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THE INFLUENCES OF WINEMAKING TECHNOLOGIES AND GRAPES WINEGROWING AREA ON CHEMICAL COMPOSITION OF FETEASCA NEAGRA RED WINES

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Abstract

Feteasca neagra is a romanian red wine variety obtained from grapes originated in 4 different terroirs (Pietroasa, Bucuresti, Odobesti şi Valea Calugareasca). Grapes were vinified in the autumn of 2009 by classical winemaking technology, excepting maceration – fermentation which was made in the absence or in the presence of extraction enzymes. There were obtained six technological variants, one control (to which will be reported the results obtained after analyzing all the established variants) and five adding different oenological materials (V1 = control, V2 = selected yeast Lalvin BM 45 + chips, V3 = selected yeast Lalvin BM 45 + enzyme, V4 = selected yeast Lalvin BM 45 + enzyme Lallzyme OE + chips, V5 = selected yeast Lalvin BM 45+ enzyme Lallzyme OE + tannin Limousine, V6 = selected yeast Lalvin BM 45 + enzyme Lallzyme OE + tannin Tostato), with three repetition for each variant. For Bucharest center were obtained only four technological variants (V3 – V6), because there were no samples produced without enzymes from Bucharest grapes. The results were reported as means of all repetitions. The present study was made to evaluate the sensory profile in order to determinate the effect of enzyme, oak chips and liophylised tannins addition. The differences presented in volatile profile were evaluated by performing Principal Component Analysis (PCA) and Discriminant Factor Analysis (DFA) on the basis of chromatograms obtained with a dual-column gas-chromatograph working on the principle of an electronic nose based on flash-chromatography. The results showed that both the winemaking technology and terroir had a big influence on volatile profile of analyzed wines. The physical-chemical analyses of the produced wines showed that the winemaking technology applied has a big influence on analyzed chemical parameters (acidity, alcohol, dry content, colour hue and intensity). We may also say that the wine-growing area has influence on chemical composition of studied wines.

Keywords: *Malus x domestica*; energy balance; energy inputs; integrated production

1. INTRODUCTION

Feteasca neagra

is an autochthonous variety increasingly recognized as an important representative for our red wine assortment. As such, it has witnessed a rapid spread to various viticultural regions of the country. This variety leads to wines of very good color and a complex red fruit and plum aroma which, however, depends on vintage year and cultivation region.

The present paper present a set of wines produced from grapes of four different winegrowing region (Bucharest, Odobesti, Valea Calugareasca and Pietroasa), assessing the differences induced by winemaking technologies and geographic area.

2. MATERIAL AND METHODS

Feteasca neagra grapes were harvested in the autumn of 2009 from four different Romanian vineyards (Bucharest, Odobesti, Valea Calugareasca and Pietroasa) and vinified in 6, respectively 4 technological variants in our laboratory. The winemaking was performed in vats by classical maceration on cap in the absence or in the presence of extraction enzymes. One month after the fermentation was completed, oak chips and lyophilized tannins were added in both enzyme treated wines and non-enzyme treated wines. Each technological variant was obtained in triplicate. In brief, all the variants are presented in Table 1.

The oenological yeast BM45 used for the fermentation of all samples was provided by Lallemand and is mostly recommended for red wines, in which it enhances the varietal character, with a moderate fermentation speed at a temperature between 18-28°C. According to the producer's description BM45 yeast produces high levels of polyphenol-reactive polysaccharides, resulting in wines with great mouth feel and improved color stability.

The extraction enzyme used, Lallezyme OE from Lallemand, is a high concentration pectinase from *Aspergillus niger* recommended for red grapes maceration. It also displays medium cellulase and hemicellulase secondary activities, allowing for a smooth extraction effect.

The oak chips were Pronektar medium toast from American oak provided by Tonnellerie Radoux USA. Generally the American oak chips release in wines less tannins than French oak chips, but they confer slightly more aroma of vanilla and cocoa.

The tannins used were both provided by Enologica Vason. The Premium Limousin is a granulated tannin obtained from oak wood from the Limousin region of France through a special hydro-alcoholic extraction that allows the extraction of substances similar to those extracted during aging in wooden casks. This tannin contributes to the stabilization of the color fractions of red wines, improving the aging potential and its resistance to oxidation. The Premium Tostato is a granulated tannin obtained from toasted French cask oak through a special extraction and desiccation process. This product is a very soft tannin, supposed to increase the woody toasty hints tending towards cocoa.
The wines were analyzed 4 months after the completion of fermentation. The physico – chemical parameter were determined using standard anlysis methods. Colour characteristics were tested using Specord 250 spectrophotometer. The results of physico – chemical analysis of the 22 variants of studied wines are reported as means of all repetions and presented in table nr. 2.

Table 1. The technological variants wines produced from Feteasca neagra (FN) grapes

Terroir	Technological variant	Type of oenological product	Dosage and time of addition
Odobesti	FNO1 (r1, r2,r3)	Selected yeast	30 g/hl BM45 yeast (in the beginning of fermentation)
	FNO2 (r1, r2,r3)	selected yeast + oak chips	30 g/hl BM45 yeast + 250 g/hl oak chips (added after fermentation, kept in contact 4 weeks)
	FNO3 (r1, r2,r3)	selected yeast + maceration enzyme	30 g/hl BM45 yeast + 2 g/hl Lallzyme OE enzyme (in the beginning of fermentation)
	FNO4 (r1, r2,r3)	selected yeast + maceration enzyme + oak chips	30 g/hl BM45 yeast + 2 g/hl Lallzyme OE enzyme + 250 g/hl oak chips (added after fermentation, kept in contact 4 weeks)
	FNO5 (r1, r2,r3)	selected yeast + maceration enzyme + Limousin tannin	30 g/hl BM45 yeast + 2 g/hl Lallzyme OE enzyme + 2 g/hl Limousin tannin (added after fermentation)
	FNO6 (r1, r2,r3)	selected yeast + maceration enzyme + Tostato tannin	30 g/hl BM45 yeast + 2 g/hl Lallzyme OE enzyme + 2 g/hl Tostato tannin (added after fermentation)
Pietroasa	FNP1 (r1, r2,r3)	Selected yeast	30 g/hl BM45 yeast (in the beginning of fermentation)
	FNP2 (r1, r2,r3)	selected yeast + oak chips	30 g/hl BM45 yeast + 250 g/hl oak chips (added after fermentation, kept in contact 4 weeks)
	FNP3 (r1, r2,r3)	selected yeast + maceration enzyme	30 g/hl BM45 yeast + 2 g/hl Lallzyme OE enzyme (in the beginning of fermentation)
	FNP4 (r1, r2,r3)	selected yeast + maceration enzyme + oak chips	30 g/hl BM45 yeast + 2 g/hl Lallzyme OE enzyme + 250 g/hl oak chips (added after fermentation, kept in contact 4 weeks)
	FNP5 (r1, r2,r3)	selected yeast + maceration enzyme + Limousin tannin	30 g/hl BM45 yeast + 2 g/hl Lallzyme OE enzyme + 2 g/hl Limousin tannin (added after fermentation)
	FNP6 (r1, r2,r3)	selected yeast + maceration enzyme + Tostato tannin	30 g/hl BM45 yeast + 2 g/hl Lallzyme OE enzyme + 2 g/hl Tostato tannin (added after fermentation)
Bucuresti	FNB3 (r1, r2,r3)	selected yeast + maceration enzyme	30 g/hl BM45 yeast + 2 g/hl Lallzyme OE enzyme (in the beginning of fermentation)
	FNB4 (r1, r2,r3)	selected yeast + maceration enzyme + oak chips	30 g/hl BM45 yeast + 2 g/hl Lallzyme OE enzyme + 250 g/hl oak chips (added after fermentation, kept in contact 4 weeks)
	FNB5 (r1, r2,r3)	selected yeast + maceration enzyme + Limousin tannin	30 g/hl BM45 yeast + 2 g/hl Lallzyme OE enzyme + 2 g/hl Limousin tannin (added after fermentation)
	FNB6 (r1, r2,r3)	selected yeast + maceration enzyme + Tostato tannin	30 g/hl BM45 yeast + 2 g/hl Lallzyme OE enzyme + 2 g/hl Tostato tannin (added after fermentation)
Valea Calugareasca	FNV1 (r1, r2,r3)	Selected yeast	30 g/hl BM45 yeast (in the beginning of fermentation)
	FNV2 (r1, r2,r3)	selected yeast + oak chips	30 g/hl BM45 yeast + 250 g/hl oak chips (added after fermentation, kept in contact 4 weeks)
	FNV3 (r1, r2,r3)	selected yeast + maceration enzyme	30 g/hl BM45 yeast + 2 g/hl Lallzyme OE enzyme (in the beginning of fermentation)
	FNV4 (r1, r2,r3)	selected yeast + maceration enzyme + oak chips	30 g/hl BM45 yeast + 2 g/hl Lallzyme OE enzyme + 250 g/hl oak chips (added after fermentation, kept in contact 4 weeks)
	FNV5 (r1, r2,r3)	selected yeast + maceration enzyme + Limousin tannin	30 g/hl BM45 yeast + 2 g/hl Lallzyme OE enzyme + 2 g/hl Limousin tannin (added after fermentation)
	FNV6 (r1, r2,r3)	selected yeast + maceration enzyme + Tostato tannin	30 g/hl BM45 yeast + 2 g/hl Lallzyme OE enzyme + 2 g/hl Tostato tannin (added after fermentation)

Table 2. Principal physico – chemical parameters (average)

Sample	Acidity g/l tartaric acid	Alcohol vol./vol %	Dry content g/l	Color intensity ICM = D420+ D520+ D620	a	b
FNO1	14.53	8.33	40.63	7.34	48.36	-2.74
FNO2	14.4	8.08	42.69	7.30	50.27	-2.83
FNO3	14.81	8.15	34.03	6.60	47.56	-3.52
FNO4	14.66	8.01	36.23	6.74	48.00	-3.36
FNO5	14.68	8.26	35.48	6.80	47.95	-3.00
FNO6	14.64	8.36	37.36	6.83	48.45	-2.90
FNP1	12.16	5.68	30.56	4.06	22.62	3.50
FNP2	12.03	5.94	30.53	3.93	23.34	2.69
FNP3	11.99	6.15	32.78	4.32	25.66	3.78
FNP4	12.24	6.15	32.71	3.82	22.12	3.42
FNP5	12.39	6.17	33.23	4.11	24.39	3.08
FNP6	12.3	6.15	33.13	4.16	24.81	3.02
FNV1	12.33	6.57	26.41	3.08	23.27	-0.10
FNV2	12.35	6.57	26.3	2.94	22.30	-0.56
FNV3	12.51	6.85	26.3	3.55	26.72	-0.85
FNV4	13.14	6.97	28.03	3.6	26.74	-0.79
FNV5	13.19	6.88	28.61	3.6	26.59	-0.86
FNV6	13.23	7.04	28.36	3.71	27.64	-1.07
FNB3	11.59	7.72	33.83	3.50	25.32	1.57
FNB4	11.65	7.86	33.81	3.67	24.61	1.90
FNB5	11.71	7.91	34.41	3.76	25.87	1.73
FNB6	11.73	7.98	34.96	3.72	26.17	1.63

3. RESULTS AND DISCUSSION

The first obvious difference due to production region is the acidity of the samples, which is strictly correlated with the geographical area, more than with the winemaking technology.

Figure nr.1 present an increase of acidity for V6 variant (yeast+enzyme+Tostato tanin) compare to V1 variant (control=yeast) for wines obtained from grapes cultivate in Odobeşti, Pietroasa and Valea Călugărească centers and compare to V3 variant for Bucuresti center.

The acidity increse begin with V3 variant, when the enzyme was added.

Acidity analysis of tested samples relieve the highest value for Odobeşti center with an average value of 8,20 g/l tartaric acid and the minimum value for Pietroasa center of 6,04 g/l tartaric acid.

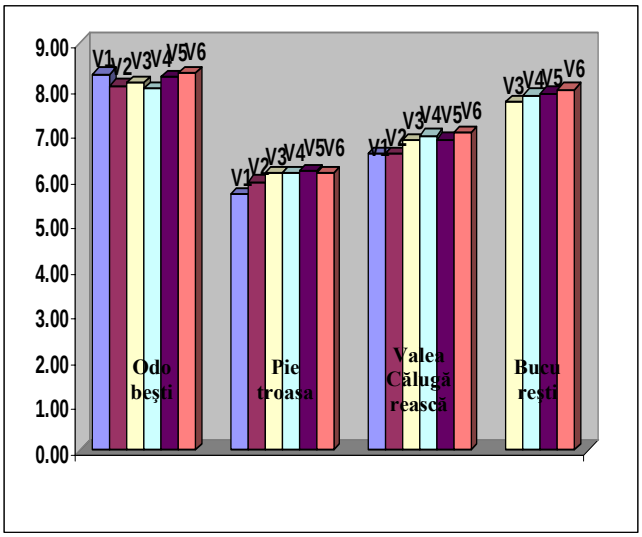

Figure 1. Winemaking technologies influence on tested samples acidity

Regarding the alcohol content of all the analyzed samples (Fig.2) we can see the it was not influenced by winemaking technology applied for each variant. The highest value were recorded for samples of Odobesti wine, with an average value of 14,62 % v/v and the lowest for samples of Bucuresti, with an average value of 11,67 %v/v.

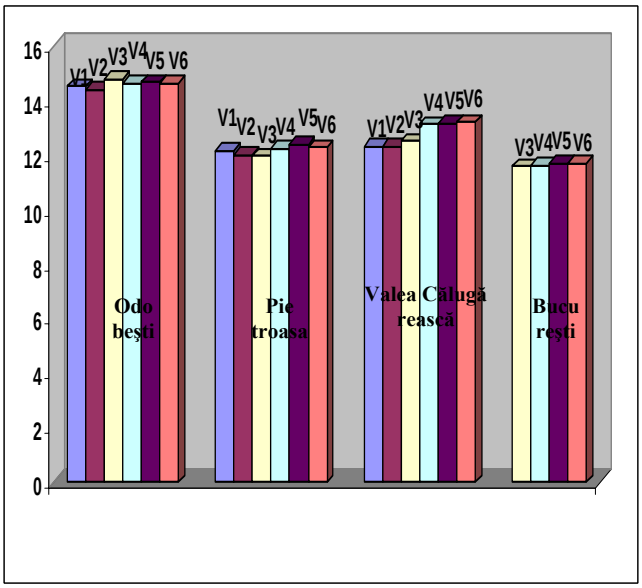

Figure 2. Winemaking technologies influence on tested samples alcohol content

In the case of colour intensity ICM the highest values are recorded for wine from Odobesti center with an average value of 6,94 and the lowest for wines from Valea Calugareasca center, with an average value of 3,41.

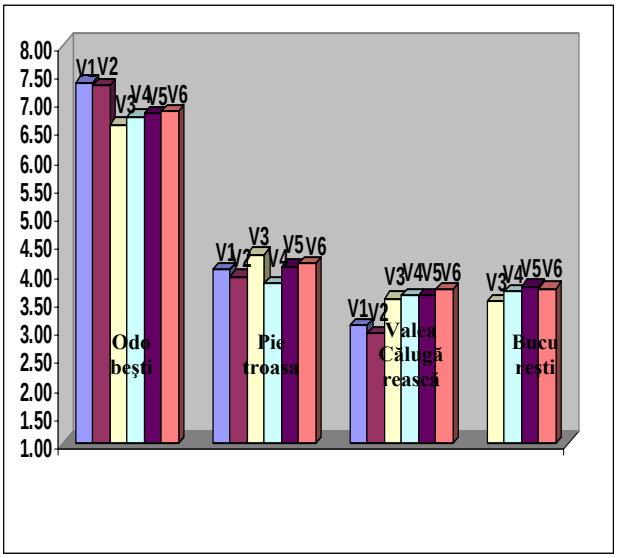

Figure 3. Colour intensity ICM of tested samples

The dry extract content for all the four analized centers is slowly increasing for the samples treated with enzyme (Fig. 4). The highest values were recorded for wines from Odobesti center with an average valu of 37,74 g/l and the lowest for wines from Valea Calugaresca center, with an average value of 27,34 g/l.

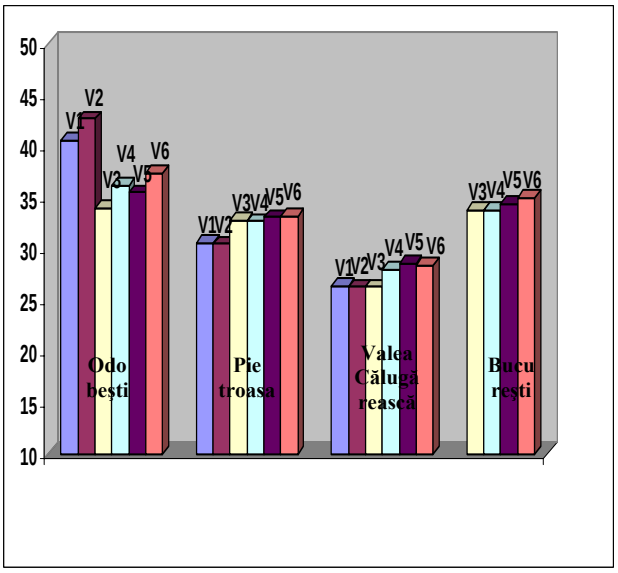

Figure 4. Winemaking technologies influence on tested samples dry content

4. CONCLUSIONS

Althought there are differences between the technological variants amoung every wine-growing area and variety the differences induced by terroir are dominants.

The analysis of Feteasca neagră wines from the four wine-growing center shows that both winemaking technology and wine- growing region has a big influence on chemical composition and colour parameters of wines. More obvious than winemaking technology is the influence of geographic area.

We must also keep in ming that the wines, at the moment of analysis were very young – only 4 months.

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