

VARIATION OF PHYSICAL-CHEMICAL PARAMETERS IN RED WINES OBTAINED FROM ROMANIAN GRAPE VARIETIES

VARIAȚIA UNOR PARAMETRI FIZICO-CHIMICI LA VINURI ROȘII OBTINUTE DIN SOIURI ROMÂNEȘTI

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Abstract. *This present study aims at determining of physical-chemical parameters that can be used in differentiating the wines obtained from local grape sorts Băbească neagră, Fetească neagră and Codană, the latter being obtained from the sexual hybridization of the former two. The studied wines can be differentiated according to: absorption spectrums, computerized color simulation, color differences calculation and of the percentage area of the main anthocyanins.*

Key words: physical-chemical parameters, local grape sorts, absorption spectrums, color, anthocyanins

Rezumat. *În studiul de față s-a urmărit determinarea unor parametri fizico-chimici ce pot fi folosiți la diferențierea vinurilor obținute din soiurile autohtone Băbească neagră, Fetească neagră și Codană, ultimul obținut prin hibridarea sexuată a primelor două. Vinurile studiate se pot diferenția prin: spectrele de absorbție, simularea computerizată a culorii, calcularea diferențelor de culoare și a ariei procentuale a principalilor antociani.*

Cuvinte cheie: parametri fizico-chimici, soiuri autohtone, spectre de absorbție, culoare, antociani

INTRODUCTION

This study presents the main characteristics of wines obtained from local grape varieties, Băbească neagră and Fetească neagră, as well as Codană, grape sort obtained by hybridizing of Băbească neagră × Fetească neagră [5], harvested from Iași and Odobești vineyards, with different annual average temperatures (9,3, and 9,7°C).

MATERIAL AND METHOD

The grapes were harvested in 2008 and processed through classic wine-making technology [3]. The wines were analyzed after their malolactic fermentation and bottling, according to OIV regulations and specialized literature.

The alcoholic concentration, reductive sugars, volumic mass, relative density, total and volatile acidity, pH, conductivity, free and total SO₂ non-reductive extract, total dry extract, as well as anthocyanins content [4] and chromatic parameters were registered.

The chromatic parameters (L, a, b, C, H°), color intensity (I) and hue (N) were determined according to CIE Lab 76 method. Using DIGITAL COLOUR ATLAS 3

software the computerized color simulation was effectuated for underlining the color differences and for sensorial classification of the wine. Based on chromatic characteristics L, a, b, C and H°, color differences were calculated using ΔE 1976 and ΔE 2000, for better observing if the wines obtained from the same or different grape varieties but using the same technology, can be differentiated according to these chromatic parameters.

RESULTS AND DISCUSSIONS

From the data in table 1/figure 1 and figure 2 and the wines’ sensorial characteristics, the analyzed wines can be classified as follows [2]: DOC-CMD (Fn-Iași, Bn-Iași, Codană-Odobești), DOC-CT (Fn-Odobești, Bn-Odobești), IG (Codană-Iași).

Table 1

Main composition characteristics of analyzed wines

Grape variety	Fn Iași	Fn Odob	Bn Iași	Bn Odob.	Codană Iași	Codană Odob.
Alcoholic concentration (%vol.)	11,07	13,73	11,42	14,23	9,66	11,92
Relative density at 20°C	0,9949	0,9930	0,9930	0,9921	0,9940	0,9942
Total acidity (g/L C ₄ H ₆ O ₆)	7,66	7,66	7,92	7,58	6,18	6,88
Volatile density (g/L C ₂ H ₄ O ₂)	0,14	0,24	0,17	0,31	0,24	0,24
Free SO ₂ (mg/L)	11,95	8,81	10,07	15,73	7,55	23,91
Total SO ₂ (mg/L)	57,25	38,69	35,23	71,72	27,05	121,8
Reductive sugars (g/L)	3,15	2,92	1,97	2,73	1,45	2,62
Total dry extract (g/L)	25,00	27,90	22,99	27,10	18,30	25,50
Non-reductive extract(g/L)	21,85	24,98	21,02	24,37	16,85	22,88
pH	3,45	3,57	3,37	3,43	3,51	3,40
χ (mS)	2,37	2,75	2,10	2,27	2,18	2,49

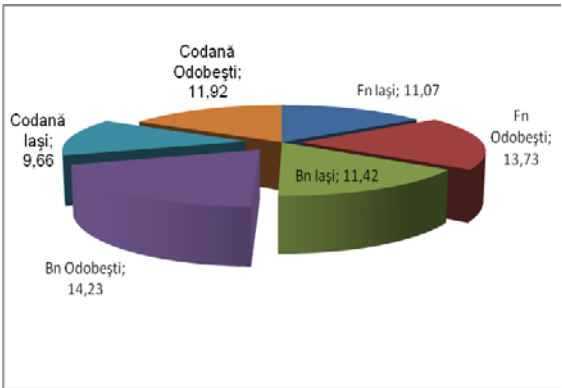


Fig. 1. Alcoholic concentration (% vol. alc.)

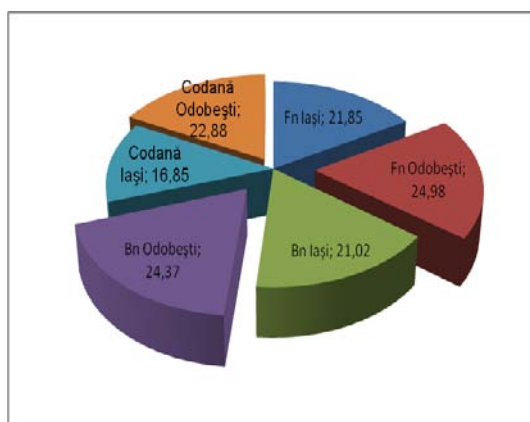


Fig. 2. Non-reductive extract (g/L)

By comparing the wines obtained from the same varieties, but harvested from different vineyards, one can say that: in the case of the wines obtained from Fetească neagră grape variety, the highest absorbance value is in the case of Fn-Iași, followed by Fn-Odobești; in the case of Băbească neagră the results are reversed; the highest value for the obtained wines from Codană grape variety is also in the case of Odobești vineyard (Tab. 2). The main fact is that the order given by the digital color's analysis for the analyzed wines is similar to the one given by the absorbance curves of the studied wines.

Table 2

Chromatic parameters' values of analyzed wine samples

Grape variety	Fn Iași	Fn Odob.	Bn Iași	Bn Odob.	Codană Odob.	Codană Iași
Computerized simulation of wine's color						
Clarity, L	25,51	45,10	51,63	51,54	59,31	70,08
Chromaticity (-a ÷ +a)	57,60	62,39	62,32	60,45	54,20	38,78
Chromaticity (-b ÷ +b)	39,16	25,29	11,98	15,76	11,32	8,69
Saturation C	69,65	67,32	63,46	62,34	55,37	39,74
Tonality H°	34,21	22,07	10,88	17,87	11,80	12,64
Intensity ($A_{420}+A_{520}+A_{620}$)	7,63	3,27	2,45	2,55	1,22	1,18
Hue (A_{420}/A_{520})	0,46	0,57	0,58	0,57	0,67	0,96

The color intensity has decreasing values, directly proportionate with the simulated colors for the studied wines and the hue has increasing values, inversely proportional to simulated colors.

When the color differences are calculated by using the ΔE 1976 formula (Tab. 3), the less rigorous one, and also the ΔE 2000 formula (Tab. 4), the most rigorous one, major differences can be observed regarding the variety and vineyard; one can also conclude that all wines can be sensorial differentiated.

Table 3

Color difference analysis using ΔE 1976

Grape variety	Fn lași	Fn Odobești	Bn Odobești	Bn lași	Codană Odobești	Codană lași
Fn-lași	0,00	24,47	35,12	37,99	43,92	57,18
Fn-Odobești	24,47	0,00	11,67	14,83	21,54	38,17
Bn-Odobești	35,12	11,67	0,00	4,22	10,91	29,39
Bn-lași	37,99	14,83	4,22	0,00	11,19	30,09
Codană-Odobești	43,92	21,54	10,91	11,19	0,00	19,00
Codană-lași	57,18	38,17	29,39	30,09	19,00	0,00

Table 4

Color difference analysis using ΔE 2000

Grape variety	Fn lași	Fn Odob.	Bn Odob.	Bn lași	Codană Odob.	Codană lași
Fn-lași	0,00	17,98	25,49	26,60	33,64	46,18
Fn-Odobești	17,98	0,00	7,80	9,14	15,43	24,60
Bn-Odobești	25,49	7,80	0,00	2,04	7,70	17,56
Bn-lași	26,60	9,14	2,04	0,00	7,56	17,58
Codană-Odobești	33,64	15,43	7,70	7,56	0,00	10,21
Codană-lași	46,18	24,60	17,56	17,58	10,21	0,00

Also, by analyzing the results obtained regarding wine color, it can be stated that, the anthocyanins percentage from total phenolic compounds concentration registers values between 12.84 and 15.22% (tab. 5). Vineyard and phenolic maturity influences can be observed [6], the registered values being 2576.07 mg/L and 2203.01 mg/L for Fetească neagră and 1424.56 mg/L and 1798.21 mg/L for Codană.

Table 5

Total phenolic compounds content and the indexes specific to obtained wines

Grape variety	Digital wine color simulation	Phenolic compounds (mg/L)	D ₂₈₀	IFc	% anthocyanins of total phenolic compounds
Fn-lași		2576,07	31,25	19,46	15,22
Fn-Odobești		2203,73	29,10	16,65	13,23
Bn-Odobești		2033,01	25,72	15,36	13,08
Bn-lași		2025,15	15,40	15,30	13,07
Codană-Odobești		1798,21	17,78	13,58	12,84
Codană-lași		1424,56	11,92	10,76	13,66

Analyzing the total anthocyanins' content of the wines, we can underline the fact that it presents values close to Băbească neagră and very different from Fetească neagră and Codană (392.09 mg/L compared to 194.62 mg/L)(tab. 6).

Table 6

Anthocyanins' content and absorbance values at 520nm

Grape sort	Digital wine color simulation	Anthocyanins (mg/L)	A 520 Control sample	A 520 Sample
Fn-Iași		392,09	0,1664	1,1853
Fn-Odobești		291,48	0,2103	0,9687
Bn-Odobești		265,90	0,1415	0,8337
Bn-Iași		264,79	0,0883	0,7776
Codană-Odobești		230,86	0,1415	0,7429
Codană-Iași		194,62	0,0580	0,5656

The established order for the anthocyanins content of the studied wines is the same with the established hierarchy based on the total phenolic compounds concentrations, the absorption spectrums and with the digital wine color simulation.

Table 7

**Area percentage values of the main nine anthocyanins
(% anthocyanins $\pm$ standard deviation)**

Grape variety	Fn Iași	Fn Odob.	Bn Iași	Bn Odob.	Codană Iași	Codană Odob.
Del-3-gl (%)	5,87 $\pm 0,19$	3,28 $\pm 0,15$	2,13 $\pm 0,03$	1,30 $\pm 0,02$	1,55 $\pm 0,01$	0,60 $\pm 0,01$
Cya-3-gl (%)	0,35 $\pm 0,01$	0,19 $\pm 0,01$	0,00 $\pm 0,00$	0,00 $\pm 0,00$	0,11 $\pm 0,01$	0,00 $\pm 0,00$
Pt-3-gl (%)	11,96 $\pm 1,23$	7,93 $\pm 1,04$	4,74 $\pm 1,12$	4,76 $\pm 0,87$	3,77 $\pm 0,89$	2,31 $\pm 0,34$
Po-3-gl (%)	1,51 $\pm 0,45$	4,08 $\pm 0,08$	0,65 $\pm 0,05$	0,71 $\pm 0,07$	2,31 $\pm 0,12$	2,05 $\pm 0,09$
Mv-3-gl (%)	63,80 $\pm 9,60$	70,86 $\pm 12,13$	67,48 $\pm 7,56$	84,69 $\pm 8,73$	61,12 $\pm 3,44$	77,20 $\pm 6,89$
Po-3-gl-acet (%)	2,14 $\pm 0,02$	0,42 $\pm 0,02$	0,25 $\pm 0,01$	0,31 $\pm 0,00$	1,08 $\pm 0,01$	0,87 $\pm 0,00$
Mv-3-gl-acet (%)	2,99 $\pm 0,12$	3,33 $\pm 0,17$	8,54 $\pm 0,23$	7,98 $\pm 0,12$	13,17 $\pm 0,1$	9,70 $\pm 0,12$
Po-3-gl-cum (%)	1,23 $\pm 0,21$	1,89 $\pm 0,12$	0,81 $\pm 0,04$	0,00 $\pm 0,00$	2,17 $\pm 0,02$	1,01 $\pm 0,01$
Mv-3-gl-cum (%)	10,16 $\pm 2,01$	8,02 $\pm 1,08$	15,40 $\pm 1,23$	0,24 $\pm 0,00$	14,72 $\pm 2,14$	6,25 $\pm 0,45$
$\Sigma gl/(\Sigma acet + \Sigma cum)$	5,05 $\pm 0,00$	6,32 $\pm 0,03$	3,00 $\pm 0,04$	10,71 $\pm 0,04$	2,21 $\pm 0,01$	4,61 $\pm 0,02$
$\Sigma acet/\Sigma cum$	0,45 $\pm 0,00$	0,38 $\pm 0,01$	0,54 $\pm 0,02$	33,91 $\pm 0,02$	0,84 $\pm 0,01$	1,46 $\pm 0,01$

As it can be seen in table 7, the values of area percentage, obtained by means of HPLC, for each main anthocyan, can differentiate the studied wines.

CONCLUSIONS

1. The studied wines can be differentiated according to: absorption spectrums, computerized color simulation, color differences calculation, percentual area of the main anthocyan.

2. The anthocyan content shows an influence of the vineyard and also of the maturity degree at harvest.

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