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## Technological Characteristics of the Vranac and Cabernet Sauvignon Grapevine Varieties in the Conditions of the Trebinje Vineyards

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### Abstract

The aim of this paper is to present technological characteristics of the Vranac and Cabernet Sauvignon grapevine varieties in the conditions of the Trebinje vineyards during the vegetation in 2016 and 2017. Researching technological characteristics includes mechanical compounds of grapes and berries as well as the quality of grapes and berries (sugar, total acid content in the must and pH). Bunch weight, the number of berries on a bunch, the weight of 100 berries, the weight of 100 berries flesh, the weight of berries skin as well as the weight of 100 berries seeds were higher for both varieties in 2017. The bunch weight of Vranac was higher in 2016, and for Cabernet Sauvignon in 2017. Sugar content and acid content were higher in the must of the Vranac variety in 2016, while its pH value did not vary. The sugar content of the Cabernet Sauvignon variety was the same in both examined years, the content of acids was higher in 2016, while the pH value was higher in 2017.

*Key words:* technological characteristics, grape, Trebinje vineyards, Vranac, Cabernet Sauvignon

## Introduction

In the area of Herzegovina there are a large number of varieties, out of which some are native (Žilavaka, Blatina, Trnjak, Bena etc.), while a certain number of varieties have been introduced. Smederevka, Prokupac, Vranac, etc. are among the most important introduced varieties. In the last decade the renovation of Herzegovina vineyards has started so some other varieties such as Merlot, Cabernet Sauvignon, Pinot Noir, Muscat, Shiraz, Chardonnay and others have been introduced as well. The aim of this paper is to study the technological characteristics of the Vranac and Cabernet Sauvignon varieties that were grafted on *Berlandieri* × *Riparia* Kober 5BB rootstock in agro ecological conditions of Trebinje. The yield and quality of grapes of these varieties were studied in different locations by a number of authors: Pajović *et al.* (2009), Popović *et al.* (2013), Mijatović *et al.* (2009) and Banjanin and Kulina (2015).

## Material and Methods

The study of technological characteristics of the grapevine varieties was done during the vegetation of 2016 and 2017. The experiment was set up at the location of Petrovo polje, Trebinje. The vineyard was established in 2004 at an altitude of 269 m, with the planting distance of 2.4 x 0.9 m for Vranac and 2.4 x 1.0 m for Cabernet Sauvignon. During the research year, basic pruning measures were applied in experimental vineyards, as well as protection measures from the most important causes of diseases and pests.

As for the technological characteristics of the tested varieties, the mechanical composition of bunch and berries and chemical composition of must were determined. The mechanical analysis of bunch and berries determined the following indicators: the composition of the bunch (bunch weight, number of berries on a bunch) and the composition of berries (the weight of 100 berries, the weight of 100 berries flesh, the weight of the berries skin and the weight of seeds in 100 berries) expressed in grams. As for the parameters of chemical composition pH, sugar and total acids content in the must were examined. Results were statistically analysed by using the analysis of variance and the LSD test (GenStat software, 12<sup>th</sup> Edition).

## Results and Discussion

The absolute and relative values of the parameters of mechanical composition are different for various varieties of vines and for different growing conditions.

The knowledge of mechanical composition of berries and bunch had special practical importance in assessing the grapes as raw material for processing and consumption in fresh condition.

The relationship between certain parts of the bunch depends on the grape variety, the health condition of grape, the ecological conditions of cultivation and harvesting time (Downey *et al.*, 2006). The values of certain parameters of mechanical composition found in the bunch are presented in Table 1.

Tab. 1. The bunch weight values for the Cabernet Sauvignon and Vranac varieties in 2016 and 2017

*Вриједности масе грозда за сорте Cabernet Sauvignon и вранац у 2016 и 2017*

Variety (A)		Year (B)		Average for variety
		2016	2017	
Cabernet Sauvignon		105.1	163.1	134.1
Vranac		351.6	359.3	355.4
Average for year		228.3	261.2	244.8
LSD	A	B	A x B	
0.05	34.71	34.71	49.08	
0.01	45.99	45.99	65.04	

Of the examined varieties, the Vranac variety had the highest bunch weight (359.3 g) in 2017, and the lowest was found for Cabernet Sauvignon (105.1 g) in 2016 (Tab. 1). An analysis of the significance of differences in the average bunch weight of the examined varieties shows that there is a very significant difference in the bunch weight between varieties. Our results regarding the bunch weight are in accordance with the results of other authors (Pajović *et al.*, 2009; Popović *et al.*, 2013; Karoglan-Kontić *et al.*, 2000). However, they slightly differ from the results stated by Mijatović *et al.* (2009).

Taking into account the usable value of a variety, it is better for the variety to have a large number of berries in the structure of a bunch. It can be concluded that the Cabernet Sauvignon variety which weighed 134.7 g proved to be the best (Tab. 2).

An analysis of the significance of differences in the average number of berries on the bunch of the examined varieties shows that there is not any significant difference in the number of berries between varieties. Our results are in accordance with the results of Pajovic *et al.* (2009).

Tab. 2. The values in regards with the number of berries on the bunch of the Cabernet Sauvignon and Vranac varieties in 2016 and 2017  
*Вриједности броја бобица по грозду за сорте Cabernet Sauvignon и вранац у 2016 и 2017*

Variety (A)		Year (B)		Average for variety
		2016	2017	
Cabernet Sauvignon		105.0	134.7	119.8
Vranac		125.8	134.2	130.0
Average for year		115.4	134.4	124.9
LSD	A	B	A x B	
0.05	14.69	14.69	20.77	
0.01	19.46	19.46	27.52	

The results of the study showed that the Vranac variety had the highest weight of 100 berries) in 2017 (369.8 g) and the lowest was found for Cabernet Sauvignon in 2016 (100.4 g) (Tab. 3). An analysis of the significance of difference in the 100 berries weight of the examined varieties shows that there is a very significant difference between the tested varieties and years.

Tab. 3. The values of 100 berries weight (g) for the Cabernet Sauvignon and Vranac varieties in 2016 and 2017  
*Вриједности масе 100 бобица (g) за сорте Cabernet Sauvignon и вранац у 2016 и 2017*

Variety (A)		Year (B)		Average for variety
		2016	2017	
Cabernet Sauvignon		100.4	145.8	123.1
Vranac		311.5	369.8	340.6
Average for year		205.9	257.8	231.9
LSD	A	B	A x B	
0.05	12.43	12.43	17.59	
0.01	18.84	18.84	26.64	

The fleshy part of berries makes up their largest part. The fleshy part participates with 75-85% in the berries weight. The results of the 100 berries flesh weight show that the Vranac variety had the highest flesh weight in 2017 (333.4 g) and the lowest (85.2 g) was found in Cabernet Sauvignon in 2016 (Tab. 4).

The analysis of variance results in regards with the 100 berries flesh weight among the examined varieties shows there is a statistically very significant difference between the varieties and years.

Tab. 4. The values of 100 berries flesh weight (g) of the Cabernet Sauvignon and Vranac varieties in 2016 and 2017  
*Вриједности масе меса плода (g) 100 бобица за сорте Cabernet Sauvignon и вранац у 2016 и 2017*

Variety (A)		Year (B)		Average for variety
		2016	2017	
Cabernet Sauvignon		85.2	128.3	106.8
Vranac		290.3	333.4	311.8
Average for year		187.8	230.9	209.3
LSD	A	B	A x B	
0.05	11.11	11.11	15.71	
0.01	16.83	16.83	23.81	

The corpulence and elasticity of berries skin depends on the variety and the conditions of cultivation. The skin participates with 15 - 20% in the berries mass. The highest weight of the 100 berries skin was found for the Vranac variety (25.66 g) in 2017 and the lowest weighing 10.04 g in Cabernet Sauvignon in 2016 (Tab. 5). The analysis of the significance of difference in the 100 berries skin weight for the examined varieties shows that there is a statistically very significant difference between the varieties and years.

Tab. 5. The values of 100 berries skin weight (g) of the Cabernet Sauvignon and Vranac varieties in 2016 and 2017  
*Вриједности масе егзокарпа плода (g) 100 бобица за сорте Cabernet Sauvignon и вранац у 2016 и 2017*

Variety (A)		Year (B)		Average for variety
		2016	2017	
Cabernet Sauvignon		10.04	11.02	10.53
Vranac		17.14	25.66	21.40
Average for year		13.59	18.34	15.96
LSD	A	B	A x B	
0.05	1.176	1.176	1.663	
0.01	1.782	1.782	2.520	

The results of the study showed that the highest weight of 100 berries seeds was found in the Vranac variety (10.74 g) and the lowest in Cabernet Sauvignon (4.06 g) (Tab. 6). A statistically very significant difference in the tested properties was recorded between the examined varieties.

Tab. 6. The values of 100 berries seed weight (g) of the Cabernet Sauvignon and Vranac varieties in 2016 and 2017

*Вриједности масе сјемења (g) 100 бобица за сорте Cabernet Sauvignon и вранац у 2016 и 2017*

Variety (A)		Year (B)		Average for variety
		2016	2017	
Cabernet Sauvignon		5.11	6.46	5.78
Vranac		4.06	10.74	7.40
Average for year		4.58	8.60	6.59
LSD	A	B	A x B	
0.05	0.745	0.745	1.054	
0.01	1.129	1.129	1.597	

The chemical composition of the must is very complex. It varies over a wide range, depending on the variety, ecological conditions, applied agro-technology, the degree of maturity of grapes, health status, etc. In our research we examined the following parameters comprising the chemical composition of must: sugar content, total acid content and pH value. The results of our study of chemical composition are shown in Tab. 7.

Tab. 7. The chemical composition of must in the tested varieties

*Хемијску састав ишце испитиваних сорти*

Variety	Vranac		Cabernet Sauvignon	
	2016	2017	2016	2017
Sugar content (%)	23.0	22.4	22.0	22.0
Total acid content (g l <sup>-1</sup> )	5.03	4.27	9.15	6.83
pH	3.40	3.40	3.13	3.19

The obtained results show that the highest sugar content in the must was found in the Vranac variety (23.0%) in 2016, whereas Cabernet Sauvignon had the same sugar content (22.0%) in both examined years.

The results of our research are in accordance with Mijović *et al.* (2004), while Garić *et al.* (2010), Bešlić and Todić (2010), Avramov *et al.* (2003), Karoglan-Kontić *et al.* (2000), quote some lower values in the origins of our research. In terms of the sugar content in the must, significant influence of weather conditions and applied agro-technology on the examined varieties can be noticed. The total acid content of grape varieties varies over a considerable range, from 3 to 12 gL<sup>-1</sup>, most often 5-8 gL<sup>-1</sup>, which depends on the variety, ecological conditions, the degree of maturity of grapes, etc. The results of our study showed that the highest total acid content in the must has been found in the Cabernet Sauvignon variety (9.15 gL<sup>-1</sup>) in 2016, and the lowest in Vranac (4.27 gL<sup>-1</sup>) in 2017 (Tab. 3). The results of our research are in accordance with Mijović *et al.* (2004), Karoglan-Kontić *et al.* (2000), Avramov *et al.* (2003), Pajović *et al.* (2009) and Popović *et al.* (2013).

The lowest pH value was in the Cabernet Sauvignon variety (3.19) in 2017, and the Vranac variety had the same pH (3.4) in both examined years (Tab. 3). The results of our research are in accordance with Pajović *et al.* (2009) and Bešlić and Todić (2010).

## Conclusions

Based on the results presented on technological characteristics of the Vranac and Cabernet Sauvignon grapevine varieties in the conditions of the Trebinje vineyards, the following conclusions can be made:

- The bunch weight, the number of berries on a bunch, the weight of 100 berries, the weight of 100 berries flesh, the weight of berries skin as well as the weight of seeds in 100 berries were higher for both varieties in 2017.
- Sugar content and acid content in the must of the Vranac variety were higher in 2016, while its pH value did not vary. The sugar content in Cabernet Sauvignon was the same in both examined years, the acids content was higher in 2016, while the pH value was higher in 2017.
- In the agroecological conditions of the Trebinje vineyards both Cabernet Sauvignon and Vranac have exhibited excellent technological characteristics for the production of high-quality wines.

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# Технолошке карактеристике сорти винове лозе вранац и *Cabernet Sauvignon* у условима требињских винограда

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## Сажетак

Циљ овог рада је представити технолошке карактеристике сорти винове лозе Вранац и *Cabernet Sauvignon* у условима требињских винограда током вегетације 2016. и 2017. године. Истраживање технолошких карактеристика укључује механички састав грожђа и бобица, као и њихов квалитет (садржај шећера, укупан садржај киселина у шири и рН). Вриједности масе грозда, броја бобица у грозду, масе 100 бобица, масе меса плода 100 бобица, масе егзокарпа 100 бобица, као и масе сјемена 100 бобица биле су веће за обе сорте у 2017. години. Маса грозда сорте вранац имала је веће вриједности у 2016. години, а сорте *Cabernet Sauvignon* у 2017. години. Садржај шећера и садржај киселина у шири били су већи код сорте Вранац у 2016. години, док се рН вредност није разликовала. Садржај шећера код сорте *Cabernet Sauvignon* је био исти у обје испитиване године, садржај киселина био је већи у 2016. години, док је рН вредност била већа у 2017. години.

*Кључне ријечи:* технолошке карактеристике, грожђе, требињски виногради, вранац, *Cabernet Sauvignon*

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