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MECHANICAL COMPOSITION AND FERTILITY ELEMENTS OF CLONES 48, 1089, and 1091 cv. RIESLING

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Abstract

Agroecological conditions and production technology have the greatest impact on the composition of wine, sensory characteristics, and consumer attitudes. The analysis of the connection between these factors is the basis for the recommendation of a certain variety (clone) in a production region. In this study, three French clones of cv. Riesling: 48, 1089, and 1091 were analyzed for the first time in Ukrina vine-growing region (the northwestern part of the Republic of Srpska - Bosnia and Herzegovina). The research was conducted during the 2016-2017 period in the vineyard of a private winery, by determining its production potential and technological characteristics. The basic elements of fertility and mechanical characteristics of grapes and berries were analyzed. In years with very variable climatic conditions, the examined clones had a satisfactory mass of grapes (85.7-131.8 g), a high share of berries in the structure of the cluster (94.70-96.00%) and a slightly lower yield (5.4-7.5 t·ha^{-1}). Tested clones deserve attention for further examination of their characteristics (wine quality) with regard to product characteristics and the possibility of their cultivation in the examined area

***Key words**: riesling, clone, productivity, quality.*

INTRODUCTION

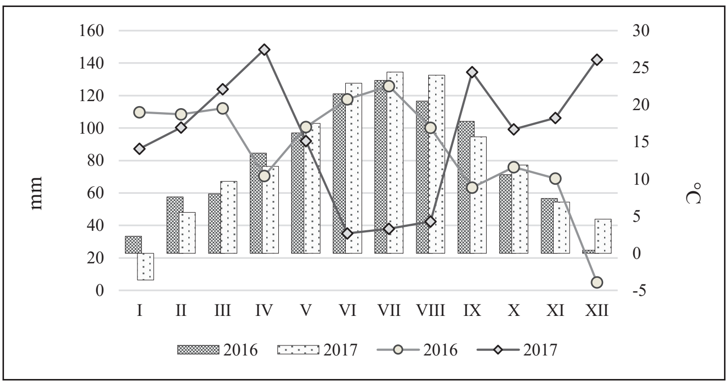
The choice of the appropriate grape variety is given great importance in modern viticulture (Kerridge and Antiliff, 2004). Variety as a quality factor, with its specificity has a crucial role in wine production especially when it comes to the production of high quality wines (Jovanović-Cvetković et al., 2008). Today, there are many different clones of certain varieties, with different quality characteristics. Clone selection is a way to correct old or significant varieties, i.e. to single out individuals who have not experienced negative mutations in production traits (Manninia, 2000; Cindrić, 2003). As it has been in production for many years cv. Riesling has shown a great deal of heterogeneity so its clonal selection has been done in Europe. Clonal selection can increase the yield of cultivar Riesling by up to 36% (Jacsons and Lombard, 1993). New clonal selections provide an excellent opportunity for growers to improve the production of this variety in different environmental conditions and to achieve satisfactory wine quality. Examination of the characteristics of the cultivar Riesling indicated the need to determine the influence of macro and micro climates, soil type and technology of grape and wine production on the composition of wine, sensory characteristics and attitude of consumers. Without a better knowledge of the correlation between these elements in production, classification of wines based on geographical origin may be inappropriate (Fischer, 2011). Examination of the characteristics of the cultivar Riesling (Cindrić et al., 2000; Todić et al., 2000; Friedel et al., 2016) and its clonal selections (Pejović and Maraš, 1994; Ćirković and Garić, 2006; Jovanović-Cvetković et al., 2011; Stroe and Ioana, 2015) is of great importance for the recommendation of further expansion in production. The research aims to determine for the first time in the area of Ukrina vine-growing region (the northwestern part of the Republic of Srpska - Bosnia and Herzegovina) the production potential and technological characteristics of Riesling clones and indicate the justification of their cultivation in this region.

MATERIALS AND METHODS

The field experiment was performed in 2016 and 2017 in the vineyard of the "Fazan" winery, which belongs to the Ukrina vine-growing region. The characteristics of French clones 49, 1089 and 1091 of the Riesling were examined. So far, vineyard was established in 2008 with a planting distance of 3.0 x 1.0 m. The training system of the vine is Gijo simple. Mixed pruning was performed on 10 randomly selected vines - one long spur with 10 buds and one renewal spur with 3 buds (with total load of 13 buds per vine). The basic elements of fertility (fertility coefficient, grape mass and grape yield per grapevine) and uvological characteristics of grapes and berries were analyzed. The fertility coefficient was obtained from the ratio of the number of inflorescences per vine and the number of fruiting shoots per vine. Mechanical analysis was performed on bunches at the time of optimal maturity on 10 bunches and 100 berries. Elements of the mechanical composition of the grapes and berries were made according to the method of Prostoserdov (1946). The statistical analysis was performed using Statgraphics Centurion. Obtained results were subjected to analysis of variance (ANOVA) according to a factorial design, where the sources of variation were year and clone, and their interaction. Comparison of means was performed by the Tukey test ($\alpha = 0.05$). The results are presented as the mean value ± standard error of mean (SEM), and coefficient of variation (CV).

RESULTS AND DISCUSSIONS

Variable climatic conditions prevailed in the research period (Graphic 1). Slightly higher air temperatures and smaller precipitation amounts were recorded in 2017 which was therefore somewhat more favorable for the wine production and protection against pathogens. Clones 1089 and 1091, respectively, had a higher cluster mass and a mass of berries in the cluster in 2016 compared to 2017 (Table 1) which like other parameters was likely influenced by climatic conditions. Clone 1089 had the highest mass of grapes in 2016 (131.8 g) but at the same time the lowest in 2017 (85.7 g). The difference in cluster mass of clone 1089, was statistically significant between the years, but not in comparison with the other two clones in the survey years. Variations in the mass of grapes in the cultivar Riesling ranged from 90.71 g to 150.00 g (Todić et al., 2000; Cindrić et al., 2000; Stroe and Ioana, 2015). Similar characteristics are shown by clones 198, Gm 239 (Pejović and Maraš, 1994) and clone B 21 (Jovanović-Cvetković et al., 2011).



Graphic 1. The average monthly temperatures (°C) and total precipitation (mm) during 2016-2017 period

Accordingly, the mass of berries in the cluster at clone 1089 was statistically significantly higher in 2016 (124.7 g) compared to 2017 (81.5 g). Interaction Year × Clone is significant in bunch weight and mass of berries. Berries were heavier in 2016 (81 g/bunch) than in 2017 (69), in average clone 49 had heavier berries (82 g per bunch) than clone 1091 and 1089 (72 and 71 g per bunch, respectively). The number of berries in the cluster during the research period ranged from 58.9 to 87.0, which can also be considered as a cultivar characteristic (Žunić and Garić, 2017). The suitability of grapes for processing depends also on the percentage ratio of individual components, as determined by mechanical analysis of the grapes and berries. These elements, with the characteristics of the grape of variety grown under certain conditions, provide enough elements to draw conclusions about the quality of grapes for processing into wine. The percentage of shellfish and berries (Figure 1) is uniform in the clones examined. Clone 1091 had the highest percentage of berries during the research (96.00 %). Riesling clones Gm 239 (95.97 %) and B21 (96.50 %) have a similar percentage of berries in the cluster structure (Jovanović-Cvetković et al., 2011). In both years of research, the largest percentage of meat with juice (Figure 2) had clone 49 (86.45%), which is significantly higher compared to clones Gm 239 and B 21 as well as the standard cultivar Riesling (Jovanović-Cvetković et al., 2011).

Table 1. Structural bunch indicators of tested Riesling clones

Year/clones	Average bunch weight (g)	Number of berries per bunch	Mass of berries per bunch
	$\bar{X} \pm$ SEM		
2016/49	$99.9^{ab} \pm 8.81$	$87.0^{a} \pm 4.97$	$94.9^{ab} \pm 8.38$
2016/1089	$131.8^{b} \pm 10.04$	$82.7^{a} \pm 4.98$	$124.7^{a} \pm 9.37$
2016/1091	$106.3^{ab} \pm 9.84$	$73.2^{a} \pm 4.79$	$102.1^{ab} \pm 9.56$
2017/49	$104.7^{ab} \pm 9.80$	$77.2^{a} \pm 5.91$	$99.9^{ab} \pm 9.34$
2017/1089	$85.7^{a} \pm 6.63$	$58.9^{a} \pm 4.53$	$81.5^{b} \pm 6.12$
2017/1091	$94.4^{ab} \pm 9.32$	$70.3^{a} \pm 5.72$	$90.0^{ab} \pm 8.88$

[a, b]means (interaction Year × Clone) followed by different letter(s) are significantly different (Tukey, α = 0.05)

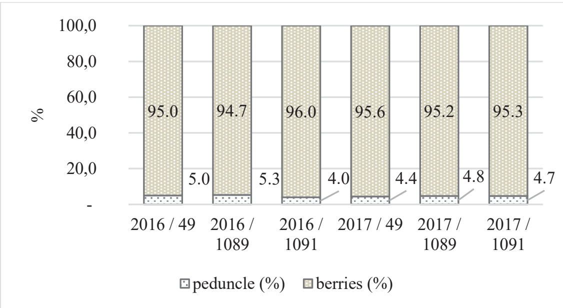


Figure 1. Mechanical composition of the bunch

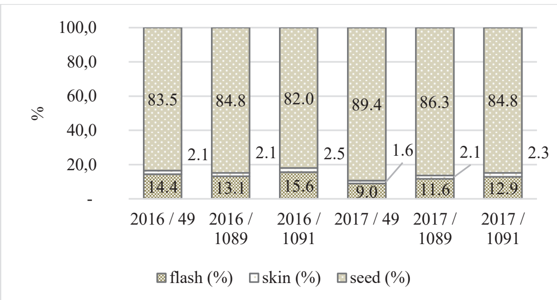


Figure 2. Mechanical composition of berry

The clones tested had a larger mass of 10 berries in 2017 compared to 2016 (Table 2). Interaction Year × Clone is significant in the mass of ten berries.

Table 2. Mass and number of seeds in berries

Year/clones	Mass of 10 berries (g)	Number of seeds in 10 berries
	$\bar{X}$ ± SEM	
2016/49	13.7^{b} ± 0.36	15.8^{a} ± 1.19
2016/1089	15.8^{a} ± 0.58	19.1^{a} ± 0.98
2016/1091	15.4^{ab} ± 0.35	16.4^{a} ± 0.76
2017/49	17.1^{a} ± 0.59	23.2^{a} ± 1.14
2017/1089	16.3^{a} ± 0.36	22.3^{a} ± 1.06
2017/1091	15.3^{ab} ± 0.52	21.0^{a} ± 0.77

$^{a,\,b}$means (interaction Year × Clone) followed by different letter(s) are significantly different (Tukey, α = 0.05)

Clone 49 in 2016 had a statistically significantly lower mass of 10 berries than in 2017. This clone also had a statistically smaller mass of 10 berries than clone 1089 in both survey years.
The results obtained are in accordance with the statements of other authors who found that the average weight of the cultivar Riesling berry averages 1.38 g (Friedel et al., 2016a) and 1.32 g (Stroe and Ioana, 2015).
The size of the berry of the Riesling is influenced by the position of the berry in the cluster (Friedel et al., 2016a) but also by the measures applied in the production process (Friedel et al., 2016b). Berries had a significantly higher number of eeds in 2017 than in 2016 (22 and 17 in ten berries, respectively).
The teritility coefficient was fairly uniform with the clones tested in the years of research (Table 3) and significantly higher than the standard variety (Todić et al., 2000). Clones 49 and 1091, had a slightly higher fertility rate than clone 1089, indicating that they belong to the group with high fertility rate (Žunić and Garić, 2017), which, depending on the load in this variety, ranges from 1.82 to 1.93.

Table 3. Fertility elements - fertility coefficient

	2016		2017	
	$\bar{X}$ ± SEM	CV (%)	$\bar{X}$ ± SEM	CV (%)
49	2.2 ± 0.48	22.1	2.1 ± 0.18	8.8
1089	1.9 ± 0.17	9.0	1.8 ± 0.27	15.3
1091	2.0 ± 0.31	15.6	2.0 ± 0.30	15.3

Clones 1089 and 1091 had higher yields (t·ha^{-1}) in 2016 compared to 2017 (Table 4). Interaction Year × Clone is significant in the grape yield. Clone 1089 had a statistically significantly higher yield in 2016 (7.5 t·ha^{-1}) compared to 2017 (5.4 t·ha^{-1}).

Table 4. Fertility elements - grape yield (t·ha^{-1})

	2016		2017	
	$\bar{X}$ ± SEM	CV (%)	$\bar{X}$ ± SEM	CV (%)
49	6.2^{ab} ± 1.24	20.1	6.6^{ab} ± 1.32	20.0
1089	7.5^{a} ± 1.62	21.7	5.4^{b} ± 1.22	22.7
1091	7.0^{ab} ± 1.63	23.3	5.7^{ab} ± 1.73	30.6

$^{a,\,b}$means (interaction Year × Clone) followed by different letter(s) are significantly different (Tukey, α = 0.05)

The difference from the other two clones in the survey years was not statistically significant. The different fertility of the tested clones in France (1089 - 2.3 kg per vine; 1091 - 3.1 kg per vine; 49 - 3.8 kg per vine) indicates different predispositions of these clones, as well as the influence of the growing region (www-pepinieres-jenny-com).
The yield of the Riesling variety depends on the number of the buds (Stroe and Ioana, 2015) which certainly has an impact on the quality of the grape.

CONCLUSIONS

During the two-year study, the tested clones showed variety characteristics specific to the Riesling and his clones. The mass of the cluster was uniform, except for clone 1089, which in 2016 had a significantly higher mass than other clones. The largest variations were observed in this clone in the other analyzed parameters as well, which was not found in the other two clones. Mechanical analysis of grapes and berries indicates good predispositions of these clones in terms of flesh ration in wine production. The tested clones had a lower yield compared to data from other regions, but also compared to the original cultivar and some other clones. The issue of yield is also closely related to the desired quality, so the level and intensity of vine management can greatly affect the realization of the final yield.

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