PHYSICAL-CHEMICAL CHARACTERISATION OF SOME RED WINES OBTAINED THROUGH CLASSICAL TECHNOLOGY FROM IASI VINEYARD

CARACTERIZAREA FIZICO-CHIMICĂ A UNOR VINURI ROŞII OBŢINUTE PRIN TEHNOLOGIA CLASICĂ DIN SOIURILE ROMÂNEŞTI DIN PODGORIA IAŞI

***BUBURUZANU C.*[1], *COTEA V.V.*[1], *NICULAUA M.*[2], *ZAMFIR C. I.*[2], *GEORGESCU O.*[1], *MORARU I.*[1]**

[1]University of Agricultural Sciences and Veterinary Medicine Iaşi, Romania

[2]Research Centre for Oenology - Iaşi branch of Romanian Academy[2]

Abstract: *The present study analyses the evolution of some parameters when producing red wines from Romanian grape varieties of Iasi vineyard, through the classical fermentation technology, with no enzymes and selected yeasts addition. The wines have been characterised through their physical-chemical basic analyses: alcoholic concentration, total acidity, volatile acidity, volumic mass, reductive sugars, non reductive extract and phenolic compounds. Following analysis of red wines a correlation was shown to exist between the quantity of phenolic acids and anthocyans, expressed in galic acid.*

Key words: physical-chemical parameters, Romanian grape varieties, colour, anthocyans profile, phenolic acids, galic acids.

Rezumat: *În studiul de faţă s-a urmărit evoluţia unor parametri ai unor vinuri roşii provenite din soiuri româneşti de struguri din podgoria IAŞI, obţinute prin tehnologia clasică de fermentare, fără însămânţare cu levuri şi enzime. Vinurile au fost caracterizate prin efectuarea analizelor fizico-chimice de bază: concentraţia alcoolică, aciditatea totală, aciditatea volatilă, masa volumică, zaharurile reducătoare, extract nereducător, compuşi fenolici. În urma analizei datelor obţinute privind vinurile roşii s-a evidenţiat existenţa unei corelaţii între cantitatea de acizi fenolici şi cea de antociani, exprimată prin proporţia de acid galic.*

Cuvinte cheie: parametri fizico-chimici, soiuri autohtone, culoare, profil antociani, acizi fenolici, acid galic

INTRODUCTION

Maceration-fermentation is a very important step in red wines production (Cotea D.V. ş.a., 2009). The present study aims at characterising through physical-chemical analyses the red wines from Iasi vineyard obtained by a classical fermentation process without adding yeasts and enzymes.

MATERIAL AND METHOD

In this study red grapes from local grape varieties was (Rotaru Liliana, 2009) were used, 2009 harvest, from the Ampelographic Collection of UŞAMV Iaşi.

Table 1

Compositional characteristics of grapes at harvest

No.	Vineyard	Reductive sugars (g/L)	Total acidity (g/L) $C_4H_6O_6$
1	Amurg	170	7.66
2	Arcaş	215	6.32
3	Balada	193	7.26
4	Băbească neagră	168	6.91
5	Bătută neagră	138	7.05
6	Busuioacă de Bohotin	198	7.68
7	Codană	143	6.98
8	Fetească neagră	193	6.51
9	Negru aromat	227	7.49
10	Negru de Căuşani	193	7.79
11	Negru de Drăgăşani	182	7.56
12	Negru vârtos	138	6.91
13	Negru moale	170	8.04
14	Novac	198	7.11
15	Vulpe	221	7.53

Harvesting was done manually, in wooden crates. The grapes were processed at the Pilot Research Station of the Horticulture Faculty Iasi. The obtained must was homogenised and processed as the classical maceration –fermentation technology foresees, (Cotea D.V. 1985) in stainless steel tanks (KEG), for 120 hours with cap washing 4 times/day. After the maceration-fermentation was over, the marc was pressed with a hydraulic pump, the must passing into glass vessels, where it finished its alcoholic and malolactic fermentation. Bottling was done after a sterile filtering with SA 795 (40x40) paper filtering disks – for normal filtering – and SA 995 (40x40) – for sterile filtering. The physical-chemical analyses were done according to methods of national and international standards and specific literature. The chromatic parameters of the wine samples were calculated according to CIE Lab 76 method, according to the registered absorption spectrum of each sample. In order to minimise errors, adequate vials were used for each wine sample, concerning the liniar domain of the method, of 0,1 – 1,2 absorbency units. The content in phenolic compounds is measured through its characteristic indices: IFC, IPT (D_{280}) and I_{Mn}. The Folin - Ciocâlteu index (IFC) is specific only to phenolic compounds with reductive qualities. The total polyphenolic index (IPT or D_{280}) registers the content of total phenolic compounds (phenolic acids, tannins and colour compounds) in wines. These parameters were determined by the UV-VIS AnalytikJena Specord 200 spectrophotometer, as the specific literature (Compendium of International Methods of Analysis of Wine and Musts, 2009 - O.I.V., Paris) confirms.

RESULTS AND DISCUSSIONS

The main compositional characteristics of the wines obtained from local grape varieties of Iasi vineyard are shown in table 2. The alcoholic concentration has values between 8,67% vol. at Codană wine and 13,78% vol. in Fetească neagră wine (fig.1). The maximal values of the non-reductive extract (fig.2) was obtained in the Negru moale wine (30,9 g/L), while the minimal was found to be

in Busuioacă de Bohotin wine (19,1 g/L), showing that the obtained wines can be classified as controlled origin denomination wines. The remnant sugar quantity was low, the wines obtained were dry, the highest value being found in Novac wine (3,29 g/L). An exception is the wine sample obtained from Busuioacă de Bohotin grapes, with a sugar content of 17,04 g/L. Total acidity values vary from 5,62 g/L tartaric acid in Arcaş wine, up to 7,39 g/L tartaric acid in Negru moale.

Table 2

Compositional characteristics of red wines obtained from local grapes varieties from IASI vineyard

No.	Grape variety	Free SO_2	Volatile acidity g/L $C_2H_4O_2$	Total acidity g/L $C_4H_6O_6$	Density	Alcohol	Non-reductive extract
1	Amurg	74.54	0.20	6.96	0.9938	10.51	20.3
2	Arcaş	52.75	0.07	5.62	0.9918	12.84	22.2
3	Balada	57.48	0.14	6.66	0.9918	12.49	21.4
4	Băbească neagră	59.69	0.26	6.21	0.9950	10.95	24.8
5	Bătută neagră	88.75	0.30	6.35	0.9936	9.32	19.2
6	Busuioacă de Bohotin	90.65	0.96	7.05	0.9998	11.85	19.1
7	Codană	43.59	0.42	6.18	0.9938	8.67	20.0
8	Fetească neagră	80.54	0.20	5.71	0.9924	13.78	26.6
9	Negru aromat	112.12	0.21	6.79	0.9929	14.65	30.5
10	Negru de Căuşani	32.53	0.66	6.79	0.9905	12.18	19.7
11	Negru de Drăgăşani	41.06	0.18	6.96	0.9925	10.96	21.1
12	Negru vârtos	26.21	0.71	6.22	0.9957	9.01	19.5
13	Negru moale	33.48	0.61	7.39	0.9995	10.07	30.9
14	Novac	57.80	0.57	6.44	0.9931	12.65	23.3
15	Vulpe	124.44	0.21	6.83	0.9932	13.34	24.4

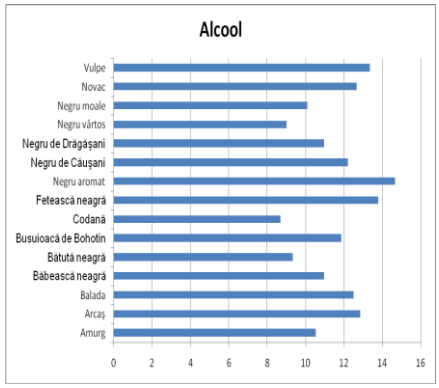

Fig. 1. Alcohol

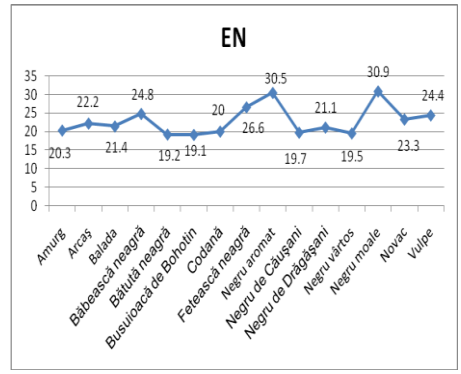

Fig. 2. Non-reductive extract

Table 3

Chromatic parameters values of wines obtained from Romanian grape varieties from IASI vineyard

No.	Grape variety	Clarity L 0(opaque) – 100(transparency)	Color coordinates a red(+) green(-)	Color coordinates b yellow(+) blue(-)
1	Amurg	44,7	59,35	35,69
2	Arcaş	27,3	48,52	46,97
3	Băbească neagră	87,8	15,73	14,47
4	Balada	22,5	48,43	38,61
5	Bătută neagră	59,3	50,82	26,25
6	Busuioacă de Bohotin	60,6	40,26	18,19
7	Codană	86,9	24,54	7,39
8	Fetească neagră	24,3	54,48	35,06
9	Negru aromat	29,0	58,67	49,83
10	Negru de Căuşani	19,1	51,56	32,69
11	Negru de Dragaşani	14,5	43,93	24,85
12	Negru moale	61,0	47,14	20,75
13	Negru vârtos	68,0	41,98	11,86
14	Novac	30,5	61,57	52,47
15	Vulpe	6,3	35,58	10,75

Of the entire colour components measured using the CIE Lab76 method, the most important are clarity L and the values of the changes *a* and *b* parameters undergo. Clarity L characterises the visual aspect more or less shiny of the wine and can have values between 0 (zero) for a black – opaque sample and 100 (one hundred) for colourless, transparent samples. Clarity L (Tab. 2) varies from 87,8 in Băbească neagră to 6,3 in Vulpe wines. The „a“ red-green component of the colour represents the coordinate of the red-green complementary colours. This parameter frequently has negative values for white wines where green tones are preponderant to red ones and positive values in red wines, with values between 15,73 in Băbească neagră and 61,57 in Novac. The „b“ yellow-blue component of colour represents the coordinate of the yellow-blue complementary colours. The values of this parameter are usually positive, the yellow nuances being preponderant towards the blue ones, the minimal value being registered in Codană (7,39).

Classifying the analysed wines according to the computerised analysis of colour parameters is as follows: the highest vales are found in Vulpe wine, then Balada, Novac, Negru de Drăgăşani, Fetească neagră, Arcaş, Negru aromat, Negru de Căusani, Negru vârtos, Bătută neagră, Băbească neagră, Negru moale, Amurg, Codană and Busuioacă de Bohotin wines.

One could notice that the order established by the values of the content of total phenolic compounds in studied wines is the same with the hierarchy drawn based on the anthocyans content with the ones established on the absorption spectrums specific to each wines and with the one configured by the digital

simulation of wines' colour, as previous research have shown. At the same time, one must know that the harvest time of the grape varieties from the Ampelographic Collection of UASMV Iaşi, has been the same for all grapes (24.09.2009), not all having reached their full maturity, being varieties with a longer vegetation period, meant for the South of Romania.

The phenolic compounds contribute to the savour and body of the wine, bringing astringency when in too much quantity, influencing their colour and appearing in must or wine changes (oxidative processes, aging processes) and in conditioning treatments, pushing back the oxidation of other components in the wine.

Following the analyses of data obtained from the red wines processed from local grape varieties of IASI vineyard, a correlation between the quantity of phenolic acids (IFC galic acid equivalent) and that of anthocyans, one can see that the values close to 1 show an equilibrium between phenolic compounds, sub-unitary values demonstrate the preponderance of compounds with antioxidant properties, while values higher than 1 – preponderance of anti-reductive compounds.

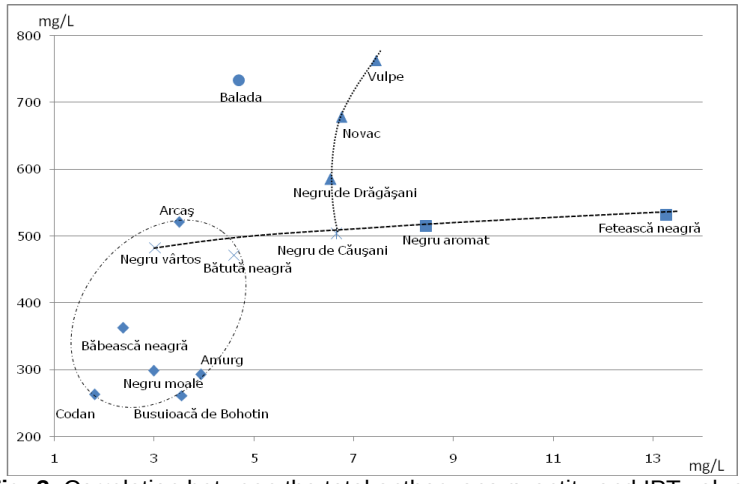

Fig. 3. Correlation between the total anthocyans quantity and IPT values

Figure 3 represents the correlation of the total quantity of anthocyans and the IPT values (mg/L galic acid), three levels being visible, suggesting the existence of some common characteristics: the grape varieties Arcaş, Negru vârtos, Bătută neagră, Băbească neagră, Negru moale, Amurg, Codană and Busuioacă de Bohotin in one field, Vulpe, Novac, Negru de Drăgăşani and Negru de Căuşani on a axis with a growing tendency while Negru vârtos, Bătută neagră, Negru de Cauşani, Negru aromat and Fetească neagră, on a slightly growing median axes.

Regarding the correlation between the total anthocyans quantity and IFC values (mg/L galic acid) (fig. 4), the grouping of the values is slightly different than the previous case, in the same field being Băbească neagră, Negru moale, Amurg, Codană and Busuioacă de Bohotin, while, at the same time, two

ascending areas, approximately parallel, are formed by the Codană, Băbească neagră, Negru vârtos, Arcaş and Balada, respectively by Busuioacă de Bohotin, Amurg, Bătută neagră, Negru de Drăgăşani, Novac and Vulpe, the common aspect being represented by the group on the median axes of the same grape varieties (Bătută neagră – Fetească neagră).

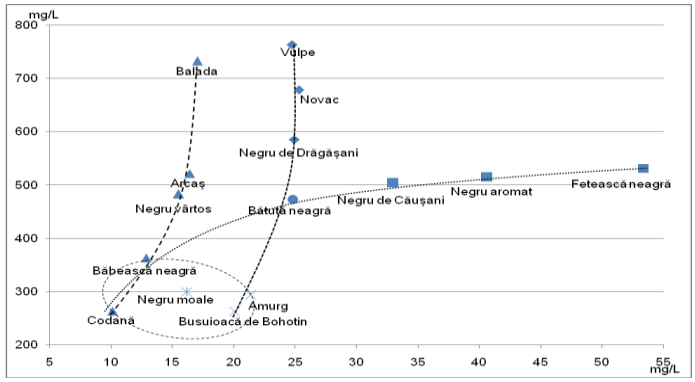

Fig. 4. Correlation between the total anthocyans quantity and IFC values

CONCLUSIONS

1. The main compositional characteristics of red wines obtained from local grape varieties in Iasi vineyard allow their registry in the quality category of controlled origin denomination.

2. Classification according to computerised determination of colour parameters in wines obtained from local grape varieties through classical maceration fermentation methods clearly underlines the extended possibility of producing a large palette of red wines according to their colour intensity.

3. The values of the phenolic compounds are data proof of the savour and body of the obtained wines, thus influencing their colour and their antioxidant properties.

REFERENCES

1. **Cotea D.V., Barbu N., Grigorescu C., Cotea V.V.**, 2000 - *Podgoriile şi vinurile României*. Editura Academiei Române, Bucureşti.
2. **Cotea D.V., Zănoagă V. C., Cotea V.V.,** 2009 - *Tratat de oenochimie*, vol.1 si 2. Editura Academiei Române, Bucureşti.
3. **Cotea V.V.**, **Cotea D.V.,** 2006 - *Tehnologii de producere a vinurilor*. Editura Academiei Române, Bucureşti.
4. **Pomohaci N., Cotea V.V., Popa A., Stoian V., Sîrghi C., Nămoloşanu I., Antoce Arina**, 2001 - *Oenologie*, vol. 2. *Îngrijirea, stabilizarea şi îmbutelierea vinurilor. Construcţii şi echipamente vinicole*. Editura Ceres, Bucureşti.
5. **Rotaru Liliana**, 2009 - *Soiuri de viţă de vie pentru struguri de vin.* Editura Ion Ionescu de la Brad, Iaşi.
6 .***, 2009 - *Compendium of International Methods of Analysis of Wine and Musts*, O.I.V., Paris.