 2LG treatment in postfecundary period. „Terra vitis” Ltd., 2013, (Italian technology)

Index	The variant of experience							deviation of the 2nd variant from the 1st variant, ±	DL 0,95
	Control- H ₂ O	GG2LG-0,65 l/ha			GG2LG-0,82 l/ha				
	— x̄	— x̄	deviation from the control, ±	% to the control	— x̄	deviation from the control, ±	% to the control		
Bunch weight, g	503,3	586,0	+82,7	116,4	640,0	+136,7	127,2	+54,0	
The quantity of berries per bunch, berries, total	167,0	208,0	+41,0	124,6	214,0	+47,0	128,1	+6,0	
including undeveloped berries	21,0	43,3	+22,3	-	47,0	+26,0	-	+3,7	
100berries' weight,g	395,8	368,4	-27,4	93,1	403,2	+7,4	101,9	+34,8	
Harvest, kg/vine	3,8	4,5	+0,7	118,4	4,9	+1,1	129,0	+0,4	0,49
The content of:									
- sugar, %	22,6	22,0	-0,6	-	23,3	+0,7	-	+1,3	
- titratable acidity, g/dm ³	8,9	8,5	-0,4	-	8,3	-0,6	-	-0,2	
Price MDL* per kg	7,00	7,50	+0,5	107,14	7,50	+0,5	107,14	,0	
Value, MDL per vine	26,60	33,75	+7,2	126,88	36,75	+10,2	138,16	+3,0	
Total cost, MDL per hectare	15200,0	15400	+200,0	101,32	15500	+300,0	101,97	+100,0	
Sales revenue, MDL per hectare	59105,2	74992,5	+15887,3	126,88	81658,5	+22553,3	138,16	+6666,0	
Profit, MDL per hectare	43905,2	59592,5	+15687,3	135,73	66158,5	+22253,3	150,68	+6566,0	
Profitability, %	288,85	386,96	+98,1		426,83	+138,0		+39,9	

* MDL – Moldova's money, lei (NBM 1 Euro=22,5 MDL)

According to the data reflected in Table 1 it is noted that the grape weight is 503.3 g in the control, but in the 1st variant (0,65 l/ha) - 586.0 g, with 87.2 g or 16.4% more, and in the 2nd (0,82 l/ha) - 640.0 g, with 136.7 g or 27.2% more. The 2nd variant exceeded with 54.0 g the 1st variant. The bunch is big, conically shaped, and dense. The berries have an oblong shape. (Table 1, Figure 1).

The quantity of grapes per vine in the 1st variant was 4.5 kg, with 0.7 kg or 18.4% more in comparison with control variant, but in 2nd variant - 4.9 kg, with 1.1 kg or 29,0% more in comparison with control variant. The 2nd variant exceeded with 0,4 kg the 1st variant. The value of $DL_{0,95} = 0,49$ kg.

The level of profitability in the 1st variant was 386,96%, with 98,1% more in comparison with control variant, but in 2nd variant - 426,83%, with 138,0% more in comparison with control variant. The 2nd variant exceeded with 39,9% the 1st variant.

Table 2

The reaction of the Presentabil variety to the Gobbi Gib 2LG treatment in postfecundary period. „Terra vitis” Ltd., 2013 (Moldova technology)

Index	The variant of experiment								DL 0,95
	Control - H ₂ O	GG2LG-0,98l/ha			GG2LG-1,3l/ha			deviation of the 2nd variant from the 1st variant, ±	
	— x	— x	deviation from the control, ±	% to the control	— x	deviation from the control, ±	% to the control		
Bunch weight, g	503,3	649,0	+145,7	129,0	651,5	+148,2	129,4	+2,5	
The quantity of berries per bunch, berries, total	167,0	255,0	+88,0	152,7	196,5	+29,5	117,7	-58,5	
including undeveloped berries	21,0	50,0	+29,0	-	18,0	-3,0	-	-32,0	
100 berries' weight, g	395,8	376,2	-19,6	95,1	404,6	+8,8	102,2	+28,4	
Harvest, kg/vine	3,8	4,9	+1,1	129,0	5,0	+1,2	131,6	+0,1	0,49
The content of: - sugar, %	22,6	23,6	+1,0	-	21,6	-1,0		-2,0	
- titratable acidity, g/dm ³	8,9	8,6	-0,3	-	8,4	-0,5		-0,2	
Price MDL* per kg	7,00	7,50	+0,5	107,14	7,50	+0,5	107,14	0	
Value, MDL per vine	26,60	36,75	+10,15	138,16	37,50	+10,9	140,98	+0,75	
Total cost, MDL per hectare	15200,00	15400,00	+100,00	101,32	15500,00	+300,0	101,97	+100,0	
Sales revenue, MDL per hectare	59105,20	81658,50	+22553,3	138,16	83325,00	+24219,8	140,98	+1666,5	
Profit, MDL per hectare	43905,20	66258,50	+22353,3	150,91	67825,00	+23919,8	154,48	+1566,5	
Profitability, %	288,85	430,25	+141,4		437,58	+148,73		+7,33	

* MDL – Moldova's money, lei (NBM 1 Euro=22,5 MDL)

The usage of Gobbi Gib 2LG following the Moldova technology.

According to the data reflected in Table 2 it is noted that the grape weight is 503.3 g in the control, but in the 1st variant (0,98 l/ha) - 649.0 g, with 145,7 g or 29.0% more, and in the 2nd (1,3 l/ha) – 651,5 g, with 148,2 g or 29,4% more. The 2nd variant exceeded with 2,5 g the 1st variant. The bunch is big, conically shaped, and dense. The berries have an oblong shape. (Table 2, Figure 1).

The quantity of grapes per vine in the 1st variant was 4.9 kg, with 1,1 kg or

29,0% more in comparison with control variant, but in 2nd variant – 5,0 kg, with 1.2 kg or 31,6% more in comparison with control variant. The 2nd variant exceeded with 0,1 kg the 1st variant. The value of $DL_{0,95} = 0,49$ kg.

The level of profitability is an important index of economic efficiency. This index in the 1st variant was 430,25%, with 141,4% more in comparison with control variant, but in 2nd variant – 437,58%, with 148,73% more in comparison with control variant. The 2nd variant exceeded with 7,33% the 1st variant.

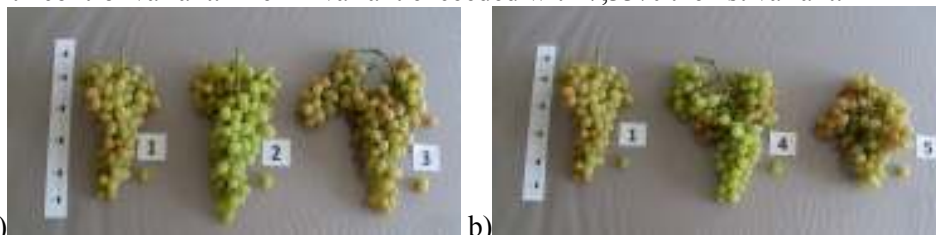


Fig. 1 - The Gobbi Gib 2LG influence on the external appearance of the bunch and berries.

- a) The Presentabil variety, "Terra vitis" Ltd., 2013, (Italian technology). The variant of experiment: 1-Control – H₂O; 2-GG2LG-0,65 l/ha; 3-GG2LG-0,82 l/ha
 b) The Presentabil variety, "Terra vitis" Ltd., 2013, (Moldova technology). The variant of experiment: 1-Control – H₂O; 2-GG2LG-0,98l/ha; 3-GG2LG-1,3l/ha

Beauty seedless table grape variety.

The usage of Gobbi Gib 2LG following the Italian technology.

Table 3

The reaction of the Beauty seedless variety to the Gobbi Gib 2LG treatment.
 „Terra vitis” Ltd., (Italian technology)

Index	The variant of experience								DL 0,95
	Control- H ₂ O	GG2LG -3,6 l/ha			GG2LG -4,6 l/ha			deviation of the 2nd variant from the 1st variant, ±	
	— x	— x	deviation from the control, ±	% to the control	— x	deviation from the control, ±	% to the control		
Bunch weight, g	251,7	404,8	+153,1	160,83	424,4	+172,7	168,61	+19,6	
The quantity of berries per bunch, berries, total	239	245	+6	102,51	227,7	-11,3	95,27	-17,3	
including undeveloped berries	24,7	5	-19,7	20,24	1,7	-23	6,88	-3,3	
100 berries' weight, g	113,8	175,4	+61,6	154,13	191,4	+77,6	168,19	+16	
Harvest, kg/vine	3,9	6,2	+2,3	158,97	6,5	+2,6	166,67	+0,3	0,58
The content of:									
- sugar, %	17,3	16,6	-0,7	95,95	18,2	+0,9	105,20	+1,6	
- titratable acidity, g/dm ³	11,7	10,8	-0,9	92,31	10,9	-0,8	93,16	+0,1	
Price MDL* per kg	7	7,5	+0,5	107,14	7,5	+0,5	107,14	0	

Value, MDL per vine	27,3	46,5	+19,2	170,33	48,75	+21,45	178,57	+2,25	
Total cost, MDL per hectare	15200	15400	+200	101,32	15500	+300	101,97	+100	
Sales revenue, MDL per hectare	60660,6	103323	+42662,4	170,33	108322,5	+47661,9	178,57	+4999,5	
Profit, MDL per hectare	45460,6	87923	+42462,4	193,40	92822,5	+47361,9	204,18	+4899,5	
Profitability, %	299,08	570,93	+271,85		598,85	+299,77		+27,92	

* MDL – Moldova's money, lei (NBM 1 Euro=22,5 MDL)

According to the data reflected in Table 3 it is noted that the grape weight is 251,7 g in the control, but in the 1st variant (3,6 l/ha) – 404,8 g, with 153,1 g or 60,83% more, and in the 2nd (4,6 l/ha) – 424,4 g, with 172,7 g or 68,61% more. The 2nd variant exceeded with 19,6 g the 1st variant. The bunch is big, conically shaped, and dense. The berries are spherical or slightly oval shape. (Table 3, Figure 2).



Fig. 2 - The Gobbi Gib 2LG influence on the external appearance of the bunch and berries. Beauty seedless variety, "Terra vitis" Ltd., 2013. The variants of experience: 1-Control-H₂O; 2-GG2LG -3,6 l/ha; 3- GG2LG -4,6 l/ha, (Italian technology); 4-GG2LG -2,0l/ha; 5- GG2LG-2,4l/ha (Moldova technology)

Table 4

The reaction of the Beauty seedless variety to the Gobbi Gib 2LG treatment while the post fecundation period. „Terra vitis” Ltd., 2013, (Moldova technology)

Index	The variant of experience							DL 0,95	
	Control-H ₂ O	GG2LG -2,0 l/ha			GG2LG -2,4 l/ha				
	\bar{x}	\bar{x}	deviation from the control, \pm	% to the control	\bar{x}	deviation from the control, \pm	% to the control		
Bunch weight, g	251,7	454,8	+203,1	180,69	508,3	+256,6	201,95	+53,5	
The quantity of berries per bunch, berries, total	239	238	-1	99,58	242	+3	101,26	+4	
including undeveloped berries	24,7	0	-24,7	0,00	1,7	-23	6,88	+1,7	
100 berries' weight, g	113,8	196,3	+82,5	172,50	217,6	+103,8	191,21	+21,3	
Harvest, kg/vine	3,9	7,0	+3,1	179,49	7,8	+3,9	200,00	+0,8	1,22

The content of:								
- sugar, %	17,3	16,1	-1,2	93,06	16,1	-1,2	93,06	0
- titratable acidity, g/dm ³	11,7	11,5	-0,2	98,29	11,8	+0,1	100,85	+0,3
Price MDL* per kg	7	7,5	+0,5	107,14	7,5	+0,5	107,14	0
Value, MDL per vine	27,3	52,5	+25,2	192,31	58,5	+31,2	214,29	+6
Total cost, MDL per hectare	15200	15400	+200	101,32	15500	+300	101,97	+100
Sales revenue, MDL per hectare	60660,6	116655	+55994,4	192,31	129987	+69326,4	214,29	+13332
Profit, MDL per hectare	45460,6	101255	+55794,4	222,73	114487	+69026,4	251,84	+13232
Profitability, %	299,08	657,50	+358,42		738,63	+439,54		+81,13

* MDL – Moldova's money, lei (NBM 1 Euro=22,5 MDL)

The quantity of grapes per vine in the 1st variant was 6,2 kg, with 2,3 kg or 58,97% more in comparison with control variant, but in 2nd variant – 6,5 kg, with 2,6 kg or 66,67% more in comparison with control variant. The 2nd variant exceeded with 0,3 kg the 1st variant. The value of $DL_{0,95}$ – 0,58 kg.

The level of profitability in the 1st variant was 570,93%, with 271,85% more in comparison with control variant, but in 2nd variant – 598,85%, with 299,77% more in comparison with control variant. The 2nd variant exceeded with 27,92% the 1st variant.

The usage of Gobbi Gib 2LG following the Moldova technology.

According to the data reflected in Table 3 it is noted that the grape weight is 251,7 g in the control, but in the 1st variant (2,0 l/ha) – 454,8 g, with 203,1 g or 80,69% more, and in the 2nd (2,4 l/ha) – 508,3 g, with 256,6 g or 101,95% more. The 2nd variant exceeded with 53,5 g the 1st variant. The bunch is big, conically shaped, and dense. The berries are spherical or slightly oval shape. (Table 4, Figure 2).

The quantity of grapes per vine in the 1st variant was 7,0 kg, with 3,1 kg or 79,49% more in comparison with control variant, but in 2nd variant – 7,8 kg, with 3,9 kg or 100,0% more in comparison with control variant. The 2nd variant exceeded with 0,8 kg the 1st variant. The value of $DL_{0,95}$ – 1,22 kg.

The level of profitability in the 1st variant was 657,5%, with 358,42% more in comparison with control variant, but in 2nd variant – 738,63%, with 439,54% more in comparison with control variant. The 2nd variant exceeded with 81,13% the 1st variant.

Early studies in Moldova with different varieties (Muscat de Hamburg, Loose perlette, Cardinal, Codreanca and others) and there results showed the similar effects of treatments (Nicolaescu *et al*, 2009, 2012, 2015, Mihov, 2010).

CONCLUSIONS

In finally, for the Prezentabil (seeds variety) table grape variety in the

conditions of southern part of Moldova, high results we obtained in the 2nd variant with the dose of 1.3 l/ha. The level of profitability 437,58%, with 148,73% more in comparison with control variant.

The Beauty seedless (seedless variety) table grape variety in the conditions of southern part of Moldova, high results we obtained in the 2nd variant with the dose of 2,4 l/ha. The level of profitability 738,63%, with 439,54% more in comparison with control variant.

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