

VARIABILITY OF POLYPHENOLIC COMPOSITION OF QUALITY RED WINES DEPENDING ON THE ORIGIN OF RAW MATERIAL AND WINEMAKING CONDITIONS

Luminița VIȘAN, Diana GROPOȘILĂ-CONSTANTINESCU

University of Agriculture and Veterinary Medicine Bucharest, Faculty of Biotechnologies, Mărăști Bvd, no. 59, zip code 011464, Bucharest, Romania, tel. 021 318 22 66, l_visan@yahoo.com, diana_gconst@yahoo.com

Corresponding author email: l_visan@yahoo.com

Abstract

Our studies refers to the influence of geographical origin of the raw material and the conditions of maceration and fermentation on the composition and extraction of polyphenolic complex at two of the most important varieties of high quality red wines from Romania, Cabernet Sauvignon and Feteasca Neagra; varieties come from different wine regions, Dealu Mare and Murfatlar, harvest of 2010. As regards the oenological practices, our studies aimed three variants of maceration and fermentation of the materials from the mentioned varieties, 5, 10 and 18 day. Analyzes have been carried out in the extracts from epicarp and in the resulted wine by UV-VIS spectrometry techniques. Total content of polyphenols have been determined by IPT technique. Tannins have been determined by the Ribereau-Gayon si Stonestreet method (1996), anthocyanins by dilution technique of the extract with a large amount of solvent (methanol) in strongly acidic conditions and in case of wines was used the discolouration technique with SO₂. Color intensity and shade were determined at $\lambda=420$ nm and $\lambda=520$ nm. The results of the analyzes have shown significant differences concerning the polyphenolic complex content determined both of the origin of the raw materials as well as the technique used for maceration.

Keywords: Polyphenolic complex, color intensity, tannins, total polyphenols index, Feteasca Neagra.

INTRODUCTION

Obtaining a high quality red wine depends on a variety of factors, assembled in a multicriterial system influencing the accumulation of sugars and polyphenolic compounds as well as their subsequent evolution [2]. Raw material characteristics depend on the environmental factors (soil, climate and microclimate - terroir) and the potential of the variety. Further, cultivation techniques and oenological practices are important in obtaining a quality red wine, with an optimal polyphenolic complex [3]. Our studies refers to the influence of these factors, geographical origin of the raw material and the conditions of maceration and fermentation on the composition and extraction of polyphenolic complex at two of the most important varieties of high quality red wines from Romania, *Cabernet Sauvignon* and *Feteasca Neagra*; varieties come from different wine regions, Dealu Mare and Murfatlar, harvest of 2010.

MATERIAL AND METHOD

To establish the influence of the ecosystem and vineyard and winemaking condition on polyphenolic composition of quality red wines, two varieties of black grapes were studied, *Cabernet Sauvignon* and *Feteasca Neagra*, which are varieties that occupy the largest area in Romanian vineyards to obtain high quality red wines. The vineyard ecosystems studied are two wine-growing areas in southern Romania, specialized in obtaining of quality red wines: Dealu Mare and Murfatlar. Raw materials are coming from the harvest of 2010.

Grapes raw material for wine were harvested randomly from a few plots, harvesting being taken at full maturity of the grapes.

Cabernet Sauvignon and *Feteasca Neagra* wine was analyzed in terms of physico-chemical: alcoholic strength (vol% alcohol), total acidity (g/l sulfuric acid), volatile acidity (g/l acetic acid), total dry extract (g/l) and glycerol (g/l).

Total content of polyphenols have been determined by IPT technique (g/l gallic acid),

tannins (g/l) have been determined by the Ribereau-Gayon si Stonestreet method (1996), anthocyanins (mg/l) by dilution technique of the extract with a large amount of solvent (methanol) in strongly acidic conditions and in case of wines was used the discolouration technique with SO₂. Color intensity and shade were determined at $\lambda=420$ nm and $\lambda=520$ nm [1].

Tannins from wines were characterised by the use of following indices: gelatin index (astringente tannins, least condensed), HCl index (condensed tannins) and ethanol index (tannins-polysaccharides complex). Wines have been noted: V1 – *Cabernet Sauvignon Dealu Mare*; V2 - *Cabernet Sauvignon Murfatlar*; V3 – *Feteasca neagra Dealu Mare*; V4 – *Feteasca neagra Murfatlar*.

RESULTS AND DISCUSSIONS

Observations and analysis demonstrated the influence of ecosystem vineyard and and winemaking condition on the quality red wines. The results showed differences between wine quality parameters: alcoholic strength and content of the glycerol, greater at Dealu Mare compared with the values recorded for Murfatlar.

Table 1. Chemical parameters of red wines (*Cabernet Sauvignon* and *Feteasca neagra*)

Wines	Chemical parameters of red wines				
	alcoholic strength, vol % alcohol	total acidity, g/l sulfuric acid	volatile acidity, mg/l CH ₃ COOH	dry extract, g/l	glycerol g/l
V ₁	12,5	3,5	0,6	30,8	7,8
V ₂	12,0	3,2	0,4	31,2	7,5
V ₃	13,0	3,3	0,3	30,2	9,5
V ₄	12,5	3,0	0,3	29,4	8,0

Chromatic compounds accumulation is done in parallel and in a positive relationship with the accumulation of sugars. Often, high concentrations of characteristic phenolic compounds of the variety are reached before a high concentration of sugars, but only under a year when climatic factors have allowed [4]. Analyses showed that in case of *Cabernet Sauvignon* and *Feteasca Neagra* wines, the amount of phenolic compounds and tannins content was lower than in wine center Dealu

Mare. The anthocyanins concentration followed the same curve, higher accumulation occurring in Dealu Mare center, the difference being quite large between the center Murfatlar.



Fig. 1. Alcoholic strength and glycerol content of red wines (*Cabernet Sauvignon* and *Feteasca neagra*)

The results of our experiments showed that both vineyard ecosystems and winemaking conditions have a major influence on the technological potential of the variety and in the end on the quality of the wine. Significant differences were recorded on color characteristics of wines of two varieties analyzed.

Table 2. Polyphenols content of red wines (*Cabernet Sauvignon* and *Feteasca neagra*)

Wines	total content of polyphenols mg/l gallic acid	tannins g/l	anthocyan mg/l	intensity color wines
V ₁	3,30	3,7	580	1,150
V ₂	3,00	3,5	520	1,050
V ₃	2,75	3,3	380	0,900
V ₄	2,20	2,9	370	0,870

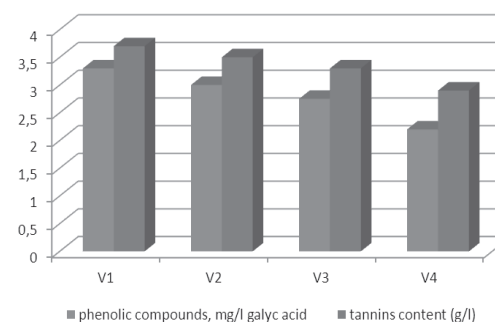


Fig. 2. Polyphenols and tannins content of red wines (*Cabernet Sauvignon* and *Feteasca neagra*)

Table 3. Indices of tannins (*Cabernet Sauvignon* and *Feteasca neagra* wines)

Wines	gelatin index	HCl index	ethanol index
V ₁	67	8,5	8,1
V ₂	62	8,0	7,9
V ₃	58	6,3	8,6
V ₄	55	6,8	8,5

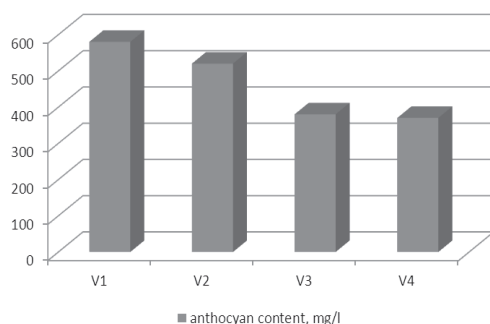


Fig. 3. Anthocyan content of red wines (*Cabernet Sauvignon* and *Feteasca neagra*)

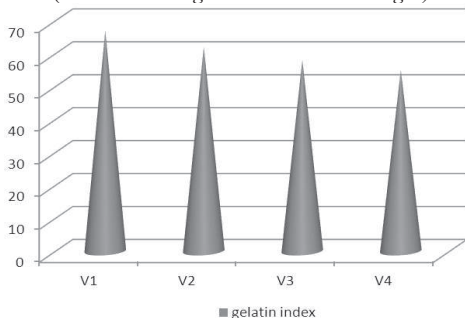


Fig. 4. Gelatin index

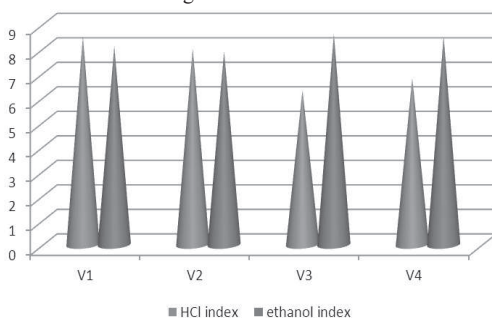


Fig. 5. HCl and ethanol index

Table 4. Influence of the extraction method on the content in polyphenols (*Cabernet Sauvignon* and *Feteasca neagra* wines)

Variant	CS 5	CS 10	CS 18	FN 5	FN 10	FN 18
Total content of polyphenols mg/l gallic acid	1,55	3,00	3,80	1,50	2,70	3,00
Color intensity (IC)	0,600	1,100	1,200	0,420	0,850	0,900

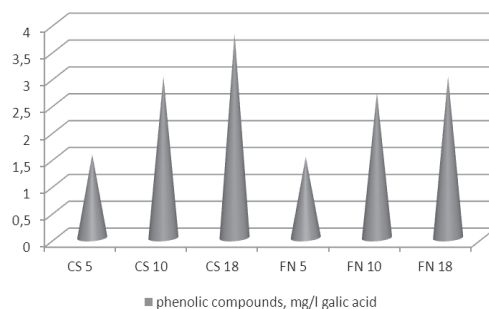


Fig. 6. Variant influence over the content in polyphenols extraction

CONCLUSIONS

Polyphenols content of red wine depends on the vineyard and winery conditions; *Cabernet Sauvignon* and *Feteasca neagra* wines have recorded higher values in the wine-growing Dealu Mare.

As regards tannins, have registered high levels of astringent tannins in the wine-growing Dealu Mare.

Each black grape variety has a different technological potential of phenolic compounds and behaves differently from color extraction; great value of content in phenolic compounds were recorded in version 2 (10 days of maceration).

REFERENCES

- [1] Mark A., Klingshirm M., 2002. *The chemistry of wine*. University of Alabama.
- [2] Bonardi L., 2007. *Des parallelisms oeno-climatiques entre France et Italie du Nord*. Colloque International et pluridisciplinaire sous l'égide de la chaire UNESCO Vin et Culture, Dijon, France.
- [3] Chabin J.P., 2007. *Les vignobles beaunois face au rechauffement climatique*. Colloque International et Pluridisciplinaire sous l'égide de la chaire UNESCO Vin et Culture, Dijon, France.
- [4] Augustin M. et Glories Y., 1992. *Maturite phenologique des raisins rouges*. Rapport d'Activites 1990-1992 de l'Institut d'Oenologie. 55-57.