SOME IMPORTANT AGROBIOLOGICAL AND TECHNOLOGICAL CHARACTERISTICS OF PROMISING GRAPEVINE GENOTYPES OBTAINED FOR RED WINE PRODUCTION

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ABSTRACT

This paper describes some important properties of five new grapevine genotypes (8533, 7912, 15212, 13283 and 14558) created for red wine production. Yield, mechanical properties of bunch and berry, and quality properties of grapes were analyzed. Genotype 7912 had a high yield (2.75 kg vine^{-1}). The high contents of anthocyanins in grape berry skin were found in the genotypes 8533, 13283 and 15212 (10.65; 10.36; 10.07 mg/sample). Quality of grape of examined genotypes were determined to be high under the agroecological conditions of Belgrade grape growing region in Serbia. Genotype 13283 appeared to be the most promising for yield and grape quality. All the investigated genotypes have been proposed to the Committee on new varieties in Serbia.

INTRODUCTION

One of aims in grapevine breeding is to obtain new grapevine cultivars with high quality grape for optimal quality of wine. In the breeding process parental materials selection has a key role. Cultivar selection is a major viticultural factor in increasing the yield and quality of grapes. Also, the preservation of grapevine genetic resources is a priority task for breeding purposes (Nikolic et al., 2015). Different methods are used, such as introduction, hybridization and individual clone selection for the improvement of grapevine cultivars by more qualitative genotypes. Hybridization has an important role in the diversification of grape varieties (This et al., 2006). Well-known varieties such as Cabernet-Sauvignon, Chardonnay, Syrah and Merlot are obviously the result of crossings between older varieties (Bowers and Meredith, 1997; Bowers et al., 1999; Vouillamoz and Grando, 2006; Boursiquot et al., 2009). Enrichment of the existing grapevine cultivars with new improved genotypes of better properties and better grape quality is performed in accordance with the requirements of modern viticultural science and practice.

During the 1960s, Serbian research institutions focused their attention on breeding activities, creating new cultivars (Avramov, 1991; Cindrić et al., 2000; Nikolić, 2012). Until now, the Faculty of Agriculture in Belgrade has created 23 cultivars (15 for fresh consumption and 8 for wine production). Also, from numerous crossing combinations, many promising hybrids have been created and some of them have been proposed to the Committee on new varieties in Serbia.

A description of some important agrobiological and technological characteristics of five promising genotypes obtained for red wine production, are represented in this paper.

MATERIAL AND METHOD

Five new genotypes for red wine production were tested (8533, 7912, 15212, 13283 and 14558) (Table 1). Genotypes created by hybridization. In breeding work were used cultivars of different origin and properties: Začinak and Prokupac are autochthonous cultivars from Serbia; Vranac is autochthonous cultivar from Montenegro; Tenturier of Župa (Alicante Bouschet x Gamay Noir) is new Serbian cultivar, recognized in 1979.

Investigations of new genotypes were repeated in 2014 and 2015 at the Experimental Station 'Radmilovac' of the Faculty of Agriculture, University of Belgrade (Belgrade grape growing region, sub-region of Grocka). For each genotype, 6 vines were considered as replications. All grapevines were grafted on *V. berlandieri x V. riparia* Kober 5BB rootstock and planted at a distance of 3.0 x 1 m. The training system was double Guyot. The important properties were investigated for the genotypes: grape yield, mechanical composition of bunch and berry, grape and wine quality. Grape yield (kg per vine) was established by measuring the weight of all bunches of each vine. Bunch length (cm), width (cm) and weight (g) was calculated based on the average of all bunches produced by 10 shoots. Berry length (cm), width (cm) and weight (g) were the average values of 100 berry measurements. Sugar content of the must (%) was established by refractometer (Pocket Atago Pal 1) and total acids content in the must (g/l) was determined by titration with n/4 NaOH. Total anthocyanin content (mg/sample) was determined by the spectrophotometric method (AWRI, 2009) in berry skin.

Statistical analyses were performed with the software Statistica (StatSoft, Inc., Tulsa, OK, USA). Analysis of variance was applied to distinguish the effect of the genotype on the studied traits. Individual testing was done by LSD test. For both tests, probabilities which were applied were 0.05 and 0.01.

Table1

Code and origin of the investigated genotypes

Genotype	Origin
8533	Začinak x Muscat Otonel
7912	Začinak - self-pollination
15212	Alicante Bouschet x Vranac
13283	Začinak x Prokupac
14558	Merlot x Tenturier of Župa

RESULTS AND DISCUSSIONS

Grape yield is the most important element of fertility. May be varied depending of the number of buds, fruiting canes, vines vitality, but also from the climate and soil characteristics in the vineyard.

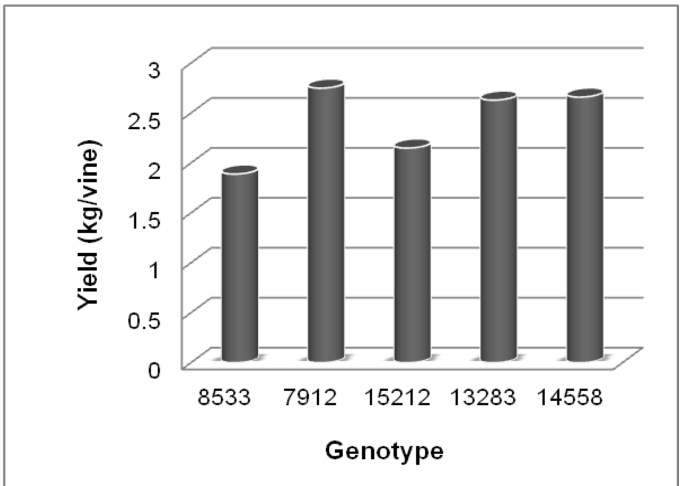

Figure 1 Grape yield (kg vine^{-1}) of the investigated genotypes (2014-2015)

Figure 1 shows grape yield of investigated genotypes which were determined during the investigation years. Genotype 7912 had the highest grape yield (2.75 kg·vine-^{1}).

Approximate values were genotypes 13283 and 14558. The lowest grape yield was found in the genotype 8533 (1.89 kg·vine-[1]).

The important properties of bunch and berry of the studied genotypes are shown in Table 2. Significant differences in berry characteristics were determined and dependent on the genotype.

According to the research Matthews and Kriedemann (2006), the quality of wine is decreasing with increase of grape yield or berry size. The berry size can be influenced by genotype, environmental factors and the many management practices that have an impact on the growth balances and microclimate of the vine (Walker et al., 2005; Matthews and Nuzzo, 2007; Barbagallo et al., 2011; Dai et al., 2011). The final berry size at harvest therefore would be an expression of the integrated effect of many biotic and abiotic factors that eventually also would be expressed in the wine (Melo et al., 2015).

Genotype 15212 had the highest berry weight, length and width (2.68 g; 15.80 cm; 15.50 cm) (Table 2). Nikolić et al. (2015) faund that genotype 15212 had a berry weight of 3 g, berry length and width of 16.04 cm and 16.08 cm, in tree years (2010-2012).

For the characteristics of the bunch have not been determined statistically significant differences among the genotypes.

Table 2

Mean values of bunch and berry properties of investigated genotypes (2014-2015)

Genotype	Properties						
	Bunch				Berry		
	Weight (g)	Number of berry	Length (cm)	Width (cm)	Weight (g)	Length (cm)	Width (cm)
8533	183.20	81.4	11.50	7.10	2.63ab	13.65ab	12.85b
7912	253.00	132	14.10	8.30	1.60b	12.48b	11.77b
15212	321.60	114.8	13.20	10.20	2.68a	15.80a	15.50a
13283	243.80	96	14.72	7.90	2.46ab	9.22c	8.90c
14558	202.20	121	14.40	8.20	1.63b	14.13ab	13.54ab

Mean values followed by the same letter do not differ significantly according to LSD test at P = 0.05; 0.01

Evaluation of grape quality is based on different parameters. The balance between vegetative and generative potential of vines in a vineyard has an effect on optimal content of chemical compounds in grapes (Jones et al., 2005). One of the most important factors of the grape quality is sugar content in grape juice which is influenced by a range of abiotic and biotic factors, such as cultivar, meteorological factors, characteristics of soil, agrotechnical and amphelotechnical measures, etc. The effect on berry sugar content is yield-dependant; in low yields, vine water deficit enhances berry sugar content and in high yields it depresses berry sugar content (Tregoat et al., 2002).

In our work, sugar content in the genotypes ranged from 20.7% (genotype 14558) to 22.5% (genotype 15212). Total acid in the must ranged from 7.7 g L^{-1} (14558) to 10.2 g L^{-1} (7912) (Figure 2).

Significant differences in the sugar and total acid content in the must was determined by Nikolić et al. (2003, 2007) for many hybrids from different crossing combinations.

Besides optimal content of sugar and acids, high content of some phenolic compounds in berries is especially desired when grapes are grown for the production of red wines (Mattivi et al., 2002).

In berry skin accumulates large amounts of anthocyanins, which contribute to the sensory attributes of wine (Mori et al., 2007). Many factors can affect phenolic accumulation in the grape, including maturity (Kennedy and Jones, 2001), temperature (Spayd et al., 2002), light (Keller and Hrazdina, 1998) and vine water status (Ojeda et al., 2002; Bellincontro et al., 2004).

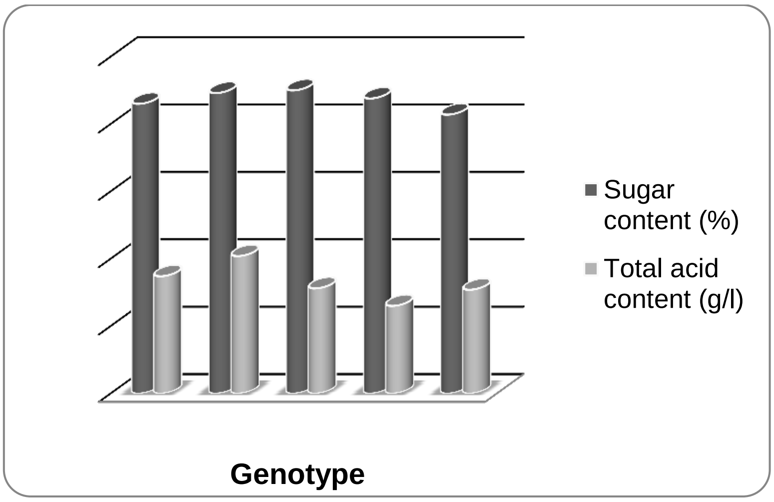

Figure 2 Sugar and total acic content in the must of the investigated genotypes (2014-2015)

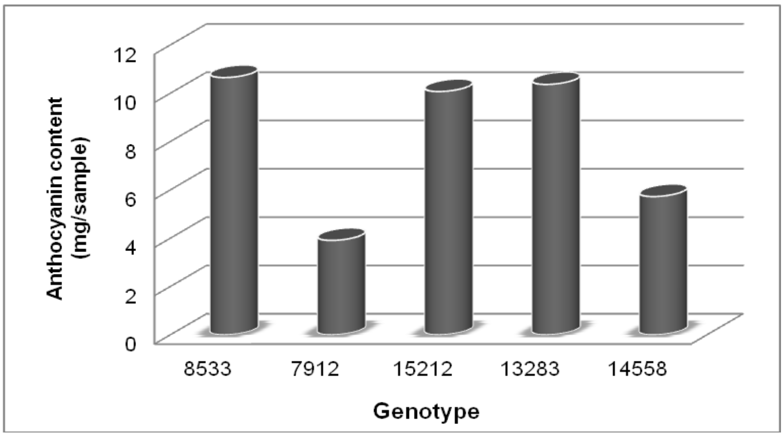

Figure 3 Anthocyanin content in berry skin of the investigated genotypes (2014-2015)

The high content of anthocyanins in grape berry skin were determined in the genotypes 8533, 13283 and 15212 (10.65; 10.36; 10.07 mg/sample). Significant lower content of anthocyanins had genotype 7912 (3.91 mg/sample) (Figure 3).

CONCLUSIONS

The conservation of grapevine genetic resources such as, different species, cultivars, genotypes, is a one of priority goals for breeding purposes in viticulture. It is also important to study new varieties and genotypes in different environmental conditions.

The investigated genotypes examined in agroecological conditions in the grape growing region of Belgrade, sub-region of Grocka satisfied the aims of selection. As the best regarding yield and grape quality was genotype 13283. All of the investigated genotypes have been proposed to the Committee on new cultivars in Serbia.

Acknowledgements

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