PHYSICO-CHEMICAL ANALYSIS OF WINES PRODUCED FROM LOCAL VARIETIES IN ROMANIA AND REPUBLIC OF MOLDOVA

ANALIZA FIZICO-CHIMICĂ A UNOR VINURI OBȚINUTE DIN SOIURI AUTOHTONE DIN ROMÂNIA ȘI REPUBLICA MOLDOVA

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Abstract. *The natural conditions extremely favorable from Romania and Republic of Moldova, near the Danube Delta and the Black Sea, in latitudes similar to those in France, have favored over the time an expansion of lands cultivated with vines. Viticulture and wine production were basic occupations of people from this territory. Over time under the influence of many climatics, economics and historicals factors were obtained grape varieties adapted to the local conditions. Certain viticultural practices have been developed who contributed to the individualisation of wine from two different geographical areas. Wine made from Băbească neagră and Fetească neagră two local varieties cultivated in Romania and Republic of Moldova differentiates both by physicochemical and organoleptic characteristics, the aim of this paper being a comparative analysis of physicochemical composition and organoleptic properties of these wines. As a result for physico-chemical and organoleptic assays of Fetească neagră si Babească neagră wines from Iasi and Chateau Vartely vineyards, significant differences were identified.*
Key words: *wine, alcohol concentration, physicochemical analysis, organoleptic characteristics*

Rezumat. *Condițiile naturale deosebit de prielnice din Romania și Republica Moldova, apropierea de Delta Dunării și Marea Neagră, situarea la latitudini similare cu cele din Franța, au favorizat o extindere a suprafețelor cultivate cu viță de vie de-a lungul timpului. Sub influența a numeroși factori de ordin climatic, economic și istoric s-au obținut anumite soiuri de struguri care s-au adaptat la condițiile locale. S-au înrădăcinat practici de cultură care contribuie la individualizarea vinurilor obținute din cele două spații geografice diferite. Vinul obtinut din Băbească Neagră si Feteasca Neagră, două soiuri autohtone cultivate in România și în Republica Moldova diferă atât prin caracteristici fizico-chimice cât și organoleptice, scopul acestei lucrări fiind analiza comparativă a compoziției fizico chimice a acestor vinuri. În urma determinărilor fizico-chimice și senzoriale ale vinurilor din soiurile Fetească neagră și Băbească neagră din podgoriile Iași și Chateau Vartely s-au observat diferențe semnificative.*
Cuvinte cheie: *vin, concentraţia alcoolică, analize fizico-chimice, caracteristici organoleptice*

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INTRODUCTION

The very favourable environmental conditions for vine culture led to its continuous development in the right and left side of Prut river, so vine growing and wine making became one of the main basic tasks of the inhabitants.

The viticultural assortment of Romania and the Republic of Moldova has some very valuable local grape varieties, the following being the most widely cultivated in both countries:

-for white wines: Fetească albă, Fetească regală

-for red wines: Băbească neagră (also known as Rară neagră in the Republic of Moldova), Fetească neagră

-for aromatic wines: Tămâioasă romanească, Busuioacă de Bohotin.

It should be mentioned that in Romania indigenous varieties are grown extensively, while in Moldova there is a rather narrow range in trade meeting is mainly red wines made from varieties Rară neagră (Băbească neagră) and Fetească neagră.

According to data from 2011, Romania is the 7th largest grape producer in Europe. In 2011 there were 8,5 million quintals, both grapes and wine. While Romanian production is influenced by many factors, climatic conditions remain one of the most important: wine production was very low in 2005 and 2010 due to very severe climate of Eastern Europe. Moreover, a general downward trend can be observed in 2006. This trend is due to the restructuring of vineyards - direct producing hybrid varieties are gradually replaced by *Vitis vinifera* L. offering less yield but high quality wines.

Romania is one of the top ten wine producing countries in the world and one of the top six in Europe, along with France, Spain, Italy, Germany and Portugal. Wine production follows the same trends as grape production (Arvanitoyannis et al., 1999). Difficult weather conditions halved wine production in 2010.

Moldovan wine sector has been and continues to be one of the most important agricultural subsectors in a predominantly agricultural economy. As an industry, it represents 5% of GDP, around 25% of exports, and 8% of total agricultural land in production. The total area of vineyards registered in Moldova was 156 400 ha in 2007, including 141,200 ha in production. In 2007, 5,700 hectares of new plantations of vines were recorded, a record compared to only 460 ha in 2001.

On the market in Moldova are about 150 wine producing companies.

Although there are many data regarding the characteristics of local grape varieties, a comparative analysis of the characteristics of wines traditionally obtained on both sides of the Prut river is strongly required in order to identify similarities and differences that are unique to those wines.

MATERIALS AND METHOD

The four analysed wine samples were registered as follows: V1=Fetească neagră Iași (Adamachi), V2= Fetească neagră Chateau Vartely, V3=Băbească neagră Iași (Adamachi), V4=Băbească neagră Chateau Vartely.

Experimental Samples 1 and 3 are wines harvest of 2013, obtained from Fetească neagră and Băbească neagră grapes from ”Adamachi” didactic farm and that were processed according to the general flux of red wines (Cotea, 1985; Cotea and Sauciuc, 1988). After destemming and crushing, the maceration-fermentation took place for a week with addition of 3 g/100 L Aroma G enzymes. Pressing was done with a hydraulic press and the must was transferred into 25 L glass vessels with addition of Fermactiv Grand Rouge Structure yeasts. Fermentation lasted for a week, after which the wine was racked, filtered, sulphited and stored for 3 months (Ribéreau-Gayon and Glories, 2006).

Comercial Samples 2 and 4 are 2011 harvest wines obtained from Fetească neagră and Băbească neagră grapes from Chateau Vartely vineyard, Republic of Moldova.

The grapes were processed according to the red wine technology, using as auxiliary treatments SIHA bentonite, enzimes Panzim Arome G, fish glue FINECOLL, SIHA Tannin Mox and French Oak toasted oak chips.

Wine analyzes were performed in the Laboratory of Oenology Horticulture Faculty of the University of Agricultural Sciences and Veterinary Medicine "Ion Ionescu de la Brad". Physico-chemical analyzes were carried out according to the methods specified in the international standards and studies (Garrido and Borges, 2011; Iland et al., 2004; Ribéreau-Gayon, 1972; Tudose-Sandu-Ville et al., 2010; Țârdea, 2007). The following were registered: total acidity, volatile acidity, total and free SO_2, sugars and alcohol of the wine. The methods used are according to the OIV (OIV, 2013).

The specific parameters for polyphenolic compounds were performed on a UV-VIS spectrometer Analytik Jena Specord 2000. Thus were determined: total polyphenolic index (IPT), Folin-Ciocalteu index, color analysis according to STAS 6182/35 - 75.

The organoleptic assessment has been made according to a method accepted by the OIV, namely evaluating the aromatic parameters by "blind tasting” and their registration. This method aims to characterize the wines in terms of the profile of smell and taste standpoint by analyzing 19 specific features for red wines. The evaluation method is to provide points depending on the organoleptic characteristics of wines.

RESULTS AND DISCUSSIONS

The compositional characteristics of the analysed wines are present in table 1. Total acidity of samples rages between 4,26 and 7,48 g/L tartaric acid and respects the limits imposed by the Vine and Wine Law nr.67/1997, that states that the totalacidity in wines must be between 4,5 – 9 g/l tartaric acid. The highest value, 7,48 g/L tartaric acid, is registered in B.n.– V3, while the lowest is in B.n. – V4. The values of the total acidity in wines from Iaşi vineyard are higher, due to colder climatic conditions.

Table 1

Physical-chemical analysis of studied wines

Samples	Volatile acidity (g/L acetic acid)	Total acidity (g/L tartaric acid)	Alcoholic conc. (%)	Density (g/L)	Remanent sugars (g/L)	Free SO_2 (mg/L)	Total SO_2 (mg/L)
V1	0,31	5,24	12,31	0,9920	3,86	11,45	53,88
V2	0,51	4,7	14,5	0,9916	4,51	18,58	98,16
V3	0,27	7,48	11,60	0,9961	7,20	8,36	63,79
V4	0,39	4,26	14,5	0,9907	4,13	26,94	118,60

Table 2

Values of D280 and IFC

Parameters	V1	V2	V3	V4
D280	17,06	51,42	9,97	56,67
IFC g/l	18,08	48,37	11,98	54,40

According to the table 1, the highest values of alcoholic concentration were recorded in samples Fn-V2- and Bn- V4, that, due to the technological process for obtaining these wines.

After analysis we can see that IFC index has values of 48,37 in Fn-V2 and 54,40 in Bn-V4, which gives better sensorial stability and conservability to wines during maturation and aging (table 2).

Table 3

Values of chromatic parameters of wines obtained from Fetească neagră and Băbească neagră

Parameter / Sample	L	a	b	C	Hº	I	N	Computerised colour simulation
V1	45,78	52,681	15,186	54,826	16,080	2,055	0,612	
V2	9,272	36,326	15,308	39,420	22,851	8,218	1,138	
V3	50,75	45,868	4,885	46,127	6,079	1,238	0,515	
V4	21,242	50,836	35,280	61,879	34,760	6,918	1,058	

The values of the chromatic parameters show in table 3 the influence of the technological process used in Chateau Vartely and Iaşi. The L index has values of 9,27 in Fetească neagra wine and 21,24 in Babeasca neagra wine compared to the

much higher values obtained in Iaşi wines. Analyzing the computerised simulation of color carried by DIGITAL COLOUR ATLAS 3.0 program, one can see that the commercial samples have extremely intense colors.

Comparative organoleptic analysis of wines from Fetească neagra V1 and V2 indicates differences between the values of the main characteristics of wines, depending on the technological process of obtaining them. Most features have a higher value in V2 compared to V1. Fn-V2 shows cherry flavors (4,28), dried fruits (2,90), and spices (3,7), due to malolactic fermentation absent in the production of Fn-V1. The aroma of wood (oak) in Fn-V2 has a higher value (3,08) than in Fn-V1 (0,53), because the wine was matured in oak barrels. The vegetal aroma is stronger in F.n.-V1(2,13) as the wine is much younger (2013), compared to F.n.-V2 (2011).

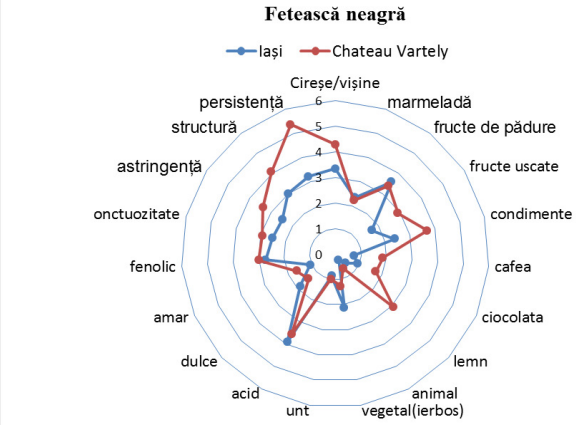

Fig. 1 - Sensorial profile of Fetească neagră wine

High values are found in Băbească neagră sample V2 compared to B.n.-V1, with predominant aromas such as marmelade (2,73), dried fruits (3), cherries (3,66) in B.n.-V2. The wood aroma is higher in B.n.-V4 (3,2) due to maturation in wooden barrels, also responsible for the spicy aroma in B.n.-V4 (2,66).

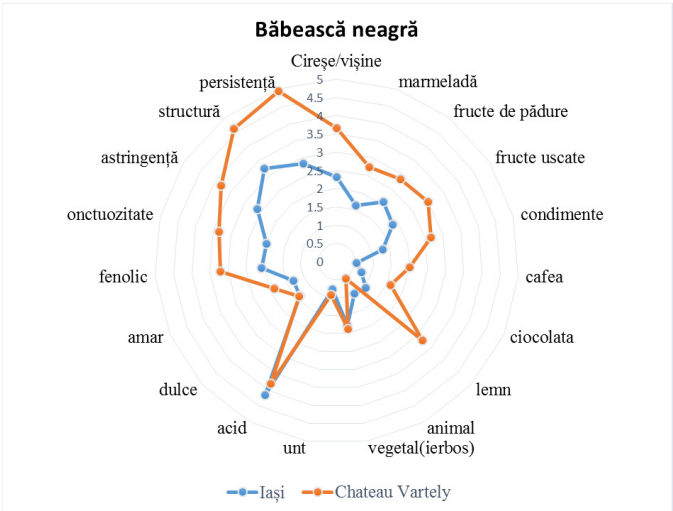

Fig. 2 - Sensorial profile of Băbească neagră wine

CONCLUSIONS

The studied wines can be classified as quality DOC wines, due to their physical – chemical characteristics (alcoholic ocncentration that ranges between 11,60% in V3 and 14,5% in V2 and V4).

The organoleptic evaluation of experimental Fetească neagră samples indicate forest fruit notes and cherries/sourcherries pits, as well as vegetal/herbeceous notes. In experimental Băbească neagră samples, notes of dried fruits and cherries are predominant.

In Chateau Vartely wines, the oak and spice aroma is pronounced, due to the wood contact during wine maturation.

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REFERENCES

1. **Arvanitoyannis I. S., Katsota M. N., Psarra E. P., Soufleros E. H., Kallithraka S., 1999** - *Application of quality control methods for assessing wine authenticity: use of multivariate analysis (chemometrics)*. Trends Food Sci. Technol., 10, pp. 321–336.
2. **Cotea V. D., 1985** - *Tratat de Oenologie, vol. I .Vinificația și biochimia vinului.* Editura Ceres, București.
3. **Cotea V. D., Sauciuc J., 1988** - *Tratat de oenologie , vol. II – Limpezirea, stabilizarea și îmbutelierea vinului*. Editura Ceres, București;
4. **Garrido J., Borges F, 2011** - *Wine and grape polyphenols -a chemical perspective*, Food Res. Int. 44, pp. 3134–3148.
5. **Iland P., Bruer N., Ewart A., Markides A., Sitters J., 2004** - *Monitoring the winemaking process from grapes to wine techniques and concepts*. Patrick Iland Wine Promotions PTY LTD, Cambelltown, SA 5074 Australia.
6. **Ribéreau-Gayon J., 1972** - *Evolution des composes phenolique en cours de la maturation du raisins*. Conn. Vigne. Vin.
7. **Ribéreau-Gayon P. and Glories Y., 2006** - *Handbook of Enology. The Chemistry of Wine Stabilization and Treatments*. 2nd Edition, Editura John Wiley & Sons, West Sussex, England.
8. **Tudose-Sandu-Ville Ș., Cotea V. V., Colibaba Cintia, Nechita B., Lăcureanu G., Mogârzan Cristina, 2009** - *Study of phenolic compounds in red wines obtained in Iaşi vineyard by different maceration-fermentation methods.* Lucrări ştiinţifice USAMV Iaşi, seria Horticultură, vol. 52, pp. 805-810.
9. **Țârdea C., 2007** - *Chimia și analiza vinului.* Editura Ion Ionescu de la Brad, Iași.
10. ***** OIV, 2013** - *Recueil des methodes internationales d'analyse des vins et des mouts.* Office International de la Vigne et du Vin, Editura O.I.V., Edition Officielle, Paris.