CONTRIBUTIONS TO THE KNOWLEDGE OF THE BEHAVIOR OF NEW VARIETIES OF VINE PAULA AND GELU TO BAD WEATHER CONDITIONS

CONTRIBUȚII LA CUNOAȘTEREA COMPORTĂRII SOIURILOR NOI DE VIȚĂ DE VIE PAULA ȘI GELU LA CONDIȚII CLIMATICE NEFAVORABILE

ALEXANDRU C.[1], DAMIAN Doina[2], MĂNTĂLUȚĂ Alina[2]
e-mail: lulu75cata@yahoo.com

Abstract. *In the vineyard ecosystem Copou-Iasi, in 2012, were recorded absolute minimum temperatures far below the freezing limit of the vine, -26.7°C and -33.0°C in air and ground surface. In the summer and early autumn of 2012 it was very hot, with average daily temperatures higher by 1°C to 4°C above normal, and the absolute maximum temperature above 35°C, persistent, sometimes reaching 40°C and the rainfalls totalised 89,6 mm. These values have influenced the phenophases of vegetation growth processes, the productivity and quality characteristics of the vines in the variety. New varieties, Paula and Gelu, were affected by the frosts in winter, when the buds losses ranged from 60-70% and by the prolonged drought in 2011 which has increased in 2012 that has resulted in yields under the potential of the variety of grape, limitation of the size of the grapes and grains and thus reducing their commercial value.*
Key words: *new varieties, resistance, climatic factors, production, quality*

Rezumat. *În ecosistemul viticol Copou-Iaşi, în anul 2012 au fost prezente temperaturi minime absolute, cu mult sub limita de îngheț a viței de vie, respectiv de -26,7°C în aer şi de -33,0°C la suprafața solului. Vara anului 2012 şi începutul toamnei, a fost foarte caldă, caniculară şi secetoasă, cu temperaturi medii zilnice mai mari cu 1°C până la 4°C față de cele normale, şi temperaturi maxime absolute de peste 35°C, persistente, atingând uneori 40°C, iar precipitațiile au însumat 89,6 mm. Aceste valori şi-au pus amprenta asupra fenofazelor de vegetație, proceselor de creştere, însuşirilor de productivitate şi calitate ale soiurilor de viță de vie din sortiment. Soiurile Paula şi Gelu au fost afectate de îngheț, înregistrând pierderi de muguri de 60-70% cât şi de seceta prelungită din 2011 care s-a accentuat în anul 2012 şi care a condus la realizarea unor producții de struguri sub potențialul soiurilor afectând şi calitatea acestora.*
Cuvinte cheie*: soiuri noi, rezistență, factori climatici, producție, calitate*

INTRODUCTION

Viticultural conveer that constructs the assortment of table grape varieties, was improved by creating new varieties with early maturing age, with better

[1] University of Agricultural Sciences and Veterinary Medicine of Iaşi, Romania
[2] Research and Development Station for Viticulture and Vinification Iaşi, Romania

adaptability to the ecosystem in which they were created, with superior characteristics of production and quality due berry and grapes size, core consistency and diversified skin coloration shaded in different colors, making them attractive to consumers. Studies regarding the knowledge of these species behavior in their originary areas, were performed by their authors in certain environmental conditions (Calistru et. al., 1997, 1998, 1999, Doina Damian 1992, 2006). Climate changes that have occurred in recent years, showed a national average warming of 0.3°C, more pronounced in the eastern half of the country and a lower rainfall regime. From this point of view, in Copou-Iaşi vineyard ecosystem, we see a decrease of precipitation regime, an alternation of rainy and excessively rainy years (1-2 years) with excessively dry and very dry years and with normal years. At these conditions are added an increased frequency of severe frosts in winter, with absolute minimum temperatures below freezing level of the vine. The climatic conditions in 2012, allowed performing the research on new table grapes varieties behavior, Paula and Gelu, on the cumulative effect of stressful environmental factors, in terms of production resistance and its quality compared with another new variety created at SCDVV Iaşi, Aromat de Iaşi, with close age of maturation and mixed functions.

MATERIAL ŞI METHOD

The research was conducted in the experimental plantations filled with new varieties, Paula and Gelu, established in 2002. They are located on a chernozem soil in which were practiced planting distance of 2.2 m between rows and 1.2 m on row, providing an average density of 3787 vines / ha. Was performed the culture system on stems of 70 cm height, the vine trunk beeing driven as bilateral cordon and the cutting system was the short cane with 2-3 buds ensuring a load of fruit of 25 - 35 buds / vine and with safety buds at the basis of vine that were protected by a mound in winter in order to regenerate the vine trunk vegetative potential in case of cane buds freezing.

The culture technology used was that recommended by vine agrotechnics for table grapes culture. The observations made on the studied varieties included the following aspects: monitoring the climatic factors by weather station AGROEXPERT and calculation of their level, recording the vegetation phenophases, grapes production and quality and especially resistance to wintering, prolonged drought and extreme temperatures.

RESULTS AND DISCUSSIONS

Climatic conditions of the year 2012 were less favorable for viticulture, negatively influencing the physiological and metabolic processes, conditioning the increasing, the fructification and grapes production and its quality.

From thermal point of view, the winter of 2012 was a frosty one with absolute minimum temperatures much below the strength of the vine, which occurred periodically with values of -26.7°C in air and -33.0°C at the soil surface that was covered by a thick layer of snow (50 cm) which ensured by melting 60 mm of precipitation (table 1). Note that in February,diurnal maximum temperatures were low, with values between -10.5°C and -14.9°C, and the

average daily temperatures between 2°C and -19.2°C, the average of this month being -9.3°C against the multi-annual value of -1.9°C.

Table 1

Values of the main climatic elements registered in 2012 in Iaşi-Copou Vineyard Center

Month	Temperature ^{0}C, aer			Temperature ^{0}C, sol			Amount degrees of temperature, ^{0}C			Hygros-copicity %	Precip itation m	Heat stroke, hours
	med	max	min	med	max	min	global	activ	useful			
I	-2,8	11,8	-17,9	-3,2	10,7	-21,8				81	12,3	99,8
II	-9,3	7,2	-26,7	-11,1	1,5	-33,0				80	61,0	150,1
III	3,8	20,4	-9,5	3,4	33,8	-8,6				65	15,8	157,6
IV	12,9	30,0	-1,5	14,2	51,5	-1,9	387,3	340,1	120,1	62	66,2	187,2
V	17,7	31,0	6,3	22,5	56,4	6,1	548,4	548,4	238,4	63	85,0	217,9
VI	22,3	36,0	11,6	29,5	66,8	7,5	670,2	670,2	370,2	56	26,2	314,7
VII	25,4	38,0	14,0	33,3	68,0	10,5	788,7	788,7	478,7	49	29,5	334,4
VIII	22,6	40,1	10,6	26,3	61,2	6,8	700,8	700,8	390,8	53	33,9	227,3
IX	18,6	30,5	8,4	21,3	49,7	4,2	557,4	548,1	258,1	57	46,4	217.6
X	11,7	28,0	0,4	12,1	39,5	-1,8				75	55,2	121,7
XI	6,0	18,6	-2,5	5,8	25,5	-3,8				84	26,8	76,1
XII	-3,8	9,4	-13,7	-4,6	8,9	-21,0				88	77,6	65,1
Total	**10,4**			**11,6**			**3652,8**	**3596,3**	**1856,3**	**68**	**535,9**	**2169,8**

Spring began with negative average temperatures which gradually increased reaching to 23-24°C in late April. The absolute maximum temperatures reached 30°C in air and 51.5°C at the soil surface. Accumulated rainfall in April-May was 151.2 mm. The summer of 2012 was estimated to be very warm; extreme hot and very dry with daily average temperatures between of 22.3-25.4°C, with 3-4°C over specific thermal normal of this season. Absolute maximum temperatures were very high reaching values over 35°C (13 days in July) and 40.1°C in August. Along with hot weather was installed the atmospheric and pedologic drought, the soil accessible moisture value for vine being below the wilting coefficient. The rainfalls accumulated in the summer months were only 89.6 mm, representing only 44% of normal of this period. The amount of sunshine hours recorded high values between 217.9 and 334.4 hours. Warm weather has been maintained in the autumn months, in September the value of daily average temperature was 18.6°C, with 2°C above multiannual average and the absolute maximum was 30.5°C, October and November while maintaining the same characteristic of warm weather. Referring to the period of active growth, it appears that global thermal balance, active and useful, showed high values, respectively 3652.8°C, 3592.3°C and 1856.3°C, rainfalls were reduced, only 287.6 mm, and the length of sunshine hours of 1499.1. By going through unfavorable conditions of climate, the knowledge of Paula and Gelu varieties behavior has been complemented with new elements necessary for the practice of production. Studied in terms of resistance to frost, it was found that they were affected in a large proportion, as a specific characteristic for table grape varieties. By winter buds viability analysis determined in dormant period by longitudinal

sections of buds complex and visualization at binocular magnifier, it was found that on the length of a cane of 10-12 buds the viability was variable, being corelated to temperature differences recorded at different heights (table 2).

Table 2

Winter buds viability of studied genotypes, in Iaşi-Copou Vineyard Center

No.	Variety	% viable buds – pozition on the cane								
		1 - 3			1 - 6			1 - 12		
		P	S	P + S	P	S	P + S	P	S	P + S
1	Paula	44	83	83	36	86	86	32	88	88
2	Gelu	31	94	94	18	94	94	19	94	94
3	Aromat de Iaşi (control)	21	56	56	26	69	69	24	70	70

A better resistance showed Paula variety, the percentage of viable primary buds was 44% (position 1-3), decreasing to the peak at 32% (position 1-12), and the viability of the whole buds complex was smaller at the basis of the cane (83%), up to 88% on top of the cane. Gelu variety showed a lower resistance, only 31% of the main buds on chord position 1-3 were viable, and on the whole buds complex was 94%. Both varieties were superior for this feature to compared variety Aromat de Iaşi, where the proportion of viable buds was growing from the base (21% primary buds) to the top of the chord (24%). At the begining of the vegetation, these varieties have recovered their vegetative system through protected buds on the safety cords or through secondary buds from the cords.

The started shoots had a high force of growth mostly being fertile. At Paula variety, the shoots had a good fertility thus ensuring the production of this year by a lower quality. Research on the phenophases sequence and physiological perfection completed by the studied varieties in relation to ecological factors characteristic for 2012, shows that the phenophases of vegetation were conditioned by the level and cumulative action of climatic factors and by the hereditary specific of the variety. The budbursting occurred for Paula variety on April 25th 2012, followed by Gelu variety, on 26th April 2012, both after Aromat de Iaşi, on 23th April 2012 (table 3), being influenced by high temperatures in late April.

Table 3

Phenological cycle of the grapevines – 2012, in Iaşi-Copou Vineyard Center

Variety	Budburst	Flowering	Veraison	Grape maturity	Leaves fall	Vegetation periode, no. days
Paula	25.04	30.05	09.07	08.08	03.11	190
Gelu	26.04	02.06	15.07	15.08	03.11	189
Aromat de Iaşi (control)	23.04	26.05	11.07	25.08	03.11	192

Flowering took place between 30th May to 2th June, Paula and Gelu varieties being brought forward with 4-7 days towards witness variety and with about two weeks towards normal years. Cold weather and high atmospheric humidity during flowering led to an uneven and closed flowering, and the processes of pollination, fertilizaton and binding berries have been affected,

aspects that will be reflected in the quantity and especially the quality of production. Grapes veraison was marked by Paula variety (9th July), followed by Gelu variety (15th July), and the grapes could be consumed since 8th August (Paula variety) and after 15th August the Gelu variety, while the witness after 25th August. Cycle of active vegetation period at studied varieties totaled 189-192 days, the end of vegetation taking place on 3 th November due to occurrence of frost. The fertility and the productivity as elements that define the ability of a variety for fructification and production, have been strongly influenced by climatic conditions of the year 2012 (table 4).

Table 4

Fertility and productivity of studied varieties, in Iaşi-Copou Vineyard Center

Variety	Fertile shoots %	Fertility coefficient		Productivity index	
		FCA	FCR	PAI	PRI
Paula	33	1,0	0,45	205	92
Gelu	47	1,15	0,55	230	110
Aromat de Iaşi (control)	52	1,25	0,73	200	116

FCA – fertility coefficient absolutely, FCR – fertility coefficient relative
PAI – productivity absolutely index, PRI –productivity relative index

The percentage of fertile shoots had values below the potential of each variety, as well the coefficients of fertility and indices of productivity. Compared to the reference variety, Aromat de Iaşi, Paula and Gelu varieties had lower fertility, with values of the fertility coefficient absolutely above unit 1,0 or 1.15, and with the relative one of 0.45 and 0.55. The absolute and relative productivity was also small. Cumulative action effect of the climatic factors of stress can be found in grapes production and its quality.

Thus, buds losses due to frosts in winter, cold and wet weather during flowering and berries binding as well as strong drought and hot weather during grapes growth and ripening, have led to lower grapes production, which not reached to the known quality parameters (table 5).

Table 5

Grapes production and its quality during year 2012 in Iaşi-Copou Vineyard Center

Variety	Grapes production			Quality of production			
	Effective Kg/vine	Calculated t/ha	Wares %	Average weight grape, g	Average weight of 100 berries, g	Sugars g/l	Total acidity g/l H_2SO_4
Paula	0,75	2,85	76	205	328	170	2,9
Gelu	2,4	9,1	80	200	318	168	2,1
Aromat de Iaşi (control)	1,71	6,0	65	160	22,0	175	3,5

The new varieties of table grapes Paula and Gelu, realized very small productions, far below from normal years values, being strongly affected by winter frost, when a large part of the fruit buds were destroyed. And crop quality

was affected mainly by unfavorable conditions during the growing season, the grapes obtained being smaller, by 200 g at Gelu variety and 205 g at Paula variety, with smaller berries. The sugar accumulations were helped by the very hot weather during grapes ripening. The results obtained in 2012 regarding the culture of new varieties for table grapes in Iaşi Vineyard, impose mandatory measures to protect the vines in winter by burying the safety canes from the base, ensuring the recovery possibility of vegetative and production potential.

CONCLUSIONS

1. Viticultural year 2012 was characterized by absolute minimum temperatures below freezing limit for vine (-27.6°C), a cold and rainy spring, a hot summer and dry with daily average temperatures higher with 1-4°C compared to normal ones, with accumulated rainfall during June-July-August of only 89.6 mm.

2. Studied varieties were affected by frost, the fruit buds viability being of 20-32%.

3. Vegetation phenophases were brought forward almost with two weeks, compared to years with normal weather conditions.

4. Fertility of studied varieties has been below their genetic potential; between 33 and 47 % of the started shoots from the vine trunk being fertile.

5. Under the influence of mentioned climatic factors, the studied varieties, Paula and Gelu did not complete their known potential for quantitaty and qualitaty .

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