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COMPOSITIONAL QUALITY ASSESSMENT OF WINES PRODUCED IN SILVANIEI VINE GROWING CENTER OF ŞIMLEUL SILVANIEI, 2013- 2015 HARVEST

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Abstract: *Wine is a food product produced exclusively by partial/total alcoholic fermentation of fresh grapes. From a chemical point of view, wine is a complex mixture consisting of water, sugar, ethanol, amino acids, polyphenolic compounds, anthocyanins, organic/inorganic materials. Viticulture depends on meterorological conditions. The wine industry from Romania is particularly involved in the controversial effects generated by climate change. Although the overall effects of climate change on Romanian viticulture are uncertain, it is known that grapevine yields diminish with the occurrence of abiotic stress, such as freezing temperatures, increasing soil salinity and drought because of the varying effects on grape quality. The purpose of this work is to present data relating to the composition characteristics of some quality wines from the Şimleul Silvaniei in the new climate conditions over the last few years. The biological material consisted of the varieties: Fetească regală (F.r.), Fetească albă (F.r.), Italian Riesling (R.i.) and Furmint (F.m.). The weight values obtained for 100 grains (182.06±5.98 g F.a. 2014), sugar (202.28±2.98 g/L F.a 2013), titratable acidity (9.39±0.03 g/L $C_4H_4O_6$ F.m 2014), acidity (4.70±0.09 g/L H_2SO_4 F.m. 2014), pH (3.92±0.24 R.i. 2014) in grapes and reducing sugars (2.63±0.17 g/L F.a. 2015), total dry extract (27.73±1.29 g/L R.i. 2013), non-reducing extract (26.62±0.46 g/L R.i. 2013), total acidity (7.65±0.11 g/L $C_4H_4O_6$ F.r. 2013), volatile acidity (0.57±0.04 g/L CH_3COOH) of wine, are specific to the four varieties analyzed. The correlation analysis revealed a number of strong correlations between the qualitative characteristics of wine and composition of grapes.*

Keywords: *grapes, wine, Vitis vinifera.*

1. Introduction

Wine is food product produced exclusively by partial/total alcoholic fermentation of fresh grapes, whether or not pressed or by must fermentation (O.I.V). From a chemical point of view, wine is a complex mixture consisting of sugar, water, ethanol, amino acids, polyphenolic compounds, anthocyanins, organic/inorganic materials [1, 2, 3, 4].

Today, the vines are grown throughout the world; Europe has the highest percentage (51%) of the global planted with vines, followed by America and Asia [5]. In Romania the vineyard area has decreased since the 1990s and it currently ranks fifth in Europe after Italy, Spain, France, Portugal, and in 2013 Romania has an area of 229 000 hectares of vineyards [6, 7].

Europe encompasses the largest vineyard area in the world (OIV, 2012). Large scale analyses have demonstrated that climate change effects in Europa are spatially variable: water deficits and severe dry conditions are expected to decrease wine quality and increase annual fluctuations in yields in the Romanian zone. Conversely, in Northern Europe and Central, warming conditions are forecast for the future, and this should improve wine quality [8]. Wine industry from Romania is particularly involved in the controversial effects generated by climate change. *Although the overall effects of climate change on Romanian viticulture are uncertain, it is known that grapevine yields diminish with the occurrence of abiotic stress, such as freezing temperatures, increasing soil salinity and drought becase of the varying effects on grape quality.* Aridity would likely affect viticulture from Romania, especially during the crop-growing season [9].

The spatial variability of climate change effects in the wine industry is recognizable also to the local scale. This implies the adoption of a finer scale of the resolution in simulations of future climate conditions. The micro-climatic and meso-climatic characteristics of a given winemaking zone are considered key factors of the wine production performance [10]. Moreover, soil structure and chemistry, as well as vineyard management practice, are factors varies also at a local scale and there is evidence that they influence very significantly wine performance [11]. Soil is one of the most important factors for vine [12] it supports the root system, which absorbs water, accumulates carbohydrates and other nutrients, being crucial for grapevine growth, physiology and yield attributes [13]. Soil water retention properties are also important, as they can affect grapevine quality [14].

Past, current and future changes in global climatic conditions are condensed in the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, IPCC [15]. According to the IPCC report, the global mean temperature has increased by 0.74^0C±0.18^0C from 1906 to 2005 in non-linear way: the warming rate over the last 100 years is 0.07^0C±0.02^0C per decade, over the last 50 years 0.13^0C±0.03^0C and over the last 25 years near surface temperature increased by 0.18^0C±0.05^0C per decade. From the 1996 years, all years from 1995 to 2006 rank among the 11 warmest years on record since 1850. The number of cold nights (lowest 10%, based on 1961-1960) has decreased in the period of 1951 to 2003, whereas the number of warm night (highest 10%) has increased [16].

These changes affect agriculture in general and viticulture in particular. Amongst others the vegetative period lengthens when temperatures, especially spring temperatures are increasing in last several years. Clear changes in the dates of phonological vine stages are observable in many coutries form Europe [17].

In Alsace region, budburst and flowering events occurred about two weeks earlier in 2003 compared with 1965. The period between flowering and change of colour of berries shrunk by 8 days and change colour of the berries occurred almost 23 days early [18].

Viticulture depends on meteorological conditions. Evidence of this phenomen on is provided by extensive and worldwide empirical literature. Adopting different scale of analysis and new methods, researchers have demonstrated that climate affects vineyard yields [19, 20] wine quality [21, 22, 23, 24]. Some studies have considered effects on winegrower's profitability in terms of net revenue of profit [25, 26, 27]. Other studies have shown that ecoclimate conditions change impacts on grapevines are highly heterogeneous across varieties [28]. In Romania the effect of ecoclimatic conditions on the vine culture was studied by [29, 30, 31, 32, 33, 34].

The purpose of this work is: i) present data relating to the composition characteristics of some quality white wines that may be obtained from the vine varieties grown frequently in the Șimleul Silvaniei center for the Silvania vineyard in the new climate conditions from the last few years as a result of global warming, that increasing the amount of useful temperatures both during the growing season and the maturation of the grapes and ii) to also present the climatic conditions (temperature, insolation, raifall) and theier interaction, expressed by some viticultural indices and coefficients form Șimleul Silvaniei.

2. Matherials and methods

Four vine varieties for high quality white wines were used in the research: Fetească regală, Fetească albă, Italian riesling and Furmint grafted on the rootstock Berlandieri x Riparia Kobber 5 BB and cultivated in the area of Șimleul Silvaniei (47°05' North, 47°35' East), Satu Mare county, NW Romania.

Grape samples was collected in 2013 at full maturity and 10 kg of grapes/variety were collected from 10 vines/repetition. Three repetitions/variety were used, placed in randomized blocks. The grapes were harvested from the middle, top and lower, of each vine, grapes exposed to the sun, but also from shaded, thus obtaining a homogeneous sample [35]. After sampling, the samples were placed in sealable plastic bags, they were numbered and shipped as soon as possible to the laboratory. The grape samples was pressed with the laboratory press (manually) and the must was obtained, followed by the process of microvinification which resulted in the samples of wine.

In order to characterize the areas of Șimleul Silvaniei center for the Silvania vineyard meteorological data from the National Meteorological Agency has been used. Based on their specific formulas, ecoclimatic indicators were determined, important for the growth and the fruition of vines, such as global thermal balance (Σtog); active thermal balance (Σtoa); useful thermal balance (Σtou); thermal coefficient (Ct); annual and monthly rainfall amount; amount of hours of sunshine (Σir) and real sunburn coefficient (Ci). To get a wider picture on how climatic factors influence the growth and fruition of vines, the heliothermic index (HI), hydrothermal coefficient (CH) and bioclimatic index (Ibcv) were calculated [36].

Statistical analyses was performed using the statistical software package SPSS (version 23.0; SPSS Inc., Chicago, IL., USA). The data were expressed as mean ± standard deviation (SD) of three replications foe each sample analyzed. In order, for determination the significance differences among values, analysis of variance (ANOVA) and DUNCAN multiple range test (MRT) was performed. Pearson's corelation was done using version 23.0 of SPSS (SPSS Inc. Chicago, IL., USA).

3. Results and discussion

Analysis of the main climate data. Global warming has caused a disruption in the natural evolution of climatic conditions in the vineyards ecosystem, therefore summers have become extremely dry and autumns have become cold, wet, or warmer. As an indicatior of the vocation of a vineyard region, but also for establish the direction of production, the thermal balance and the amount of temperature degrees and have an absolute importance. The length of the vegetation period is within the normal cultivation limits of vines, over 170 days. In all three years studied can be seen that the length of the vedetation period has exceeded this limit: 196 (2013); 193 (2014) and 194 (2015). The thermal balance with the highest values was recorded in 2013, the global thermal balance ($\sum t^0g$) 3683, the active thermal balance ($\sum t^0a$) 3394 and the active useful thermal balance ($\sum t^0u$) 1549, the opposite with the thermal balance which has the lowest values was recorded in 2014, the global thermal balance ($\sum t^0g$) 3652, the active thermal balance ($\sum t^0a$) 3287 and the active useful thermal balance ($\sum t^0u$) 1538. We can see that from this point of view the years 2013 and 2014 are extremes of this research, while 2015 shows average values compared whit 2013 and 2014 (Table 1).

To appreciate the thermal resource and for interpreting the interaction of climatic factors from a vineyard area, is calculated the thermal coefficient (C_t). Given that 2013 was the warmest year of all, the highest thermal coefficient (18.1 (C_t) (Table 1) was registered.

When assessing the favorability of sun light which is used in viticulture, the following parameters are taken into consideration: insolation (sun shining) potential and actual (real ($\sum ir$)) and coefficient of insolation (C_i). The highest values of insolation were recorded in 2013 (1594 ($\sum ir$)) and (7.81 (C_i)), followed by the values obtained in 2015 (1563 ($\sum ir$)) and (7.69 (C_i)), whereas the lowest ones were recorded in 2014 (1498 ($\sum ir$)) and (7.53 (C_i)) (Table 1).

Precipitation is expressed in mm height of the layer of water, respectively l/m^2. The amount of rainfall is the average of daily values of calendar year ($\sum pp$). Coefficient of precipitation (Cp) is the ration between the amount of precipitation and the number of days. To establish correlations between grape production and precipitation, it is recommended to consider wine growing in on year. The highest values of precipitations was recorded in 2014 (536.9 ($\sum pp$); 1.83 (Cp)), followed by 2015 (521.9 ($\sum pp$); 1.79 (Cp)), the lowest values of precipitation was recorded in 2013 (489.6 ($\sum pp$); 1.72 (Cp)) (Table 1).

In most centers, vineyards, not exceeding 550 mm precipitation annually ($\sum pp$) and in four of them do not reach even 500 mm. This suggests that vine growth and fructification, does not need much water and that irrigation would be unnecessary. This view may be supported by the negative influence of abundant precipitations in areas with moderate temperatures on product quality wine. Scientific research shows that vines have need more water than the quantity of precipitation infiltrates in the soil (Table 1).

In nature, ecoclimatic factors (temperature, insolation and precipitation) do not act independently, but in a complex connection. The values of real heliothermic index (IH_r) it is between values 1 and 5. It is considered optimal for vineyard when values of real heliothermic index (IH_r) exceed 2.6. In Romania real heliothermic index (IH_r) has values between 1.35 and 2.70 [37]. From this point of view values of real heliothermic index (IH_r) are between 1.75 (2013), 1.56 (2014) and 1.69 (2014) (Table 1).

Hydrothermal coefficient (CH) it shows how vines are satisfied in terms of water in a certain temperature regime. Express the degree of suitability for a particular year. May have values between 0.3-3.4 but normal value for our country is between 0.5-2.5 [38]. Hydrothermal coefficient (CH) values are between 1.35 (2013), 1.48 (2014) and 1.41 (2015). It can be seen on hydrothermal coefficient (CH), that year with most precipitations is 2014 (1.48 (CH)) (Table 1).

Bioclimatic index (I_{bcv}) and express the interaction between temperature, insolation and humidity. It indicated the possibility of an area for one or the other directions production of vine. Bioclimatic index (I_{bcv}) has values between 8.3 (2013), 7.6 (2014) and 8.1 (2015) (Table 1). The ecoclimatic conditions from Șimleul Silvaniei vine growing revealed the exceptional character of this area and nature of wine from din vineyard present in large variety of wine produced in the area studied.

Table 1

Climate data from Șimleul Silvaniei area in 2012-2014

Area	Year	Studies elements		Specific: Average vales	Specific: Extreme limits Min.	Specific: Extreme limits Max.	Optimal condions for cultivation of vines
Șimleul Silvaniei	2013	The vegetation period	days	196	191	199	150-170
		Thermal balance	Global ($\sum t^0 g$)	3683	3456	3731	2700-3600
			Active ($\sum t^0 a$)	3394	3305	3697	2600-3500
			Useful ($\sum t^0 u$)	1549	1541	1561	1000-1700
			Thermal coefficient (C_t)	18.1	17.3	19.2	16-19
		Insolation (hours)	Real ($\sum ir$)	1594	1456	1661	1200-1600
			Coefficient of insolation (C_i)	7.81	6.84	8.31	7-9 hours
		Precipitations (mm)	Total annual ($\sum pp$)	489.6	459.4	549.3	500-700
			Coefficient of precipitation (Cp)	1.72	1.36	2.01	0.9-2.7
		The interaction of climatic factors	Real heliothermic Index (IH_r)	1.75	1.05	2.31	1.35-2.70
			Hydrothermal coefficient (CH)	1.35	1.25	1.70	0.6-1.8
			Bioclimatic index (I_{bcv})	8.3	7.9	8.9	4-15
	2014	The vegetation period	days	193	189	196	150-170
		Thermal balance	Global ($\sum t^0 g$)	3652	3369	3697	2700-3600
			Active ($\sum t^0 a$)	3287	3219	3654	2600-3500
			Useful ($\sum t^0 u$)	1538	1531	1594	1000-1700
			Thermal coefficient (C_t)	17.6	17.0	18.2	16-19
		Insolation (hours)	Real ($\sum ir$)	1498	1420	1643	1200-1600
			Coefficient of insolation (C_i)	7.53	7.59	8.01	7-9 hours
		Precipitations (mm)	Total annual ($\sum pp$)	536.9	521.9	578.6	500-700
			Coefficient of precipitation (Cp)	1.83	1.52	1.98	0.9-2.7
		The interaction of climatic factors	Real heliothermic Index (IH_r)	1.56	1.09	2.23	1.35-2.70
			Hydrothermal coefficient (CH)	1.48	1.12	1.53	0.6-1.8
			Bioclimatic index (I_{bcv})	7.6	6.9	8.1	4-15
	2015	The vegetation period	days	194	191	195	150-170
		Thermal balance	Global ($\sum t^0 g$)	3676	3484	3869	2700-3600
			Active ($\sum t^0 a$)	3321	3532	3846	2600-3500
			Useful ($\sum t^0 u$)	1551	1493	1676	1000-1700
			Thermal coefficient (C_t)	16.9	15.3	19.0	16-19
		Insolation (hours)	Real ($\sum ir$)	1563	1395	1569	1200-1600
			Coefficient of insolation (C_i)	7.69	7.53	7.96	7-9 hours
		Precipitations (mm)	Total annual ($\sum pp$)	521.9	512.1	568.3	500-700
			Coefficient of precipitation (Cp)	1.80	1.70	1.99	0.9-2.7
		The interaction of climatic factors	Real heliothermic Index (IH_r)	1.69	1.51	2.06	1.35-2.70
			Hydrothermal coefficient (CH)	1.41	1.36	1.82	0.6-1.8
			Bioclimatic index (I_{bcv})	8.1	8.0	8.4	4-15

Analysis of the main qualitative indicators of grapes. The content in sugar of the grapes it was between values of 202.28±2.98 (2013) (g/L) and 201.32±1.59

(2015) (g/L) obtained by variety F.a. the opposite is variety F.r. 179.72±2.46 (2014) (g/L) and F.m. 185.72±5.59 (2014) (g/L). We can see that the accumulation of sugar in this case was influenced by factor Years ($F=11.711$, $p \leq 0.000$) and Variety ($F=20.640$, $p \leq 0.000$). Titratable acidity expressed in g/L ($C_4H_4O_6$) has the following values: the highest values was registered to F.m variety (9.34±0.08 (g/L) 2013) and (9.39±0.03 (g/L) 2014), the lowest values was registered to F.a. (8.70±0.04 (g/L) 2013) and (8.68±0.04 (g/l) 2015). Acidity expressed in g/L (H_2SO_4) in this case it was influenced by factor Years ($F=64.777$, $p \leq 0.000$) and Variety ($F=11.803$, $p \leq 0.000$) and the higest values was obtained to F.m. (4.70±0.09 g/l H_2SO_4 (2014)). Values of pH it was included in the normal limits for the variety analyzed. Mass of 100 gains had values between 134.39±1.47 (g) (2015) and 182.06±5.98 (g) (2014) (Table 2).

Table 2

The main features of the composition of grapes

Area	Va-riety	Years	Weight of 100 grains (g)	Sugar (g/L)	Titratable acidity (g/L $C_4H_4O_6$)	Acidity H_2SO_4 (g/L)	pH
Ș.S.	F.r.	2013	174.75±4.26 c α	191.72±2.46 cde α	9.14±0.04 b α	4.59±0.15 ab α	3.22±0.05 bcd β
		2014	182.06±5.98 a α	179.70±2.45 f β	9.22±0.05 b α	4.58±0.11 ab α	3.92±0.24 a α
		2015	181.60±1.75 ab α	187.68±3.45 de α	9.18±0.02 b α	4.43±0.05 c α	3.84±0.10 a α
	F.a.	2013	129.32±2.19 f α	202.28±2.98 a α	8.70±0.04 e β	4.28±0.04 c β	3.12±0.03 d β
		2014	130.16±1.96 f α	196.27±5.78 abc α	9.05±0.06 c α	4.56±0.07 b α	3.21±0.04 bcd α
		2015	129.91±1.39 f α	201.32±1.59 a α	8.68±0.04 e β	4.21±0.02 c β	3.19±0.02 cd α
	R.i.	2013	134.63±5.02 ef α	193.21±4.77 bcde β	9.17±0.01 b α	4.55±0.03 b α	3.42±0.02 b β
		2014	140.84±4.97 e α	190.43±0.84 cde β	9.17±0.02 b α	4.54±0.06 b α	3.92±0.24 a α
		2015	134.39±1.47 ef α	199.87±1.39 ab α	8.79±0.05 d β	4.25±0.04 c β	3.84±0.10 a α
	F.m.	2013	167.97±1.47 d α	187.92±7.46 de α	9.34±0.08 a α	4.67±0.05 ab α	3.39±0.03 bc α
		2014	169.67±4.23 cd α	185.72±5.59 f α	9.39±0.03 a α	4.70±0.09 a α	3.27±0.03 bcd β
		2015	175.39±5.14 bc α	193.41±3.03 bcd α	9.19±0.02 b β	4.27±0.05 c β	3.25±0.04 bcd β
F (Fisher Factor)			109.531	8.615	87.231	17.268	24.372
Sig.			$p \leq 0.000$	$p \leq 0.000$	$p \leq 0.000$	$p \leq 0.000$	$p \leq 0.000$
Year	F^1		4.270	11.711	96.520	64.777	23.882
	Sig.		*	***	***	***	***
Variety	F^1		395.055	20.640	211.922	11.803	53.009
	Sig.		***	***	***	***	***
Years x Variety	F^1		1.856	1.571	21.790	4.164	10.217
	Sig.		ns	ns	***	**	***

F.r. = Fetească regală; F.a. = Fetească albă; R.i. = Italian riesling; F.m. = Furmint; Ș.S. = Șimleul Silvaniei
F^1 = Fisher Factor

Analysis of the main qualitative indicators of white wine. The reducing sugar (g/L) was very significantly influenced by variety factor (F=12.952, p ≤ 0.000), the interaction the year x variety had a distinctly significant influence (F=4.595, p = 0.003), but the year factor had not influenced this character. The highest values were registered to F.a. variety (2.63±0.17 (g/L) 2015) and the lowest values were registered to F.m. (1.70±0.17 (g/L) 2015). The highest content of total dry extract (g/L) was recorded in wines from R.i. variety (27.73±1.29 (g/L) 2013); (25.66±1.92 (g/L) 2014) and F.a. variety (25.84±1.48 (g/L) 2013) this variants are equal in statiscal terms. The lowest content of total dry extract was recorded to wine obtained from F.m. (19.32±1.88 (g/L) 2013; 19.42±1.00 (g/L) 2014 and 19.80±0.75 (g/L) 2015). The differences between variants were statistically assured (F=12.442, p ≤ 0.000). The biggest influence on the non-reducing extract content was given by variety factor (F=50.244, p ≤ 0.000), followed by year factor (F=6.92, p = 0.004) and interaction of factors years x variety (F=2.677, p = 0.039), this had a distinctly significant influence on this character. The highest content of non-reducing extract was recorded in wine obtained from R.i. variety (26.62±0.43 (g/L) 2013 (Table 3).

Table 3

The main features of the composition of white wine

Area	Variety	Years	Reducing sugars (g/L)	Total dry extract (g/L)	Non-reducing extract (g/L)	Total acidity (g/L $C_4H_4O_6$)	Volatile acidity (g/L CH_3COOH)
Ș.S.	F.r.	2013	1.94±0.08 de *α*	22.75±0.84 bc *α*	19.70±0.78 d *α*	7.65±0.11 a *α*	0.45±0.02 cde *α*
		2014	2.15±0.19 bcd *α*	21.47±0.93 bcd *αβ*	20.58±0.58 cd *α*	7.53±0.10 ab *αβ*	0.50±0.03 abcd *α*
		2015	2.08±0.08 d *α*	20.48±0.91 cd *β*	19.91±1.18 d *α*	7.38±0.06 b *β*	0.52±0.09 ab *α*
	F.a.	2013	2.48±0.43 ab *α*	25.84±1.48 a *α*	24.83±0.31 b *α*	7.30±0.15 bc *αβ*	0.41±0.02 ef *α*
		2014	2.12±0.11 cd *α*	21.35±1.09 bcd *β*	23.78±0.32 b *α*	7.11±0.05 cd *β*	0.46±0.03 bcde *α*
		2015	2.63±0.17 a *α*	23.30±1.72 b *αβ*	24.31±1.83 b *α*	7.35±0.06 b *α*	0.44±0.03 de *α*
	R.i.	2013	2.46±0.13 abc *α*	27.73±1.29 a *α*	26.62±0.46 a *α*	6.92±0.12 de *α*	0.53±0.03 a *α*
		2014	2.14±0.05 bcd *α*	25.66±1.92 a *α*	25.48±0.88 ab *α*	6.89±0.05 de *α*	0.57±0.04 a *α*
		2015	2.50±0.30 ab *α*	21.86±1.63 bcd *β*	24.42±1.91 b *α*	7.01±0.03 de *α*	0.51±0.04 abc *α*
	F.m.	2013	1.99±0.13 de *α*	19.32±1.88 d *α*	24.57±0.92 b *α*	6.61±0.12 f *α*	0.39±0.02 ef *α*
		2014	2.16±0.03 bcd *α*	19.42±1.00 d *α*	21.86±0.68 c *β*	6.82±0.15 ef *α*	0.37±0.04 f *α*
		2015	1.70±0.17 e *β*	19.80±0.75 d *α*	21.10±0.48 cd *β*	6.61±0.31 f *α*	0.36±0.03 f *α*
F (Fisher Factor)			6.168	12.442	16.421	21.321	10.140
Sig.			p ≤ 0.000	p ≤ 0.000	p ≤ 0.000	p ≤ 0.000	p ≤ 0.000
Years	F^1		0.709	11.712	6.920	0.237	1.631
	Sig.		ns	***	**	ns	ns
Variety	F^1		12.952	28.771	50.244	71.752	32.981
	Sig.		***	***	***	***	***
Year x Variety	F^1		4.595	4.521	2.677	3.138	1.556
	Sig.		**	**	*	*	ns

F.r. = Fetească regală; F.a. = Fetească albă; R.i. = Italian riesling; F.m. = Furmint; Ș.S. = Șimleul Silvaniei
F^1 = Fisher Factor

The total acidity (g/L) $C_4H_4O_6$ and volatile acidity (g/L) CH_3COOH recorde very significant differences between variants total acidity (g/L) $C_4H_4O_6$ ($F=21.321$, $p \leq 0.000$) and volatile acidity (g/L) CH_3COOH ($F=10.140$, $p \leq 0.000$). In both cases the factor who influencing most was the variety ($F=71.752$, $p \leq 0.000$ total acidity (g/L) $C_4H_4O_6$) and ($F=32.981$, $p \leq 0.000$ volatile acidity (g/L) CH_3COOH). The highest content was recorded in F.r. (7.65±0.11 (g/L) 2013 total acidity $C_4H_4O_6$) and R.i. (0.53±0.03 (g/L) 2013; (0.57±0.04 (g/L) 2014 volatile acidity CH_3COOH) (Table 3).

Pearson correlation coeficients of composition of grapes and qualitative characteristics of white wine. To reveal if the composition of the wine are influenced by the composition of grape, in this sense we have performed Person correlation between composition of grapes (weight of 100 grains, sugar, titratable acidity, acidity and pH) and qualitative characteristics of wine (reducing sugars, total dry extract, non-reducing extract, total acidity and volatile acidity). Values greater than 0.5 represent a strong correlation between variables, a positive correlation means that, when a variable increases, correlated variables increase also, while a negative correlation means an increase in the primary variable causes a decrease in the correlated variables.

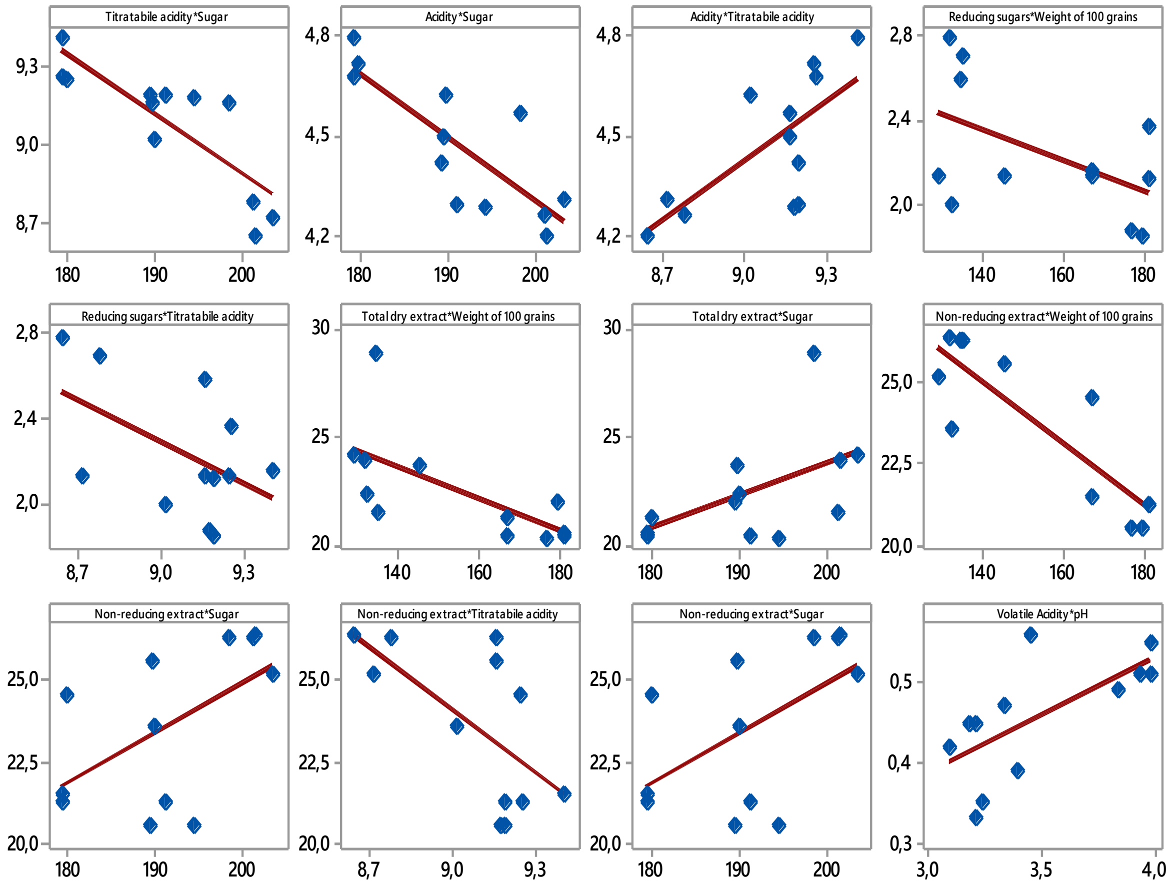

Fig. 1. Pearson correlation coeficients of composition of grapes and qualitative characteristics of white wine

They have obtained a large number a string relationships between the qualitative characteristics of wine and composition of grapes: titratabile acidity & sugar (-0.835**); acidity & sugar (-0.821**); acidity & titratabile acidity (0.715*); reducing sugars & weight of 100 grains (-0.526*); reducing sugars & titratabile acidity (-0511*); total dry extract & weight of 100 grains (-0.666*); total dry extract & sugar (0.529*); non-reducing extract & weight of 100 grains (-0.874**); non-reducing extract & sugar (0.559*); non-reducing extract & titratabile acidity (-0.641); non-reducing extract & sugar (0.698*) and volatile acidity & pH (0.673*).

4. Conclusion

The ecoclimatic conditions from Silvaniei vine growing revealed the exceptional character of this area and nature of authenticity of wine from vineyard present in large variety of wine produced in the area studied. Regarding qualitative assessment of varieties taken in testing, based on the results it can be observed that the varieties have a good suitability in the area studied and quality determinations show particular characteristics but also influence of the ecoclimatic and ecopedologic on wine quality. The quality of wine obtained for F.r., F.a., R.i. and F.m. in years 2013, 2014 and 2015 in Șimleul Silvaniei center, was particulary influenced by the balance between alcoholic strength, acidity and residual sugar. In the conditions of Silvaniei vineyard, at the Șimleul Silvaniei center can be obtained wines fresness and flavour, giving it a speial personality that is appreciated by connoisseurs and casual consumers. Person's correlation analysis revealed a number of strong correlation between the qualitative characteristics of wine and composition of grape.

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