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# INVESTIGATION OF THE IMPACT OF GRAPE CULTIVARS ON THE GRAPE BRANDIES QUALITY

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**Abstract**. *The results of the four-year investigation of the grape cultivars impact of the first Yugoslav interspecies hybrids Lucija and Mediana on the grape brandies quality are presented. The experiment was carried out with reference to the standard grape cultivar Smederevka intended for production of grape brandies. Investigation covered a procedure for establishing parameters, which determine the quality of strong alcoholic beverages and organoleptic rating. Higher presence of methanol with reference to standard cultivar was not established in the investigated hybrids brandies, which demonstrates properties similar to that of precious cultivars. The highest average content of higher alcohols was found out with the Mediana grape brandy, which amounts to 3295.3 mg/Laa, followed by the Smedervaka grape brandy with 3261.8 mg/Laa, the Mediana/Lucija grape brandy with 3130.0 mg/Laa and the Lucija grape brandy with 2940.0 mglLaa of higher alcohols. The concentration of higher alcohols positively affects aroma of the beverage. The Mediana grape brandy and the variant where fermentation of the Mediana and Lucija grapes in the 50:50 ratio was carried out possess better organoleptic characteristics than those of Smederevka, while the Lucija grape brandy shows worse organoleptic characteristics.*

**Key words**: *interspecies hybrid, grape brandy, quality parameters*

## 1. INTRODUCTION

Grape brandy is a product obtained by means of fermentation and distillation of the complete squashed grapes of the precious grapevine *Vittis vinifera* [1-2]. The grape brandy quality depends upon a great number of factors such as: grapevine cultivars, climate, soil, applied agricultural measures, grape yield and its health condition, technological procedure of grape processing, fermentation characteristics, time and method of distillation, method of storing etc. Considering that the technological procedure has been properly carried out, the grapevine

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cultivar considerably impacts the grape brandy properties, particularly its organoleptic characteristics - odour and aroma [3-5].

Grape brandy is produced only in several countries (Serbia, Montenegro, Italy, Austria and Chile) so that suitability of grape cultivars, both authochtonous and those newly developed, for its production has not been extensively investigated [6-8].

The quality of grape brandies made from the Lucija and Mediana interspecies hybrids of the fourth generation with reference to the Smederevka standard cultivar was investigated. Former investigations have shown that these cultivars feature good fertility [9] and good resistance to diseases so that the quality of wines [10] and wine distillates is of high standards [11].

## 2. MATERIALS AND METHODS

Healthy and technically mature grape of the following cultivars was used in the experiment: Smederevka – autochtonous cultivar of the Balkans as a standard cultivar, Lucija and Mediana interspecies hybrids of the fourth generation The aforementioned grapevine cultivars are grown at the experimental station of the Agriculture Research Institute "Srbija", Centre for Viticulture and Winemaking in Niš. The investigations were carried out under the laboratory conditions of the Centre over the 1996-1999 period. The experiment was carried out in three variants (Variant I – Mediana 100%, Variant II - Lucija 100% and Variant III – Mediana 50% and Lucija 50%) and the control - Smederevka 100%. The grapes were squashed by an electric squasher, which separates pedicles. Fermentation was carried out with the autochthonous microflora over the period of 10 to 15 days. Distillation of the fermented squashed grapes was done in the 100-litre discontinuous type copper apparatus and the brandy produced was weak. Redistillation of weak brandies was also done in the 10-litre discontinuous type copper apparatus. The first distillation was carried out with the maximum alcohol obtained. When redistilling, separation of the following fractions was obtained: first-made brand – 1% of the still, heart of the strong brandy – medium course of the distillate which is 55% on the average, and the weak brandy – the last fraction of the distillate to the maximum alcohol exploited.

Such obtained distillates were kept in flasks and after six months physically and technically stabilised brandies were analysed.

To establish chemical composition of the brandies produced, standard methods were used prescribed according to the Rules on the Methods of Sampling and Performance of Physical Analyses of Alcoholic Beverages, Official Register of LSFRY [12]. Organoleptic rating was done by the 1 to 20 positive numbers method.

## 3. RESULTS AND DISCUSSIONS

Based upon the results obtained a conclusion can be made that the grape brandies produced fulfil quality standards prescribed by the Rules on the Methods of Sampling and Performance of Physical Analyses of Alcoholic Beverages, Official Register [13] Chemical composition of the brandies produced is shown in Table 1.

Alcohol content in the brandies produced shows that the distillation technological operation was correctly done and that the distillates were maximally, as far as it was possible, freed from the undesirable evaporable compounds.

Table 1. Chemical Composition of Grape Brandies and Values Prescribed by the Rules

| Investigating Parameter / Variant | Alcohol vol% | Total acids g/L | Esters mg/Laa | Methyl alcohol g/Laa | Higher alcohols mg/Laa | Furfurol mg/Laa | Total aldehydes mg/Laa | Total $SO_2$ mg/L |
|---|---|---|---|---|---|---|---|---|
| Smederevka 96 | 54.69 | 199.6 | 1614 | 1.67 | 2268.0 | 3.66 | 177.0 | 6.9 |
| Smederevka 97 | 55.59 | 101.2 | 1076 | 1.27 | 3159.0 | in traces | 191.7 | 6.9 |
| Smederevka 98 | 50.20 | 106.9 | 1192 | 1.43 | 3900.0 | 4.6 | 53.1 | 3.9 |
| Smederevka 99 | 56.67 | 166.3 | 1034 | 1.67 | 4125.0 | 9.1 | 51.8 | 2.6 |
| Smederevka – investigation average value | 54.29 | 143.5 | 1229 | 1.51 | 3261.8 | 4.34 | 118.4 | 5.0 |
| Mediana 96 | 56.77 | 124.7 | 1278 | 1.35 | 1822.0 | 6.14 | 170.8 | 6.9 |
| Mediana 97 | 50.66 | 107.5 | 1122 | 1.19 | 2754.0 | in traces | 173.7 | 6.9 |
| Mediana 98 | 53.73 | 106.9 | 1140 | 1.35 | 4750.0 | 2.6 | 50.8 | 3.9 |
| Mediana 99 | 57.68 | 166.3 | 1044 | 1.82 | 3450.0 | 4.5 | 58.6 | 3.9 |
| Mediana – investigation average value | 54.71 | 126.4 | 1140 | 1.43 | 3295.3 | 3.31 | 113.5 | 5.4 |
| Lucija 96 | 51.41 | 149.7 | 1995 | 1.35 | 2349.0 | in traces | 143.3 | 8.3 |
| Lucija 97 | 52.07 | 156.2 | 1429 | 1.19 | 2835.0 | in traces | 146.0 | 6.9 |
| Lucija 98 | 55.45 | 166.3 | 832 | 1.59 | 3350.0 | 0.9 | 78.2 | 3.9 |
| Lucija 99 | 57.97 | 102.2 | 789 | 2.3 | 3225.0 | 9.5 | 76.6 | 3.9 |
| Lucija – investigation average value | 54.22 | 143.6 | 1261 | 1.61 | 2940.0 | 2.6 | 111.0 | 5.75 |
| Mediana/Lucija 96 | 52.15 | 149.9 | 1406 | 1.43 | 2106.0 | in traces | 155.7 | 9.7 |
| Mediana/Lucija 97 | 54.07 | 135.6 | 1377 | 1.03 | 2713.0 | in traces | 228.5 | 6.9 |
| Mediana/Lucija 98 | 56.52 | 101.0 | 1135 | 1.43 | 4500.0 | 1.5 | 57.3 | 206 |
| Mediana/Lucija 99 | 57.46 | 102.2 | 766 | 2.14 | 3200.0 | 10.2 | 54.1 | 2.6 |
| Mediana/Lucija – investigation average value | 55.05 | 122.2 | 1171 | 1.51 | 3130.0 | 2.92 | 123.9 | 5.45 |
| Values prescribed by the Rules [13] | min. 37.5 | max.1000 | 400 -4000 | 1 - 4 | 1000 -6000 | max.30 | 40 - 400 | max.40 |

Total acids in the brandies can be found in relatively small concentrations, the lowest established concentration amounts to 74.1 mg/L (Mediana – 1997) and the highest to 199.6 mg/L (Smederevka - 1996).

Concentration of esters is also relatively low from 766.0 mg/Laa, as found in the Mediana/Lucija grape brandy of 1999, to 1614 mg/Laa as established in the Smederevka grape brandy of 1966. The average content ranges from 1171.0 to 1261.3 mg/Laa.

Content of methyl alcohol in the subject grape brandies ranges within the boundaries from 1.03 g/Laa (Mediana-Lucija – 1997) to 2.30 g/Laa (Lucija – 1997). Higher presence of methyl alcohol was not established with the Mediana and Lucija brandy [14] with reference to the Smederevka standard cultivar, which proves that the interspecies hybrids feature characteristics very close to those of the precious grape cultivars.

Higher alcohols are within the boundaries from 1822 mg/Laa (Mediana – 1996) to 4125 mg/Laa (Smederevka – 1999). Higer alcohols favourably contribute to the sensory characteristics of beverages in concentrations of 400 mg/L when wine is considered, and 4000 mg/Laa in strong brandies where concentration of higher alcohols considerably affects sensory characteristics of strong beverages [15]. In higher concentrations they are recognized for heavy and strong odour and they can completely diminish the primary aroma of the beverage.

Concentration of furfurol in certain variants almost equals zero, while the maximum found was 10.2 mg/Laa in the Mediana-Lucija grape brandy of 1999. The concentration of furfurol is related to the concentration of pentose in the grapes. We presume that agrobiological conditions during the 1999 vegetation season were favourable for its creation in greater quantities.

Concentration of aldehydes was within the boundaries from 50.8 mg//Laa (Mediana – 1998) to 228.5 mg/Laa (Mediana-Lucija – 1997). Higher concentration of aldehydes was in the years when higher concentration of total $SO_2$ was also established, because these compounds link together and make aldehyde sulphuric acid. Addition of sulphur dioxide was not done during the technological procedure of production. It comes from the sulphur of sulphuric preparations used for protection of grapevines. 1996 and 1997 were the years favourable for development of fungi diseases of grapevines, so that application of protective agents over the late stage of the devlopment of the fruit was indispensable, resulting in sulphur deposition on the berries and then transferred to fermenting vessels.

The aforementioned facts demonstrate that distillation of the fermented squashed grapes was timely done with the controlled separation of evaporable constitunets.

Article 15. of the aforementioned Rules stipulates sensory properties that alcoholic beverages must satisfy. The brandies produced are colourless and clear featured by the odour and taste characteristic of grape brandies. Sensory rating of grape brandies was performed by a 5-membered panel of judges using the positive points method. Average ratings are given in Table 2.

The best organoleptic rating was that of the Mediana grape brandy produced in 1996 year, while the poorest was that of Lucija of the same year. Organoleptic ratings of the subject grape brandies do not differ considerably, although a trend of Mediana as organoleptically more acceptable was observed. The Mediana grape brandy and the variant where fermentation of the Mediana and Lucija grapes mixture in the 50/50 ratio was done, generally showed better organoleptic characteristics than those of the Smederevka standards, while the Lucija grape brandy had slightly lower ratings. The 1999 Mediana grape brandy featured clear, pleasant and mild fruit odour and taste.

Table 2. Organoleptic Ratings of Experimental Grape Brandies

| Grape brandy Smederevka | Organo-leptic Rating | Grape brandy Mediana | Organo-leptic Rating | Grape brandy Lucija | Organo-leptic Rating | Grape brandy Mediana Lucija | Organo-leptic Rating |
|---|---|---|---|---|---|---|---|
| Year 1996 | 17.5 | Year 1996 | 17.08 | Year 1996 | 16.80 | Year 1996 | 17.40 |
| Year 1997 | 17.28 | Year 1997 | 17.20 | Year 1997 | 17.56 | Year 1997 | 17.71 |
| Year 1998 | 17.05 | Year 1998 | 17.75 | Year 1998 | 17.28 | Year 1998 | 17.38 |
| Year 1999 | 17.85 | Year 1999 | 17.90 | Year 1999 | 16.78 | Year 1999 | 17.20 |
| $\overline{X}$ | 17.33 | $\overline{X}$ | 17.48 | $\overline{X}$ | 17.11 | $\overline{X}$ | 17.42 |

## 4. CONCLUSIONS

Based upon the Mediana and Lucija interspecies hybrid grape brandies quality investigation with reference to the Smederevka standard cultivar, the following conclusions can be made:

The cultivars investigated produce such quality of grape brandies that the analytical parameters obtained satisfy standards prescribed by the law.

The values obtained of the total acids, esters, methanol, furfurol, aldehydes and $SO_2$ content of the investigated brandies are close to the lower values prescribed by the law, while higher alcohols have mean values prescribed by the law.

Higher presence of methanol with reference to the Smederevka standard cultivar was not established which proved that the interspecies hybrids characteristics were very close to those of the precious clutivars.

The highest average content of higher alcohols was found out in the Mediana cultivar grape brandy which amounted to 3295.3 mg/Laa followed by the Smederevka grape brandy with 3261.8 mg/Laa, the Mediana/Lucija grape brandy with 3130.0 mg/Laa and the Lucija grape brandy with 2940.0 mg/Laa higher alcohols. The concentration found is a mean value presribed by the law and represents a concentration that shows a positive impact on the beverage aroma.

The grape brandies produced can be described as colourless and clear, having odour and taste characteristic of grape brandies. The Mediana grape brandy and the variant where fermentation of the Mediana and Lucija grapes mixture in the 50:50 ratio was done show better organoleptic characteristics than the Smederevka standards, while the Lucija grape brandy shows worse organoleptic characterisics.

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# ISPITIVANJE UTICAJA SORTE GROŽĐA NA KVALITET RAKIJA LOZOVAČA

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*U ovom radu su prikazani četvorogodišnji rezultati istraživanja uticaja sorte grožđa, prvih jugoslovenskih interspecijes hibrida Lucije i Mediane, na kvalitet rakije lozovače. Ogled je izveden u odnosu na standardnu sortu grožđa za proizvodnju rakija lozovača Smederevku. Ispitivanje je obuhvatilo utvrđivanje parametara koji određuju kvalitet jakih alkoholnih pića i organoleptičko ocenjivanje. Rakije lozovače ispitivanih hibrida nemaju veći sadržaj metanola u odnosu na standardnu sortu Smederevku, što potvrđuje bliskost osobina ispitivanih hibrida sa plemenitim sortama. Najviši prosečan sadržaj viših alkohola utvrđen je u lozovači Mediane i iznosi 3295,3mglLaa, a zatim slede lozovača Smederevke 3261,8mg/Laa, lozovača Mediana/Lucija 3130,0mg/Laa i lozovača Lucija koja je imala 2940,0mgLlaa viših alkohola. Navedeni sadržaj viših alkohola ima pozitivan uticaj na aromu pića. Lozovača sorte Mediana i varijanta gde je izvršena fermentacija sorti grožđa Mediana i Lucija u odnosu 50%:50% poseduju bolje organoleptičke osobine od standarda Smederevke, dok lozovača sorte grožđa Lucija ima lošije organoleptičke osobine.*