

EVOLUTION OF RIPENING GRAPES IN COPOU IASI VITICULTURE ECOSYSTEM IN ATYPICAL CLIMATE CONDITIONS OF 2012

EVOLUȚIA PROCESULUI DE MATURARE A STRUGURILOR ÎN ECOSISTEMUL VITICOL COPOU IAȘI, ÎN CONDIȚIILE CLIMATICE ATIPICE ALE ANULUI 2012

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Abstract. In this paper we followed the evolution of the maturation process of the wine grapes depending on the annual viticulture climate, the vegetation period climate and the maturation period. The year 2012 was characterized by a very cold winter, when temperatures reached absolute minimum below the frost resistance of the vines, followed by a warmer than normal spring and a dry summer with little rainfalls and an uneven distribution in conjunction with high temperature values. The frequency of the risk factors was higher in July and August, being recorded values of 80.65% and 51.61% respectively. Due to the climatic conditions this year, the full maturation of the grapes and the phenolic maturity were reached much sooner, which led to the outbreak of the harvest campaign 15 days earlier than normal.

Key words: climatic factors, drought, grapes varieties, ripening.

Rezumat. În prezenta lucrare s-a urmărit evoluția procesului de maturare a strugurilor în funcție de climatul viticol anual, al perioadei de vegetație și al perioadei de maturare. Anul 2012 s-a caracterizat printr-o iarnă cu temperaturi foarte scăzute, când s-au înregistrat temperaturi minime absolute sub limita de rezistență la îngheț a viței de vie, urmată de o primăvară mai caldă decât normal și o vară secetoasă, cu precipitații puține și neuniform repartizate, coroborate cu valori ale temperaturii foarte ridicate. Frecvența apariției factorilor de risc a fost mai mare în lunile iulie și august înregistrând valori de 80,65 % și respectiv 51,61 %. Datorită condițiilor climatice deosebite din acest an, procesul de maturare deplină a strugurilor și maturitatea fenolică s-a atins mult mai devreme, ceea ce a condus la declanșarea campaniei de recoltare a strugurilor cu 15 zile mai repede față de normal.

Cuvinte cheie: factori climatici, secetă, soiuri de struguri, maturare.

INTRODUCTION

In 2012 viticulture climate was particularly compared to previous years. In January, the mean temperature was close to normal, however the mean temperature in February in air, was much lower, with - 9.3°C to the normal value, of -1.9°C. In this month, for 10 days, there were absolute average temperatures below the frost resistance of the vine.

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Spring was warmer than normal. In all months were recorded mean monthly temperature whose value was higher than normal, namely, by 3.8°C to 3.3°C in March, 12.9°C to 10.1°C in April and 17.7°C to 16.1°C in May. Summer months were very hot, monthly mean temperatures being 22.3°C, 25.4°C and respectively 22.6°C. At soil, the absolute highest temperature was reached in July, namely 68°C and the absolute highest temperature of 40.1°C in air was recorded in August. Since June there was a drought period when every month, there have been shortages of rainfall. To characterize ripening grape was considered necessary analysis of the vegetative period climate, the maturation period climate and frequency of risk factor (%) (Cotea, 1985; Pomohaci et al., 2000).

MATERIAL AND METHOD

To analyze specific climate factors of 2012 were used AGROEXPERT meteorological system of Research Development Station for Viticulture and Winemaking Iasi and recorded data of Regional Meteorological Centre Iasi Moldova. Annual viticulture climate was monitored by calculating the mean temperature (°C), the average minimum temperature (°C), the average maximum temperature (°C) and rainfall (mm). Viticultural climate of growing season was determined by mean temperature, sunshine period, Huglin index (Huglin, 1978), the global, active and useful thermic balance. Ripening period climate was characterized by mean air temperature, minimum and maximum temperature (mean and absolute), hygroscopicity, number of days with temperatures above 30°C, the sunshine duration and the cool nights index (Tonietto et al., 2004).

From vineyard of Copou Iasi viticultural center were harvested grape varieties samples Aligoté, Chardonnay, Feteasca albă, Feteasca regală, Riesling Italian, Sauvignon blanc, Cabernet Sauvignon, Busuioaca of Bohotin and Muscat Ottonel. Ripening grapes was analyzed in dynamic, in every five days. In grapes sample was determined the weight of 100 grains. In stum obtained by grapes pressing were determined the sugars content (STAS 6182/17-81) and total acidity (STAS 6182/1-79).

RESULTS AND DISCUSSIONS

Viticultural climate of growing season was analyzed from April to September. During this period there were reached monthly mean temperatures greater than the multiannual values, increasing from 12.9°C in April to 25.4°C in June. June, July and August were the warmest, the averages of maximum temperatures were 28.3°C, 32.8°C, 29.3°C respectively. Since June has been installed drought, on account of high temperatures, when the number of days with precipitation greater than 10 mm was very low, namely two days in April and May, no day in June and one day in July, August and September. Thus, the amount of precipitation during the growing season was 287.2 mm to 350-400 mm as normal in the Copou Iasi viticultural center. The sunshine duration of during the growing season was 1499.1 hours, 1.78% higher than in 2011.

In viticultural area of Copou Iasi center, Huglin index sum was 2541 for six months. Depending on this value has been established climate class for this year, namely warm climate class with values greater than 2400 and less than or equal to 3000. The analysis of global, active and useful thermic balances, in vineyard area Copou Iasi, found that in 2012, these parameters have reached the highest values

compared to those determined in the last 14 years, providing conditions for ripening grapes to the V era of maturation and biological threshold growth vine.

Viticultural climate of the ripening period was analyzed between July to September 2012. During ripening there were normal values for minimum, medium and absolute temperatures (Table 1), however, mean values of maximum temperatures were higher than in 2011, namely 32.8°C in July, 29.3°C in August and 25.3°C in September. These values result that in these months, maximum temperatures were above 30°C for 25 days in July, 16 days in August and three days in September. The maximum mean temperatures have increased during these months, compared with 2011, by 4.8°C in July, 2.5°C in August and 0.8°C in September.

Table 1

The ripening period climate in Copou - Iasi viticultural center

Month	Air temperature					Hygroscopicity (U%)	Days with T>30°C	Insolation (ore)	Index of cool nights
	T med (°C)	T min (°C)		T max (°C)					
		mean	absolute	mean	absolute				
July	25,4	18,6	14	32,8	38	49	25	334,4	-
August	22,6	16,8	10,6	29,3	40,1	53	16	227,3	-
September	18,6	13,2	8,4	25,3	30,5	57	4	217,6	13,2

The drought and high temperatures conditions have led to values lower of hygroscopticity coefficient in 2012 with 2.5% in July, 5.3% in August and 3.3% in September. During the three months were 55 days in which there were frequent temperatures from 33.5 to 36.5°C. The index cool nights was calculated of September only, the value obtained was 13.2, corresponding class environment with cool nights. Depending on the number of days with critical values were calculated frequencies of the risk factor (%). Thus, the highest values of the risk factor, namely 80.65% and 51.61% were recorded in July and August.

The ripening of grapes was followed starting on 01.08.2013 until harvest at nine grape varieties, evaluating, in dynamic, weight of 100 grape berries (g), the total acidity (g/L tartaric acid) and sugar content (g/L), (table 2). At white wine varieties, *weight of 100 grains* increased differently percentage of five in five days. Between 06.08.2012 - 15.08.2012, weight of 100 grains increased significantly by 19.0% - 23.2% in four varieties. The lowest percentage, 11.8%, was recorded at Feteasca regala variety and the highest percentage, 24.2%, was recorded at Chardonnay. Between 20.08.-29.08.2012 the grains weight increased by 5.6% and 10% for Aligoté, Fetească ragala, Fetească alba, Chardonnay, Riesling Italian varieties and only 1.7% for Sauvignon blanc.

On 29.08.2012 it was found that most of the berries weight was obtained in Fetească alba variety, namely 136 g, and the lowest weight, 112 g, was recorded in Riesling Italian variety. At Cabernet Sauvignon variety the significant increase in the weight of 100 grains was 26% in the period 06.08.-15.08.2012. The same evolution of the 100 berries weight was found in aromatic wine varieties, Busuioaca Bohotin and Muscat Ottonel. The 100 berries weight evolution during 01.08 - 29.08.2012 highlights the influence of climatic conditions. In July and especially in August 2012, were high temperatures over 30°C, totaling 41 days. In this context, associated with very little precipitation, the weight of the grapes was clearly affected.

Table 2

The grapes ripening evolution, in 2012, in the Copou-Iași vineyard center

Wine	Variety	Data	Basic analytical parameters			
			Sugars (g/L)	Weight 100 berries (g)	Total acidity (g/L tartaric acid)	pH
White wines	Aligoté	01.08.	68	79	27,5	2,99
		06.08.	91	85	24,4	3,70
		15.08.	137	108	14,5	3,17
		20.08.	149	117	12,3	3,17
		29.08.	172	125	7,7	3,38
	Chardonnay	01.08.	90	75	17,3	3,16
		06.08.	109	89	17,1	3,11
		15.08.	158	110	13,8	3,31
		20.08.	158	113	10,7	3,24
		29.08.	180	122	7,7	3,55
	Feteasca alba	01.08.	88	81	19,3	3,08
		06.08.	115	96	15,0	3,25
		15.08.	135	125	12,2	3,36
		20.08.	147	125	9,2	3,55
		29.08.	186	136	6,1	3,66
	Feteasca regală	01.08.	70	91	20,7	2,96
		06.08.	102	97	16,8	3,08
		15.08.	138	110	13,8	3,29
		20.08.	153	118	11,5	3,23
		29.08.	174	125	6,9	3,43
	Riesling italian	01.08.	40	60	32,4	2,85
		06.08.	70	71	24,5	2,96
		15.08.	103	90	15,3	3,12
		20.08.	117	100	14,5	3,04
		29.08.	153	112	10,7	3,13
	Sauvignon blanc	01.08.	84	77	18,3	3,05
		06.08.	107	81	17,1	3,01
		15.08.	138	107	13,8	3,23
		20.08.	154	113	12,3	3,11
		29.08.	175	115	6,9	3,33
Red wines	Cabernet Sauvignon	01.08.	38	56	33,5	2,95
		06.08.	56	56	34,2	2,92
		15.08.	98	72	16,8	3,16
		20.08.	115	79	15,6	3,15
		29.08.	160	85	11,5	3,28
Aromatic wines	Busuioaca de Bohotin	01.08.	90	94	19,4	3,07
		06.08.	117	96	16,4	3,12
		15.08.	143	113	12,2	3,32
		20.08.	145	116	11,5	3,43
		29.08.	176	125	7,9	3,52
	Muscat Ottonel	01.08.	76	97	14,7	3,06
		06.08.	87	99	15,3	3,18
		15.08.	103	110	9,9	3,20
		20.08.	105	120	8,9	3,27
		29.08.	152	138	5,4	3,44

The sugars content evolution in the range 01.08.-29.08.2012, was different for white wines and red wines varieties. Increasing sugar content was high between 01.08.-15.08.2012 for all varieties analyzed, highlighting Chardonnay variety with the highest concentration of sugar, 158 g/L, and Riesling Italian variety with the lowest concentration of 103 g/L. In the next period, 15.08.-20.08.2012 the sugars accumulations were lower. On 20.08.2012 the concentration of sugars increased by only 3.0 -11.0 % depending on the variety.

The progressive accumulation of sugars, slow, the next nine days, resulted concentrations of sugars between 172-180 g/L for Aligoté, Chardonnay, Fetească regală and Sauvignon blanc varieties. In 2012 compared with 2011, at the same 29.08.2012 date, concentrations of sugars of grapes for white wines varieties were higher by 31.9% in Aligoté, 11.6 % Chardonnay, 18,3% Fetească albă, 26.4% in Fetească regală, 18.8% Sauvignon Blanc and 38.1% for Cabernet Sauvignon. In contrast, aromatic wine variety, Muscat Ottonel, accumulated the same amount, of 152 g/L sugars, on 29.08. both in 2011 and in 2012.

The values of total acidity of must on 01/08/2012 was ranged between 32.4 to 17.3 g/L tartaric acid. Based on these values, at the time intervals analyzed, total acidity continued to fall differently depending on the variety. In the first period 01.08. - 06.08.2012 total acidity decreased by 6.5 to 18.8% for Sauvignon Blanc, Aligoté, Fetească regală and 22.2% - 24.3% for Fetească alba and Riesling italian. Total acidity values in the next period 06.08.-15.08.2012 declined in all varieties analyzed, namely by 37.5% and 40.5% for Riesling Italian and Aligoté. Between 15.08.-29.08 was accentuated decrease in total acidity so, at the end of period, on 29.08.212, the values of total acidity in white wine varieties, ranged from 6.1 to 10.7 g/L tartaric acid. A similar evolution was found in the case of total acidity in red wine variety, Cabernet Sauvignon, and aromatic wine varieties, Bohotin Busuioaca and Muscat Ottonel. This evolution of total acidity due to high temperatures both during forerunner determinations (June and July) and in August 2012.

An overview of the maturation process data, show that in 2012, full and phenolic maturity reached much faster due to climatic conditions which led to the starting of grape harvest campaign soon about 15 days. The white wine grape varieties were harvested in the first decade of September 2012, namely between 03.09. - 11.09.2012. Cabernet Sauvignon and Busuioaca Bohotin varieties were collected on 13.09.2012 and 14.09.2012 in 2012. Given the conditions of drought and high temperature values, in 2012, yields in stum have been much smaller than in previous years, namely between 71.81% for white wine varieties and 76.00 % in Cabernet Sauvignon.

CONCLUSIONS

1. The year 2012 was characterized by a frosty winter with low temperatures, below the frost resistance of the vine, a warmer than normal spring followed by a dry summer with high temperatures.
2. During April-September, according to vineyard climate of the growing season were recorded average monthly temperatures higher than the multiannual

values, these increasing from 12.9 in April to 24.5 in June. June, July and August were the warmest months, when average maximum temperatures were 28.3°C, 32.8°C and 29.3°C.

3. Ripening period of the grapes was very hot recorded, even in June and during July and August, 55 days, with frequently temperatures from 33.5 to 36.5°C. This period coincided with the installation and maintenance of drought by the end of the ripening period of the grapes.

4. Climatic conditions in 2012 led faster to the achievement of technological and phenolic maturity of grapes, thus, starting grape harvest campaign was earlier almost 15 days.

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