

STUDIES ON THE CHROMATIC CHARACTERISTICS OF SOME ROMANIAN RED WINES

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Abstract

The chromatic profile of red wines is formed by the participation of various phenolic compounds: anthocyanin, tannins, flavones and phenolic acids; anthocyanin are polyphenolic substances with the most important role in the color of young wines. The evolution of red wine leads to changes of structures and chromatic properties of wine due to polymerization reactions, condensation and oxidation. Also the red wine color is influenced by region of origin, the wine grape variety and vintage year. There were studied chromatic characteristics of Romanian red wines as Pinot noir and Feteasca Neagră from two vineyards with different ecopedoclimatic conditions, Sâmburești and Ceptura (in southern Romania), the 2011 year harvest. The polyphenolic composition of wines was assessed by the content in total polyphenols, tannins and anthocyanin. A wine tannin structure was analysed by their concentration in condensed tannins (HCL index), astringent tannins (gelatine index) and tannin-polysaccharide complex (ethanol index). Analyses have been carried out in the wine by UV-VIS spectrometry techniques. Total content of polyphenols have been determined by the DO₂₈₀ index. Tannins have been determined by the Ribereau-Gayon method, tannin structure after Glories method; anthocyanins were determined by the discoloration technique with SO₂. The study on color of red wines analysed during their evolution referred to the study of chromatic parameters, the content of anthocyanin monomers and polymers (Glories method).

Key words: red wines, anthocyanin monomers, condensed tannins.

INTRODUCTION

Phenolic compounds are essential compounds for the quality of wines and particularly red wines; also they have a very important role in health and food hygiene of the grape and wine consumers. With a powerful antioxidant effect, polyphenols represent an important class of chemical compounds; red wine is a rich product in polyphenols, although its content in these substances vary, sometimes in wider limits in relation with: variety, viticultural area, vintage year etc. (Mazue F., 2001, Paixao N., 2007, Vișan L., 2012).

The polyphenolic compounds have an important role in the evolution of wines during maturation. The evolution of red wines leads to the modification of the structure and chromatic properties by polymerization, condensation and oxidation. The content of wines in polyphenolic compounds depends of many factors, among them, the most important are: the variety, the year of harvest and region (Landrault N, 2001, Vișan L., 2012).

Our studies concern the influence of the viticultural region (with different ecopedoclimatic conditions) and grape variety about the chromatic characteristics of two red quality wines, *Pinot noir* and *Fetească Neagră*, in the climatic conditions of the same harvest year 2011. Also, was studied the chromatic profile evolution of wines through the modification of anthocyanin structure during maturation process.

MATERIALS AND METHODS

Pinot noir and *Fetească Neagră* wines, from two different Romanian vineyards Sâmburești and Ceptura, the 2011 year harvest, were analysed in terms of physico-chemical: alcoholic strength (vol% alcohol), total acidity (g/L tartaric acid), volatile acidity (g/L acetic acid), non-reducing extract (g/L) and glycerol (g/L) analyses were performed by standard methods (O.I.V.): ebulliometric method, for alcoholic strength; titrimetric method for total acidity; distillation method Saunier-Cazenave

for volatile acidity; Tabarié method for dry extract and volumetric method for glycerol.

The polyphenolic composition of wines was assessed by the total content in polyphenols, tannins and anthocyanin. Analyses have been carried out in the wine by UV-VIS spectrometry techniques (Giusti M., 2001). Total content of polyphenols have been determined by DO₂₈₀ index (Ribereau-Gayon J., 1978). Tannins have been determined by the Ribereau-Gayon method (1996) and tannins structure after Glories method (1978), based on the following indicators: gelatine index (for astringent tannins); HCl index (for condensed tannins); ethanol index (for the macromolecular associations tannins-polysaccharides). These indicators was determined by spectrophotometric method at $\lambda = 280$ nm (Glories Y, 1984). The anthocyanins were determined by the discoloration technique with SO₂ (Dallas C., 1994). The study on color of red wines analysed during their evolution referred to the study of chromatic parameters, the content of anthocyanin monomers and polymers (Glories method).

Wines have been noted: PN₁ – *Pinot noir* Sâmburești region; PN₂ – *Pinot noir* Ceptura region; FN₁ – *Fetească neagră* Sâmburești region; FN₂ – *Fetească neagră* Ceptura region.

RESULTS AND DISCUSSIONS

In Romania, the year 2011 was characterized by optimum temperature and precipitations for vines, both in winter and spring. The prolonged drought of summer-autumn period has positively influenced the accumulation of sugars in the grapes, but also the concentration in phenolic compounds, especially anthocyanin. The two varieties of vine *Pinot noir* and *Fetească Neagră* behaved well in 2011, in both studied regions, the larger accumulation of sugars leads to obtain some higher alcoholic wines.

Of the two varieties, the *Fetească Neagră* variety has accumulated the largest amount of sugars: 240 g/L in Ceptura region, respectively 233.6 g/L in Sâmburești region. Both vines have recorded higher values of the non-reducing extract and glycerol content in both regions, although slightly higher, in both cases of vines in Ceptura region.

Although normally, the two varieties accumulate normal amounts of organic acids, in the study year, the total acidity was low, especially for *Pinot noir* variety. *Pinot noir* wines, especially in Ceptura region had total acidity very low, requiring corrections.

Table 1. Chemical parameters of red wines *Pinot noir* and *Fetească neagră*

Wines	Chemical parameters of red wines				
	alcoholic strength (vol % alcohol)	total acidity (g/l tartaric acid)	volatile acidity (mg/l CH ₃ COOH)	non-reducing extract (g/l)	glycerol (g/l)
PN ₁	13.7	5.9	0.3	29.5	8.4
PN ₂	13.5	4.3	0.3	30.9	8.38
FN ₁	13.9	6.3	0.45	27.2	8.42
FN ₂	14.5	4.9	0.55	31.1	9.4

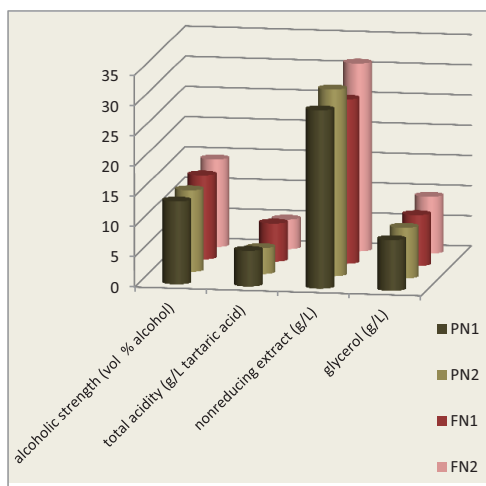


Fig 1. The main chemical parameters in red wines (*Pinot noir* and *Fetească neagră*)

The accumulations of phenolic compounds in grapes were high, as in the sugar case, leading to higher concentrations of polyphenols in wine. Influence of ecopedoclimatic conditions on the accumulation of phenolic compounds is visible, in both varieties recorded higher concentrations in the Ceptura region. The results show a greater sensitivity of *Pinot noir* variety at the climatic and edaphic factors of the culture region. Regarding the influence of

variety, we can see that *Fetească Neagră* variety had higher accumulation of polyphenols compared with *Pinot noir*. The wine concentration in tannins varied, as well as total polyphenol content, both by region and variety. In tannin case, both varieties recorded slightly higher values in Sâmburești region.

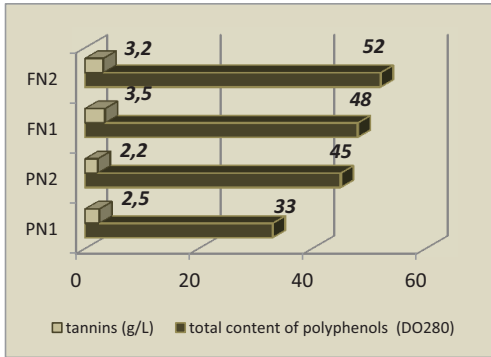


Fig 2. Total content of polyphenols and tannins in red wines (*Pinot noir* and *Fetească neagră*)

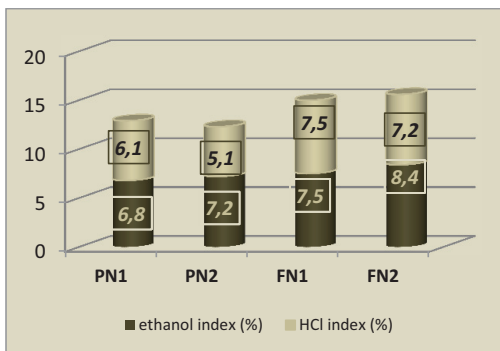


Fig. 3. Ethanol index and HCl index

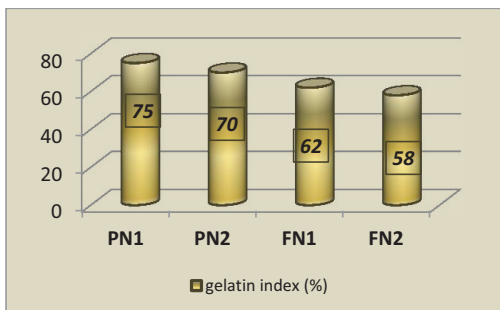


Fig. 4. Gelatine index (%)

The tannins in wines were characterized based on three indices, with their help has determined

the share of different types of tannins in wines; the ethanol index, which sets the share of macromolecular associations of polysaccharide; the HCL index, which were determined the condensed tannins and the gelatine index, for determination of tannin percentage with astringent properties.

Regarding the tannins structure of wines, the results show that the *Fetească neagră* wine has a greater ethanol index; the tannins proportion from the tannins-polysaccharides complex is higher than FN₂ (Ceptura region).

In both varieties, the ethanol index has a higher value in Ceptura region. The percentage of condensed tannins, determined using HCl index was also higher in the *Fetească Neagră* wine.

In terms of the tannins proportion less condensed, with astringent properties, this was higher in *Pinot noir* wine; on regions, the obtained wines in Sâmburești had presented a higher percentage of astringent tannins, in both varieties.

The wine content in anthocyanin is different by variety, a larger amount being in *Fetească Neagră* wine. Differences occur in the anthocyanin accumulation, depending on ecopedoclimatic conditions of culture area. Results showed a higher accumulation of anthocyanin in Ceptura region, for both varieties.

The polyphenols compounds structure is change during the wine maturation due to polymerization reactions, condensation and oxidation, leading to the change of the chromatic properties. As regarding anthocyanin, at the red wines color participate the anthocyanin monomers, polymers and copigmented, they change during wine maturation. Therefore, the anthocyanin monomers turn into the polymeric form.

In fig. 6 and 7 shows the percentage of the 3 types of anthocyanin in young wines, of *Fetească Neagră* and *Pinot noir*, immediately analysed after the alcoholic fermentation.

The evolution of the three types of anthocyanin can be seen from fig. 8 and 9, wines being analysed at 3, 6 and 12 months after completion of alcoholic fermentation. The percentage of monomeric anthocyanin, higher in *Fetească Neagră* wine, decreases along maturation of wines, in favor of the polymer shape of anthocyanin.

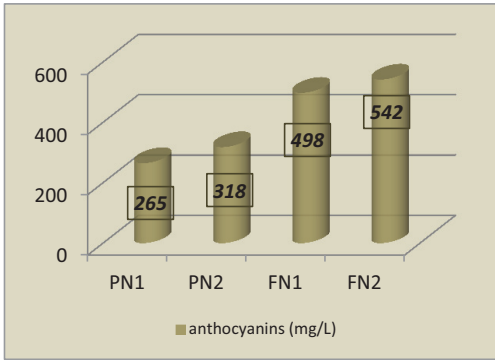


Fig. 5. Anthocyanin content (mg/L) of red wines

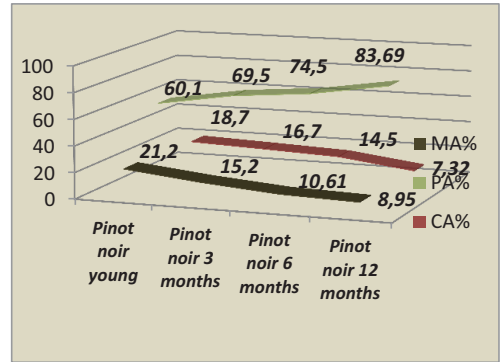


Fig. 8. Evolution of anthocyanin(%) during the *Pinot noir* wine maturation

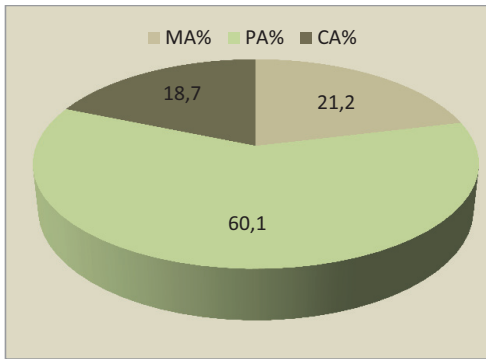


Fig. 6. Percentage of anthocyanin monomers (MA%), polymers (PA%) and co-pigmented (CA%) in young wine *Pinot noir*

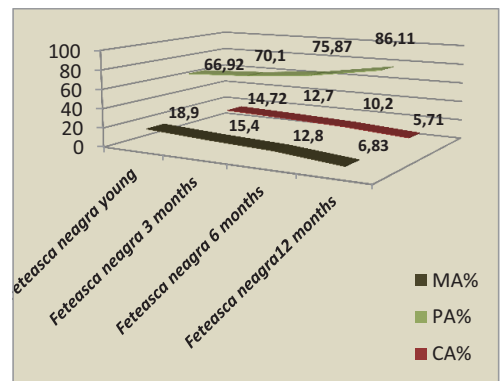


Fig. 9. Evolution of anthocyanin(%) during the *Fetească neagră* wine maturation

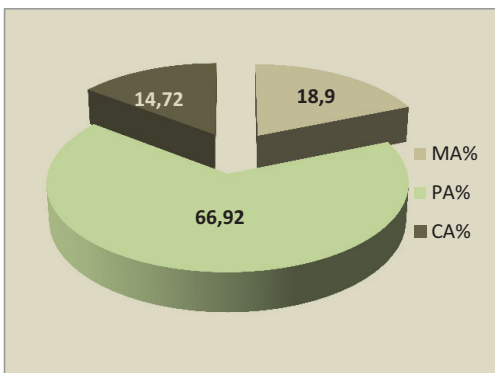


Fig. 7. Percentage of anthocyanin monomers (MA%), polymers (PA%) and co-pigmented (CA%) in young *Fetească neagră* wine

CONCLUSIONS

Fetească Neagră and *Pinot noir* varieties give high quality wines, especially in the south area of Romania (including the Ceptura and Sâmburești regions). Obtained wines have a strong typicality specific of the variety, complex flavours and well structured. However, the two varieties have reacted to the difference of ecopedoclimatic conditions specific of the two regions, the *Pinot noir* variety is more sensitive and also the differences between wines are visible.

The accumulations of sugars were elevated in both varieties, in both regions, although *Fetească Neagră* presented higher values, especially in Ceptura region. The non-reducing extract and glycerol content, two important markers of quality of wine, showed higher

values in the *Fetească Neagră* wine in Ceptura region.

The accumulations of phenolic compounds in grapes were raised, which led to high concentrations of polyphenols in wine. The influence on the accumulation of polyphenols from the region is visible, in both varieties recorded higher concentrations in Ceptura region. Results show a greater sensitivity of *Pinot noir* variety at the influence of the climatic and edaphic factors of region.

The wine content in tannins varies, also with variety, *Fetească Neagră* wines are richer in tannins compared to those of *Pinot noir*. The results show differences determined by the culture region, wines from the both studied varieties being more tannin in the Sâmburești region.

In terms of structure of tannins, results show that *Fetească Neagră* wine has a higher percentage of good tannins and a lower percentage of astringent tannins compared with *Pinot noir*, superior values in Ceptura region.

The anthocyanin content varies with growing area and variety, a higher content presenting the *Fetească Neagră* wine in Ceptura region.

The percentage of anthocyanin monomers decreases along maturation of wines, in favor of their polymer form.

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