COMPARATIVE STUDY OF SOME COMPOSITIONAL CHARACTERISTICS OF WHITE AND RED WINES OBTAINED BY FERMENTATION WITH INDIGENOUS AND SELECTED YEAST

STUDIUL COMPARATIV AL UNOR CARACTERISTICI COMPOZIȚIONALE LA UNELE VINURI ALBE ȘI ROȘII OBȚINUTE ÎN URMA FERMENTĂRII CU LEVURI INDIGENE ȘI LEVURI SELECȚIONATE

MOROȘANU Ana- Maria[1], COTEA V.V.[1], NICULAUA M.[2], NECHITA C. B.[1], COLIBABA Lucia Cintia[1], MORARU I.[2], TARȚIAN A.C.[1]

e-mail: morosanu.anamaria88@yahoo.ro

Abstract. *International competition existing in the wine market, consumer demand in terms of adapting to new styles of wines and growing concerns about environmental sustainability in the wine production causes a continuous research of a new technique for modeling the profile of a wine. A new concern for the researchers is the exploitation of indigenous yeasts as a commercial option. This is because the wines made with indigenous yeasts are supposed to have a more complex aromatic level and more specificity. In the case of intensive wine production that already is successfully using selected yeasts the key problem that it comes is the technological efficiency. Thus, if the selected yeast allow a rapid fermentation, has a good tolerance to high levels of ethanol, a reduced production of acetic acid, there remains the question whether native yeast can provide for the technologist the same benefits or even superior results.*

Key words: *fermentation, selected yeast, indigenous yeast, technological efficiency, compositional characteristics*

Rezumat. *Concurența internațională existentă pe piața vitivinicolă, cererea consumatorilor în ceea ce privește adaptarea unor noi stiluri de vinuri, precum și preocupările crescânde cu privire la sustenabilitatea ecologică a producției de vin determină o cercetare continuă a unor noi tehnici de modelare a profilului unui vin. O nouă preocupare a cercetătorilor o reprezintă exploatarea levurilor indigene ca și opțiune comercială. Aceasta se datorează faptului că vinurile realizate cu drojdii indigene sunt percepute ca având o complexitate mai mare la nivel aromatic, dar și o specificitate mai mare. În cazul producției vinicole intensive care deja utilizează cu succes drojdii selecționate se pune problema eficenței tehnologice. Astfel, dacă drojdiile selecționate permit realizarea unei fermentații rapide, prezintă o toleranță bună la nivelurile crescute de etanol, o producție redusă de acid acetic, rămâne deschisă problema dacă drojdiile indigene pot oferi tehnologului aceleași avantaje sau chiar rezultate superioare.*

Cuvinte cheie: *fermentație, levuri indigene, levuri selecționate, eficență tehnologică, caracteristici compoziționale*

[1] University of Agricultural Sciences and Veterinary Medicine of Iasi, Romania
[2] Oenological Research Center, Iasi Branch of the Romanian Academy, Iasi, Romania

INTRODUCTION

Wine by definition is a product resulting from biological and biochemical complexes interactions that occur between grapes (grape juice) and various microorganisms (fungi, yeasts, bacteria) with the participation of mycoviruses and bacteriophages (Fleet, 2003).

In most countries, wine production is based on using selected yeasts able to determine obtaining wines with superior features: high alcohol level, pleasant aromas, reduced production of acetic acid in a relatively short time.

However, using selected yeasts inevitably lead to a standardization of wine styles, so in the end the idea of specificity and biodiversity is much diminished.

The present study aims to identify physico-chemical differences in wines produced by fermentation with indigenous yeasts and selected yeasts.

MATERIAL AND METHOD

The wines analyzed were obtained both from white grape varieties, namely: Fetească regală, Fetească albă, Tămâioasă românească , Muscat Ottonel and black grape varieties: Fetească neagră, Cabernet Sauvignon, Merlot and Băbească neagră. After the vinification process of each grape variety there were obtained two technological variants, namely: control- variant (M) fermented with indigenous yeasts and V1- variant fermented with selected yeast. It is also necessary to mention that the comparative analysis was performed on wine samples coming from the same varieties.

In a first stage, the wines were subjected to common physico-chemical analyzes, respective: acidity, density, pH, alcohol concentration, etc. The analytical methods used to determine these parameters were in accordance with the European standards and those imposed by the OIV (OIV, 2011). In the second stage the wines were studied in terms of phenolic component and it was imposed to do some photometric analyzes with Shimadzu UV-1800 spectrophotometer.

The reading of D280 index polyphenols was achieved at an 280 nm absorbance and for the Folin-Ciocalteu index it was used the method described by Watherhouse in 2002, so in this way the phenolic compounds are expressed by using a gallic acid standard curve with the following concentrations: 50, 100, 250, 500 mg / L (Watherhouse, 2002).

For an objective evaluation of the characteristic color of the wines the recommended method used was the one described by "Eclairage International Comission", namely: Cie Lab 76 (Cotea *et a*l., 2009). The recording of transmittance spectra was performed using a UV-VIS spectrophotometer Carl Zeiss SPECORD coupled with an IBM-PC computer. In this way was made the digitization and the automatic recording of transmittance spectrum in a file stored on the computer. Digitized spectral data was processed with the program "WINECOLOR" to obtain the chromatic parameters L, a, b, c, and H□.

RESULTS AND DISCUSSIONS

This article is a comparative study between different samples of wines obtained from different varieties on which was applied a fermentation process using indigenous and selected yeast.

Table 1

Physico-chemical analysis of the wines

Wines considered	SO_2 mg/L		Vol. acidity ($g/L C_2H_4O_2$)	Total acidity 8($g/L C_4H_6O_6$)	Relative density	Alch. conc. (% vol.)	Reductive subst. (g/L)	T.D.E (g/L)	N.E. (g/L)	pH
	Free	Total								
Fetească regală- M	28.64	92.7	0.58	7.23	0.9993	11.93	2.02	29.18	22.06	3.4
Fetească regală- V_1	26.23	75.88	0.59	7.5	0.9933	12.1	1.23	26.39	25.12	3.34
Fetească albă- M	49.13	102.89	0.48	6.89	0.9989	12.01	2.1	30.36	21.25	3.46
Fetească albă- V_1	33.71	92.08	0.46	6.95	0.9931	12.18	1.77	27.63	19.04	3.31
Tâmâioasă românească- M	31.27	87.36	0.44	5.13	0.9939	11.38	2.37	24.53	22.12	3.71
Tâmâioasă românească – V_1	29.59	85.71	0.42	5.11	0.9924	11.81	2.31	22.71	20.46	3.68
Muscat Ottonel- M	22.89	79.13	0.46	4.92	0.9947	11.42	3.24	25.58	22.28	3.62
Muscat Ottonel- V_1	24.03	81.53	0.43	4.87	0.9958	11.45	3.18	29.24	26.3	3.68
Fetească neagră- M	21.3	105.24	0.33	6.58	0.9923	10.89	1.15	25.69	22.72	3.6
Fetească neagră- V_1	25.12	77.53	0.29	6.99	0.9928	11.23	1.21	25.36	24.09	3.6
Cabernet Sauvignon - M	25.18	71.19	0.69	6.34	0.9912	13.18	1.14	27.68	26.71	3.71
Cabernet sauvignon- V_1	22.34	68.12	0.58	6.49	0.9935	13.46	1.78	29.1	27.35	3.74
Merlot- M	26.52	105.78	0.49	6.28	0.9929	11.89	1.24	25.46	24.27	3.69
Merlot- V_1	19.37	92.18	0.45	6.78	0.9934	12.23	1.38	26.29	25.12	3.57
Băbească neagră- M	20.28	75.36	0.45	5.96	0.9933	11.59	1.18	22.37	21.11	3.63
Băbească neagră- V1	11.77	37.45	0.23	6.05	0.9938	11.97	1.59	24.52	22.96	3.66

The compositional charactheristics of the analysed wines are presented in the Table 1. Observing two parameters: the alcohol concentration and the reductive substances, the wine samples that were analyzed can be included in the category of dry quality wines.

Following the physico-chemical analyses that were conducted on the wine samples, it can be seen that no major differences were found between the parameters of the control samples and those of the samples treated with selected yeasts.

Though, a slightly difference could be observed in the case of Băbească neagră wine samples concerning the volatile acidity feature. Thereby, the Băbească neagră – control sample fermented with indigenous yeasts had a higher value of volatile acidity, 0.45 g/L acetic acid than the Băbească neagră sample fermented with selected yeasts which has recorded a lower value of 0.23 g/L acetic acid.

Analyzing the alcohol concentration, it can be observed that this parameter presented insignificant variations, except wine samples obtained from Fetească neagră variety. So, the control sample obtained from Fetească neagră grapes recorded a lower value of the alcohol concentration feature of 10.89 %, than the V1 sample obtained from the same variety, respectively 11.23 %.

For each pair of samples, using the spectrophotometry it was observed the variation of two features, namely: the index of total polyphenols (IPT) and the Folin-Ciocâlteu index (IFC).

In the case of Fetească regală, Tămâioasă românească, Merlot and Băbească neagră samples, there were no significant differences recordered for the index of total polyphenols (IPT) and Folin-Ciocâlteu index (figure 1). However, the Fetească albă control sample presented a higher value for the Folin- Ciocâlteu index of 4.46 than the Fetească albă V1- sample which registered a lower value of 3.48.

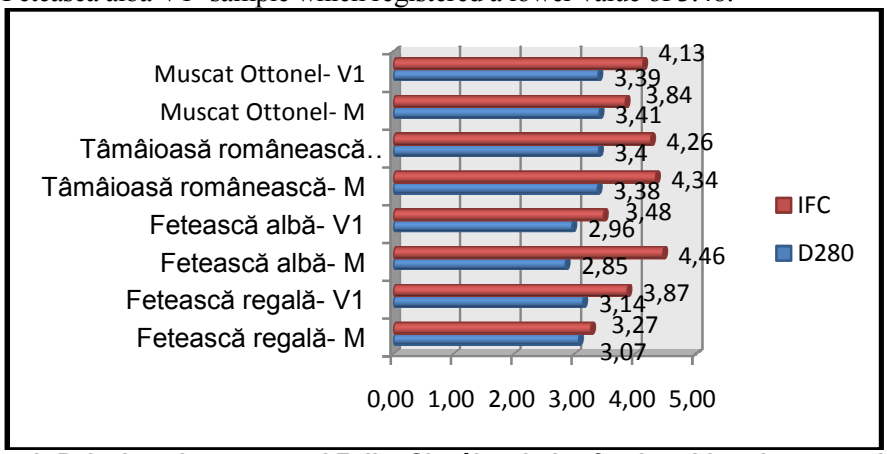

Fig. 1- Polyphenol content and Folin- Ciocâlteu index for the white wines samples

Observing the Muscat Ottonel samples, it can be seen that the control sample had a lower value of the polyphenol index with reducing proprieties than the sample V1 treated with selected yeasts.

The Fetească neagră sample treated with selected yeasts presented higher values for both Folin- Ciocâlteu index and total polyphenols index, respectively 32.79 and 25.26 than the control sample.

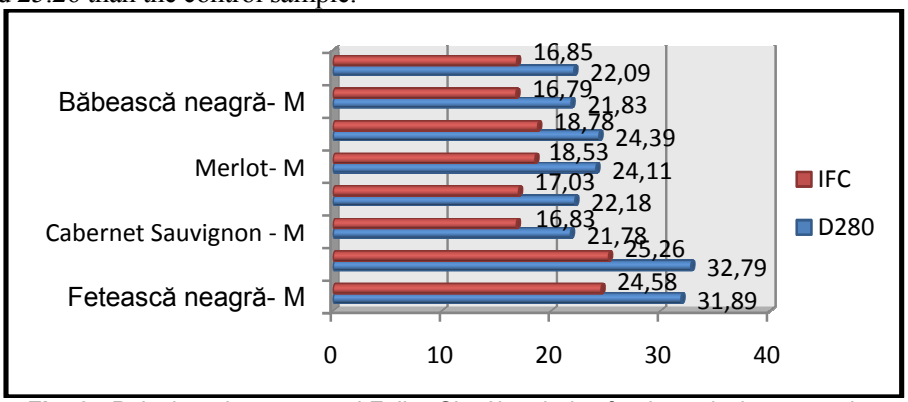

Fig. 2 - Polyphenol content and Folin- Ciocâlteu index for the red wines samples

In what concerns the Cabernet Sauvignon samples, from Figure 2, it can be seen the same variations both for the Folin- Ciocâlteu and total polyphenols index that were noted in the case of Fetească neagră samples.

Thereby, the Cabernet Sauvignon samples treated with selected yeasts presented higher values for Folin- Ciocâlteu and total polyphenols index than the control samples.

Table 2

Values of chromatic parameters of the analyzed wines

Samples	L	Color coordinates		C	H	I	N	Color
		a	b					
F. R. - M	95.36	1.75	5.53	4.63	-80.39	0.21	1.97	
F. R. - V_1	99.27	1.46	3.92	1.98	-76.59	0.15	0.05	
F. A. - M	98.10	1.64	7.01	7.04	-84.65	0.14	3.83	
F. A. - V_1	98.22	1.69	6.98	7.00	-84.24	0.13	4.00	
T. R. - M	93.66	2.05	8.56	7.28	-75.61	1.02	1.37	
T. R. – V_1	92.87	2.41	8.08	7.56	-77.21	0.23	1.48	
M. O. - M	94.53	-0.27	5.86	5.33	-81.42	0.98	1.21	
M. O. - V_1	95.88	-0.51	5.92	6.08	-80.89	0.96	0.99	
F. N. - M	37.69	49.56	28.97	57.29	30.28	3.51	0.81	
F. N. - V_1	30.98	52.11	40.89	66.25	38.08	4.79	0.85	
C. S. - M	6.79	35.92	11.48	37.64	17.77	13.43	0.59	
C. S. - V_1	6.78	35.89	11.47	3761	17.75	13.47	0.59	
Merlot- M	31.88	57.94	41.21	71.09	35.32	5.11	0.69	
Merlot- V_1	31.14	57.01	45.23	72.76	38.41	5.39	0.71	
B. N. - M	64.52	43.89	20.48	48.47	25.08	1.79	0.69	
B. N. - V1	55.01	52.61	15.87	54.98	16.81	2.04	0.68	

*L- clarity; C- saturation; H- tone; I- intensity of color; N- color tint.

Analyzing data obtained using the spectrophometer, it can be observed (Table 2) that the white wine samples presented specific yellow and light red shades of color, excepting the Muscat Ottonel samples where predominated the green and yellow shades of color. In the case of red wine samples, as expected the red and yellow shades of colour prevailed.

As expected, from the analysis of the L-parameter (brightness), it resulted that the white wine samples presented a high level of clarity. However, the Fetească regală samples and the Fetească albă samples had higher values of L-parameter than the other white wine samples analyzed. In the case of red wine samples, the lowest values of brightness were recorded by the Cabernet Sauvignon samples and the highest values were registered by the Băbească neagră samples. The facts stated above were sustained once again by the simulated colors from Table 2.

In order to emphasis the impact of the yeast on the physico- chemical features of the analyzed samples it was conducted a paired t-test. For each pair of samples, it was considered a general hypothesis: that the fermentation process conducted with indigenous yeasts (control samples) and with selected yeasts (V1-samples) had a significant influence on the physico-chemical features of the analyzed wines.

The statistical results revealed for each pair of samples the value of P (significance) was higher than 0.05. Therefore, it can be stated that the variable didn't had a significant impact on the physico-chemical features of the analyzed pairs.

CONCLUSIONS

Following the results of the physico- chemical characteristics (specifically the alcohol concentration and the reductive substances) obtained by analyzing the considered pair of samples, these could be included in the category of quality dry wines.

So, in this preliminary study, it can be concluded that the type of yeasts used (indigenous yeasts and selected yeasts) didn`t had a major influence on the physico-chemical features, such as: alcohol, density, volatile acidity, total acidity, T.D.E, N.E., pH, etc. This statement is supported once again even by the statistical analysis performed, for which it was obtained a value higher than 0.05 for the P (significance) feature.

However, it has been observed that using different types of yeasts did had a slightly influence on the phenolic profile of the wines. In this case, remains open the question of the yeast influence on the phenolic and flavor components.

REFRENCES

1. **Fleet H. Graham, 2003 -** *Wine microbiology and biotechnology*. Ed. Harwood Academic Publisher, Singapore, p. 233- 234
2. **Fleet H. Graham, 2003**- *Yeast interactions and wine flavor*. International Journal of Food and Microbiology, 86: 11–22.
3. **OIV, 2013** - *Compendium of international methods of wine and must analysis*. Volume 1 and 2, Paris.
4. **Rankine B. C., 1968** - *The importance of yeasts in determing the composition and quality of wines*. Vitis Journal, 7: 22- 49