THE ANALYSE OF PHYSICOCHEMICAL COMPOSITION, TOTAL PHENOLIC CONTENT AND COLOUR OF SOME RED WINES FROM DEALU BUJORULUI VINEYARD

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Abstract. The complex composition of a red wine is due mainly to the presence of phenolic substances and anthocyanins with a major role to form the quality characteristics: color, aroma and flavour. The aim of this paper is to analyse the physicochemical composition of the five young wines from the Dealu Bujorului Vineyard (Merlot, Feteasca Neagra, Burgund Mare, Babeasca Neagra and Cabernet Sauvignon), obtained under the climatic conditions of the year of 2017. The main oenological parameters, color intensity, total polyphenol content and anthocyanins were determined according O.I.V. methods. Results show that wines recorded the highest values for alcohol content 14.18±0.09 (% vol.) for Merlot, 14.17±0.21 (% vol.) for Feteasca Neagra and the lowest values of alcoholic strength were recorded by Cabernet Sauvignon 13.77±0.25 (% vol.). A variation in total phenolic contents of tested wine samples was observed, the highest values of the total polyphenols being recorded by Babeasca Neagra wine (2.35±0.00 g/L), followed by Feteasca Neagra 2.21±0.00 g/L and the lowest values by Cabernet Sauvignon (1.96±0.00 g/L). Regarding the anthocyanins, the highest values were recorded for Merlot wines 984.13±0.00 g/L, followed by Babeasca Neagra 842.81±0.00 g/L and the lowest values for Cabernet Sauvignon wines 636.42 g/L. Wine quality parameters analyzed were mainly influenced by the grape variety.

Keywords: red wine, alcohol content, polyphenols, anthocyans, quality

INTRODUCTION

In Romania, viticulture has a long tradition and important role in agriculture sector. There are some autochthonous grapevine varieties in Romania which play a significant role in viticulture and winemaking section due to the interest of consumers for diversity of wines. Feteasca Neagra is the most widespread black grapevine variety in Romania, but there are also some red grape varieties such as Burgund Mare, Babeasca Neagra (Coldea et al., 2015). Bora et al., 2016b, highlighted the exceptional climatic conditions from Dealu Bujorului Vineyard for the growth of white and red grape varieties for producing high quality wines. The main ecoclimatic conditions for Dealu Bujorului indicates an average temperatures during the growing season from 19.4°C to 21.0°C; the hydrothermal coefficient between 0.59 and 1.57, the heliothermal real index between 2.0-3.12, the oenoclimatic skills index showing that this viticultural region is mainly for the production of the red and white wines. Climatic factors and cultural practices affect the quality of wine the impact of each other is difficult to estimate (Jackson et al., 1993). To analyze the main oenological parameter of a wine assume a laborious and an expensive work. The analytical results must express the real

physicochemical parameters of wine composition, to establish the wine quality (Giosanu et al., 2011). The authenticity of wine is a basic attribute that generate the wine quality and is determined by the harvest and by geographic origin or the *terroir* of the wine (Bora et al., 2018b). Some of the criterias for control the authenticity and quality of red wines are the anthocyanin spectrum, the fingerprint of amino acids, the wine alcohol content, isotopic composition (Giosanu et al., 2011; Babincev et al, 2016; Bora et al., 2018c). Some studies shown that the crop level, climatic conditions, cultural practices and wine making technique can influence the anthocyanins and the total phenolic compound of wine (Guidoni et al., 2002; Košmerl et al., 2013; Moldovan et al., 2015).

The aim of this paper is to highlight the quality of the red wines (oenological parameters, color, total phenolic and anthocyanins content) from Dealu Bujorului Vineyard, Galați County, in the ecoclimatic conditions of the year of 2017.

MATERIAL AND METHOD

The compositional characteristics of wines studied were alcohol, total acidity, volatile acidity, non-reducing extract, reducing sugar, free and total dioxide, non-reducible extract, pH, acetic acid, total polyphenols, anthocyanins, color intensity and color tint. Five grape varieties representative for this viticultural area were chosen: Merlot, Burgund Mare, Cabernet Sauvignon, Babeasca Neagra and Feteasca Neagra, from 2017 wine production. All wine samples were obtained under the same microwine production. Around fifty kilograms of grapes were destemmed and crushed and transferred to a micro-fermentator (20 L clyndrical glass container, cover with alumium foil) (Bora et al., 2016a). All varieties grapes were manually harvested on September 26, 2017. Fermentation took place at 25°C and humidity of 58-60%. The methods of analysis described by Postolache et al., (2016) were used for the physicochemical analyses of wine performed in the Laboratory of Winemaking of the RSVE Bujoru. The total polyphenols, anthocyans, color intensity and color tint was made by the same protocol used by Bora et al., 2018a.

Statistical analysis

The DUNCAN test was used to analyze the data. The statistical program used was the SPSS, version 24 (SPPS Inc. Chicago, IL, USA). The statistical parameters arithmetic average, standard deviation and average error were calculated using the same statistical package SPSS version 24. The data were interpreted by variance analysis (ANOVA), the separation of wine varieties was performed using the DUNCAN test at $p \leq 0.005$.

RESULTS AND DISCUSSIONS

Physico-chemical characteristics of wines samples. The wine samples used were obtained from Feteasca Neagra, Merlot, Burgund Mare, Babeasca Neagra and Cabernet Sauvignon wines under the same conditions of 2017, from Dealu Bujorului Vineyard. Wine varieties recorded the highest values for alcohol content 14.18±0.09 (% vol.) for Merlot, 14.17±0.21 (% vol.) for Feteasca Neagra and the lowest values of alcoholic strength were recorded by Cabernet Sauvignon 13.77±0.25 (% vol.) (Table 1). The studied wines have a high alcoholic potential, being within the normal range from 13.77 to 14.18 (% vol.) for red wines. The result may by compared with those obtain by Bora et al. 2018a, for Merlot 15.51±0.38 (% vol.) in 2015 and 15.40±0.14 (% vol.) in 2016, obtained in the same area and for Feteasca Neagra 14.89±0.38 (% vol.) in 2015 and 14.71±0.10 (% vol.) in 2016, obtained

in Stefanesti-Arges vineyard. Others authors found lower values for alcoholic strength for those varieties, such as 13.12 (% vol.) for Melot from Cricova (Republic of Moldova) and 13.50 (% vol.) for Feteasca Neagra from Panciu (Manolache et al., 2018a). Regarding total acidity (g/L H_2SO_4), vine varieties for red wines grown in Dealu Bujorului vineyard recorded the highest values for total acidity in Burgund Mare wines (4.27±015 g/L H_2SO_4) and Merlot (4.23±0.14 g/L H_2SO_4). On the opposite, Babeasca Neagra registered the lowest value of total acidity of 3.33±0.31 g/L H_2SO_4. Our results are higher for total acidity expressed in sulfuric acid compared with data obtained by Giosanu et al., 2011, 2.94 g/L H_2SO_4 for Merlot and 3.63 g/L H_2SO_4 for Feteasca Neagra from Valea Calugareasca. Varieties grown in Dealu Bujorului vineyard recorded the highest values for volatile acidity for Burgund Mare 0.51±0.01 g/L CH_3COOH, while Babeasca Neagra and Cabernet Sauvignon recorded the lowest values of 0.4±0.02 g/L CH_3COOH. The results are comparable with those reported by Manolache et al., 2018a, for wines from Republic of Moldova (over 0.50±0.00 g/L CH_3COOH for Shiraz, Vin Virgin, Rara Neagra, Cabernet Sauvignon and Codru) and by Manolache et al., 2018b, for Cabernet Sauvignon 0.45-0.48 g/L CH_3COOH from Dobra, Feteasca Neagra 0.54-0.59 g/L CH_3COOH and Pinot Noir 0.51-0,54 g/L CH_3COOH from Ratesti, Merlot 0.62-0.68 g/L CH_3COOH and Feteasca Neagra 0.70-0.75 g/L CH_3COOH from Alimanu. The highest values of non-reducible extract was recorded by Feteasca Neagra 32.60±0.46 g/L, followed by Burgund Mare 29.10±0.10 g/L. On the opposite pole Cabernet Sauvignon 20.33±0.85 g/L recorded the lowest non-reducible extract. The results may be compared with those obtained by Bora et al., 2018a, for Merlot variety from Stefanesti-Arges (24.54±0.41 g/L in 2015 and 25.58±0.34 g/L in 2016). The sugar content values vary within large range, from 9.47±0.48 g/L for Burgund Mare; 8.83±0.15 g/L for Feteasc㠠Neagra to 1.60±0.05 g/L for Carbent Sauvignon. According to the level of the sugar content, the analyzed wines may be categorized as dry, semi-dry and semisweet wines. The highest pH was obtained in the wine produced from Feteasca Neagra 3.51±0.22, followed by Burgund Mare 3.41±0.22. The wine of Cabernet Sauvignon recorded the lowest pH values 3.24±0.09. The results of this parameter are close to those recorded by Bora et al., 2018a, for Feteasca Neagra wines from Stefanesti-Arges vineyard (3.07±0.01 in 2015), recorded by Bora et al., 2016a, for Merlot wines from Dealu Bujorului vineyard (3.30±0.01 in 2015) and reported by Coldea et al., 2015, for Feteasca Neagra (3.87). The results regarding the content of free and total SO_2 , showed that all wines have a much lower content than the one required by low, therefore the wine can be preserved or consumed. Our results show a variation in total phenolic contents of tested wine samples. The highest values of the total polyphenols were recorded by Babeasca Neagra wine (2.35±0.00 g/L), followed by Feteasca Neagra 2.21±0.00 g/L and the lowest values by Cabernet Sauvignon (1.96±0.00 g/L) (Figure 1). The results are comparable with those reported by Bora et al., 2016a, for Merlot (1.29±0.01 g/L), Cabernet Sauvignon (1.14±0.02 g/L), Feteasca Neagra (1.28±0.01 g/L) grown in the same area and also with those reported by Pazourek et al., 2005, for red wines from New South Wales and Moravia, with values of total polyphenols content ranged from 1.68 to 4.10 g/L. Regarding the anthocyanins, the highest values were recorded for Merlot wines 984.13±0.00 g/L, followed by Babeasca Neagra 842.81±0.00 g/L and the lowest values for Cabernet Sauvignon wines 636.42 g/L (Figure 2). Bora et al., 2018a, obtained lower values for anthocyanins content for red wines from Stefanesti-Arges vineyard as follow: Feteasca Neagra 407.92±1.25 g/L in 2015 and 489.62±19.71 g/L in 2016; Merlot 316.81±0.61 g/L in 2015 and 418.33±16.96 g/L 2016 and red wines from Dealu Bujorului vineyard such as: Feteasca Neagra 913.67±4.04 g/L in 2015 and 621.87±11.99 g/L in 2016; Merlot 663.44±7.05 g/L in 2015 and 502.56±6.88 g/L in

2016. Lower values of the anthocyanins were also obtained by Giosanu et al., 2011, for two red wines obtained in Valea Călugareasca, 109 mg/L for Merlot from 2006 vintage and 241 mg/L for Feteasca Neagra from 2007 vintage. This variability of polyphenos and anthocyanins content may be due to the grape variety, climatic conditions, *terroir* and winemaking tehniques.

The color intensity of the analyzed wines recorded the highest values in the Feteasca Neagra wines (8.31±0.00) followed by Merlot wines (7.31±0.00) and the lowest color intensity in Cabernet Sauvignon wines (2.72±0.00) (Figure 3). The results are lower than those reported by Bora et al., 2018a, for Feteasca Neagra variety from the same area (9.09±0.06 in 2015 and 8.94±0.04 in 2016) and for the same wine obtained in Stefanesti-Arges vineyard (8.32±0.02 in 2015 and 7.86±0.06 in 2016). The highest concentration color tint was recorded in Merlot wines 0.885±0.00, followed by Babeasca Neagra wines 0.846±0.00, and lowest values were registered in Cabernet Sauvignon wines 0.729±0.00 (Figure 4). The results may be compared with those reported by Bora et al., 2016a, for Merlot wines 0.810±0.040, Cabernet Sauvignon wines 0.690±0.020, Feteasca Neagra wines 0.740±0.020 in the same area, and also those reported by Babincev et al., 2016, for Merlot (0.86±0.00), Vranec (0.81±0.00), Prokup (0.81±0.00), Cabernet Sauvignon (0.85±0.00) and Game (0.83±0.00) wines from grape varieties from Republic of Kosovo.

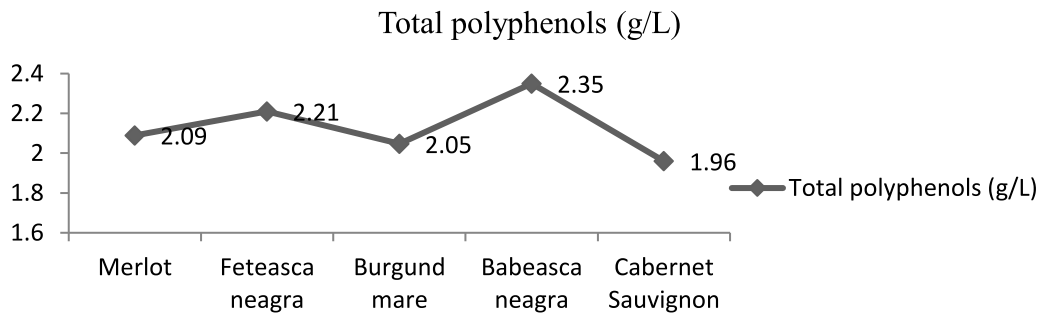

Figure 1. Total polyphenols (g/L) content in red wines from Dealu Bujorului Vineyard

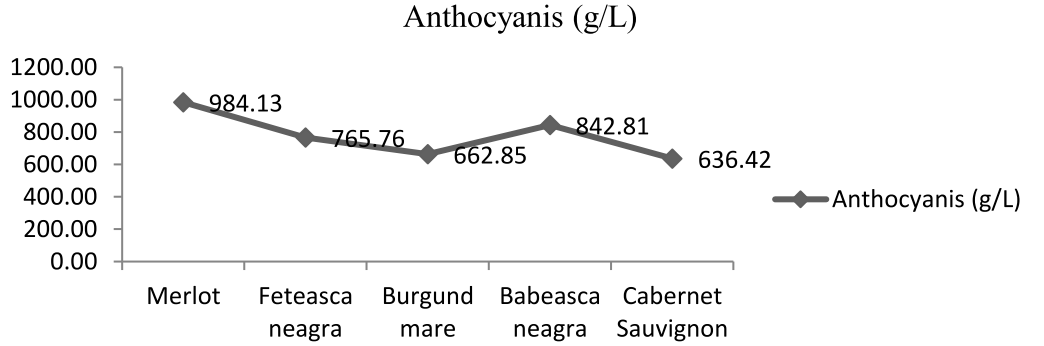

Figure 2. Total anthocyanis (g/L) content in red wines from Dealu Bujorului Vineyard

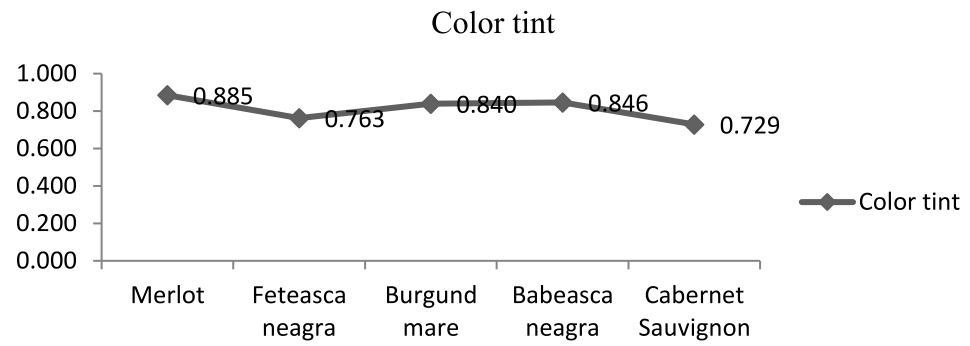

Figure 3. Color tint in red wines analyzed from Dealu Bujorului Vineyard

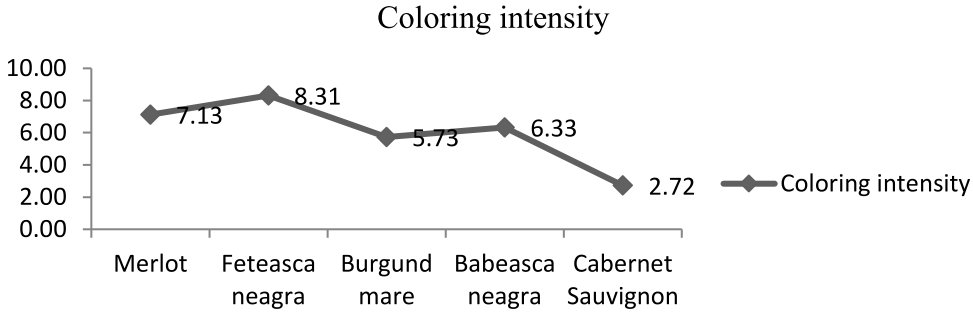

Figure 4. Coloring intensity of analyzed red wines, from Dealu Bujorului Vineyard

CONCLUSIONS

According on the results, the red grapes varieties has a good suitability in the Dealu Bujorului areas to obtain quality red wines. Each wine display a particular character of the grape variety, as well as the ecoclimatic and ecopedological conditions influence on the quality of wine. In general, the studied wines had a high alcoholic potential, being within the normal range from 13.77 to 14.18 (% vol.) for red wines. The results show a variation in total phenolic content, anthocyans content, color intensity and color tint of tested wine samples. The wines from the autochthonous grape varieties Babeasca Neagra, Burgund Mare and Feteasca Neagra highlighted good results of those parameters compared with wines from Cabernet Sauvignon and Merlot in the same climatic conditions.

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Table 1.

Physicochemical characteristics of red wines (n = 3)

Area/ Vineyard	Variety	Parameters Analyzed									
		Year	Alcohol (% vol.)	Total acidity (g/L H_2SO_4)	Volatile acidity (g/L CH_3COOH)	Non-reducible extract (g/L)	Sugar content (g/L)	pH	Free SO_2 (mg/L)	Total SO_2 (mg/L)	Protein/ Tartar Stability
Dealu Bujorului	Merlot	2017	14.18 ± 0.09 [a]	4.23 ± 0.14 [ab]	0.52 ± 0.01 [a]	25.37 ± 0.21 [c]	6.53 ± 0.15 [b]	3.33 ± 0.08 [a]	38.27 ± 0.12 [b]	115.47 ± 0.64 [b]	-
	Feteasca Neagra		14.17 ± 0.21 [a]	4.03 ± 0.15 [ab]	0.51 ± 0.02 [b]	32.60 ± 0.46 [a]	8.83 ± 0.15 [a]	3.51 ± 0.22 [a]	48.67 ± 3.40 [a]	180.00 ± 18.03 [a]	-
	Burgund Mare		14.00 ± 0.10 [ab]	4.27 ± 0.15 [a]	0.54 ± 0.01 [a]	29.10 ± 0.10 [b]	9.47 ± 0.40 [a]	3.41 ± 0.22 [a]	25.57 ± 0.06 [e]	81.83 ± 1.65 [c]	-
	Babeasca Neagra		14.00 ± 0.10 [ab]	3.33 ± 0.31 [c]	0.40 ± 0.02 [c]	21.50 ± 0.70 [d]	1.90 ± 0.50 [c]	3.34 ± 0.19 [a]	30.33 ± 1.53 [d]	95.80 ± 5.80 [c]	-
	Cabernet Sauvignon		13.77 ± 0.25 [b]	3.90 ± 0.10 [b]	0.40 ± 0.01 [c]	20.33 ± 0.85 [e]	1.60 ± 0.05 [c]	3.24 ± 0.09 [a]	32.10 ± 0.26 [c]	123.70 ± 11.37 [b]	-
	Average		14.00 ± 0.07	3.95 ± 0.08	0.49 ± 0.01	25.71 ± 0.44	9.39 ± 0.26	3.36 ± 0.07	34.99 ± 1.43	119.36 ± 7.24	-
Variety	F		3.086	12.337	148.885	2200.313	1240.529	1.003	84.850	59.683	
	Sig.		ns	**	***	***	***	Ns	***	***	
Bora et al., 2018a			14.89 ± 0.38	3.59 ± 0.08	0.62 ± 0.01	36.18 ± 0.28	36.89 ± 0.05	3.46 ± 0.04	31.26 ± 1.28	88.48 ± 0.76	

Average value ± standard deviation (n = 3). Romans letters represent the significance of the variety difference ($p \leq 0.05$). The difference between any two values, followed by at least one common letter, is insignificant. Ns = insignificant.

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