THE STUDY OF ACCLIMATIZATION OF GRAPES OF MEDITERRANEAN ORIGIN TO THE WEATHER CONDITIONS OF THE WINE-GROWING REGIONS OF SEGARCEA

R. CĂPRUCIU[1], A. M. DODOCIOIU[1], N. GIUGEA[1], C. D. COSTEA[1], E. MĂRĂCINEANU[2]

[1]Faculty of Horticulture, 13, A.I.Cuza Street, Craiova, Dolj, Romania
[2]Sud Oil Ltd., Işalnița workstation, Dolj, Romania

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ABSTRACT

This study was carried out during 2019-2020 on plots belonging to the wine-growing areas of Segarcea, famous wine areas in point of extracting red wine with remarkable qualities in the south of the country. The significance of the work consists in improving the useful climate of the wi ne area of Segarcea by introducing into the culture beside black grapes varieties, renowned varieties like Feteascăneagră, Merlot, Cabernet-Sauvignon, Pinot noir, etc., other grape varieties of Mediteranean origin, such as Syrah and Marselan. The aim is to rigorously monitor the weather conditions with a direct impact on the soils with a production potential, observing the dynamics of its establishment and maturation index for each variety during the period studied.

INTRODUCTION

Environmental conditions play an important role in determining not only yield, but also grape quality potential. In addition, depending on these conditions (and other factors like market access), profitability for growers in some regions can be driven by optimizing yields and reducing production costs, while in other regions it can be driven more by producing higher quality grapes for higher price wines (Van Leuwen et al., 2019; Ollat et al., 2017). Thorough knowledge of environmental factors as well as the opportunities of taking control over them by means of cultivation technologies, it is an essential condition to obtain high yields of grapes, top quality, in terms of increased economic efficiency (Dejeu, 2009).

Wine quality and yield are strongly influenced by climatic conditions and depend on complex interactions between temperatures, water availability, plant material and viticultural techniques. In established winegrowing regions, growers have

optimized yield and quality by choosing plant material and viticultural techniques according to local climatic conditions, but as the climate changes, these will need to be adjusted (Spayd et al., 2002; Van Leuwen et al., 2019, Drappieret al., 2019, Parker et al., 2019).

Because of the change in weather conditions over the last years, strict monitoring is required in order to ascertain the degree of water stress and heat the wine is subjected to with potential repercussions on the quality (Van Leuwen et al., 2004; Popa, 2006; Popa, 2008; Mira de Orduna, 2010; Caffarra et al., 2012;). To decide which is the best moment for harvesting the grapes, several parameters and subscripts of maturity are used (Abbal et al., 1992; Panigai et al., 1994; Wheeler et al., 2005).

MATERIAL AND METHOD

The climate data was supervised with the help of the weather station settled in the vineyard of Segarcea. The biological material used for analysis consisted of grape varieties belonging to the newly introduced Mediterranean origin (fourth year after planting), Syrah and Marselan.

The test was done by using the method of randomized block with four variants, representing the varieties studied, constitutes studied varieties grown under identical adaphic and orographic (plateau) conditions.

The qualitative analysis of the varieties already mentioned was carried out every five days during the process of maturation and included: establishing the weight of 100 grains using an laboratory automatic analytical scale, determining the sugar by using the refractive method (Abbe refractometer), determining the total acidity by using the process of maturity of the varieties of Mediterranean origin which was traced by determining the glucose-acidimetric index rendered in the formula: IGA = G / TA, where G stands for sugars (carbohydrates) and At for total acidity of the soil.

RESULTS AND DISCUSSIONS

Climatic factors were monitored in order to asses restrictive climatic indicators with an impact on the bioproductive an qualitative behavior of the soils being analyzed, the data being processed and analyzed in light of the general climatic indicators (unicriterial). Data regarding the assessment of heat (absolute minimum and maximum

temperatures, average temperatures), the assessment of light resources, the quantity of precipitation as well as the relative humidity in the air are climate factors which were processed and analysed. The thermal resources constitute the permanent element that, being variable, causes the most important manifestation of the vine (Martin, 1968). It is also known the lower threshold that triggers the biological processes of the vine at 10°C.

From the data given in Table 1 it is noted that this threshold was reached both in 2019 as well as in late spring of 2020 in Segarcea, when the average monthly temperatures were 12,2°C 13,5°correlated with absolute minimum temperatures 2,1°C 3,1°C. A criteria to asses the condition for the quality of grapes is indicated by the average temperature of the warmest month (July and August), which in Romania is a minimum of 18,5°C and maximum of 23,2°C. We noticed that in 2019 the temperatures exceeded the maximum monthly average (24,5°C), the year 2020 being optimal in this concern (22,8°C)-table 1.

Exceeding the maximum threshold allowed for our country (in 2019), is closely related to accumulating compounds that give black grapes and later the red wine the quality required. The absolute maximum temperature in August is a restrictive factor concerning the quality of grapes when the temperatures exceed 42°C.

When air temperature reaches this value the process of photosynthesis is blocked leading to increased respiration and evapotranspiration, processes leading to lower levels of organic acids (malic acid), sugars and aromatic substances. This phenomenon was not recorded during the study analyzed,the maximum of temperature reached was of 38°C in August 2019 and 37,2°C in 2020. Average maximum temperature in August is a restrictive factor when it exceeds 34°C. During the reported period the value of this factor was 31,5°C in 2019 and 29,6°C in 2020 (Table 1).

The requirements for the soils analyzed for moisture content were estimated by precipitation and relative humidity (hygroscopicity). Overall, the years studied, represented in terms of hygroscopicity a normal year for an optimal growth of vines (values ranged from 50% in July and August to 82-93% in the rest of 2019).

We can also observe that the average recorded UR/2019 72,9% is different from 2019 (78,1%). During the vegetation RH (%) it had optimal values (64,0% in 2019 and 68,6% in 2020) - Table 2. We

can say, in terms of rainfall, looking at the data given in Table 2, the period studied was characterized by fluid deficit which required the provision of a fluid through the irrigation system. We notice from this view restrictive August rainfall was losing 2,4 mm (2019) and 6,6 mm in 2020-Table 2.

The light varies daily, the requirements of the vine varieties are different as for variety, age and stage of vegetation. This is expressed by the total amount of annual hours of sunlight (potential) and the amount of actual brightness (actual). As for Σir, following the estimation there is a higher favorability in 2020 (1827,9, 1684,6 hours to 2019 hours), and data regarding Σia indicates the presence of light in abundance, especially in ripening period (2438,7 hours 2397,7 hours in 2019 and 2020) - Table 2.

These issues are extremely important, dependent insolation quantities of grapes analyzed in dye content. In the last two decades, there has been an increasing interest in the scientific research in viticulture and winemaking for those chemical constituents of grapes which define different types of wine.

The research on the potential quality of grapes is significant. In this respect, the curve of aging was tracked by determining the sugar, acidity and weight of 100 grains) for each species examined at intervals rigorously established. Due to small amount of rainfall recorded during the growing and maturation processes, a steady increase in grain weight was recorded, without significant changes.

Among the Mediterranean soils studied, Syrah comes forward, covering a weight at harvest of 141,0 per 100 grains per 100 grains in 2019 and 140,1 in 2020, while Marselan variety, although it had a uniform growth, not managed to accumulate more than 115,3 g/100 grains in 2019, 114,1 g/100 grains in 2020 (Table 3).

Due to the draught during the maturation phase (2,4 mm/m2 and 6,6 mm/m2 in 2019 in 2020) there are noticeable rapid decreases in acidity in all species analyzed until the first half of September. In point of acidity, both varieties recorded pH values approximately equal when they reached full maturation (Syrah 4,6 g/l and Marselan 4,5 g/l in 2019).

The year 2020 is remarkable for a more increased acidity in ripening grapes (Syrah 4,8 g/l and Marselan 4,7 g/l) - table quantitative 3.

The progressive accumulation, more or less spectacular, lead to obtaining a superior level of sugars in maturation, different in

varieties, with a maximum of the variety Marselan (277 g/l) and a lower quantity of the variety Syrah (minimum 248 g/l), in 2019.

By paying attention to the dynamic of the maturation index in Figure 1, we notice that during the period studied, with climatic conditions already established, all the varieties meet the conditions necessary for obtaining high quality red wines, the best ripening being made by Marselan, closely followed by Syrah.

In 2011, 23 French research laboratories collaborated in the LACCAVE project to study the effect of climate change in viticulture and potential grower's adaptations (Ollat et al., 2017).

CONCLUSIONS

Both 2019 and 2020 were, in terms of temperature and RH (%), average years for best conditions of growth of the vine.

We can notice a steady increase in grain weight of the varieties analyzed by the end of August, after which, due to the precipitations in September 2019, compared to the same period in 2020, there was a change in the ratio of weight without any significant differences being registered in the harvest.It is the same with determining the amount of acid content.

In terms of accumulation of carbohydrates,we can notice that the variety Syrah shows a smaller amount when compared to Marselan all the way until the harvest.

After determining the quality parameters of the Mediterranean varieties studied, we can say that both Syrah and Marselan were adapted to the climate of wine-growing region of Segarcea which brings together all the necessary conditions to obtain high quality red wines.

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Table 1

Climatic parameters (temperature) registred in theyear 2019 and 2020, in thewine-growing district Segarcea

Month	Air temperature (°C)					
	Absolute maximum		Month medium		Absolute minimum	
	2019	2020	2019	2020	2019	2020
I	9,8	12,4	-3,6	-0,9	-17,2	-13,0
II	18,5	16,4	3,2	1,2	-9,7	-11,6
III	21,2	18,5	8,5	9,2	-4,9	-2,0
IV	24,7	25,3	12,2	13,3	2,1	3,1
V	34,0	34,2	16,8	17,3	4,2	4,9
VI	35,2	34,3	21,3	20,1	9,1	6,5
VII	36,2	37,1	23,8	23,3	11,1	11,1
VIII	38	37,2	24,5	22,8	12,6	13,2
IX	36,2	34,6	16,7	20,1	4	7,3
X	24,4	27,9	12,5	11,6	0,6	-1,1
XI	22,6	18,7	6,1	7,4	-7,1	-0,9
XII	15,5	11,0	2,0	-0,5	-12,1	-19,4

Table 2

The hygroscopicityandinsolationsregistred in thewine-growing district Segarcea

Month	Precipitations (mm)		Air relative moisture (%)		Insolations (hours)			
					∑I		∑ia	∑ir
	2019	2020	2019	2020	2019	2020	2019/ 2020	2019/ 2020
I	30,4	72,8	91	92	53,8	41,6	2438,7/ 2397,7	1684,6/ 1827,9
II	2,4	62,2	77	86	120,7	66,9		
III	14,8	14,0	63	81	182,6	178,8		
IV	56,4	48,4	76	77	253,2	265,6		
V	34,6	51,2	71	72	280,6	277,8		
VI	130,4	73,0	70	75	304,7	344,6		
VII	59,2	107,2	50	66	335,9	289,9		
VIII	2,4	6,6	50	59	369,0	351,2		
IX	76	28,6	67	63	241,2	298,8		
X	78,8	123,6	82	84	145,4	122,6		
XI	13	56,4	85	90	74,8	71,5		
XII	111,2	71,0	93	93	46,8	88,4		

Table 3

Determination of the qualitative parameters of the Mediterranean soils studied in the wine-growing district Segarcea

Para-meters	Variety	Calendaristic data													
		10VIII		15VIII		20VIII		25VIII		30VIII		5IX		10IX	
		2019	2020	2019	2020	2019	2010	2019	2020	2019	2020	2019	2020	2019	2020
Weight of 100 grains (g)	Syrah	85,2	89,2	98,6	99,4	107,6	108,2	119,7	120,3	128,3	127,5	137,4	156,2	141,0	140,0
	Marselan	68,3	70,1	73,9	74,2	80,3	80,9	87,8	89,2	97,4	98,3	107,9	106,1	115,3	114,1
Acidity (g/l H2SO4)	Syrah	10,1	9,8	9,3	8,7	8,5	8,1	7,0	7,3	6,1	6,5	5,2	5,4	4,6	4,8
	Marselan	11,0	10,8	9,5	9,6	8,7	8,8	7,3	7,5	6,6	6,8	5,3	5,7	4,5	4,7
Sugars (g/l)	Syrah	170	173	187	182	191	190	203	209	214	220	246	243	248	249
	Marselan	186	185	206	200	232	229	248	240	265	258	270	269	277	275

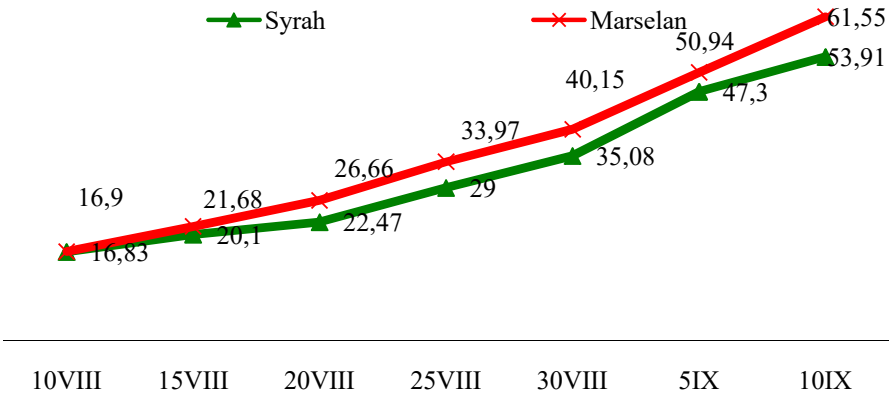

Figure 1 **The dynamic of the maturation index by Marselan and Syrah registred in the wine-growing district Segarcea**