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OENOLOGICAL CHARACTERIZATION OF WINES FROM GRAPE CLONES CREATED AT RESEARCH STATION FOR VITICULTURE AND ENOLOGY BLAJ, ROMANIA

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Abstract. Climate has an important influence on the growth and development of grapevine. The main climatic conditions (temperature, insolation, precipitation) have a positive effect on the growth and fruit setting when are at the optimum level. The climatic index for Târnave Vineyard in experimental years registered values which state the different climatic conditions. The aim of this study was to analyse the quality of wine obtained from three clone grapevine, created at R.S.V.E. Blaj (Fetească Regală 21 Bl, Sauvignon Blanc 9 Bl and Muscat Ottonel 12 Bl). The wine samples were obtained from wine production under local climatic conditions of Târnave Vineyard, Romania. The oenological analysis of wines showed that the highest alcohol content was recorded for Sauvignon Blanc 9 Bl clone (12.91% vol. and 12.67 % vol.), in both experimental years. The highest level of acidity was registered for Fetească Regală 21 Bl (7.65 g/l tartric acid) and the lowest acidity for Muscat Ottonel 12 Bl wine (5.25 g/l tartric acid). The level of free SO_2 and total SO_2 in wines was significantly different between samples. The Pearson correlation coefficient was calculated for each analyzed parameter and the most relevant correlations were between alcohol and sugars in must; alcohol and dry extract; sugars in must and dry extract and sugars in must and 100 berries weight. The quality of the wine produced in the Blaj Wine Center of Târnave Vineyard is directly contingent on oenological parameters and also by the climatic conditions of the year.

Key words: Grapevine; Clones; Wine; Climate; Quality; Alcohol content; Acidity; Sugars.

INTRODUCTION

In Transylvania, viticulture has been earthed since antiquity, perpetuating and developing ever since the migration of people during the feudal period and till present (Macici, 1996). The interest of the inhabitants in this vineyard area has been and is, both in terms of cultivation and the preparation and preservation of wine. The existence of an ancient, well-developed, well-known viticulture in the center of Transylvania imposed the necessity of studying and establishing on a scientific basis the basic assortment specific to this area. For this purpose it was necessary to set up experimental wine-growing stations, which would contribute to the scientific solution of the requirements related to the quantitative increase and the quality of the grape production (Cudur, F. et al., 2014; Popescu, D. et al. 2014). In this respect, in the 1940`s, the experimental vineyard station Crăciunelul de Jos was set up, and in 1960, the unit would move its headquarters to Blaj. From the viticultural point of view, Research Station for Viticulture and Enology Blaj is located in the Târnave vineyard, named because most of the vineyards are located on the slopes that delineate the valleys of the Târnava Mare and Târnava Mică rivers. Târnave vineyard includes five wine centers: Blaj, Jidvei, Mediaş Târnăveni, Zagăr and Valea Nirajului (Grecu, V. 2010).

The Blaj Wine Center is located at the intersection of the geographical coordinates 46°10′31″ north latitude and 23°54′52″ eastern longitude. The vineyard perimeter in this area is very favorable for vine cultivation and quality wines with DOC and IG. The specific ecoclimatic conditions in Târnave Vineyard allow the production of high quality dry, semi-sweet or sweet wines, semi-aromatic and aromatic wines and sparkling wines.

The main climatic factors influencing the variability of the production and quality of the vine and the wines obtained are insolation, temperature and precipitation. Of these, temperature and precipitation have the greatest impact on harvest and grain composition, very sensitive to changes in these climatic factors (Dry, P. et al. 2010; Bora, F. et al. 2014). The quality of harvest and wine from one year to another varies greatly from the temperature variability, which determines the amount of sugars and acidity accumulated in grapes (Hunter, J., Bonnardot, V. 2011; Bunea, C. et al. 2013; Bora, F. et al. 2016) and the winemaking technology and storage (Coldea, T., Mudura, E. 2015; Manolache, M. et al. 2018).

The aim of this study was to evaluate the influence of ecoclimatic conditions of 2016 and 2017 in Tânave vineyard, Romania on the quality of the white wines obtains from clone grape obtained at R.S.V.E. Blaj and the correlations between the main quality parameters of grapes and wine (alcohol, total acidity, dry extract).

MATERIALS AND METHODS

The weather data used in this research was recorded at the weather forecasting center system of R.S.V.E. Blaj. Based on this data, some important ecoclimatic indicators for the growth and fruit setting for the grapevine were determined: global thermal balance (∑t°g), active thermal balance (∑t°a) usefull thermal balance (∑t°u); thermal coefficient (TC); amount of monthly and annual precipitation; amount of hours with sun (Σir) and real insolation coefficient (IC). Interactions of climate factors were calculated as follow the real heliothermal index (HIr), the hydrothermal coefficient (HC), the bioclimatic vineyard index, annual aridity index Martonne, oenoclimatic skills index (OeSI). After a long and persistent selection work, the clones Sauvignon Blanc 9 Bl, Fetească Regală 21 Bl and Muscat Ottonel 12 Bl, were obtained and approved at R.S.V.E. Blaj. The clones are representative for the Târnave vineyard, the experimental plot being located in the R.S.V.E. Blaj, Crăciunelu de Jos viticulture farm. The study area is 3 ha and grape clones: Fetească Regală 21 Bl (4166 vines; 1 ha cultivated area), Muscat Ottonel 12 Bl (4166 vines; 1 ha cultivated area) and Sauvignon Blanc 9 Bl (4166 vines; 1 ha cultivated area). The vines were planted in 2006 (Muscat Ottonel 12 Bl) and in 2013 (Fetească Regală 21 Bl and Sauvignon Blanc 9 Bl) at 2 m between rows and 1.20 m between vines, were pruned according to the Guyot with replacement arms system. The trellis system is monoplan with three-row wires (1-simple, 2 and 3-double).

Fig. 1. *Fetească Regală 21 Bl*

Fig. 2. *Muscat Ottonel 12 Bl*

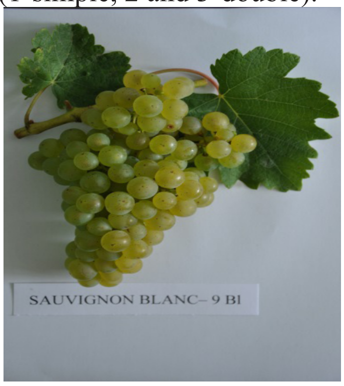

Fig. 3. *Sauvignon Blanc 9 Bl*

All clones were grafted on SO4-4 rootstock, a clone also approved at R.S.V.E Blaj.

Observations and determinations on the development of the phenophases were made on 30 vines of each clone, the phenological stages were noted using the Baggiolioni code, 1952 (Belea, G. 2008).

The grapes were harvested on the second decade of September, in both experimental years, at full maturity. Observations and determinations were performed on 30 grapevines in each clone, organized in 3 replicates with 10 vines / repetition, placed in randomized blocks. Around 50 grapes grapes / clone were collected from 10 vines / replication (Bunea, C. 2010). After sampling, the grapes were placed in plastic bag and they were sent to the laboratory for analysis to determine the technological maturity, the quantity of sugars, the total acidity and the 100 berries weight. The vinification process was made at the winemaking station of R.S.V.E. Blaj. The fermentation took place at 10-15°C for 10 days. The wine was clarified with bentonite (1 g/l) and combined with SO_2 up to 50 mg/l (for Fetească Regală 21 Bl) and 100 mg/l for Muscat Ottonel 12 Bl and Sauvignon Blanc 9 Bl. Then the wines were filtered and protected with neutral gases for stabilization. The wine samples were stored in glass bottles at 5°C until the analyses.

The basic composition of the wine was analyzed according to the methods proposed by OIV 2013 (Mureşan, C. 2008; Ţârdea, C. 2007).

Statistical analysis. The results were statistical processed to calculate the following statistical parameters: arithmetic average, standard deviation, standard error. The statistical interpretation of the data was performed using the Duncan test, SPSS Version 23 (SPSS Inc., Chicago, IL., USA). The analysis of variance (ANOVA) was used to interpreted data and calculate de F (FISHER) factor. The average separation was performed with the DUNCAN test at $p \leq 0.05$. The Pearson correlation coefficient was calculated to determine if the major wine quality parameters may affect each other, using SPSS version 23 (SPSS Inc., Chicago, IL., USA).

RESULTS AND DISCUTIONS

In order to obtain economically profitable yields the grape varieties need different temperature, water and light conditions (Pop, 2010). The climate of the Târnave vineyard is characterized by low values of the thermal balance and a relatively low duration of the vegetation period (Iliescu, 2010).

In the experimental plot, the Fetească Regală 21 Bl and Muscat Ottonel 12 Bl clones are grown on brown cambisol (eumezobasic) soil, with clay texture. The Sauvignon Blanc 9 Bl clone is cultivated on cambisol (colluvisol/alluvisol) soil, with a clay-sandy texture. The experimental plot has a southern exposure.

Generally, in the Târnave vineyard, the average daily temperature above 10°C is recorded in spring during the second decade of April, and autumn falls below this limit, beginning in the second decade of October (Ciobanu et al., 2010).

In Târnave vineyard, the lenght of the growing season is within the limit of 190 days, but in 2017 this limit was exceeded to 203 days. In the experimental year of 2016 the thermal balance values obtained were higher than multiannual average, the global thermal balance (Σt°g) was 3934°C and active thermal balance (Σt°a) was 3403°C. Regarding the useful thermal balance multiannual average (Σt°u 1514°C) was higher than 2016 (Σt°u 1483°C) and 2017 (Σt°u 1512) (Table 1). The precipitation amount in 2016 was much higher (1006 mm) than average of the last fifteen years (589 mm). In the growing season, the precipitations values were 549 mm in 2016, above the multiannual average of 372 mm for Blaj Wine Center. The rainfall fell mainly during the veraison period, degrading the quality of the grapes. The insolation measured in the growing season was higher than normal, with 1342 hours in 2016 and 1239 hours in 2017, compared to the multiannual average of 1286 hours.

Table 1. *Ecoclimatic conditions in Blaj Wine Center, Târnave Vienyard*

Climate conditions		Multianual average 2000-2015	2016	2017	Extreme values 2000-2015	
					minimum	Maximum
The vegetation period		190	191	203	166	206
Thermal balance	Global Σt°g	3798	3934	3376	3186	4450
	Active Σt°a	3391	3403	3099	2924	3793
	Beneficial Σt°u	1514	1483	1512	1321	1875
	Thermic coefficient	17.8	17.8	15.4	15.3	21.9
	Annual mean t°C	10.4	10.6	10.3	9.7	11.8
	In growing season t°C	18.5	18.5	17.4	16.9	20.5
	Minimum absolute air temperature t°C	-	-18.4	-24.7	-24.5	-
	Maximum absolute air temperature t°C	-	37.3	37.9	-	41.6
Insolation (hours)	Real	1964	1907	1663	1558	2402
	∑ hours of insolation in the growing season	1283	1342	1239	1096	1663
	Insolation coefficient (IC)	6.8	7.1	6.5	5.5	8.4
Precipitation (mm)	∑ precipitations in the growing season	372	549	369	225	466
	Annual ∑	589	1006	614	349	767
	Precipitation coefficient (PC)	2.0	2.9	1.9	1.1	2.6
Interaction of climatic factors	Real heliothermic index (HIr)	1.4	1.6	1.2	1.0	1.6
	Hydrothermal coefficient (HC)	1.1	1.6	1.1	0.6	1.6
	Bioclimatic vineyard index (BVI)	7.3	5.6	5.4	4.7	11.5
	Oenoclimatic skills index (OeSI)	4564	4446	4511	4219	5118
	Annual aridity index Martonne	13.1	19.3	14	7.8	16.9

Insolation coefficient (IC) recorded value closed to the multiannual average (6.80), in both experimental years. The real heliothermal index (HIr) value was 1.6 in the climatic conditions of 2016 and 1.2 in 2017, the values close to optimal conditions for white grapes varieties (Pop, 2010).

It is important to mention the presence of the fog in the area of Târnave, which favors the preservation of the aromas in the grapes and the obtaining of highly appreciated aromatic wines in this viticultural region. The fog is present since the third decade August till late in autumn, almost daily, during the veraison and harvest, up to 8 to 9 in the morning.

The hydrothermal coefficient (HC) had a very high value of 1.60 in the year of 2016, compared to the multiannual average, which states that the amount of precipitations was over the normal for Blaj Wine Center. The bioclimatic vineyard index (BVI) with a value of 5.6 in 2016 highlight that that the helio-thermal resources were lower that normal in according with high values of hydrous resources for the Blaj Wine Centre (multiannual average was 7.3). The oenoclimatic suitability index (OeSI) had a multiannual average value of 4564, which indicate an area with favourable conditions for growth for the white wines.

The Martonne aridity index has a multiannual average value of 13.1 for Blaj Wine Center, which show a semiarid climate. According to this index, the 2016 may be characterized as a humid year and 2017 as a semihumid year, in the growing season. The ecoclimatic conditions of Târnave vineyard hi-ghlighted the exceptional viticultural characters of the Blaj Wine Centre. These characters can be found in the authenticity and specificity of a large assortment of wines produced in this viticultural area.

The climatic conditions of the year have an important impact on the main phenophases of the studi-ed clones (Table 2). Usually, in Târnave vineyard budbreak is being unfolding in the second decade of April. Due to the climatic conditions of the year, the flowering is mainly influenced by the temperature levels on the two experimental years as it is showed in Table 2. The harvest of grapes usually takes place on the second to third decade of September.

Table 2. *The main phenophase in experimental plots*

Clone	Budbreak	Flowering	Veraison	Harvest
2016				
Fetească Regală 21 Bl	April 15	June 14	August 25	September 16
Sauvignon Blanc 9 Bl	April 15	June 14	August 24	September 16
Muscat Ottonel 12 Bl	April 20	June 15	August 26	September 20
2017				
Fetească Regală 21 Bl	April 18	June 5	August 22	September 18
Sauvignon Blanc 9 Bl	April 19	June 5	August 24	September 18
Muscat Ottonel 12 Bl	April 20	June 3	August 20	September 19

Analysing the quality of harvest, the results achieved by the studied clones are shown in Tabel 4. Re-garding the 100 berries weight Fetească Regală 21 Bl is distinguished through significantly higher values in both experimental years, 230.91 g and 209.34 g, respectively, compared with Muscat Ottonel 12 Bl and Sauvignon Blanc 9 Bl. The results obtain in this study for 100 berries weight for Fetească Regală 21 Bl are much higher than obtained in the same area by Popescu et al. (2014), of 168.0 g in 2012 and 178.1 g in 2013, characterized as normal years. Those differences may be explained by the climatic conditions in experimental years, especially the amount of precipitations during ripening which may contribute to larger berries. The sugar content varied in experimental years. Among the clonal created at R.S.V.E. Blaj, was noted Sauvignon Blanc 9 Bl who recorded an amount of sugars in must of 225.37 g/l (2017) and 219.32 g/l (2016), significantly higher than Fetească Regală 21 Bl and Muscat Ottonel 12 Bl, as it may be seen in Table 3. Our results may be comparable with those obtained by Ranca et al., 2016, in Târnave vineyard in organic and conventional system, during 2013-2014, for varieties Fetească Regală (203.1 g/l and 198.5 g/l, respectively), Muscat Ottonel (216.7 g/l and 215.8 g/l, respectively) and Sauvignon Blanc (209.6 g/l and 219.4 g/l, respectively). The level of acidity in grape berries is influenced by the variety and night temperature during veraison (Keller, 2010). It is known that Fetească Regală grape variety has a high level of acidity in grapes. In the experimental years, Fetească Regală 21 Bl clone is distinguished with a signifi-cantly high acidity in grapes (7.72 g/l H_2SO_4 and 7.61 g/l H_2SO_4, respectively), compared with Sauvignon Blanc 9 Bl and Muscat Ottonel 12 Bl. The results are similar with those obtained by Ranca et al., 2016, and higher than obtained by Popescu et al., 2014 in Târnave vineyard.

The alcohol content of the analyzed wines, states that the highest value was recorded at Sauvignon Blanc 9 Bl (12.91 % vol. in 2017 and 12.67 % vol. in 2016). In Table 3 it can be seen that the lowest alcohol content was recorded for all three clones studied in 2016, due to the climatic conditions in that year. It may also be seen, that between the samples the differences were significant showing a values of F = 36.617, p ≤ 0.000 (Table 3). The results may be comparable with those reported by de Bora et al. (2016) which reported higher alcohol content for Sauvignon Blanc wines (14.35 % vol.), Fetească Regală (13.80 % vol) and lower for Muscat Ottonel (11.00 % vol.) in Dealu Bujorului vineyard (Galati County, east of Romania), in the year 2015, a favourable year for viticulture in that area. The chemical characteristics and concentration of tartaric acid in grapes and wines are important factors in the wine stabilization and sensory properties. A low level of acidity induces a flat taste of wine and a poor storage endurance (Cosme, F. et al. 2017). Ţârdea (2007) states that the total acidity of wine must have a minimum content of 4.0 g/L expressed as tartaric acid. The highest level of acidity in wine was registered for Fetească Regală 21 Bl (7.65 g/l tartric acid) in 2016, followed by the Sauvignon Blanc 9 Bl (6.83 g/l tartric acid) in the same year. In contrast, the lowest acidity level was recorded in Sauvignon Blanc 9 Bl wines 5.25 (g/l tartric acid) (Table 3). Ţârdea (2007) states that the volatile acidity is represented by all the volatile fatty acids from the acetic series that can be found in wine in a free state or in the form of salts: acetic acid, formic, propionic and others. The wines from Muscat Ottonel 12 Bl clones recorded the lowest level of volatile acidity (0.44 g/l acetic acid) in 2017, compared with Sauvignon Blanc 9 Bl (0.57 g/l acetic acid) and Fetească Regală (0.55 g/l acetic acid) with the highest volatile acidity, in 2016 (Table 3). It can be observed that the analyzed varieties present significant differences (F = 28.245, p ≤ 0.000). The total dry extract represents all nonvolatile components that precised physical conditions do not volatilize. From the chemical point of view, the total extract is composed by: fixed organic acids (tartaric, malic, succinic acid, lactic acid), glycerol, 2,3 butylene glycol, sugars, tannins and dyes, nitrogen, pectin, gums, etc. (Bora et al., 2015). The wines obtained in 2017 recorded a higher content of the dry extract, compared with wines from 2016, due to the climatic conditions that year, with a rainy fall, between the samples the differences were significant showing a values of F = 88.630 and of F=161.299, respectively, for p ≤ 0.000 (Table 3). The highest content of dry extract was recorded for Muscat Ottonel 12 Bl (26.20 g/L), followed by Fetească Regală (24.20 g/L). In contrary, Sauvignon Blanc 9 Bl wines registered the lowest content of dry extract 19.10 g/l.

Table 3. *The analysis of the main wine quality parameters obtained in Blaj Wine Center, in 2016 and 2017*

Parameter	*Fetească Regală 21Bl*		*Sauvignon Blanc 9Bl*		*Muscat Ottonel 12 Bl*		*F (Fisher Factor)*	*Significance*
	2016	*2017*	*2016*	*2017*	*2016*	*2017*		
100 berries weight (g)	230.91 **a** ±3.28	209.34 **b** ±2.89	185.32 **d** ±2.54	184.47 **d** ±1.34	198.25 **c** ±3.95	196.73 **c** ±3.63	96.838	p≤0.000
Sugars in must (g/l)	195.42 **d** ±4.10	203.80 **cd** ±3.75	219.32 **ab** ±1.17	225.37 **a** ±3.88	193.42 **d** ±4.12	210.92 **bc** ±11.09	15.893	p≤0.000
Acidity in must (g/l H_2SO_4)	7.72 **a** ±0.36	7.61 **a** ±0.32	6.97 **b** ±0.19	5.72 **d** ±0.21	6.21 **c** ±0.24	5.85 **cd** ±0.11	36.617	p≤0.000
Alcohol (% vol.)	11.18 **d** ±0.13	12.09 **c** ±0.05	12.67 **ab** ±0.25	12.91 **a** ±0.19	11.26 **d** ±0.26	12.38 **bc** ±0.33	32.139	p≤0.000
Total acidity (g/l tartric acid)	7.65 **a** ±0.24	6.38 **c** ±0.18	6.83 **b** ±0.16	5.25 **e** ±0.15	5.93 **d** ±0.18	5.38 **e** ±0.15	78.339	p≤0.000
Volatile acidity (g/l acetic acid)	0.55 **a** ±0.01	0.48 **c** 0.02	0.57 **a** ±0.02	0.52 **b** ±0.03	0.46 **cd** ±0.02	0.44 **d** ±0.01	28.245	p≤0.000
Total dry extract (g/l)	20.40 **d** ±0.18	24.20 **b** ±0.55	19.10 **e** ±0.38	22.60 **c** ±0.13	23.30 **c** ±0.42	26.20 **a** ±0.82	88.630	p≤0.000
Non-reducing dry extract (g/l)	18.48 **c** ±0.18	23.16 **a** ±0.30	17.18 **d** ±0.21	20.56 **b** ±0.12	17.14 **d** ±0.31	23.84 **a** ±0.83	161.299	p≤0.000
Invert total sugars (g/l)	1.04 **d** ±0.10	1.92 **bc** ±0.10	1.72 **c** ±0.10	2.04 **ab** ±0.20	2.16 **ab** ±0.18	2.32 **a** ±0.21	25.301	p≤0.000
SO_2 free (mg/l)	20.68 **c** ±0.46	16.50 **e** ±0.26	50.02 **a** ±0.50	12.50 **f** ±0.43	22.50 **b** ±0.42	17.50 **d** ±0.26	3430.196	p≤0.000
SO_2 total (mg/l)	115.34 **e** ±0.27	102.50 **f** ±0.30	200.35 **a** ±0.29	140.50 **d** ±0.26	197.50 **b** ±0.45	175.50 **c** ±0.31	52055.985	p≤0.000
Glucose +fructose (g/l)	0.14 **f** ±0.01	0.81 **c** ±0.05	0.51 **d** ±0.03	1.38 **a** ±0.08	0.36 **e** ±0.01	1.21 **b** ±0.07	310.887	p≤0.000

Average values, ± standard deviation (n=3).

*The difference between two values in the same row, followed by a common letter is insignificant (Duncan test p<0.5)

The content of SO_2 in wines was significantly different between samples (clones and years), as it can be seen in Table 3. The highest content of free SO_2 was recorded in Sauvignon Blanc 9 Bl wines (50.02 mg/l) in 2016, but for the same clone, in the 2017, the content of free sulphur dioxide in wines was the lowest (12.50 mg/l) between the analyzed samples. Regarding the total SO_2 values for all wine samples were less than specific limit existing for white wines to 200 mg/l, proposed by EU.

The Pearson correlation coefficient was calculated for each analyzed parameter, in order to determine if the main quality parameters of wine may have an influence each other. A value higher than 0.5 of Pearson correlation coefficient shows a strong correlation between the analysed samples. A positive correlation between two parameters shows that both parameters increased and a negative correlation indicates that a parameter increased while the second one decreased and vice-versa (Bora et al., 2016). As is shown in the Table 4, these provide a large number of both positive and negative correlations between the main parameters of the analysed wines. The most relevant correlations are between alcohol and sugars in must, (r^2 = 0.906**); alcohol and dry extract (r^2 = 0.750** and r^2=0,777**); sugars in must and dry extract (r^2 = 0.702** and r^2 = 0.668**); sugars in must and 100 berries weight (r^2 = -0.739**).

For volatile acidity and free SO_2 the values of the Pearson correlation coefficient for these parameters displayed few correlations. Through this study it have been highlight that the parameters analysed from wine had an influence on each other based on the Pearson correlation index. The quality of the wine produced in the Blaj Wine Center of Târnave Vineyard is directly contingent on all these parameters and also by the climatic conditions of the year.

Table 4. *Pearson correlation matrix between the analysed wine parameters*

	Alc.	*AciT.*	*AciV.*	*ExtT*	*ExtN*	*InvS*	*SO_2f*	*SO_2t*	*g+f*	*100b*	*Must S*	*MustA*
Alc.	1											
AciT.	**-0.493****	1										
AciV.	0.110	**0.594****	1									
ExtT	**0.750****	0.300	-0.168	1								
ExtN	**0.777****	**0.630****	0.265	0.764**	1							
InvS	0.401	**0.604****	-0.561*	0.061	-0.320	1						
SO_2f	0.561	0.431	0.589*	0.235	0.302	0.156	1					
SO_2t	0.135	-0.272	-0.044	0.493	0.201	**0.616****	0.589*	1				
g_+f	**0.767****	**-0.826****	-0.391	**-0.689****	**-0.923****	0.409	-0.430	-0.056	1			
100b	**-0.755****	**0.673****	0.049	0.339	0.458	**-0.651****	-0.293	**-0.623****	**-0.590****	1		
MustS	**0.906****	-0.406	0.225	**0.702****	**0.668****	0.202	0.183	0.145	**0.672****	**-0.739****	1	
MustA	-0.406	**0.865****	0.433	**0.858****	0.407	-0.503*	0.233	-0.523*	**-0.656****	**0.683****	-0.394	1

Alc. = alcohol (% vol.); AciT.= total acidity (g/l tartric acid); AciV. = volatile acidity (g/l acetic acid); ExtT = total dry extract (g/l); ExtN= dry extract (g/l); InvS=total invert sugars; SO_2f = free sulphur dioxide (mg/L); SO_2t = total sulphur dioxide (mg/L); g+f = glucose and fructose; 100b = 100 berries weight (g); MustS = sugars in must (g/l); MustA = must acidity (g/l H_2SO_4).

*the correlation is significant at $p < 0.05$ in 95%;

*** the correlation is highly significant at $p < 0.01$, in 99%; N = 12.

CONCLUSIONS

In Blaj Wine Center, the climatic conditions highlighted the exceptional viticultural value as well as the authenticity encountered in the wide variety of wines produced in this area. The grape clones created at R.S.V.E. Blaj have a very good suitability in this area, based on the results regarding the qualitative assessment. In terms of quality rating, the clones (Fetească Regală 21 Bl, Muscat Ottonel 12 Bl and Sauvignon Blanc 9 Bl) display particular improved characters of the varieties, in well-known ecoclimatic conditions and ecopedological. The study of climatic conditions in 2016 and 2017, based on climate indexes, show different climate in the analyzed years with a significant influence on the quality of grapes and wines. The highest content in alcohol was recorded in 2017, for all three clones, an year characterized by a climate closer to the multiannual average, compared with 2016, when the amount of precipitation fell mainly during the veraison, affected the quality of the grapes. The Pearson correlation index highlighted a strong relation between the main quality parameters of wine. This study revealed information on the quality of the white wines obtained from clones created at R.S.V.E. Blaj, Romania, useful for their further promotion.

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