

QUALITATIVE AND QUANTITATIVE PERFORMANCES OF THE 'FETEASCĂ NEAGRĂ' VARIETY - A TRUE AMBASSADOR OF VITICULTURAL ROMANIA

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Abstract

The development of this study began from the consideration that the Severin vineyard in the viticultural Area of the Muntenia and Oltenia Hills offers an extremely varied ecological environment and viticultural landscape, capable of meeting the requirements of the various grape vine varieties, even of those considered sensitive. Throughout this entire oenological offer, which reflects, within a limited territory, the whole country's winemaking ability, Oltenia may be considered, and rightly so, a small viticultural Romania. It is not by accident that we chose the 'Fetească neagră' variety, as it is considered a close descendant of the wild grape vine (which may be admired in the forests of Oltenia); it is considered the most representative local variety for high-quality red wines, a variety the origin of which has been lost over time. In essence, the nature of the climate here remains favorable to the 'Fetească neagră' variety, which seems well adjusted to the vine training system with fruiting woody shoot of 12 buds and the grape yield obtained and all of the wine's quality parameters meet the necessary for obtaining high-quality wines.

Key words: climate, grape, temperature, terroir, yield.

INTRODUCTION

Romania's international recognition in the winemaking field is based upon the various medals obtained by the Romanian wines in the national and international contests in which our country has participated ever since the 19th century. An area's vocation and terroir elements, its recognition, supported by its mark on the qualitative value of the products obtained, are hard to achieve. They require time, terroir studies, the variety's structure, the plant's and soil's agricultural engineering, a specific vinification technology, a permanent interest in promoting the wine (Stroe and Barcanu-Tudor, 2011; Popa et al., 2015; O.I.V., 2010).

Basically, the environment conditions offered by the Romanian viticultural territory ensure the cultivation of a diverse range of varieties, both from worldwide and local sorts, intended for raw consumption, for white and fortified wines, as well as for red wines, due to the generosity of the heliothermic resources. The

wines obtained may thus be included in different quality-related categories, from those with a protected designation of origin and degrees of quality, to those with a geographical indication or varietal wines, dry, semidry, semisweet or sweet, and each type of consumer may find, in the current viticulture and vinification, a partner that meets each and everyone's requirements.

The variety structure existing in Romanian's viticulture, one may notice that it is oriented towards the culture of white wine varieties, in a percentage of 67.3% (Oșlobeanu et al., 1980).

The percentage of black grape varieties is of 21.4%, while aromatic varieties hold 6.6%; other varieties, 4.7% (Oslobeanu et al., 1991).

The registered data has a setting point of reference in this sense, due to the fastidiousness with which the study has been developed.

At the time, 11 varieties held a percentage of 87.4% of the surface, and the remaining ones, including the 'Fetească neagră' local variety (0.8 % - 650 ha), represented a total of 12.6 %. In 2017 (www.agrinet.ro) the dominant share

was still held by the white wine varieties and 'Fetească regală' represent 18% of the total surface on which white wine grape varieties were cultivated. The surface on which red wine grape varieties were cultivated is of 27,135 ha (representing 15.9%). An analysis by comparison reveals an increase of the share held by the white grape varieties from 67.3% to 84.1% and a decrease of the position held by the black grape varieties from 21.4% to 15.9%. With respect to the share held by the 'Fetească neagră' variety, according to the data of the National Office of Vine and Wine Products, it is cultivated on 2,961.99 ha, and within the regions, the surfaces are distributed as follows (www.capital.ro): the Transilvania Plateau Viticultural Area: 34.01 ha; the Moldavian Hills Viticultural Area: 966.9 ha; the Muntenia and Oltenia Hills Viticultural Area: 1,036.16 ha; the Banat Hills Viticultural Area: 110.95 ha; the Crișana and Maramureș Viticultural Area: 154.92 ha; the Dobrogea Mounds Viticultural Area: 581.85 ha; the Danube Terraces Viticultural Area and other favorable lands in the south of the country: 77.20 ha. The development of this study began from the consideration that the Muntenia and Oltenia Hills Viticultural Area offers an extremely varied ecological background and viticultural landscape, capable of satisfying the requirements of the various grapevine varieties, so that, in this historical region of Romania, one may obtain a diverse range of wines: from white to red, from dry to semisweet or sweet, from still to sparkling, from varietal to high quality, with protected designation of origin or even white wines having black grapes as raw material for vinification (Cabernet Sauvignon - the Opișor viticultural center). Throughout this oenological offer, which reflects, within a limited territory, the winemaking abilities of the entire country, Oltenia may be considered, and rightly so, a small viticultural Romania. It is not by accident that we have chosen the 'Fetească neagră' variety. Considered a close descendant of the wild grape vine (which may be admitted in the forests of Oltenia), it is the most representative local variety for high-quality red wines, a variety the origin of which has been lost over time; many authors consider it to have Dacian origins (Constantinescu et al.,

(84.1%). From among them, 'Fetească albă' (1959). It should be iconic for our viticulture and it should become a true ambassador of viticultural Romania. One cannot ignore its significance in the activities of viticultural tourism when, offered for tasting, along other local varieties, it is capable of promoting the quality and tradition of Romanian viticulture. Despite being cultivated over almost 3,000 ha, the biggest share is held by the vineyards and the viticultural centers in the South and South Eastern region of Romania, namely the region of Moldova, Dobrogea and the Hills of Muntenia and Oltenia. If we refer to the Oltenia viticultural territory, it may be found at Breasta, Banu Mărăcine, Stârmina, Opișor, Vânu Mare and others. In the Corcova viticultural area, located in the north of the Mehedinți County, this variety is cultivated on over 6 ha; this is also the place where this study has been developed. The Mehedinți County benefits from a long viticultural tradition and a fame built especially on the quality of the red wines obtained here.

MATERIALS AND METHODS

Plant material and growth conditions

The chosen variety was 'Fetească neagră' (Figure 1) an ancient local variety, considered Dacian in origin, which seems to be a selection of *Vitis silvestris*. It is part of *Proles orientalis - subproles caspica*. It has 32 synonyms, the most well known of which are: 'Poama fetei neagră' (Black Maiden Fruit), 'Păsărească neagră' (Black Bird), 'Coadă rândunicii' (Swallow's Tail) (Rotaru, 2009; Stroe, 2014; www.vivc.de, www.eu-vitis.de/index.php). The pruning technique used was Guyot, in the Single Guyot version (1 short element 3 buds + 1 woody shoot of 12 buds - V1), Double Guyot (2 short element of 3 buds + 2 woody shoot of 10 buds - V2) and multiple Guyot (3 short element of 2 buds + 3 woody shoot of 8 buds - V3).

This way, the fruit load was gradual 15, 26 and 30 buds/vine, finalized after the pruning performed in early spring. Spacing between vines are reduced to 1.8 meters between the rows and 0.9 meters between the vines (6,172 vines/ha), meaning a high density planting,

because the growers main objective is to obtain the experimental variants: V1: 15 buds/vine, and 9.2 buds/m²; variant V2: 26 buds/vine and 16 buds/m²; variant V3: 30 buds /vine and 18.5 buds/m². During the growing period, observations were made during the entire phenological spectrum, calculating the fertility coefficients (absolute, relative), the yield indices (absolute and relative - g/vine shoot), the length of the vegetative shoots and, at the time of harvesting, on an average sample of 10 vine for each experimental variant, the following determinations were made: the number of grapes per vine the average weight of a grape, the yield kg/vine, the yied/ha, sugars (g/l) by the refractometric method, acidity (g/l tartaric acid) by the titrimetric method, the alcohol potential was achieved by the ebulliometric method and the non-sugar dry extract was determined as being the difference between the total dry extract (calculated by the direct method) and the total sugars.

The climatic conditions registered in the area

The evolution of the oenoclimatic background was based upon the calculation of certain classical synthetic indicators (the annual amount of rainfall, the amount of rainfall during the growing season, the average annual temperature, the average temperature in the month of July, the Martonne aridity index), over two viticultural years (2015-2016 and 2016-2017) and their interpretation in accordance with the information contained in the specialized literature (Oşlobeanu et al., 1980; Teodorescu et al., 1987; Paltineanu et al., 2007; Mărăcineanu, 2010). The meteorological data comes from the specialized literature, if we take into account the older entries to which our research period relates (Teodorescu et al., 1987) and from the current ones, available at the address www.wunderground.com. Thus, the average annual temperature provides information on the nature of the climate; the average temperature in the month of July is a synthetic indicator that leads the viticultural center towards a certain yield direction, the annual amount of rainfall and the amount of rainfall in the growing period indicate the area's favorability for viticulture; the Martonne aridity index indicates the nature of the climate, taking

quality wines. This way were obtained into account the temperature - humidity interaction and is calculated in accordance with the formula:

$$IAM = \frac{\text{Annual rainfall amount}}{\text{Average annual temp.} + 10^{\circ}\text{C}}$$

From a lithological point of view, the area has a diverse lithological structure and is rich in minerals, specific to the Motru Piedmont, which is part of the largest piedmont unit in the country, the Getic Piedmont.

RESULTS AND DISCUSSIONS

The oenoclimatic data that characterizes the Corcova viticultural center is presented in Table 1, by comparison to the multiannual average in the respective area and its analysis reveals that there are significant differences with respect to the defining elements of the climate. These are generally pointed out by an increase in the value of certain temperature indicators and the decrease of those corresponding to the humidity, as follows: the annual temperature increased by 1.75°C; the average temperature in the month of July increased by 1.63°C; the annual amount of rainfall decreased by 383.76 mm; the amount of rainfall in the growing period decreased by 191.13 mm.



Figure 1. 'Fetească neagră' grape, Corcova

From the point of view of the aridity index, which integrates in a single formula the value of the annual average temperature and the annual rainfall, in view of characterizing the climate, it follows that, between 1961 and 1970, Corcova had a rather humid climate. Over the years, because of the decrease in rainfall and increase in temperature, the climate may be characterized as semi-arid Mediterranean in nature.

The collected data have, of course, a indicative value, but in the same time they confirm the current climatic changes, but for a precise characterizations are needed the values for the last 30 years. In this context, for the studied period, it was appreciate that the climate nature was favorable for quality viticultural practices. Climatic challenges may arise due to the lack of precipitation, their uneven distribution or excessive temperatures, but the presence of surroundings forest ecosystems may improve the existing microclimate. During the research, the terroir of wine-growing center Corcova was studied and also the behavior of phenological spectrum of 'Fetească neagră' variety. It was observed that the triggering of all the phenophases and their length were influenced, in a small extent, by the number of bunch load, this in turn, being influenced by ecoclimatic conditions recorded in the area, but also according to the wine year.

According to the research it appears that a differentiated load of bud/vine has influenced the values of fertility coefficients (Table 2). Fertility is a measurable parameter of each variety (genetic imprint), but it can be influenced, to the same extent, by environmental conditions and by agro-technology applied to the plant and soil.

It was observed that the increase of the fruit load correlates with the decrease of the absolute fertility coefficient, so it is correlated with the decrease of the fertility buds.

There is a correlation between fertility and number of elements production elements,

(fruiting elements); as their length decreases, the fertility of buds is reduce. As a results, under the given conditions, the 'Fetească neagră' variety has a better agrobiological behavior when the pruning is made with 12 buds/shoot (V1).

The relative fertility coefficient value remains constant in the first two variants and on the third variant has a slight increase, recorded at the highest load of fruit (30 buds/vine). However, the increase of the number of inflorescences reported to the number of shoots is small, and does not compensate for the disadvantages of exaggerated vegetative growths.

Regarding the yield, measured by the two indices (api, rpi), it can be noted that as fruit load increases, the average weight of a grape decrease (Table 2).

The same trend is observed in analysis data and highlights that the length of the shoots is reducing with the increase of the buds on vine. On average, it ranges from 140 cm to 156 cm, but in the same way it also evolves the matured length of the woody shoots - the small fruit load ensures an obvious maturation of the woody shoots.

In practice, this aspect is very important considering that the extreme minimum temperatures during winter have a tendency to accentuate, at least in recent years, in most of the wine-growing areas of Romania.

The grape yield increase in proportion with the fruit load, the maximum registered was V2, with a load of 26 buds/vine (V2).

Table 1. Synthesis regarding the oenoclimatic data characterizing the Corcova viticultural center

Northern latitude	Altitude (m)	Rainfall (mm)		Average temperature (°C)		Martonne aridity index
		Annual	Growing period	Annual	July	
44°35'	150	1961-1970 Period (Teodorescu et al., 1987)				
		741.00	374.00	10.70	22.70	35.79
		2015-2017 Period				
		357.24	182.87	12.45	24.33	15.92
		-383.76	-191.13	+1.75	+1.63	-19.87

This can be explained by the fact that the quantitative yield is influenced both by the average weight of a grape and by the number of grapes on the vine, ultimately by the relative productivity index. From a qualitative point of

view, too high yields are not desirable if they are not supported from a qualitative point of view, especially in the case of varieties with high growth rate (Stroe et al., 2013).

Table 2. Quantity and quality yield attributes

Experimental varieties	Fertility coefficient		The average weight of grapes (g)	Productivity index (g/shoot)		Length of shoots (cm)			Yield Kg/vine	Yield ha (kg)	Sugars (g/l)	Total acidity (g/l H ₂ SO ₄)
	absolute	relative		absolute (g/shoot)	relative (g/shoot)	total	matured	%				
V1 15 buds/vine 1 short element of 3 buds + 1 woody shoot of 12 buds	1.3	0.38	210	273.0	79.8	156	142	91	1.25	5,932	235	4.47
V2 26 buds/vine 2 short element of 3 buds + 2 woody shoot of 10 buds	1.1	0.38	194	213.4	73.7	145	125	86	1.70	8,495	223	5.10
V3 30 buds/vine 3 short element of 2 buds + 3 woody shoot of 8 buds	1.0	0.40	175	175.0	70.0	140	115	82	1.60	7,944	203	5.30

By comparison, if for the table grapes the visual perspectives are important, for wine grapes the major importance are the elements that ensure the composition of the wine and its balance such as: sugar content, acidity, color compounds and so on (Table 3).

As shown in table 3, the content in sugars decrease as the fruit load increases. The total acidity marks a slight inverse variation, so that higher sugar content is associated with a lower acidity and vice versa. From the maturity

evolution point of view, there is sufficient accumulation of compounds responsible for ensuring the quality of the wine production.

For example, the sugar content is sufficient to provide a potential alcoholic degree of wine of approximate 13-14% volume of alcohol, under conditions of sufficient acidity.

It can be noted, that the harvest fulfills the required conditions for obtaining quality wines, both with protected designation of origin and with geographical indication (Figure 2).

Table 3. Quality indices of grape harvest and obtained wine (average 2016-2017)

Quality indices of grape harvest	
Total acidity (g/l H ₂ SO ₄)	5.3
Sugars (g/l)	220
Yield (t/ha)	5.3
Wine quality indices	
Total acidity (g/l acid tarttric)	4.2
Alcohol (vol %)	13.0
Non-reducing dry extract (g/l)	28.9

It can be seen that all the qualitative parameters, found in Table 3, provides quality elements that support the classification of 'Fetească neagră' variety in protected designation of origin category (www.onvpv.ro).

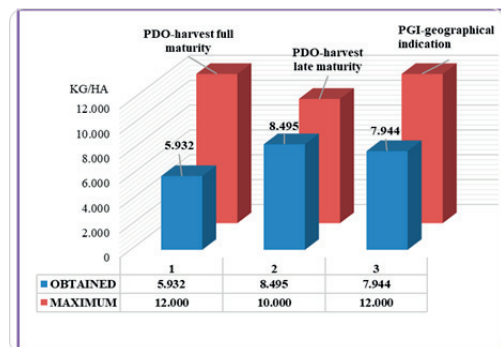


Figure 2. Achieved yield in relation with the maximum accepted for quality wines

CONCLUSIONS

Due to global warming, we observe obvious differences in the climate, highlighted by the increase values of some temperature indicators and the decrease of those corresponding to humidity.

The climate of the Corcova-Mehedinti wine-growing center, can be characterized as a Mediterranean semiarid, while almost 50 years ago it was rather a humid climate.

The climate remains favorable for the cultivation of the 'Fetească neagră' variety, and the attribution of a different fruit load, this variety seems well suited for pruning in 12 buds (V1), 15 buds/vine.

The assessment of the oenological potential revealed that the values of the compounds responsible for ensuring the quality of the wine production are sufficient to ensure an alcoholic potential of approx. 13-14 vol % alcohol, under conditions of balanced and sufficient acidity.

The grape harvest and all the quality parameters of the wine meet the necessary conditions existing in the specifications that aim to obtain quality wines with protected designation of origin.

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