COMPARISON OF FOUR CABERNET SAUVIGNON CLONAL SELECTIONS FROM SKOPJE'S VINEYARD REGION, R. MACEDONIA

Article category (original scientific paper)

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Summary

Some agrobiological and technological characteristics of four Cabernet Sauvignon clonal selections, including 15, 337, 341 and VCR5, cultivated in Skopje's vineyard region, R. Macedonia (during the period from 2005 to 2007) were determined. Certificated seedling material was introduced from Italy and France in 1999/2000, cultivated and studied at the vineyards of the Department of viticulture and enology, Institute of Agriculture, Skopje. The aim of the study was to apply optimal agrotechnical and ampelotechnical measures and to compare the characteristics of the four Cabernet Sauvignon clonal selections (15, 337, 341, VCR5) cultivated in same agroecological conditions. Different values of the examined characteristics were observed because of the selection specification, as well as, the ecological conditions during the period of examination. It was found that the yield was most stabile for the clone 15 with a variable coefficient of 10.4, and the biggest variation of 23.15 was noticed for the VCR 15 clone. Considering the chemical composition, more significant variation was observed for the sugar content in the grape must from the clone 15, while, insignificant variations were noticed for total acids in the must of all clones studied. The wine from the clone 341 obtained highest average degustation grade of 18.7 points, compared to the other wines.

Key words: clonal Cabernet Sauvignon, yield, wine, degustation grade

INTRODUCTION

In the last 10 years, the vineyards in R. Macedonia were being rebuilt, and the assortments with certified planting material with clones of more qualitative varieties such as Merlot, Cabernet Sauvignon, Cabernet Franc and others were being improved. Studying of clones and getting it a more realistic understanding of their agro-biological and technological characteristics are of great importance for the legitimacy of their breeding and further spread. Clones of one variety differ from the population in better features of the grape and better quality of wines obtained (Stefanini et al. 2000). Thus, clones differ in some properties, such as, yield, mass of the cluster, sugar content, total acids, anthocyanins, which are mostly the result of varietal specificity, and less of the impact of cultivation conditions (ENTAV-INRA, 1995, Tebeica and Popa, 2005). Selected clones of the Cabernet Sauvignon variety that are characterized by higher yield and clusters with greater mass, give lower quality of wine compared to the lower-yield clones of Cabernet Sauvignon (Fidelibus et al. 2006). From a great number of Cabernet Sauvignon clones, wines with distinctive flavor of fruit aroma, higher content of tannins, anthocyanins etc. are produced in France (Jones and Davis 2000), Italy (Fidelibuset al.2006), Australia and other countries.

MATERIALS AND METHODS

Three French (15, 337, 341) and one Italian clone (VCR5) were cultivated in same agroecological conditions with application of regular agrotechnical and ampelotechnical measures. The seedling was raised in 2000 with a certified antivirus material from France. The process of cultivation was a fruit-wall with two legged Gio's way of pruning, distance of planting of 2.5m between the lines and 1.3m between the grapevines in line with an optimal strain of 22 eyelets by grapevine. During the vegetation, regular agrotechnical and ampelotechnical measures were applied. 30 grapevines of each clone were included in the studies (three repetitions of 10 grapevines). The yield of grapevine by and ha was determined as a representative parameter of the agrobiological and technological characteristics. The chemical composition of must (content of sugar and total acids) and the quality of the wine, through chemical composition and degustation, were studied.

The yield of 30 grapevines by 1ha was mathematically calculated. The content of sugar in the must was determined by help of Oechsle Scale, and the composition of total acids was determined by titration method using solution of N/4 NaOH with factor 1.0000.

For wine production, grapes were harvested at technological maturity from each clone separately and transported to the Institute of Agriculture, Skopje, R.Macedonia. The grape mash was sulphated with 80 mg/l liquid SO_2, and then selected wine yeast *Saccharomices cerevisiae* was added. During the maceration period of 6 days, the grape was pressed mechanically two times per day. After the maceration, wines were separated from the pomace, collected in glasses balloons whereas the alcoholic fermentation finished. The temperature during the alcoholic fermentation was 23-25 ^{0}C. The wines produced with these procedure were poured off 2 times, and during every pouring off, a correction of SO_2 was done, to not lower than 25 mg/l free SO_2 and not higher than 100 mg/l total SO_2. Chemical analysis of the wine was done after the second pouring off and recommended methods of O.I.V (International organization of vine and wine) were used. For determination of the wine specific weight, alcohol and dry extract, a pycnometer method was used. The content of anthocyanins was determined by spectrophotometric method according to Ribereau-Gayon's Astonestreet method (1967). The organoleptic grade of wines was perfomred by application of Booch-Womb method.

RESULTS AND DISCUSSION

Yield is an important agro-biological characteristic that depends on agro-ecological conditions, substrate (Dobrei 2007), especially on the genetic potential of a variety. Table 1 shows the results of the quantity of handpicked grapes of the examined Cabernet Sauvignon clones. Under the same conditions of cultivation, during the test period 2005/2007, the highest average yield was obtained with clone 15 (11.051 kg / ha), and also with the greatest stability in years, with a coefficient of variation of 10.46. In years, the greatest variation was found in clones VCR 5 (23.15) and 341 with

a coefficient of variation of 20.37. Clone 337 was characterized by lowest average yield of 7.791 kg/ha.

Table 1 Yeild of grape (kg)

Clon	2005		2006		2007		2005/2007		CV%
	kg/vine	kg/ha	kg/vine	kg/ha	kg/vine	kg/ha	kg/vine	kg/ha	kg/vine
VCR 5	2.300	6.845	3.475	10.342	3.625	10.787	3.133	9.324	23.15
15	3.955	11.770	3.256	9.689	3.893	11.587	3.701	11.051	10.46
337	2.546	7.577	2.080	8.332	3.229	9.609	2.618	7.791	12.08
341	2.053	7.577	3.416	10.166	3.845	11.442	3.105	9.239	20.37

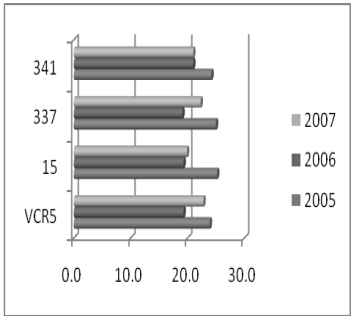
The content of sugar and total acids and their ratio are among the important parameters based on which the quality of one variety or clone is assessed. The results for the sugar content in the must are presented in Graph 1, and for total acids in Graph 2. Compared by years, the sugar content in the must in all clones was quite stable with the coefficient of variation from 8.37 (clone 341) to 15.26 (clone 15). During the period of study, the average sugar content ranged from 21.5 g/dm^3 (clone 15) to 22.1 g/dm^3 (clones 341 and 337), which enabled producing of a medium strong wines. The freshness of the wines depends on the content of total acids in the must. The average content of total acids ranged from 7.3 g/dm^3 (clones VC5 and 341) to 7.5 g/dm^3 (clone 337), or 7.6 g/dm^3 (clone 15). No significant changes of the content of total acids in the must of all clones were observed during the period of three years. The coefficient of variation ranged from 3.46 for the clone 341, to 5.99 for the clone 337. The results of the chemical analysis of wines made from the examined clones are presented in Table 2. There were very small changes of the alcohol content in the wines produced from different clone vintages. The coefficient of variation ranged from 2.33 in 2005 to 5.18 in 2006. This is due to the uniform sugar content in the musts and the completed alcoholic fermentation. In addition, the sugar-free extract (dry extract) in wine is a characteristic parameter for each variety. In the period of study, values for the dry extract ranged from 23.2 g/l in wine from clone 341 (2006, 2007) to 24.8 g/l in wine from clones 337 and 341 in 2006 and clone 15 in 2006 and 2007. Furthermore, another very important parameters which determine the quality of red wines are color of the wine and anthocyanins. The content of total anthocyanins in wine is varietal characteristic which also depends on many factors, such as vine load, soil, climate conditions, degree of maturity, temperature, duration of maceration. The difference in the content of total anthocyanins among the wines produced from clones in the 3 years studied, was greatest in 2005 and the coefficient of variation was 17.71.Wine-tasting evaluation of wine is one of the main features and together with the chemical analysis it determines the quality of wine. Wine-tasting points of the examined wines are given in Table 2 and presented in Graph 4. Average wine-tasting grades range from 11.8 for the wine from clone VCR5 to 18.7 points for wines from 341. In the years of testing, wines from all Cabernet clones were characterized by high stability assessment, i.e. the coefficient of variation ranges from 0.62 for clone 341 to 3.96 for clone 337.

Table 2. Chemical analysis on wine

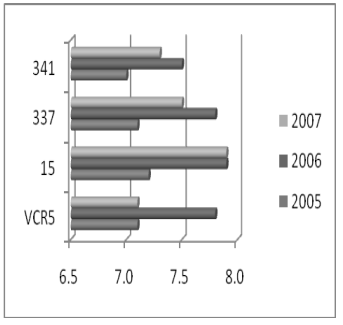
Element	2005					2006					2007				
	Clon					Clon					Clon				
	VCR5	**15**	**337**	**341**	CV%	**VCR5**	**15**	**337**	**341**	CV%	**VCR5**	**15**	**337**	**341**	CV%
Alcohol vol%	13.0	12.4	12.6	12.7	2.32	11.8	13.1	12.3	11.6	5.18	11.2	11.5	11.2	12.4	4.60
Total extract g/l	24.5	26.0	25.8	24.8	2.91	25.3	24.8	23.7	23.2	3.99	25.3	24.8	23.7	23.2	3.99
Extract without sugar g/l	24.5	24.6	24.8	24.8	0.60	24.3	24.8	23.7	23.2	2.91	24.3	24.8	23.7	23.2	2.97
Total acids g/l	5.6	6.0	6.0	5.8	3.21	6.2	5.5	5.8	6.0	5.08	5.5	5.7	5.6	6.1	4.56
Antocyanes mg/l	216	309	323	319	17.71	292	328	327	314	5.32	271	278	277	287	2.37

Degustation rating on wine (points)

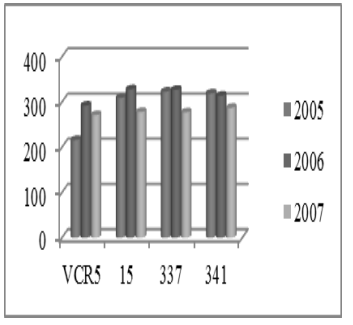
Clon	2005	2006	2007	2005/2007	CV%
C.sauvignon VCR 5	18.8	18.0	17.4	18.1	3.89
C.sauvignon 15	18.4	18.6	17.8	18.3	2.28
C.sauvignon 337	18.4	18.8	17.4	18.2	3.96
C.sauvignon 341	18.8	18.8	18.6	18.7	0.62



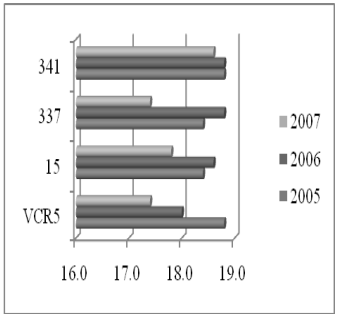
Graf.1.The total acids in the must (g/dm^3)



Graf.2.Content of sugar in the must (g/dm^3)



Graf.3.Content of antocyanes in the wine (mg/l)



Graf.4.Points from degustation of wines

CONCLUSIONS

→The yield values obtained for the examined clones in conditions of the Skopje vineyard area were within their varietal characteristics.

→The average sugar content in the must ranged from 215 g/dm^3 to 220 g/dm^3; the reason why the produced wines had medium strength, i.e. with average alcohol content.

→Wines were characterized by a relatively high dry extract that ranged from 23.2 g/dm^3 to 24.8 g/dm^3 and the wines obtained were full, harmonious, with specific varietal flavor.

→The content of anthocyanins ranged from 216 mg/l to 328 mg/l, resulting in obtaining wines with very intensive red color.

→The wine-tasting grade ranged from 18.1 points for clone VCR5 to 18.7 points for the wine from clone 341, ranging them in a group of high quality wines.

REFERENCES

1.Dunn, G.M and Martin, S.R. (2007): A functional association in Vitis vinifera L. cv. Cabernet Sauvignon between the extent of primary branching and the number of flowers formed per inflorescence. Australian Journal of Grape and Wine Research, 13: 95-100.

2.ENTAV-INRA. (1995): Catalogue of Selected Wine Grape Varieties and Clones Cultivated in France. Ministry of Agriculture, Fisheries and Food. CTPS.

3.Fidelibus, M., Christenson, L., Katayama, D., and Verdenal, P. (2006): Yield components and fruit composiotion of six Cabernet sauvignon grapevine select in the Cenral San Joaquin Vally Californija. Journal of the American Pomological society, 60(1): 32-36.

4.Jones, G. V., and Davis, R. E. (2000): Climate Influences on Grapevine Phenology, Grape Composition, and Wine Production and Quality for Bordeaux,France. American Journal Enology and Viticulture, 51(3): 249-261.

5.Benz, M., Anderson, M., Williams, M., Barnhisel, K., and Wolpert, J. (2006): Viticultural Performance of Five Merlot Clones in Oakville, Napa Valley. American Journal Enology and Viticulture, 57(2): 233-237.

6.Stefanini, M., Iacono, F., Colugnati, G., Bregnant, F., and Crespon, G. (2000): Adaption of same cabernet sauvignon clones to the environmental conditions of north-eastern Italian growing areas. ISHS Acta Horticulture, 528: 779-784

7.Stefanini, M., Colugnati, G., Grespan, G., Zenarola, C., and Colusii,G. (2000): Viticultural and oenological behaviour of the cultivar Merlot. Informatore Agrario ISSN 0020-0689, 56(37): 55-59.

8.The Catalogue selected wine grape varieties and clones cultivated in France. 2009 Eds.Boidron, R. etol. Ministry of Ag. Fisheries and Food. pp. 192-193.

9.Tebeica, V., and C. Popa (2005): Results concerning applying of clonal selection of variety Sauvignon, The Romanian Society of Horticulturists, "Ion Ionescu from Brad" Publishing House, Iasi, Year XLVIII Vol.I(48) I.S.S.N. 1454 – 7376.

10.Ribereau Gayon (1967): Enology., Volume II.

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