

IMPACT OF THE NUMBER OF CLUSTERS ON CARDINAL VARIETY PRODUCTION RESULTS

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Abstract

The Cardinal variety is a leading very early ripening table grape variety in the Republic of Macedonia. The grape quality largely depends on the applied production technology. The aim of our research is to determine the impact of the number of retained clusters per m² on the production results of the Cardinal variety, grown on pergola tendon trellis (odrina) system in the Gevgelija - Valandovo wine region. The load of 3, 4, and 5 clusters/m² respectively was noted. Based on the results, we found a significant impact of the number of clusters on the yield, dynamics of ripening, and quality of grapes. By increasing the number of clusters, the weight of the cluster decreased from 489 g in the 3 clusters/m² variant to 446 g in the 5 clusters/m² variant. The weight of the berry ranged from 7,6 g in the 5 clusters/m² variant to 8,4 g in the 3 clusters/m² variant. Total weight of packaged grapes ranged from 1,4 kg/m² for the 3 clusters/m² variant to 1,9 kg/m² for the 5 clusters/m² variant. There was a significant difference in the dynamics of ripening, i.e., the quantity of packaged grapes in the first harvest. The highest weight of 1,55 kg/m² of packaged grape in the first harvest was obtained from the variant with 4 clusters/m², and the lowest of 1,29 kg/m² from the 3 clusters/m² variant. The best quality of 9.6 points was observed in the variant with 3 clusters/m² and the lowest of 7.9 points in the grapes of the variant with 5 clusters/m². From these results, it can be concluded that the best results for the Cardinal variety are obtained by leaving 4 clusters per m².

Keywords: Table grape, production technology, yield, dynamics of ripening, organoleptic evaluation.

Introduction

The production of table grapes in R. Macedonia has a long tradition. Our country has suitable soil and climate conditions, infrastructure, human resources etc. Within the past few years, new knowledge in this area is followed and implemented, especially the assortment, the growing systems, technology of production etc. As a result, nowadays in our country there are modern plantations of table grape, equipped with irrigation systems, protective nets, grape packaging and storage premises etc. Cardinal variety is a leading, very early table variety in R. Macedonia. It characterizes with high fruiting potential and average yields. As a variety, it features many particulars in the production itself and it requires application of ample-technical measures in order timely and equal ripening, as well as reaching high yield and quality. As of the very competitive market, which mostly arises from the customer's demands, only by following and application of the newest production methods we will remain the leading country in the production of table grape in the region.

Material and methods

The examinations have been performed in viable plantations in Gevgelija- Valandovo wine-growing region, at the Chaparica locality. The Cardinal variety has been examined, on a plantation which is fully fruitful, 10 years old and has an irrigation-system-pergola. 4 variants have been examined: St, I, II and III, which differed in the number of left bunches per vine (or m²). Reduction of bunches of grapes has not been made at the variant St, i.e. all bunches of grapes that had grown were left on it. 3 bunches of grapes were left per m² at the variant I, at the variant II 4 bunches of grapes per m², i.e.

5 bunches of grapes per m² at the variant III. Despite the Standard, ample-technical measures have been implemented at the other variants: removal of double rods, leaving of two bunches of grapes per rod at the most, pinching out, defoliation etc.

The following examinations have been performed at each variant: average weight of bunch and berry, average mass of grape, yield (packaged grape and waste), dynamics of harvest, and degustation rate. Examination of technological characteristics has been performed according to an elaborated scheme by Prof. Dr. Zvonimir Bozhinovikj (Ampelography, 2010). The quantity of harvested grape is established per vine and per hectare. Thereto, there are two categories: packaged grape and waste. The dynamics of harvest has been established from the quantity of harvested grape within the I and II harvest, given in kg/m². Degustation rating has been made with application of a ten-point system whereto with the sense of sight, smell and taste the following elements have been rated: external appearance, consistence, taste and originality. On basis of the degustation rating a classification of the grape in categories (classes) has been made.

Results and discussion

The obtained results for the impact of the implemented ample-technical measures on the mass of the bunch of grape at the Cardinal variety are presented in table 1.

Table1. Average mass of a bunch of grape at Cardinal variety in g

Year	Variant			
	St	I	II	III
2015	484	536	528	485
2016	392	442,5	439,3	406,9
2015/16	438	489,3	483,7	446
Index	100	111,7	110,4	101,8

The average mass of a bunch of grape for the examined years ranges from 438 g at the ST variety to 489, 3 g at the I variety.

On basis of the obtained data, it has been concluded that the influence of the reduction of the number of bunches of grapes per vine reflects on the average mass of the bunch of grape. Variant I characterizes itself with the largest average mass of the bunch of grape where an increase of 11,7 % in relation to the standard has been recorded, whereas there is slight increase of 1,8 % compared to the standard recorded at the III variant.

Table 2 shows the impact of the applied ample-technical measures on the mass of the berry at the Cardinal variety.

Table 2. Average mass of a berry at the examined varieties in g

Year	Variant			
	St	I	II	III
2015	8,9	9,2	8,8	8,4
2016	6,58	7,67	7,17	6,83
2015/16	7,74	8,44	7,99	7,62
Index	100	109,0	103,2	98,4

The average mass of the berry of grape ranges from 7,62 g at the III variant to 8, 44 g at I variant. On basis of the obtained data we can conclude that there is impact on the clogging of the vine with bunches of grapes upon the average mass of the grape. An increase of the average mass of the gerry has been noted at I and II variants in relation to the standard of 9,0, i.e. 3, 2 %, whereas there is a decrease of 1, 6 % at III variant compared to the Standard.

Table 3 shows the impact of the applied ample-technical measures on the yield of the examined varieties.

Table 3. Total yield at the examined varieties (kg/m²)

Year	Variant							
	St		I		II		III	
	Packaged kg/m ²	Waste kg/m ²						
2015	1,74	0,13	1,50	0,01	1,95	0,01	2,06	0,26
2016	1,55	0,21	1,29	0,01	1,63	0,05	1,73	0,32
2015/16	1,65	0,17	1,40	0,01	1,79	0,03	1,90	0,29
Index	100	100	84,8	5,9	108,5	17,6	115,2	170,6

On basis of the obtained results presented in Table 3, it can be concluded that the left number of bunches of grape per m² has an impact in the quantity of packaged grape. The quantity of packaged grape ranges from 1,40 kg/m² at I variant to 1,90 kg/m² at III variant. The quantity waste ranges from 0, 01 kg/m² at I variant to 0, 29 kg/m² at III variant.

Table 4. Dynamic of harvest at the Cardinal variety

Year	Variety							
	St		I		II		III	
	I harvest kg/m ²	II harvest kg/m ²						
2015	1,48	0,26	1,34	0,16	1,65	0,30	1,33	0,73
2016	1,35	0,20	1,24	0,05	1,44	0,19	1,27	0,46
2015/16	1,42	0,23	1,29	0,11	1,55	0,25	1,30	0,60
Index	100	100	90,8	47,8	109,2	108,7	91,5	260,7

The quantity of harvested grapes in I harvest ranges from 1, 29 kg/m² at I variant to 1,55 km/m² at II variant. The quantity of harvested grapes in the second harvest ranges from 0,11 kg/m² at I variant to 0,60 kg/m² at III variant.

The leaving of number of bunches of grapes per m² has an impact on the dynamic of harvest, too. The largest quantity of packaged grape in the first harvest from 1,55 kg/m² or 9,2 % more compared to the standard has been noted at II variant, whereas the smallest quantity of packaged grape in the first harvest from 1,29 kg/m² i.e. 9,2 % less compared to the standard is noted at I variant.

Degustation rating of variants at the examined varieties is presented in Table 5.

Table 5. Impact on the application of ample-technical measures on the degustation rating of the grape berry at the examined varieties

Year	St	I	II	III
	Total rate	Class	Total rate	Class
2015	8,1	Excellent quality	9,5	Extra quality
2016	8,1	Excellent quality	9,7	Extra quality
2015/16	8,1	Excellent quality	9,6	Extra quality

Degustation rating at the Cardinal variety ranges from 7, 95 points at III variant to 9, 6 points at I variant. A significant impact from the application of the ample-technical measures on the total degustation rate of grapes can be concluded from the table. I variant is characterized with the

highest degustation rate at the examined varieties and III variant with the lowest. I and II variants characterize with the category of extra quality.

Conclusions

On basis of the obtained results and their analyses we concluded the following:

Ample-technical measures have a great impact on the production results and the quality of grapes at the Cardinal variety.

The left number of bunches of grape per m² has a significant impact on the mass of the bunch of grape and the grape berry, the ripening dynamic, the quantity of packaged grape and the quality of the grape.

The mass of the bunch of grape and the grape berry at all variants is within the range of the variety's characteristics. The bigger the number of bunches of grape is, the lower their mass is. The largest mass of the bunch of grape that measures 489 g and the mass of grape 8,4 g has the variant with 3 bunches of grape per m².

The quality of the total packaged grape at the applied variants ranges from 1,4 kg/m² at the variant with 3 bunches of grape per m² to 1,9 kg/m² at the variant with 5 bunches of grape per m².

The variant with 4 bunches of grape per m² characterizes with the largest quantity of packaged grape in the first harvest of 1,55 kg/m² and the variant with 3 bunches of grape per m² characterizes with the lowest quantity of packaged grape in the first harvest of 1,29 kg/m².

The quality of the grapes presented through degustation rating depends on the number of bunches of grape per m². Variants with 3 and 4 bunches of grape per m² characterize with the category extra quality. The standard variant characterizes with excellent quality and the variant with 5 bunches of grape per m² characterizes with very good quality.

The obtained results should also be used for production purposes. We strongly recommend the producers of Cardinal variety to apply vine clogging with 4 bunches of grape per m² which will result in early harvest, high percentage of packaged grape and obtaining grape with extra quality.

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