

STUDIES ON THE MAIN CHEMICAL COMPOUNDS AND QUALITY INDICES OF RED WINES FROM THE MAIN VINEYARDS IN OLTENIA

STOICA FELICIA, BĂDUȚĂ CÎMPEANU C., TREANȚĂ LIVIU

Key words: redwine, vineyard, chemical compounds, quality indices, typicality and authenticity

ABSTRACT

Recently, worldwide, there has been a decrease in wine consumption, as the consumer has become much more attentive to the quality of this food, refusing products that do not meet certain standards. At the same time, the new world wine regions specialize in quality production, coming on the market with a varied offer and at a convenient price.

The fame of the particularly pleasant characteristics of Romanian wines is given not only by the extremely high value of several local varieties, which have given fame to some wine centers: Fetească alba by Alba Iulia, Grasa by Cotnari, Tămâioasă by Drăgășani, or by Pietroasele, Busuioacă by Bohotin, Fetească neagră de Nicorești, Negru de Dragasani, etc., but also the fact that the most famous foreign varieties, which made famous certain regions and countries (Traminer, Sauvignon, Cabernet Sauvignon, Merlot, Pinot), cultivated in Romania wines that have often equaled or surpassed, by their "generosity" and finesse, those of the countries of origin.

For wine and especially red wine, it is important to establish its typicality and authenticity due to its impact on the large mass of knowledgeable consumers who value quality and safety.

INTRODUCTION

Viticulture, the fruit of a secular experience, and implicitly vinification, is subject to a constant evolution, faster and faster, due to the abundance of information that enriches the knowledge and allows the convenient administration of this culture.

The geographical areas favorable to the cultivation of vines include climatic regions, relief and very varied rocks, whose characteristics correlated with the ecological requirements of varieties and rootstocks are decisive in obtaining superior production of grapes and wine quantitatively and qualitatively (Schlesier K., 2009).

The winemaking processes are different depending on the type of wine (white or red). Red wines are differentiated from white wines by color, attractiveness, astringency. There are several technological variants, determined by the extraction of phenolic compounds.

The following processes can be applied to red vinification:

- the classic process: maceration - fermentation on the must and mixing of ravaç must with press must;
- hot process: hot maceration and separation of must which goes to fermentation;
- the process of maceration of grapes under CO₂ pressure (carbonic maceration).

In red wines, in addition to alcoholic fermentation, a malolactic fermentation is made to transform malic acid into lactic acid. In this way the quality of the wine is greatly improved.

Maceration brings in red wines the four characteristics, which give them specificity: "color, tannins, extract constituents, aroma" (Băducă C., 2017). In addition to the characteristic color, those expressed by the author are also valid for aromatic wines.

Authentication, identification of quality parameters and determination of conformity of the product with the specifications on the label are the requirements of consumers and the European Community (Loubry J-M., 2015). For the optimal solution of this problem, the development and harmonization of valid analytical methods at national and European level, but also the establishment and expansion of the database necessary to improve the efficiency of wine control are international priorities (Banu C., 2013).

MATERIAL AND METHOD

For the realization of this study, the evaluation of red wines was considered, in terms of quality, naturalness and authenticity, from some famous vineyards in Oltenia.

Thus, from the Drăgășani vineyard, - Prince Stirbey Winery, Cabernet Sauvignon Cuvee Genius Locci, Cabernet Sauvignon, Merlot and Negru de Drăgășani wines were analyzed, from the Severin vineyard- Oprișor winery we used Cabernet Sauvignon, Merlot and Merlot wines red Caloian and from the Segarcea, Domeniile Coroanei winery we analyzed the wines obtained from Cabernet Sauvignon, Cabernet Franc, Merlot and Pinot noir.

For the calculation of the alcohol - glycerol, extract - ash and alcohol - extract ratios, as well as of the main parameters that define the color of red wines (color intensity and color tone) we determined in the Oenology laboratory of the Faculty of Horticulture and SCDVV Drăgășani the alcoholic concentration of wines, the contents in glycerol, ash and dry extract as well as the chromatic characteristics (Muntean Camelia, Băducă C., Stoica Felicia, 2001).

RESULTS AND DISCUSSIONS

Based on the chemical analyzes performed in the oenology laboratory, the contents of metered alcohol, glycerol, mineral substances and non-reducing dry extract of some wines taken in the analysis were determined.

Using these data, the ratios between the weight of metered alcohol and glycerol, the ratios of alcohol and extract, the ratios between the weight of non-reducing dry extract and ash and the ratios between yellow pigments (D_{0420} nm) and red pigments (D_{0520} nm) expressing wine coloring quality were calculated. red by the parameter called the color tone.

To determine the extract - ash ratio, the extract is considered 100%, and the ash represents% of the extract. There is no linear relationship between the reduced extract and the ash.

To determine the color tone, spectrophotometric analysis determined the extinctions at wavelengths of 420 nm and 520 nm.

These ratios are considered mainly when determining the degree of naturalness of wines and the compositional balance of products.

It is mentioned that the degree of naturalness of the wines and the normal physico - chemical balance are achieved when the proportion of glycerol compared to alcohol and ash (mineral substances) compared to the non - reducing extract are as close as 10%.

Regarding the color quality, it is at the level of current requirements when the ratio between yellow pigments and red pigments (D_{0420} nm/ D_{0520} nm) is between 0.50 and 0.60 within a coloring intensity that does not fall below 0.8.

The results regarding the quality and authenticity of Dragasani red wines, Prince Stirbey winery are presented in Table 1.

Table 1.

The composition characteristics of the red wines obtained in the Drăgășani vineyard, Prince Stirbey winery

| Composition characteristics | Type of wine | | | |
|---|---------------------------------------|--------------------|--------|--------------------|
| | Cabernet Sauvignon Cuvee Genius Locci | Cabernet Sauvignon | Merlot | Negru de Dragasani |
| Alcohol % vol. | 13,3 | 12,8 | 13,0 | 11,1 |
| Glycerol g/l | 9,7 | 8,2 | 8,9 | 6,9 |
| Glycerol x100/Alcohol | 9,17 | 8,10 | 8,66 | 7,86 |
| Reduced extract g/l | 28,3 | 27,0 | 28,3 | 20,6 |
| Alcohol / Extract | 3,71 | 3,74 | 3,62 | 4,25 |
| Ash g/l | 3,30 | 2,67 | 2,75 | 1,75 |
| Extract / Ash | 11,66 | 9,88 | 9,71 | 8,49 |
| I D0 ₄₂₀ + D0 ₅₂₀ | 1,96 | 1,02 | 1,49 | 0,54 |
| T D0 ₄₂₀ / D0 ₅₂₀ | 0,62 | 0,70 | 0,49 | 0,56 |

As can be seen from the data contained in table 1. the wines of both Cabernet Sauvignon, Merlot and Negru de Drăgășani, are distinguished by a total alcoholic degree which, for all wines analyzed, has never fallen below 12 vol. %, but instead reached values of over 13 vol.%. Glycerol, a component with an essential role in red wines in shaping the taste roughness imprinted with tannin, is always present in significant quantities without ever being below 6 g / l, but can reach over 9 g / l.

To determine the alcohol-glycerol ratio, the alcohol content is multiplied by 10 to obtain the amount of alcohol by volume. The amount of alcohol by volume is then multiplied by 0.79 (molecular weight) to give the amount of alcohol by weight. Then by mathematical calculation the ratio between the weights of the two elements is determined. The variation limits of this ratio are between 5.5 and 13.5, with an average of 8.5 for Romanian wines. Alcohol-glycerol ratio for Cabernet Sauvignon and Merlot have values between 8.10 and 9.17, and for Negru de Drăgășani wines they register low values of 7.86.

To determine the R_R , alcohol - extract ratio, the alcohol content is multiplied by 10 to obtain the amount of alcohol in volumes. The amount of alcohol by volume is then multiplied by 0.79 (molecular weight) to give the amount of alcohol by weight. The variation limits of the R_R ratio are 4.3-5.5, for white wines and 3.6 - 4.5 for red wines. Regarding the alcohol-extract ratio, the Ross ratio R_R , it can be seen that the values recorded for all wines fall within the limits for red wines. The lowest value is recorded at Merlot and the highest at Negru de Dragasani. The explanation costs in the content of the wines in the extract, in Merlot it had the highest value, 28.3 g/l and in Negru de Dragasani the lowest value of 20.6 g/l.

Ash contents of over 2 g/l existed in the wines of Cabernet Sauvignon Cuvee Genius Locci (3.30 g / l), Cabernet Sauvignon (2.67 g/l), Merlot (2.75 g/l) and under 2 g/l l in the Negru de Dragasani wine (1.75 g/l). To determine the extract - ash ratio, the extract is considered 100%, and the ash represents% of the extract. There is no linear relationship between the reduced extract and the ash. The quality indices expressed by the ratio $\text{ash} \times 100 / \text{non-reducing extract}$ came considerably closer and exceeded to the ideal level (10%) for the Cabernet Sauvignon Cuvee Genius Locci wines (11.66), and Cabernet Sauvignon and Merlot presenting values between 9.88 and 9.71, signifying important criteria for the quality and compositional balance of the products.

Data on the participation of different categories of pigments in the composition of the coloring matter and the levels of chromatic properties of the anthocyanin complex, show very advantageous chromatic structures in all wines, and the proportions of different categories of pigments are able to ensure totally appropriate color levels. current.

From the point of view of the quality, naturalness and authenticity of the wines from Prince Stirbey Winery, in accordance with the values of the three calculated indices, it can be strongly stated that these wines are authentic wines, obtained from the mentioned varieties and with an alcohol content obtained from sugars. derived from grapes, without additional additives.

The results of the analysis of Oprisor wines are listed in table 2.

Table 2

The composition characteristics of the red wines obtained in Oprisor-Severin

| Wine sample | Alcohol %vol | Tot. acid. g/l H ₂ SO ₄ | Volat. acid. g/l H ₂ SO ₄ | Extract unred., g/l | Total extract, g/l | Ash, g/l | Alcohol / Extract | Extract / Ash |
|--------------------|--------------|---|---|---------------------|--------------------|----------|-------------------|---------------|
| Cabernet Sauvignon | 13.6 | 5.6 | 0.47 | 26,3 | 29.84 | 2.55 | 4,10 | 9.70 |
| Feteascăneagră | 14.1 | 5.3 | 0.38 | 26.4 | 29.9 | 2.62 | 4,40 | 10.1 |
| Merlot | 13.8 | 5.5 | 0.50 | 24.5 | 27.80 | 2.59 | 4,57 | 10.80 |

The alcoholic contents are in accordance with the levels established for this characteristic for the high-quality types with designation of origin. The proportions of alcohol in wines, between 13.6% vol. (Cabernet Sauvignon) and 14.1% vol. (Feteascăneagră) fully confirms what has been said. The contents in alcohol justify, in fact, those in carbohydrates, quite important, even until the first decades of September when the technological maturity occurred. The total acidity contents between 5.30 g/l (in H₂SO₄) in Feteascăneagră and 5.60 g/l (in H₂SO₄) in Cabernet Sauvignon accompany the proportions in alcohol mentioned. The values of total acidity in Merlot wine is 5.50 g/l (in H₂SO₄). Overall, this feature does not raise correction issues.

The situation is generally satisfactory, given that in recent years the ripening of grapes has taken place in conditions of excessive heat and lack of precipitation, conditions which, as is well known, considerably intensify the respiratory combustion of organic acids.

The extractivity of over 26 g/l in 2 of the 3 wines is able to give the wines attributes to be classified in the high-quality categories. A lower extractivity is recorded for Merlot wine. The ash, with contents between 2.55 g/l (Cabernet Sauvignon) and 2.62 g/l (Feteascăneagră), keeping the specific proportions, follow the contents in non-reducing extract.

The natural and high-quality character of the red wines from Oprisor results from the values of the ash / extract ratio which, with one exception, reach or even exceed a value of 10% which is considered optimal, (Fetească neagră– 10,1% and Merlot - 10.80% (Stoica Felicia et al., 2018).

The main composition parameters of the red wines from Segarcea, Domeniile Coroanei winery are listed in table 3.

Table 3

The main compositional characteristics of red wines Segarcea–
Domeniile Coroanei winery

| Wine sample | Alcohol %vol | Tot. acid. g/l H ₂ SO ₄ | Glycerol g/l | Extract unred., g/l | Ash, g/l | Glycerol × 100 / alcohol | Ash × 100 / extract unred. | Ic | Tc |
|--------------------|--------------|---|--------------|---------------------|----------|--------------------------|----------------------------|-------|-------|
| Cabernet Sauvignon | 14,2 | 4,12 | 12,03 | 26,61 | 2,59 | 10,72 | 9,73 | 1,462 | 0,590 |
| Merlot | 13,6 | 3,96 | 10,90 | 26,43 | 2,61 | 10,14 | 9,87 | 1,345 | 0,637 |
| Cabernet Franc | 14,0 | 4,24 | 11,90 | 25,60 | 2,29 | 10,75 | 9,31 | 1,017 | 0,652 |
| Pinot Noir | 13,9 | 3,82 | 10,98 | 26,91 | 2,58 | 9,92 | 9,59 | 0,730 | 0,648 |

$$Ic = DO 420nm + DO 520nm + DO 620nm$$

$$Tc = DO 420 / DO 520nm$$

Given that the warm wine years, with long periods of sunshine are years with favorable climatic conditions for the production of red wines, the alcohol content recorded, was in no case below 13.5 vol% (Merlot and Pinot noir), being over 14 vol%, in the case of Cabernet Sauvignon wine.

The total acidity is slightly more than 4 g / l at Cabernet, with the exception of the Pinot Noir and Merlot varieties, which are slightly deficient in this parameter. The explanation is found in climatic conditions - excessive summer temperatures (Cichi Daniela et al., 2009).

Glycerol, a component with an essential role in red wines in shaping the gustatory roughness imprinted by tannin, which impresses fine and soft wines, has values of over 10 g / l for all wines, being in accordance with the alcoholic degree, components formed in parallel by the process of fermentation, both depending on the contents of the fermentable carbohydrates in the must. The proportions of glycerol recorded in all the analyzed wines are a valuable factor of composition and organoleptic nature.

The alcohol - glycerol ratio registered the highest values for the wines for Cabernet Sauvignon, Cabernet Franc and Merlot with values between 10.72 and 10.75, and for the wine obtained from the Pinot Noir variety, it registered the lowest value 9, 92. Extractivity of over 26 g / l in three of the four wines is able to give them attributes to be classified in the high-quality categories. The ash, with contents between 2.29 g / l (Cabernet Franc) and 2.61 g / l (Merlot), keeping the specific proportions, follow the contents in non-reducing extract. On the whole of the varieties studied, the ratios between glycerol / alcohol and ash / extract are around 10%, or very close to this level.

An image as accurate as possible on the quantity and quality of the coloring matter in wines is obtained based on the values of the chromatic properties, for their definition being considered the values of the optical densities (Muntean Camelia et al., 2018).

The data on the participation of different categories of pigments in the composition of the coloring matter and the levels of chromatic properties of the

anthocyanin complex, show very advantageous chromatic structures in all wines, and the proportions of different categories of pigments are able to ensure totally appropriate color levels. current.

CONCLUSIONS

Studies have shown particularly convincingly that in all the areas studied, Cabernet Sauvignon, Merlot and Pinot Noir red wines achieve an exceptional quality, highlighted both by the harmonious chemical composition and by the very pleasant organoleptic properties.

The Negru de Drăgășani variety proved, both by the balanced composition of the wines and by the satisfactory properties, that it is able to use the excellent natural conditions in the area, and as such it is necessary to expand it in culture.

The balanced composition of the wines obtained from the Romanian variety Fetească Neagră brings them very close to the established varieties. Regarding the positive agrobiologically properties, it is recommended to be extended in culture, especially on slopes and poorly fertile lands where it can ensure efficient, constant and quality productions.

It can be seen that the studied wines, obtained in renowned Romanian wineries from the vineyards with a long tradition in Oltenia are competitive both on the domestic and foreign market, by their special composition and chromatic qualities and by their naturalness.

BIBLIOGRAPHY

1. **Banu C. șicolab.**, 2013- *Industria alimentară între adevăr și fraudă*, Editura ASAB, București;
2. **Băducă Cîmpeanu C.**, (2007). *A Survey of the Influence of Cultivar and Vineyard on Colour and Sensorial Characteristics of Some Romanian Red Wines*. Acta Horticulturae, nr. 754, p. 463–468. ISSN 0567–7572. ISBN 978 90 6605 620 6.
3. **Cichi Daniela Doloris, Costea D.C., Olteanu I., Camelia Popa, Giugea N., Maracineanu L.C., Cichi M.**, (2009). *Adjustment of the viticultural assortment to the climatic restraints from several viticultural areas of Oltenia*, Lucrări științifice USAMV Iasi seria Horticultură, anul LII, vol. 52, 701-706,
4. **Loubry J-M.** (2015). *Traçabilité et protection contre la contrefaçon des vins. Panorama des solutions existantes et enjeux technologiques*, La Revue des Œnologues, no. 157, 38-40
5. **Muntean Camelia, Băducă C., Stoica Felicia**, 2001 – *Operații tehnologice și metode de analiză și control în industria vinicolă*, Ed. Sitech, Craiova.
6. **Muntean Camelia, Stoica Felicia, Băducă C., Cichi Daniela**, (2018). *Study of the anthocyanic potential of grapes varieties for red wines in Dranic wine center*, Annals of U.S.A.M.V. Bucuresti, serie B, vol LXII, pag. 59-64
7. **Schlesier K, Fauhl-Hassek C, Forina M, Cotea V, Kocsi E, Schoula R, van Jaarsveld F, Wittkowski R** (2009) *Characterisation and determination of the geographical origin of wines*. Part I: overview. Eur Food Res Technol, 230:1–13
8. **Stoica Felicia, Balaban A., Popescu Raluca**, 2018 - *Control the main parameters of quality and authenticity of wines from Oprișor*, Analele Universității din Craiova, vol XXIII, (LIX), p.233-238