The quality of Cardinal grape variety through the use of biologically-active substances

Gh. Nicolaescu[1], Antonina Derendovskaia[2], N. Perstniov[1], A. Stirbu[1],
Olga Tcaciuc[2], Ana Nicolaescu[3], T. Ciobanu[4], Silvia Josan[2]
[1]Department of Viticulture, State Agricultural University of Moldova
gh.nicolaescu@gmail.com
[2]Department of Plant Physiology, State Agricultural University of Moldova
[3]Department of Economics and Statistics, State Agricultural University of Moldova
[4]Sauron Ltd, Moldova

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ABSTRACT

The culture of table grapes has become a complex issue today; the settlement will depend on the correct choice of varieties for cultivation, harvesting, storage and selling of grapes. Worldwide, the vines' cultivation in the last decade, had subjected a changes of vine assortment but the high results obtain in developed countries now. Without knowing the basic laws of physiological growth and fruiting vines, and methods of adjustment can not be obtained high yields, stable and high quality with low cost and long-term use of the productive capacity of grapes. The objectives of the study include the identification of the influence of the treatment period, the optimal dose of gibberellin on the quantity and quality of grapes and efficiency of table grapes of Cardinal variety.

INTRODUCTION

Analysis of extensive experimental material shows that the action of gibberellin is accelerated of shoot growth, a stronger development of tendrils, elongation of petioles of leaves, the formation of open petiole sinus, the appearance of bright coloration of the upper leaves (Manankov, 1981).

The sensitivity of any tissue to gibberellin is dependent on many factors: the quantity and quality of light, the physiological age of tissue, the presence of other growth regulators. The great importance on the result has the type of tissue or organ, applied gibberellin and its concentration.

Katarân (1963) and other scientists note that, increases of the shoots growth there are when spraying bushes of all varieties with gibberellin, but the sensitivity of the bushes of seed varieties for the same concentration of solution is significantly higher than that of the seedless varieties. Invoked stimulation of growth by gibberellin can be expressed not only in the elongating internodes, but also to increase their number, increasing the formation and growth of lateral shoots, increasing the number of leaves and their size. As a result, the general habitus of plants treated with gibberellin is different from the control bushes.

In grapes, like many other plants (tomatoes, peppers, etc.) the treatment with gibberellin induces the formation of seedless grapes (Katarân, 1963; Singh, 1978; Radžabov, 1993; Reynolds, 2006 etc.). Positive results, in order to obtain seedless berries were obtained in Japan, USA, Bulgaria, India and other countries.

The purpose of our researches was to study the influence of inflorescences treatment with gibberellin (GA3) on the productivity of Cardinal table grapes variety in the Republic of Moldova

MATERIALS AND METHODS

Studies performed in 2007-2009 at the experimental station with table grape variety: Cardinal, in The Central part of the Moldova Republic. We used the methods recommended for this type of research in viticulture. During the period of vegetation we studied the agrobiological properties of varieties. The inflorescences were treated with gibberellin: 25, 50 and 100 ppm.

RESULTS AND DISCUSSION

Cardinal (Flame Tokay x Alphonse Lavallée) [E. Snyder, CA, USA] is a table grapes variety. It became widespread in United States, Bulgaria, France, Italy, Romania, Spain, Moldova and other countries. Crown and top young leaves from the young shoots are light green, without pubescence, with poorly-bronzing on the ends of the teeth. Dissected of leaves is average. Annual maturate shoot is bright brown, dark brown knots. The leaves are large or very large. The upper lateral sinuses are medium. The underside of leaves is glabrous. Petiole often painted in bright pink colour. Autumn leaf colour is yellow. The flowers are hermaphroditic.

Bunch are large size (length 19-28 cm, width 13-19 cm), cylindrical-conical form, loose and very loose. Weight of bunch is 342-510 g. The berries are very large (length 21-29 mm, width 18-23 mm), round-oval or oval form, and violet-red with wax coating. The 100 berries weight 600-700 g. The skin is relatively thick, but easily broken. Flesh fleshy, juicy, crisp, greenish-white, grape pleasant, with a weakly pronounced muscatel aroma. In berries there are 2-4 large seeds.

Cardinal is a variety, where refers to the grapes very early ripening. From blooming buds to maturity are needed 121 days and the sum of active temperatures of 2308°C. Bushes are medium vigour of growth.

Shoots maturity are satisfactorily. Cardinal is a variety of potentially high, but unstable yield.

The Cardinal variety is unstable to powdery mildew (*Plasmopara viticola*), downy mildew (*Uncinula necator*), bacterial cancer (*Agrobacterium tumefacience*), strongly susceptible to botrytis berries (*Botrytis cinerea*). Grapes are very unstable to frosts and frost damage. The variety was much inclined to shattering of flowers, ovaries and formed small berries in some years with unfavourable weather conditions during the flowering period. Consequently reduced the marketability of variety in clusters often remains only 10-15 normal berries.

The results of our researches are shown in the Tables 1 and 2, as well as in the Fig. 1.

In the control variant the average weight of bunches are 390,2 gr. and berries – 383,4 gr. The bunches size are: length – 24,2 cm, width: top 13,7 cm, medium – 7,2 cm and bottom – 5,5 cm.

Established that under the action of gibberellin is an increase in bunches weight with 31,5 (GA_3-25 mg/l), 85,6 (GA_3-50 mg/l) and 77,6% (GA_3-100 mg/l), the berries weight in clusters, compared with the control. The result is a decrease the bunch structure on 1,5; 1,1 and 1,6 times, respectively.

Economic benefit analysis showed that the highest level of profitability – 818,34%, obtained in the variant GA_3-50 mg/l, which is 274,82% higher compared with control.

CONCLUSIONS

The gibberellin test on the seed varieties (clones) of table grapes; it was found that the drug's effect depends by the biological characteristics of the varieties and concentration of gibberellin.

The application of gibberellin on seed varieties – Cardinal leads to increase bunches weight, the berries weight in bunches, and decrease clusters structure rate. The optimum concentration of the gibberellin is GA_3-50mg/l. Yield increases on 31,4-85,8%. In the clusters reduces the number of substandard berries and increasing the seed rate index;

Increasing the number of seedless berries in the bunch of the seed varieties of table grapes under the action of gibberellin treatment, increase the sugar content, accelerate ripening, which is an important factor for the early varieties such as Cardinal.

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FIGURE

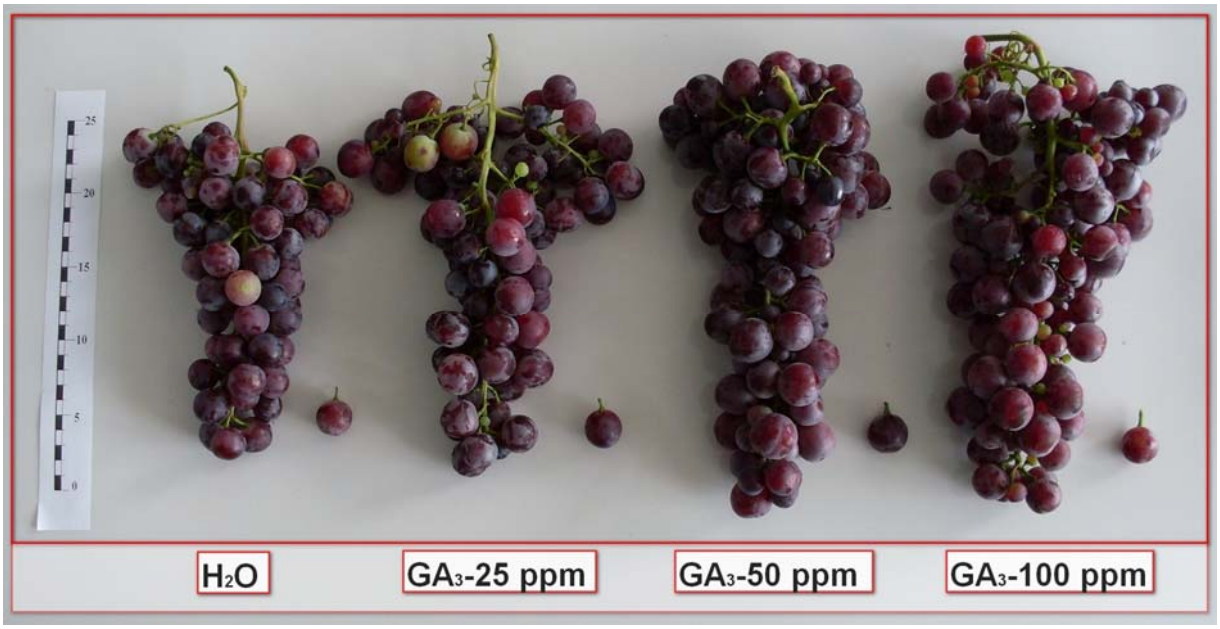

Fig. 1. Effect of gibberellin (GA3) on the appearance of bunches and berries of Cardinal variety

TABLES

Table 1. The reaction of Cardinal variety for treatment of cauliflowers with gibberellic acid (GA_3) on the stage after fecundation period

Indicators	Variants								$DL_{0,95}$
	Control - H_2O		GA_3-25 ppm		GA_3-50 ppm		GA_3-100 ppm		
	$\bar{x}$	%	$\bar{x}$	%	$\bar{x}$	%	$\bar{x}$	%	
Weight of bunches, g	390,2	100,0	513,1	131,5	724,5	185,6	693,2	177,6	
berries, g	383,4	-	499,3	-	709,7	-	673,7	-	-
Bunches size, cm									
- Length	24,2	-	28,8	-	29,7	-	29,5	-	-
- Width/top	13,7	-	21,2	-	19,7	-	20,7	-	-
mid	7,2	-	11,5	-	8,9	-	9,8	-	-
bottom	5,5	-	5,7	-	7,8	-	7,6	-	-
Peduncle size, mm	11,1 ± 0,2	100,0	12,1 ± 0,4	109,6	12,0 ± 0,2	108,4	11,2 ± 0,2	101,5	-
The number of berries in the bunch, (normal/ abnormal), pieces	68,7 8,3	100,0 -	125,3 15,3	182,5 -	141,3 5,7	205,8 -	189,0 20,7	275,2 -	- -
Berry size, mm									
-length	23,5	100,0	24,4	103,8	26,4	112,3	20,7	87,9	1,34
-width	24,3	100,0	24,1	99,2	26,1	107,4	21,7	89,5	1,35
Weight of 100 berries, g	642,2 ± 33,5	100,0 -	681,6 ± 10,6	106,1 -	831,1 ± 15,5	129,4 -	758,7 ± 26,6	118,1 -	-
The index composition of berries (pulp weight/ skin weight)	41,86	-	62,00	-	66,08	-	73,00	-	-
The number of seeds per 100 berries	285,0	100,0	170,0	59,6	220,0	77,2	190,0	66,7	-
Indicator seed index (weight of pulp/weight of seed)	41,86	-	62,00	-	66,08	-	73,60	-	-
The strength of the berries on the crushing, g	1085	100,0	1425	131,3	1120	103,2	1340	123,5	-
Yield, kg per vine	5,85	100,0	7,70	131,6	10,87	185,8	10,40	177,7	0,31
Content of sugars	125	-	141	-	151	-	141	-	-
content of acids	8,1	-	8,3	-	8,6	-	8,5	-	-

Table 2. The economic efficiency of Cardinal grapes production for gibberellic acid treatment

Indicators	Variants			
	Control - H_2O	GA_3-25 ppm	GA_3-50 ppm	GA_3-100 ppm
The costs during the growing season without gibberellic acid, MDL	12000	12000	12000	12000
The costs of closure and opening of the vines, MDL	3000	3000	3000	3000
Yield, tones per hectare	12,99	17,11	24,15	23,11
The costs for harvesting of grapes, MDL	5199,48	6843,76	9661,26	9243,52
The cost for the treatment with gibberellic acid, MDL	-	1514,632	1639,569	1890,017
The total cost, MDL	20199,48	23358,39	26300,83	26133,54
The cash proceeds from the sale of grapes, MDL	129987,00	171094,00	241531,40	231088,00
The profit, MDL	109787,52	147735,61	215230,57	204954,46
The profitability, %	543,52	632,47	818,34	784,26

Note: 1 USD ≈ 11,5 MDL