

Compariosn of three Chardonnay clones (*Vitis vinifera* L.), growing in Skopje'vineyard region, R.Macedonia

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Summary

Some agro-biological and technological characteristics were determined for three Chardonnay clones selections, including 95, 124 and 277, cultivated in the Skopje vineyard region, the R. Macedonia (during the period from 2006 to 2008). A certificated seedling material was introduced from France in 1999/2000, cultivated and studied at the vineyards of the Department of Viticulture and Oenology, Institute of Agriculture, Skopje. The aim of the study was to apply optimal agro-technical and ampelotechnical measures and to compare characteristics of the three Chardonnay clones (95,124,277) cultivated in the same agro-ecological conditions. Different values of the examined characteristics were observed because of the selection specification as well as the ecological conditions during the period of the study. It was found that the yield was most stable for the clone 277 with a coefficient of variable 14.4, and the biggest variation of 21.7 was noticed for the 124 clone. Considering the chemical composition, more significant variation was observed for sugar content in the grape must from the clone 277, while insignificant variations were noticed for total acids in the must of all clones studied. The content of alcohol in the wines ranged from 12.88 vol% in the clone 277 to 13.95 vol% in the clone 95 for the examined period, thus insignificant variations were found in the three clones. Wines from all three clones for the vintage 2006 had greater contents of total extract and, for the examined period, wines with most extract for the clones 95 (21,30 g/L) and 277 (21,20 g/L). The wine made from the 277 clone was with the highest wine-tasting rating of 17.97 points.

Key words: Chardonnay, clones, yield, wine, degustation rating

Introduction

In the last 10 years, the vineyards in the R. Macedonia were being rebuilt, and the assortments with certified planting material with clones of more qualitative varieties such as Chardonnay, Sauvignon White, Traminer, Merlot, Cabernet Sauvignon, Cabernet Franc and others were being improved. Studying of clones and getting a more realistic understanding of their agro-biological and technological characteristics are of great importance for the legitimacy of their breeding and further expansion. The clones of one variety differ from the population in better features of the grape and better quality of wines obtained (Michael M. Anderson et al., 2008). Thus, clones differ in some properties, such as yield, mass of the cluster, sugar content, total acids, which are mostly the result of varietal specificity and less of the impact of cultivation conditions (ENTAV-INRA, 1995). The selected clones of the Chardonnay variety, characterised by higher yield and clusters with greater mass, give lower quality of wine compared to the lower-yielding clones of Chardonnay (Simon Cowham, 1999). From a great number of Chardonnay clones, wines with distinctive fruit aroma, higher content of extract, etc. are produced in France (ENTAV-INRA, 1995), Italy (Calò, Antonio, Angelo Costacurta, 1990), Australia (Michael M. Anderson et al., 2008) and other countries.

Materials and methods

Three French clones (95, 124 and 277) were cultivated in the same agro-ecological conditions with application of regular agro-technical and ampelotechnical measures. The seedlings were raised in 2000 with certified antiviral material from France. The process of cultivation was a fruit-wall with two legged Guyot way of pruning, 2.5m planting distance between the lines and 1.3m between the grapevines in line with an optimal strain of 22 buds by grapevine. During vegetation, regular agro-technical and ampelotechnical measures were applied. 30 grapevines of each clone were included in the studies (three repetitions of 10 grapevines). The yield of grapevine per ha was determined as a representative parameter of the agro-biological and technological characteristics. The chemical composition of must (content of sugar and total acids) and the quality of the wine were studied through chemical composition and wine-tasting.

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

As for wine production, grapes were harvested at technological maturity from each clone separately and transported to the Institute of Agriculture, Skopje, the R. Macedonia. The must from grapes was sulphated with 80 mg/l liquid SO₂, and then selected wine yeast, *Saccharomyces cerevisiae*, was added. After turbulent fermentation, wines were collected in glass balloons wherein the alcoholic fermentation finished. The temperature during the alcoholic fermentation was 19-21

^oC. The wines produced using these procedures were poured off 2 times, and during every pouring off, a correction of SO₂ was done in order to keep it not lower than 25 mg/L free SO₂ and not higher than 80 mg/L total SO₂. The 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. To determine the wine specific weight, alcohol and dry extract, a pycnometer method was used. The organoleptic grade of wines was performed by application of Buxbaum method of twenty points (Standard ISO 5495, 1983).

Results and discussion

Yield is an important agro-biological characteristic that depends on agro-ecological conditions and substrate, but especially on the genetic potential of a variety. Table 1 shows the results of a quantity of handpicked grapes of the examined Chardonnay clones. Under the same conditions of cultivation, during the test period 2006/2008, the highest average yield was obtained with clones 95 (3.840 kg/vine) and 277 (3.830 kg/vine) and with the greatest stability over years, with a coefficient of variation of 14.4. In those years, the greatest variation was found in clone 124 (21.7) and it was characterised by the lowest average yield of 3.620 kg/vine.

Tab. 1. Yield of grape kg/vine
Prinos grožđa kg/čokot

Clones	2006	2007	2008	2006/2008	CV%
95	3.820	3.164	4.525	3.840	17.7
124	2.806	3.680	4.375	3.620	21.7
277	3.783	3.304	4.404	3.830	14.4

The content of sugar and total acids and their ratio are among important parameters based on which the quality of one variety or clone is assessed. The results for the sugar content and total acids in the must are presented in Table 2. Compared by years, the sugar content in the must in all clones was quite stable with the coefficient of variation from 7.0 (clone 95) to 10.2 (clone 124).

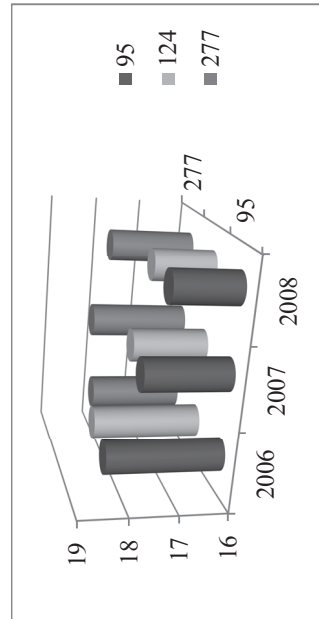
Tab. 2. Content of sugar and total acids in the must (g/L)
Sadržaj šećera i ukupnih kiselina u širi

Clones	2006		2007		2008		2006/2008		CV%	
	sugar	TA	sugar	TA	sugar	TA	sugar	TA	sugar	TA
95	223	7.9	232	6.7	202	6.8	219	7.1	7.0	7.4
124	194	7.3	235	7.1	231	6.4	220	6.9	10.2	6.8
277	202	8.1	236	7.7	236	6.7	224	7.5	8.7	9.6

Legend: T/A – total acids, CV%- variation factor

Tab. 3. Chemical analysis on wine
Hemijska analiza vina

Clones	Alcohol vol%				Dry extract g/L (sugar-free extract)				Total acids g/L				
	Year		06/08		Year		06/08		Year		06/08		
	2006	2007	2008	CV%	2006	2007	2008	CV%	2006	2007	2008	CV%	
95	13.74	14.38	13.74	2.65	24.0	19.0	20.9	21.30	11.85	6.0	5.5	5.70	4.64
124	12.95	12.78	12.92	0.70	27.6	18.3	20.3	20.07	8.28	5.2	5.2	5.47	8.45
277	13.30	13.21	14.47	5.15	23.7	18.6	21.3	21.30	12.04	6.3	6.3	5.97	9.68
Degustation rating on wine (points)													
Clones	2006		2007		2008		2006/2008		CV%				
95	18.4		17.8		17.4		17.87		2.82				
124	18.3		17.6		17.3		17.73		2.89				
277	18.0		18.1		17.8		17.97		0.85				



Graph. 1. Degustation rating of wine
Ocjena degustacije vina

During the study period, the average sugar content ranged from 219 g/L (clone 95) to 224 g/L (clone 227), which enabled production of medium strong wines. Freshness of the wines depends on the content of total acids in the must. The average content of total acids ranged from 6.9 g/L (clone 124), 7.1 g/L (clone 95) to 7.5 g/L (clone 277). 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 6.8 for the clone 124 to 9.6 for the clone 277.

The results of chemical analysis of wines made from the examined clones are presented in Table 3. There were small changes of the alcohol content in the wines produced from different clone vintages. The average content of alcohol ranged from 12.88 vol% (clone 124) to 13.66 vol% (clone 277) to 13.95 vol% (clone 95). No significant changes of the content of alcohol in the wine of all clones were observed during the period of three years. The coefficient of variation ranged from 0.70 for the clone 124 to 5.15 for the clone 277. This is due to different sugar contents in the must and 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 20.2 g/L in the wine made from clone 124 (2006/08) to 21.3 g/L in the wine made from clones 95 and 277 (2006/08). Wine-tasting evaluation of wine is one of the main features, and together with chemical analysis, it determines the quality of wine. Wine-tasting points of the examined wines are given in Table 3 and presented in Graph 4. Average wine-tasting grades ranged from 17.3 for the wine from clone 124 to 17.97 points for wines from clone 277. In the years of testing, wines from all Chardonnay clones were characterised by high stability assessment, i.e. the coefficient of variation ranged from 0.85 for clone 277 to 2.89 for clone 124.

Conclusions

The yield results, sugar content and total acids in the must, alcohol content, content of dry extract in wine and wine-tasting assessment, and their balance during the examination period are characteristics that distinguish the Chardonnay clones 277 and 95 from the clone 124. With these clones, we will improve the quality of white wines in the R. Macedonia along with usage of proper technology.

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Poređenje tri *Chardonnay* klona (*Vitis vinifera* L.), gajena u vinogradarskom regionu Skoplje, R. Makedonija

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Sažetak

Tokom perioda 2006-2008. godine određene su neke agrobiološke i tehnološke karakteristike tri odabrana *Chardonnay* klona, uključujući 95, 124 i 277, koji se uzgajaju u vinogradarskom regionu Skoplje, R. Makedonija. Sertifikovani sadni materijal uveden je iz Francuske 1999-2000. godine, koji je obrađivan i ispitivan u vinogradima Odsjeka za vinogradarstvo i enologiju, Poljoprivrednog instituta u Skoplju. Cilj istraživanja bio je da se primijene optimalne agrotehničke i ampelotehničke mjere i da se uporede karakteristike tri *Chardonnay* klona (95, 124 i 277) gajena u istim agroekološkim uslovima. Uočene su različite vrijednosti ispitivanih karakteristika zbog selekcionarne specifikacije kao i ekoloških uslova tokom perioda istraživanja. Ustanovljeno je da je prinos bio najstabilniji za klon 277 sa koeficijentom varijable 14.4, a najveća varijacija od 21.7 uočena je za klon 124. Uzimajući u obzir hemijski sastav, značajnija varijacija uočena je za sadržaj šećera u širi za klon 277, dok su neznatne varijacije uočene za ukupne kiseline u širi svih ispitivanih klonova. Sadržaj alkohola u vinima je od 12.88 vol% za klon 277 do 13.95 vol% za klon 95 za ispitivani period, a neznatne varijacije su otkrivene za sva tri klona. Vina za sva tri klona za berbu 2006. bila su sa većim sadržajem ukupnog ekstrakta, a za ispitivani period vina sa najviše ekstrakta su bila od klona 95 (21,30 g/L) i 277 (21,20 g/L). Najvišu ocjenu degustacije vina od 17,97 bodova dobilo je vino napravljeno od klona 277.

Ključne riječi: *Chardonnay*, klonovi, prinos, vino, ocjena degustacije

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