

COMPOSITIONAL ASPECTS OF QUALITY WINES PRODUCED IN AVEREȘTI VINE GROWING CENTRE OF HUȘI VINEYARD, HARVEST OF 2011

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Abstract

The purpose of this paper is to present data on the composition characteristics of quality white wines can be obtained from vine varieties commonly planted in Averești vine growing centre of Huși vineyard in the new climate conditions in recent years due to global warming, that increase the amount of useful temperatures during the growing season and in the maturation of the grapes. In order to obtain wines were used Zghihară, Fetească regală, Aligoté and Fetească albă grape varieties. Experiments were performed on 10 white wines produced in industrial conditions in the plant of S.C. Vinicola Averești 2000 S.A. Huși. During the ripening of the grapes of 2011 weather conditions were favourable for sugars accumulations, which are sufficient to obtain quality dry, semidry and sweet white wines with designation of origin. The paper presents data of the pH value of wines based on the total acidity dependent to the tartaric, malic, citric acid, volatile acids and content of potassium, calcium, magnesium and sodium cations. In all analyzed wines is observed, in general, a low pH, these showing values between 3.070 and 3.222 in dry wines, and between 3.122 and 3.261 for those with residual sugar. Low values in the tartaric acid content (between 1.52 and 1.77 g/L), potassium cations (between 368 and 426 mg/L) and calcium (between 48 and 58 mg/L) at all analyzed wines, can be explained too by tartaric deposits resulting from their retention period during the 2011-2012 winter when temperatures were very low compared to the same periods in previous years. Nonreducing extract values (between 18.26 and 21.07 g/L), in correlation with alcohol concentration values (between 11.01 and 12.05 % vol.), allowed the classification of all reviewed wines in the high quality white wines category with controlled denomination of origin (DOC).

Key words: wine colour, white wines, climatic conditions, composition characteristics, quality.

The quality wines, which are distinguished by their accomplishments originality, to be printed on the place of production, the variety or grade of the grape varieties, of the mode of culture and of the technology used in making wine used, can be placed in category of quality wines with a controlled designation of origin - DOC (*** , 2002). In accordance with the legislation in force they must be an actual alcoholic strength of not less than 11 % in volume and come from grapes with content by sugars of not less than 187 g/L.

The purpose of this work is to present data relating to the compositional characteristics of some quality white wines that may be obtained from the vine varieties grown frequently in the Averești wine center from the Huși vineyard area, in the new climate conditions from the last few years as a result of global warming, that of increasing the amount of useful temperatures both during the growing season and the maturation of the grapes.

MATERIAL AND METHOD

White wines made in this study were produced in industrial conditions in the mill of winery the S.C. "Vinicola Averești 2000" S.A. Huși, using Zghihară de Huși, Fetească regală, Aligoté and Fetească albă grape varieties, from the harvest of 2011, coming from wine growing center Averești (realm Fundătura, Arsura, Pânești) (Cotea et al. , 2000). Grapes to the 10 quality white wines (of which, 4 dry, 3 semi-dry and 3 semi-sweet) were harvested during the period 24 September to 10 October 2011, at technological maturity when the compositional characteristics (sugar, acidity) were within the limits best practices, and plant health was very good. They have been crushed, by variety, and musts has been the subject intended for purification by decantation. Analyzes of the compositional characteristics (sugars, total acidity, pH, free and total sulfur dioxide) of musts were made in the winery laboratory.

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Dry white wines have been obtained from specific technology for obtaining the quality white wines. Thus, fermentation mixture must-wine has been performed in stainless steel tanks with a capacity of 100 hL at a temperature of 14-18 °C. Initially, in the must has been added the sourdough of unsparkling lees, originating from the *Saccharomyces cerevisiae* species, at a dose of 15 g/hL. Stopping alcoholic fermentation of wines obtained have been through adding by sulfur dioxide, keep them at a temperature of 10 ± 1 °C and associated treatments with bentonite and gelatin. Thus, of course, to wines obtained from the studied varieties have been used doses of 60 ÷ 100 mg/L of sulfur dioxide, 0.7 ÷ 1.0 g/L bentonite and 2 ÷ 4 g/hL gelatin. Pulling wine in winter it has been in the period 5 ÷ 10 January 2012 after which, in next period of 60 days, the wines have been maintained during winter months in cold temperatures that has been around the value of 0 ± 2 °C. Clarification of wines has been done by natural sedimentation of suspensions, for a period of 4 months.

Semidry and semisweet wines were obtained through technology for obtaining the quality white wines with rest of sugars. Thus, fermentation mixture must-wine has been performed in stainless steel tanks with a capacity of 50 hL, at a temperature of 14 – 18 °C. Stopping alcoholic fermentation of wines obtained have been through adding by sulfur dioxide, keep them at a temperature of 10 ± 1 °C and associated treatments with bentonite and gelatin. Thus, of course, to wines obtained from the studied varieties have been used doses of 120 ÷ 160 mg/L of sulfur dioxide, 0.7 ÷ 1.0 g/L bentonite and 2 ÷ 6 g/hL gelatin. After 24 hours, the wines have been centrifuged and pulled her to tanks of storage, where they have been maintained for five months. Pulling wine in winter it has been in 2 February 2012 after which, in next period of 30 days, the wines have been subjected of stabilisation treatment (refrigeration, demetalisation) and admixture of sorbic acid with in a view to bottling.

In the period 15 ÷ 30 march, samples of wines have been subjected to physico-chemical analyzes and organoleptic assessment. Analyzes of the compositional characteristics of the wine (density, alcoholic strength, total and volatile acidity, pH, tartaric, malic and citric acids, free and total sulfur dioxide, total phenolic compounds, potassium, calcium and sodium cations, ash, glycerol, reducing sugars, total dry extract) were made in the Oenology Laboratory of U.Ș.A.M.V. Iași, using the methods indicated in the state and international standards (***, 1997; ***, 2005) or in the literature (Cotea et al., 2009; Ribereau-Gayon et al., 1972; Sauciuc, 1984; Țârdea, 2007; Würdig et al., 1989).

RESULTS AND DISCUSSION

The main features of the composition of grapes (use for producing white wines dry) to harvest are presented in table 1 (*tab. 1*). Grapes were harvested at technological maturity, in the period 1 ÷ October 10, when the status of their plant has been very good.

Thus, the content in sugar of the grapes was following values: 193 g/L to Zghihară grape variety on 10 October; 197 g/L to Fetească regală variety on 5 October; 202 g/L to Aligoté variety on 1 October; 207 g/L to Fetească albă variety on 9 October.

Titrate acidity expressed in g/L $C_4H_6O_6$ has had on the same dates the values: 9.28 to variety Zghihară; 9.08 to variety Fetească regală; 8.65 to variety Aligoté; 8.47 to variety Fetească albă. Mass of 100 grain had values between 161g to variety Fetească albă and 221g to variety Zghihară, pH values were of 3,112 from Zghihară grape variety, 3,194 from Fetească regală grape variety, 3,252 from Aligoté grape variety and 3,294 to Fetească albă grape variety.

Table 1

The main features of the composition of grapes (used to obtain dry white wines) at harvest

No.	Features of composition	Grape variety				
		Zghihară	Fetească regală	Aligoté	Fetească albă	
1	Data analysis	10 oct.	5 oct.	1 oct.	9 oct.	
2	Weight of 100 grains	221	188	166	161	
3	Total sugars (g/L)	193	197	202	207	
4	Titrate acidity (g/L $C_4H_6O_6$)	9.28	9.08	8.65	8.47	
5	Real acidity (pH)	3.112	3.194	3.252	3.294	
6	Production	kg/vine	2.56	2.91	2.26	2.42
		tons/ha	8.4	9.6	7.5	8.0

Table 2

The main features of the composition of grapes (used to obtain semidry white wine) at harvest

No.	Features of composition	Grape variety		
		Fetească regală	Aligoté	Fetească albă
1	Data analysis	7 oct.	3 oct.	8 oct.
2	Weight of 100 grains	184	163	159
3	Total sugars (g/L)	201	206	211
4	Titrateable acidity (g/L C ₄ H ₆ O ₆)	8.84	8.55	8.37
5	Real acidity (pH)	3.184	3.273	3.288
6	Production	kg/vine	2.26	2.18
		tons/ha	7.5	7.2

Table 3

The main features of the composition of grapes (used to obtain semisweet white wine) at harvest

No.	Features of composition	Grape variety		
		Fetească regală	Aligoté	Fetească albă
1	Data analysis	9 oct.	5 oct.	12 oct.
2	Weight of 100 grains	182	160	157
3	Total sugars (g/L)	203	207	220
4	Titrateable acidity (g/L C ₄ H ₆ O ₆)	8.65	8.44	8.28
5	Real acidity (pH)	3.204	3.264	3.305
6	Production	kg/vine	2.77	2.15
		tons/ha	9.1	7.1

As regards the production of grapes, in tonnes/hectare (kg/hub), it took following values: 8.4 (2.56) to variety Zghihară; 9.6 (2.91) at variety Fetească regală; 7.5 (2.26) to variety Aligoté; 8.0 (2.42) to variety Fetească white.

The composition of grapes (use for obtaining semidry white wines) at harvest are presented in table 2 (*tab. 2*). Grapes were harvested at technological maturity, in the period 3÷8 October, when the status of their plant has been very good. At harvest, the content in sugar of grapes was following values: 201 g/L variety Fetească regală on 7 October; 206 g/L variety Aligoté on 3 October; 211 g/L at Fetească albă variety from the date of 8 October. Titrateable acidity expressed in g/L C₄H₆O₆ has had on the same dates the values: 8.84 variety Fetească regală; 8.55 variety Aligoté; 8.37 variety Fetească albă. Mass of 100 grain had values between 159 g to variety Fetească albă and 184 variety Fetească regală. pH values were of 3,184 from the variety of Fetească regală, 3,273 from the variety of Aligoté and of 3,288 from the variety Fetească albă.

Production of grapes, in tonnes/hectare (kg/hub), picking up the following values: 7.5 (2.26) at Fetească regală variety; 7.2 (2.18) at Aligoté variety; 7.8 (2.36) to Fetească albă variety.

The composition of grapes (use for obtaining semisweet white wines) at harvest, are presented in table 3 (*tab. 3*). Grapes were harvested at technological maturity, in the period 5÷12 October, when the status of their plant has been very good. At harvest, the content in sugar of grapes was following values: 203 g/L variety

Fetească regală on 9 October; 207 g/L variety Aligoté on 5 October; 220 g/L at Fetească albă variety from the date of 12 October. Titrateable acidity expressed in g/L C₄H₆O₆ has had on the same dates the values: 8.65 variety Fetească regală; 8.44 variety Aligoté; 8.28 variety Fetească albă. Mass of 100 grain had values between 157 g to variety Fetească albă and 182 variety Fetească regală. pH values were of 3,204 from the variety of Fetească regală, 3,264 from the variety of Aligoté and of 3,305 from the variety Fetească albă. Production of grapes, in tonnes/hectare (kg/hub), picking up the following values: 9.1 (2.77) at Fetească regală variety; 7.1 (2.15) at Aligoté variety; 7.3 (2.21) to Fetească albă variety.

The main features of composition of white wines (dry, semidry, semisweet) are shown in the tables 4, 5 and 6 (*tab. 4, 5, 6*). Thus, wines produced from the harvest of 2011, have been following features of composition: the alcoholic strength had the value of 11.20 % vol. to Zghihară, values of (11.48, 11.25, 11.01) % vol. of the three wines (dry, semidry and semisweet) of Fetească regală, values of (11.75, 11.50, 11.05) % vol. of the three wines (dry, semidry and semisweet) of Aligoté, respectively (12.05, 11.75, 11.25) % vol. of the three wines (dry, semidry and semisweet) of Fetească albă; total acidity, expressed in g/L C₄H₆O₆, had the value of 7.03 at Zghihară, values of 6.84, 6.98 and 6.77 of the three wines (dry, semidry and semisweet) Fetească regală, values of 6.74, 6.86 and 6.81 of the three wines (dry, semidry, semisweet) of Aligoté, respectively 6.93, 6.84 and 6.67 of the three wines (dry, semidry,

semisweet) of Fetească albă; volatile acidity, expressed in g/L $C_2H_4O_2$ had values between $0.28\div 0.42$ at dry wines, between $0.32\div 0.41$ at semidry wines and between $0.35\div 0.53$ at semisweet wines; real acidity (pH) had the value of 3.070 at Zghihară, values of 3.151, 3.122 and 3.152 of the three wines (dry, semidry, semisweet) of Fetească regală, values of 3.183, 3.203 and 3.242 of the three wines (dry, semidry and semisweet) of Aligoté, respectively 3.222, 3.242 and 3.261 of the three wines (dry, semidry, semisweet) of Fetească albă; tartaric acid, in g/L, it was 1.52 at Zghihară, 1.65, 1.55 and 1.56 of the three wines (dry, semidry, semisweet) of Fetească regală, 1.70, 1.66 and 1.68 of the three wines (dry,

semidry and semisweet) of Aligoté, respectively 1.66, 1.77 and 1.74 of the three wines (dry, semidry, semisweet) of Fetească albă; the content of malic acid, in g/L, was much greater than that of tartaric acid, having values of 3.70 to Zghihară, 3.22, 3.47 and 2.98 of the three wines (dry, semidry, semisweet) of Fetească regală, 3.13, 3.22 and 3.11 of the three wines (dry, semidry and semisweet) of Aligoté, respectively 3.40, 2.98 and 2.89 of the three wines (dry, semidry, semisweet) of Fetească albă; citric acid expressed in g/L had values between $0.10\div 0.14$ to dry wines, between $0.11\div 0.16$ to semidry wines and between $0.13\div 0.17$ to semisweet wines;

Table 4

The main features of the composition of dry white wine					
No.	Composition characteristics	Grape variety			
		Zghihară	Fetească regală	Aligoté	Fetească albă
1	Density (ρ) la 20 °C, g/cm ³	0.9914	0.9911	0.9915	0.9912
2	Alcohol (% vol.)	11.20	11.48	11.75	12.05
3	Total acidity (g/L $C_4H_6O_6$)	7.03	6.84	6.74	6.93
4	Volatile acidity (g/L $C_2H_4O_2$)	0.28	0.42	0.36	0.30
5	Real acidity (pH)	3.070	3.151	3.183	3.222
6	Tartaric acid (g/L)	1.52	1.65	1.70	1.66
7	Malic acid (g/L)	3.70	3.22	3.13	3.40
8	Citric acid (g/L)	0.10	0.14	0.13	0.12
9	Potassium (mg/L)	410	398	408	412
10	Calcium (mg/L)	53	54	54	52
11	Sodium (mg/L)	23	24	24	22
12	Ash (g/L)	1.72	1.78	1.88	1.93
13	Conductivity (X), mS	2.52	2.65	2.87	3.00
14	Free sulfur dioxide (mg/L)	33.70	32.29	33.82	27.42
15	Total sulfur dioxide (mg/L)	108.71	96.27	106.32	92.31
16	Total phenolic compounds (g/L)	0.22	0.23	0.27	0.33
17	Glycerol (g/L)	6.45	6.61	6.77	6.94
18	Total dry extract (g/L)	20.90	21.10	22.90	22.90
19	Reducing sugars (g/L)	2.32	1.97	2.57	2.01
20	Non-reducing extract (g/L)	18.58	19.13	20.33	20.89
21	Quality class	DOC	DOC	DOC	DOC
22	Organoleptic assessment	very good	good	very good	very good

Table 5

The main features of the composition of semidry white wine				
No.	Composition characteristics	Grape variety		
		Fetească regală	Aligoté	Fetească albă
1	Density (ρ) la 20 °C, g/cm ³	0.9944	0.9951	0.9952
2	Alcohol (% vol.)	11.25	11.50	11.75
3	Total acidity (g/L $C_4H_6O_6$)	6.98	6.86	6.84
4	Volatile acidity (g/L $C_2H_4O_2$)	0.33	0.32	0.41
5	Real acidity (pH)	3.122	3.203	3.242
6	Tartaric acid (g/L)	1.55	1.66	1.77
7	Malic acid (g/L)	3.47	3.22	2.98
8	Citric acid (g/L)	0.11	0.13	0.16
9	Potassium (mg/L)	408	376	426
10	Calcium (mg/L)	54	48	58
11	Sodium (mg/L)	24	18	28
12	Ash (g/L)	1.74	1.91	1.95
13	Conductivity (X), mS	2.60	2.95	3.06
14	Free sulfur dioxide (mg/L)	42.95	39.70	35.64
15	Total sulfur dioxide (mg/L)	134.21	128.05	121.25
16	Total phenolic compounds (g/L)	0.24	0.28	0.35

17	Glycerol (g/L)	6.48	6.63	6.77
18	Total dry extract (g/L)	28.90	31.50	32.60
19	Reducing sugars (g/L)	10.07	10.90	11.53
20	Non-reducing extract (g/L)	18.83	20.60	21.07
21	Quality class	DOC	DOC	DOC
22	Organoleptic assessment	good	very good	very good

the potassium (the most important cation from wine) had low values in comparison with the data of the literature (Cotea et al., 2009, Crețu et al., 2002) of 410 mg/L at Zghihară wine, values of 398, 408 and 410 mg/L of the three wines (dry, semidry, semisweet) of Fetească regală, values of 408, 376 and 380 mg/L of the three wines (dry, semidry and semisweet) of Aligoté, respectively 412, 426 and 368 mg/L of the three wines (dry, semidry, semisweet) of Fetească albă; calcium expressed in mg/L, was also small values between 52÷54 to dry wines, between 48÷58 to semidry wines and between 48÷52 to semisweet wines; sodium expressed in mg/L, it has average values between 22÷24 at dry wines, between 18÷24 to semidry wines and between 18÷32 to semisweet wines; the ash content expressed in g/L, had values of 1.72 to Zghihară, of 1.78, 1.74 and 1.68 of the three wines (dry, semidry, semisweet) of Fetească regală, of 1.88, 1.91 and 1.71 of the three wines (dry, semidry and semisweet) of Aligoté, respectively 1.93, 1.95 and 1.85 of the three wines (dry, semidry, semisweet) of Fetească albă; conductivity values (χ) are in accordance with the cation and ash content, having values between 2.52÷3.00 mS at dry wines, between 2.60÷3.06 mS

at semidry wines and between 2.70÷3.25 at semisweet wines; sulfur dioxide has had normal values, lower than permissible limit of 50.0 mg/L free SO₂, respectively lower than 200.0 mg/L total SO₂; the total phenolic compounds content, expressed in g/L has average values, between 0.22÷0.33 at dry wines, between 0.24÷0.35 at semidry wines and between 0.27÷0.38 at semisweet wines; the glycerol content, expressed in g/L has average values, between 6.45÷6.94 at dry wines, between 6.48÷6.77 at semidry wines and between 6.56÷7.02 at semisweet wines; the reducing sugars content (in g/L) has normal values between 1.97÷2.57 at dry wines, between 10.07÷11.53 at semidry wines and between 15.84÷28.25 at semisweet wines is within the limits laid down by the legislation (***,1997; ***,2002); the unreducing extract in g/L, has had value of 18.58 to Zghihară wine, values of 19.13, 18.83 and 18.26 g/L of the three wines (dry, semidry, semisweet) of Fetească regală, values of 20.33, 20.60 and 18.49 g/L of the three wines (dry, semidry and semisweet) of Aligoté, respectively 20.89, 21.07 and 20.05 g/L of the three wines (dry, semidry, semisweet) of Fetească albă.

Table 6

The main features of the composition of semisweet white wines

No.	Composition characteristics	Grape variety		
		Fetească regală	Aligoté	Fetească albă
1	Density (ρ) la 20 °C, g/cm ³	0.9967	0.9979	1.0022
2	Alcohol (% vol.)	11.01	11.05	11.25
3	Total acidity (g/L C ₄ H ₆ O ₆)	6.77	6.81	6.67
4	Volatile acidity (g/L C ₂ H ₄ O ₂)	0.53	0.35	0.44
5	Real acidity (pH)	3.152	3.242	3.261
6	Tartaric acid (g/L)	1.56	1.68	1.74
7	Malic acid (g/L)	2.98	3.11	2.89
8	Citric acid (g/L)	0.13	0.15	0.17
9	Potassium (mg/L)	410	380	368
10	Calcium (mg/L)	52	50	48
11	Sodium (mg/L)	32	30	18
12	Ash (g/L)	1.68	1.71	1.85
13	Conductivity (X), mS	2.70	3.02	3.25
14	Free sulfur dioxide (mg/L)	25.59	42.52	36.86
15	Total sulfur dioxide (mg/L)	115.16	109.03	123.69
16	Total phenolic compounds (g/L)	0.27	0.30	0.38
17	Glycerol (g/L)	6.56	6.73	7.02
18	Total dry extract (g/L)	34.10	37.50	48.30
19	Reducing sugars (g/L)	15.84	19.01	28.25
20	Non-reducing extract (g/L)	18.26	18.49	20.05
21	Quality class	DOC	DOC	DOC
22	Organoleptic assessment	good	very good	very good

In correlation with these features of the composition, specific mass (ρ) at 20 °C, (g/cm^3) has had normal range values at analyzed wines, between 0.9911÷0.9915 at dry wines, between 0.9944÷0.9952 at semidry wines and between 0.9967÷1.0022 at semisweet wines.

The values of unreducing extract, in conjunction with alcoholic concentration values, allowed framing all this 10 white wines in the quality wines category with a controlled designation of origin (DOC).

CONCLUSIONS

Fare being raised of the temperatures during the vine growing season period, due to global warming, was favorable build-up of sugars, so they earned the quality white wines with a registered designation of origin.

Lower values in relation to the content in tartaric acid (between 1.52 and 1.77 g/L), in the potassium cation (between 368 and 426 mg/L) and calcium (between 48 and 58 mg/L) in all wines

That, in the last 3-5 years climatic conditions have changed favorably (in the direction of growth temperatures for the period of the growing season) for vines, they have been in the year 2011 can be obtained wines with rest of reducing sugars in the Averești wine center from Huși vineyard, too.

Organoleptic assessment of the wines reviewed has shown good value of them, being assigned grades of "good" to three wines and the "very good" to the other seven wines.

reviewed, can be explained and by tartaric deposits resulting from the 2011-2012 storage period of their during winter when temperatures were very low, as compared to the same period of time of the previous years.

The values of unreducing extract (between 18.26 and 21.07 g/L), in conjunction with alcoholic concentration values (between 11.01 and 12.05 % vol.), have allowed framing all wines reviewed in the quality white wines category with a controlled designation of origin (DOC).

REFERENCES

- Cotea, V. D., Barbu, N., Grigorescu, C. C., Cotea, V.V., 2000** - *Podgoriile și vinurile României*, Ed. Academiei Române, București.
- Cotea, V. D., Zănoagă, C. V., Cotea, V. V., 2009** - *Tratat de oenochimie, vol. I*, Editura Academiei Române, București.
- Crețu, Cl., Odăgeriu, G., Cogălniceanu, C., Cotea, V. V., Ambrosă, F., 2002** - *Aspecte privind compoziția unor vinuri de calitate superioară cu zaharuri remanente obținute în podgoria Huși*, Lucr. șt., seria Horticultură, vol. 45, U.Ș.A.M.V. Iași, p. 227-232.
- Ribereau-Gayon, J., Peynaud, E., Sudraud, P., Ribereau-Gayon, P., 1972** - *Traité d'oenologie. Sciences et techniques du vin, tome 1. Analyse et controle des vins*, Dunod-Paris, France.
- Sauciuc, J., 1984** - *Metodă fluorimetrică pentru determinarea acidului malic din vin sau din must*, Cercet. agron. în Moldova, Iași, vol. 1 (65).
- Țârdea C., 2007** - *Chimia și analiza vinurilor*. Editura "Ion Ionescu de la Brad", Iași.
- Würdig, G., Woller, R., 1989** - *Chemie des wines*, Germany, Ed. Ulmer.
- ***, **1997** - *Colecție de standarde pentru industria vinului și băuturilor alcoolice*. Ministerul Industriei Alimentare, București.
- ***, **2002** - *Legea Viei și Vinului nr. 244 în sistemul organizării comune a pieței vitivinicole*, Monitorul Oficial al României, București, anul XIV - nr. 333, luni 20 mai.
- ***, **2005** - *Recueil des methodes internationales d'analyse des vins et des mouts*, Edition Officielle, Office International de la Vigne et du Vin, Paris, juin.