

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

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### Abstract

Some agro-biological and technological characteristics of three Chardonnay clones selections, including 95, 124 and 277, cultivated in Skopje's vineyard region, R. Macedonia (during the period from 2007 to 2009) were determined. 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 the characteristics of the three Chardonnay clones (95,124,277) cultivated in 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 examination. 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 the sugar content in the grape must from the clone 277, while, insignificant variations were noticed for total acids in the musts of all clones studied. The content of alcohol in the wines is from 12.88 vol% in the clone 277 to 13.95 vol% in the clone 95 for the examined period, and it is found insignificant variations in the three clones. Wines from all three clones from the vintage 2007 are with a bigger contents of total extract, and for the examined period wines with the most extract from the clones 95 (21,30 g/L) and 277 (21,20 g/L) With the highest degustation rating from 17,97 points is the wine which is made from the clone 277.

**Keywords:** Chardonnay, clones, yield, wine, degustation rating.

### 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 Chardonnay, Sauvignon white, Traminer, 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 (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). Selected clones of the Chardonnay variety that are characterized by higher yield and clusters with greater mass, give lower quality of wine compared to the lower-yield clones of Chardonnay (Simon Cowham, 1999). From a great number of Chardonnay clones, wines with distinctive of fruit aroma, higher content of extract, etc. are produced in France (ENTAV-INRA, 1995), Italy (Cal ,Antonio, Angelo Costacurta, 1990), Australia (Michael M. Anderson et al., 2008) and other countries.

### Materials and Methods

Three French clones (95,124,277) were cultivated in same agro-ecological conditions with application of regular agro-technical 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 Guyot 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 buds by grapevine. During the 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 by and 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, 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 must from grape was sulphated with 80 mg/l liquid SO<sub>2</sub> and then selected wine yeast *Saccharomyces cerevisiae* was added. After the tumultuous fermentation, wines were collected in glasses balloons whereas the alcoholic fermentation finished. The temperature during the alcoholic fermentation was 19-21°C. The wines produced with these procedure were poured off 2 times, and during every pouring off, a correction of SO<sub>2</sub> was done, to not lower than 25 mg/L free SO<sub>2</sub> and not higher than 80 mg/L total SO<sub>2</sub>. 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 organoleptic grade of wines was performed by application of Buxbaum method of twenty point (Standard ISO 5495,1983).

### Results and Discussion

Yield is an important agro-biological characteristic that depends on agro-ecological conditions, substrate, especially on the genetic potential of a variety. Table 1 shows the results of the quantity of handpicked grapes of the examined Chardonnay clones. Under the same conditions of cultivation, during the test period 2007/2009, the highest average yield was obtained with clones 95 (3.840 kg/vine) and 277 (3.830 kg/vine) and with the greatest stability in years, with a coefficient of variation of 14.4. In years, the greatest variation was found in clone 124 (21.7) and it was characterized by lowest average yield of 3.620 kg/vine.

Table 1: Yield of grape kg/vine

Clones	2007	2008	2009	2007/2009	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 the 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). During the period of study, the average sugar content ranged from 219 g/L (clone 95) to 224 g/L (clone 277), which enabled producing of 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 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.

Table 2: Content of sugar and total acids in the must (g/L)

Clones	2007		2008		2009		2007/2009		CV%	
	sugar	TA	sugar	T	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

The results of the 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), 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 the different 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 20.2 g/L in wine from clone 124 (2007/09) to 21.3 g/L in wine from clones 95 and 277 (2007/09). 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 3 and presented in Graph 1. Average wine-tasting grades range 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 characterized by high stability assessment, i.e. the coefficient of variation ranges from 0.85 for clone 277 to 2.89 for clone 124.

Table 3; Chemical analysis on wine

Clones	Alcohol vol%					Dry extract g/L (sugar-free extract)					Total acids g/L				
	Year					Year					Year				
	2007	2008	2009	07/09	CV%	2007	2008	2009	07/09	CV%	2007	2008	2009	07/09	CV%
95	13.74	14.38	13.74	13.95	2.65	24.0	19.0	20.9	21.30	11.85	6.0	5.6	5.5	5.70	4.64
124	12.95	12.78	12.92	12.88	0.70	27.6	18.3	20.3	20.07	8.28	5.2	6.0	5.2	5.47	8.45
277	13.30	13.21	14.47	13.66	5.15	23.7	18.6	21.3	21.30	12.04	6.3	6.3	5.3	5.97	9.68
Degustation rating on wine (points)															
Clones	2007		2008		2009		2007/2009		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						



Figure1. Degustation rating of wine

### Conclusions

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

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