

THE BEHAVIOR OF 'PUTNA TABLE GRAPE VARIETY IN THE ODOBEȘTI VINEYARD IN THE CONDITIONS OF YEARS 2020-2022

COMPORTAREA SOIULUI PENTRU STRUGURI DE MASĂ 'PUTNA' ÎN PODGORIA ODOBEȘTI ÎN CONDIȚIILE ANILOR 2020-2022

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Abstract. *The study falls within the general context of research on the agrobiological and technological value of vine varieties for table grapes existing in the culture, adapted to the changing climatic conditions permanent. The 'Putna' variety was obtained at RDSVO Odobești through intraspecific sexual hybridization between the 'Ceaș' x 'Muscat de Alexandria' varieties and approved in 2014. In the climatic conditions of the study period (2020-2022) the 'Putna' table grape variety showed good fertility (70.2% fertile shoots), medium growth vigor good tolerance to the main cryptogamic diseases. Medium-sized grapes (299.7 g) reached consumption maturity in the first decade of September, achieving an average production of 5.97 kg/bunch, of which 82.9% was commodity production. It showed a high potential for the accumulation of sugars in the grains (187.7 g/L), with an average total acidity value of 4.6 g/L H₂SO₄, very well balanced glucoacidimetrically (27.3), that place it in the group of valuable table grape varieties.*

Key words: variety, table grape agrobiological and technological potential

Rezumat. *Studiul se încadrează în contextul general al cercetărilor privind valoarea agrobiologică și tehnologică a soiurilor de viță-de-vie pentru strugurii de masă existente în cultură, adaptate condițiilor climatice în permanență schimbare. Soiul 'Putna' a fost obținut la SCDVV Odobești prin hibridizare sexuală intraspecifică între soiurile 'Ceaș' x 'Muscat de Alexandria' și omologat în 2014. În condițiile climatice din perioada de studiu (2020-2022) soiul 'Putna' a prezentat o fertilitate bună (70,2% lăstari fertili), vigoare de creștere medie, toleranță bună la principalele boli criptogame. Strugurii de mărime medie (299,7 g) au atins maturitatea de consum în prima decadă a lunii septembrie, realizând o producție medie de 5,97 kg/butuc, din care 82,9% producție marfă. A prezentat un potențial ridicat de acumulare a zaharurilor în boabe (187,7 g/L), cu o aciditate totală medie de 4,6 g/L H₂SO₄, bine echilibrat glucoacidimetric (27,3), care îl plasează în grupa soiurilor de masă valoroase.*

Cuvinte cheie: soi, struguri de masă, potențial agrobiologic și tehnologic

INTRODUCTION

The structural improvement of viticultural varieties with varieties for table grapes has always been a concern of breeding researchers. Under the conditions of global and zonal climate changes (Pușcalău *et al.* 2021), table grape varieties find

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favorable growing conditions in most wine-growing areas of the country, and their behavior in different wine-growing areas is one of the topics of interest for wine-growing research. Studies regarding the establishment, improvement and behavior of the table grape assortment were carried out in different cultivation areas (Baniță, 1994; Bădițescu *et al.*, 1994; Calistru *et al.* 1998; Cichi, 2006; Damian *et al.*, 2013; Rotaru *et al.*, 2011).

MATERIAL AND METHOD

The study was carried out in the period 2020 - 2022, on a 12-year-old plantation, arranged on a leached chernozem type soil, located in the biological domain of the S.C.D.V.V. Odobesti. The table grape variety 'Putna' was obtained by intraspecific hybridization between the varieties 'Ceaș' x 'Muscat de Alexandria', it was approved in 2014 as a semi-early table grape variety. The table grape variety 'Putna' was grafted on Kobber 5 BB rootstock, with Dr. Guyot cutting system. Fruit load was 34 eyes/vine, distributed on 9-eye fruiting cane and 2-eye spur. The planting distance is 2.2m x 1.2m, returning 3787 vines/ha.

To establish the agrobiological potential, observations and determinations were made regarding: the phenological spectrum, growth vigor, fertility and productivity elements: % fertile shoots, fertility coefficients (Cfa and Cfr) and productivity indices (Ipa and Ipr), the behavior to the main vine diseases and abiotic stress factors, according to OIV (2009) descriptors. To evaluate the technological potential, determinations were made regarding the quantity (kg/vine, t/ha) and quality of grape production (g/l sugars, g/l sulfuric acid, glucoacidimetric index). The main technological indices of grapes (grape composition index, berry index and berry composition index) were calculated, which express the technological, economic and commercial value of the studied variety and complement its qualitative characteristics.

RESULTS AND DISCUSSIONS

Climate condition. The research period (2020 - 2022) was characterized by high heliothermal availability, the thermal regime expressed by the average annual temperatures (°C) and the sum of the useful temperature degrees ($\sum^{\circ}\text{tu}$) registering values much higher than the multiannual values (tab. 1). The annual average temperature recorded an excess of 2.3 °C in 2020 and 2,0°C in the year 2022, and for the sum of useful temperature degrees ($\sum^{\circ}\text{tu}$), a thermal excess of 359.8°C was recorded in 2020 and 403.3°C in 2022.

Table 1
The main climatic data from the study period (Odobesti, 2020-2022)

Climate indicator	Multiannual (1946 –2019)	Year			Average 2020-2022
		2020	2021	2022	
Annual					
The average temp., °C	10.7	13.0	11.3	12.7	12.3
Temp. max. abs. °C	35.3	37.0	37.1	36.7	36.9
Temp. min. abs., °C	-16.2	-9.8	-15.0	-10.5	-11.8
Amount degrees usful temp ($\sum^{\circ}\text{tu}$), °C	1639.8	1999.6	1604.2	2043.1	1882.3
The amount heatstroke, hours	2156.9	2516.0	2309.5	2461.3	2428.9
Precipitation amount, mm	621.3	421.6	485.6	343.2	416.8

On the vegetation period					
The average temp., °C	18.2	19.7	18,3	19,6	19,2
Temp. max. abs. °C	35.3	37.0	37,1	36,7	36,9
Temp. min. abs., °C	-8.2	-0.6	-1,3	-0,1	-0,7
No. days with temp. >30°C	28.9	68	46	58	57,3
The amount heatstroke, hours	1493.8	1725.0	1597,5	1679,5	1667,3
Precipitation amount, mm	391.4	215.0	289,6	255,0	253,2

The rainfall regime in all three years of study it was deeply deficient, both during the year and during the vegetation period. Compared to the multi-annual values (621.3 mm, respectively 391.4 mm), the amount of precipitation recorded represented only 67.1%, respectively 64.6% with the lowest values in the years 2020 and 2022. Another negative characteristic of the precipitation during the three years of the study was represented by the defective quantitative distribution, especially during the vine vegetation period. From a water point of view, this situation shows the fact that the study period (years 2020-2022) was a dry one for the Odobești wine-growing area.

The main ampelographic characters (fig. 1).



Fig. 1. 'Putna' variety (young shoots, mature leaf, grape, berry)

At the budburst (Stages C, Baggiolini), the rosette is green-bronze. The tip of the shoot is fully open with the first glabrous leaves and adult leaves are small to medium, intense green, pentalobed, with very weakly goffering of blade.

The grapes are of medium to large size, cylindrical-conical, loose, branchy, with a herbaceous peduncle, and when they are sunny they acquire a copper hue that gives them a pleasant appearance. The berries are obovoid, medium to large in size with a thick green-yellow skin.

The vegetation phases. In the climatic conditions specific to the study period in the Odobești vineyard, the 'Putna' table grape variety achieved an annual vegetation cycle between 134 - 147 days, in 2021 year was observed a tardive development of all phenophases (tab. 2). The grapes reached maturity between August 30 and September 12, falling within the 3-4th age of ripening.

Table 2

The phenological spectrum of 'Putna' variety (Odobești, 2020 -2022)

Variety	Phenological phases								Active vegetation period (days)	
	Disbudding		Flowering		Grapes ripening		Full maturity			
	Date	Σ°t useful	Date	Σ°t useful	Date	Σ°t useful	Date	Σ°t useful		
'Putna'	2020	11.IV	53,9	5.VI	274,9	3.VIII	777,7	4.IX	454,3	147
	2021	2.V	38,3	14.VI	291,9	8.VIII	758,2	12.IX	372,9	134
	2022	17.IV	63,9	2.VI	287,5	28.VII	753,7	30.VIII	462,7	136
	Average	21.IV	52,0	7.VI	284,8	31.VII	763,2	6.IX	430,0	139

Fertility and productivity. The determinations regarding the percentage of fertile shoots showed an average value over the study period of 70.2%, with higher values in 2021 (81.7%) and lower values in 2022 (61.0%). Fertility coefficients (relative and absolute) recorded an average value of 0.84 and 1.20, respectively, with higher values in 2021 (tab. 3).

Table 3

Fertility and productivity of the 'Putna' table grape variety

Variety	Year	Fertile shoots (%)	Fertility coefficients		Productivity indices		Average weight grapes (g)
			relative	absolute	relative	absolute	
'Putna'	2020	67.9	0.75	1.11	216	319	287.5
	2021	81.7	1.07	1.32	331	409	309.7
	2022	61.0	0.71	1.17	215	354	302.4
	Average	70.2	0.84	1.20	254	361	299.9

The growth vigor. 'Putna' variety recorded average values of vegetative growth between 122.6 - 133.3 cm (tab. 4), the lowest values being recorded in 2022 year, these values correspond to a vegetative development capable of sustaining a balance between growth and fruiting (1.0 - 1.5 m).

Table 4

Vegetative growth (Odobești, 2020-2022)

Variety/year	Total shoots/ vine	Length of shoots, cm			
		minimum	maximum	average	
'Putna'	2020	27.6	42.1	220.3	131.2
	2021	23.7	48.0	218.6	133.3
	2022	23.6	48.5	196.7	122.6
	Average	24.9	46.2	211.8	129.0

The assessment of biological resistance to the main cryptogamic diseases of the grapevine was carried out on the leaves and grapes, by calculating the following indicators: frequency of attack (F%); attack intensity (I%) and attack degree

(GA%). Based on the values obtained the 'Putna' variety showed good and very good tolerance to the attack of the main pathogens (tab. 5).

Table 5

Behavior of 'Putna' variety at the main to cryptogamic diseases (after OIV descriptor list for grape varieties and *Vitis* species, 2nd edition - 2009)

Variety/ year		Downy mildew (<i>Plasmopara viticola</i>)		Powdery mildew (<i>Uncinula necator</i>)		Gray rot (<i>Botrytis cinerea</i>)	
		Leaf OIV 452	Grape OIV 453	Leaf OIV 455	Grape OIV 456	Leaf OIV 458	Grape OIV 459
'Putna'	2020	7	7-9	7	7-9	7-9	5
	2021	9	9	9	9	9	9
	2022	9	9	9	9	9	9

In the climatic conditions recorded in the Odobești vineyard during the study period (2020 - 2022), the 'Putna' table grape vine variety showed good frost resistance and high drought tolerance.

Technological characteristics. The study of the technological characteristics of grape production completed the elements of knowledge for the behavior of 'Putna' table grape variety (tab. 6).

Table 6

Quantitative characteristics of the grapes for 'Putna' variety (Odobești, 2020 - 2022)

Variety	Year	No. bunch/ vine	Weight of grape (g)	Weight of 100 berries (g)	Grape production		Commodity grapes production (%)
					kg/vine	t/ha	
'Putna'	2020	21.0	287.5	322.0	6.04	22.3	84.6
	2021	22.0	309.7	367.0	6.81	25.2	75.8
	2022	16.8	302.4	307.0	5.08	18.8	88.5
	Average	19.9	299.8	332.0	5.97	22.1	82.9

The dry climatic conditions recorded during the three years of the study determined lower average values for the weight of a grape (287.5 - 309.7 g), compared to the potential of the variety (350 - 380 g). The grapes showed an increased potential for sugar accumulation (187.7 g/L), with an average total acidity of 4.6 g/L H₂SO₄, achieving a good glucoacidimetric balance. (tab. 7).

Table 7

Qualitative characteristics and the technological indices of the grapes for Putna variety (Odobești, 2020-2022)

Variety/ Year		Sugars g/L	Total acidity g/L H ₂ SO ₄	Glucoaci- dimetric index	Technological indices		
					Berry index	Structure of the grape Index	Composition of berry index
'Putna'	2020	184.2	4.43	27.0	38.6	27.7	9.3
	2021	181.0	5.21	23.0	33.5	57.8	9.6
	2022	198.0	4.15	32.0	35.9	37.2	7.2
	Average	187.7	4.60	27.3	36.0	40.9	8.7

The value of the grape composition index (40.9) corroborated with the value for the berry index (36.0) shows that the variety 'Putna' produced grapes with a high percentage of normally developed berries, meeting superior qualities that place it in the value group of table grape varieties.

CONCLUSIONS

1. The special climatic conditions (drought and high temperatures) manifested during the study period influenced the vegetative phenophases, the growth and development of shoots, productivity and quality of production.

2. Under these conditions, the 'Putna' variety demonstrated valuable agrobiological and technological characteristics, completing the varietal assortment of semi-early varieties for table grapes from the south of Moldova.

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