RESEARCH ON THE POSSIBILITY OF CULTIVATION EXTENSION IN THE NORTH-EAST AREA OF MOLDOVA OF SOME VARIETIES FOR TABLE GRAPES OBTAINED BY ROMANIAN VITICULTURE RESEARCH

CERCETĂRI PRIVIND POSIBILITATEA EXTINDERII ÎN CULTURĂ ÎN AREALUL DE NORD - EST AL MOLDOVEI A UNOR SOIURI PENTRU STRUGURI DE MASĂ OBȚINUTE DE CERCETAREA VITICOLĂ ROMÂNEASCĂ

NECHITA Ancuța[1], ZALDEA Gabi[1]*, FILIMON Roxana[1], DAMIAN Doina[1], FILIMON Răzvan[1], ALEXANDRU Lulu Cătălin[1]

*Corresponding author e-mail: gabizaldea@yahoo.com

Abstract. *The structural improvement of viticultural varieties with varieties for table grapes has always been a concern of breeding researchers. In the context of the climate changes of the last decades, it is necessary to permanently update the knowledge regarding the climatic favorability for table grapes and the expansion of their cultivation area. The paper presents preliminary results regarding the agrobiological and technological value of seven vine varieties obtained by Romanian viticultural research (Gelu, Paula, Muscat Timpuriu de București, Timpuriu de Pietroasa, Auriu de Ștefănești, Argesis, and Mara), for or the highlighting of the most valuable, adapted to the climatic conditions and from the north-eastern area of the country, in order to improve the assortment of varieties for table grapes.*

Key words: table grapes, variety, climate change

Rezumat. *Îmbunătățirea structurală a sortimentelor viticole cu soiuri pentru struguri de masă a constituit în permanență o preocupare a cercetătorilor amelioratori. În contextul schimbărilor climatice din ultimile decenii, este necesară o reactualizare permanentă a cunoştinţelor privind favorabilitatea climatică pentru strugurii de masă şi extinderea arealului de cultură a acestora. În lucrare sunt prezentate rezultate preliminarii privind valoarea agrobiologică și tehnologică a șapte soiuri de viță de vie obținute de cercetarea viticolă românească (Gelu, Paula, Muscat Timpuriu de București, Timpuriu de Pietroasa, Auriu de Ștefănești, Argesis și Mara), pentru evidențierea celor mai valoroase, adaptate condițiilor climatice și din zona de nord-est a țării, în vederea îmbunătățirii sortimentului de soiuri pentru struguri de masă.*

Cuvinte cheie: struguri de masă, sortiment, schimbări climatice

INTRODUCTION

The need to extend the consumption period of fresh grapes and diversify the assortment in viticultural areas with lower thermal conditions have been study

[1] Viticulture and Oenology Research and Development Station in Iasi, Romania

objectives and continue to concern scientific research [Rotaru *et al*., 2010; Damian *et al*., 2022]. The varietal conveyor for table grapes is established for each vineyard, including only those varieties that best exploit their production potential under the existing ecological conditions. From the analysis of the structure of the table grape variety assortment in Romania, there is a lack of very early and very late ripening varieties, which leads to inefficient use of early ripening potential in regions highly favorable for table grape cultivation [Cichi *et al.*, 2019].

Expanding grapevine varieties for table grapes in cultivation or introducing varieties into a specific area requires an assessment of ecological favorability and thorough studies of their behavior in the context of climate change [Stroe *et al*., 2014]. This paper presents preliminary results regarding the agrobiological and technological value of seven grapevine varieties developed by Romanian viticultural research, highlighting the most valuable ones with superior productive and qualitative potential compared to those currently in cultivation, adapted to climatic conditions, with high commercial value that ensures profitability for growers and meets consumer demands.

MATERIAL AND METHOD

The study was conducted under the climatic conditions of the 2023–2024 viticultural year, with the plant material represented by the grapevine varieties Gelu, Paula, Muscat Timpuriu de București, Timpuriu de Pietroasa, Argessis, Auriu de Ștefănești, and Mara. Among these, only Gelu and Paula are included in the official list of varieties recommended for cultivation in the Copou Iași viticultural center (Table 1).

Table 1

Table grape varieties studied at SCDVV Iași

Variety name	Parents	Authors
Gelu	Coarnă neagră	Calistru Gheorghe, Damian Doina
Paula	Bicane x Aromat de Iași	Calistru Gheorghe, Damian Doina
Muscat Timpuriu de București	Coarnă albă x (Regina viilor x Muscat Perlă de Csaba)	Constantinescu Gherasim, Negreanu Elena
Timpuriu de Pietroasa	Alphonse Lavallee x Regina viilor	Toma Otilia
Auriu de Ștefănești	Frumoasă albă x Augusta	Popa Camelia, Smaranda Gheorghe, Bădițescu Margareta
Argessis	Moldova x Augusta	Bădițescu Margareta, Popa Camelia
Mara	Seyve -Villard 12.303 x Ozana	Damian Doina, Calistru Gheorghe, Nechita Ancuța, Savin Costică.

The mentioned varieties are found in the research unit's plantations, cultivated on 80 cm high trunks, using a bilateral cordon training system with short pruning, ensuring 32–40 buds per vine. The applied technology follows the recommendations of viticultural agrotechnics, so all varieties benefit from the same ecopedoclimatic conditions. To assess these varieties' biological production and quality potential, the research focused on observations and measurements regarding the progression of vegetative phenophases, fertility and productivity, and the quantity and quality of the harvest, in direct relation to ecological factors.

RESULTS AND DISCUSSIONS

From the analysis of climate element values, it is observed that in the winter and spring of 2024, the thermal regime was significantly higher, and during June, July, and August, temperatures frequently exceeded 30ºC, making it a very hot summer (Figure 1).

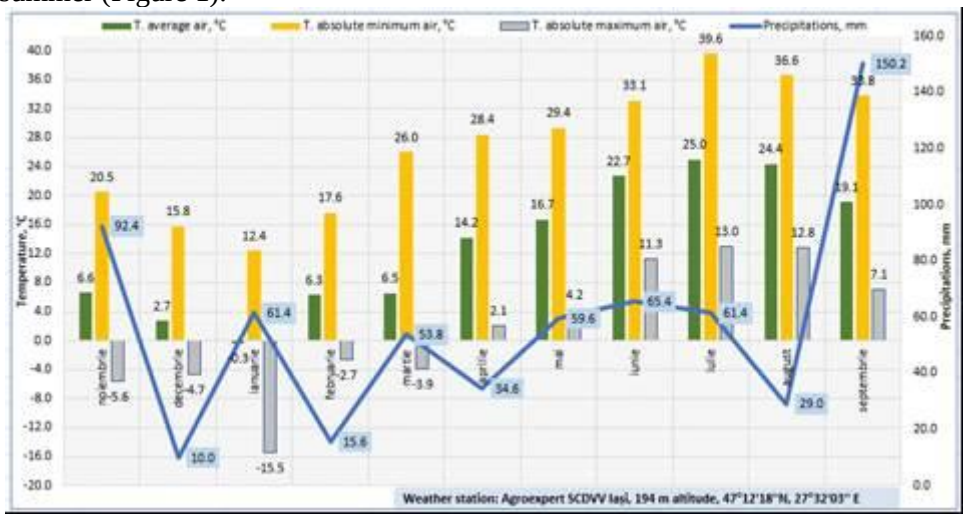

Fig. 1. The evolution of the climatic factors recorded in the Iași Vineyard

The absolute minimum temperatures were within normal limits, without dropping below the frost threshold for grapevine buds, the lowest temperature being -15.5°C in January. Between April and August, a precipitation deficit was recorded each month, totaling 77.4 mm. However, due to the very large amounts of rainfall in September (150.2 mm compared to 56.9 mm), the total precipitation during the active growing season was 400.2 mm, exceeding the multiannual average of 384.3 L/m².

Given the climatic conditions described, the studied varieties went through all the phenophases specific to the active growing season, starting with bud burst, which occurred between April 3rd and 9th, under a cumulative useful thermal balance (Σt°u) between 20.5 and 51.3 °C (Table 2).

Table 2

The progression of the vegetative phenophases of table grape varieties cultivated in the Iași Vineyard under the climatic conditions of the year 2024

Variety name	Bud burst		Flowering		Veraison		Ripening	
	date	Σt°u	date	Σt°u	date	Σt°u	date	Σt°u
Gelu	3.IV	20.5	01.VI	337.8	22.VII	720.1	23.VIII	442.1
Paula	5. IV	26.9	27.V	289.8	13.VII	613.5	09.VIII	380.8
Muscat Timpuriu de București	3. IV	20.5	26.V	290.1	14.VII	635.5	09.VIII	358.8
Timpuriu de Pietroasa	4. IV	23.7	27.V	293.0	19.VII	722.2	12.VIII	324.2
Auriu de Ștefănești	5. IV	26.9	29.V	300.7	16.VII	660.7	12.VIII	358.6
Argessis	9. IV	51.3	01.VI	307.0	05.VIII	898.1	11.IX	505.6
Mara	5. IV	26.9	28.V	295.3	31.VII	867.2	16.IX	612.0

Flowering took place between May 26th and June 1st, when the cumulative useful thermal balance values exceeded 289.8 °C, and grape veraison was marked by the Paula variety (July 13th), followed by Muscat timpuriu de București (July 14th) and Auriu de Ștefănești (July 16th). The physiological processes that condition the ripening phase were influenced by the high temperatures, allowing the grapes to be consumed starting from the first decade of August, specifically August 9th (Paula and Muscat timpuriu de București), and after September 11th for the late-ripening varieties, Argessis and Mara, from ripening stages IV–V.

The fertility and productivity of the varieties, assessed through the percentage of fertile shoots, fertility coefficients, and productivity indices, were normal, reflecting the known biological potential of each variety. The absolute fertility coefficients were above 1.0 for all varieties, with Gelu (1.31) and Mara (1.43) showing superior values, while the relative coefficients ranged between 0.48 and 1.32. The results regarding the fruiting capacity indicate that these varieties show good adaptability to the conditions of the Copou Iași viticultural ecosystem (Table 3).

Table 3

Fertility and productivity elements of table grape varieties

Variety name	Fertile shoots, %	Fertility coefficients		Productivity indices	
		relative	absolute	relative	absolute
Gelu	62	0.81	1.31	250.95	405.38
Paula	63	0.62	1.04	272.00	461.22
Muscat timpuriu de București	48	0.48	1.00	158.23	327.00
Timpuriu de Pietroasa	56	0.58	1.05	317.33	571.20
Auriu de Ștefănești	60	0.60	1.00	188.40	314.00
Argessis	57	0.63	1.12	318.57	562.18
Mara	76	1.32	1.43	327.36	355.83

The high temperatures and water deficit during the grape growth and ripening period influenced the yield and its quality parameters (Table 4).

Table 4

The production potential of the studied table grape varieties

Variety name	No. of bunches per vine	Average mass of a bunch, g	Actual yield, kg/vine	Estimated yield, t/ha	Marketable yield, %
Gelu	17	310	5.27	19.96	89
Paula	20	315	6.30	23.86	88
Muscat timpuriu de București	10	327	3.27	12.38	84
Timpuriu de Pietroasa	9	544	4.90	18.54	86
Auriu de Ștefănești	14	314	4.40	16.65	83
Argessis	11	503	5.53	20.95	81
Mara	26	248	6.45	24.42	95

The production potential, determined by the level of elements such as the average number of bunches per vine, the average weight of a bunch, and the effective and calculated yield per hectare, places the Mara variety in first place with 6.45 kg per vine, followed by Paula with 6.30 kg per vine. The effective yield of

grapes achieved by the other genotypes ranged from 3.27 kg per vine for the Muscat timpuriu de București variety to 5.53 kg per vine for the Argessis variety, values that differentiate the varieties in relation to their genetic potential and interactions with environmental factors.

The assessment of commercial value through the percentage of marketable production indicates that the majority of varieties produced over 80% of grapes that meet the requirements for fresh market sales. The qualitative characteristics of the grapes, evaluated by the average weight of 100 berries, sugar concentration, and acidity in the must, along with the gluco-acidimetric index and pulp consistency, complete the knowledge about the behavior of the studied varieties (Table 5).

Table 5

Qualitative characteristics of table grape varieties

Variety name	Average weight of 100 grapes (g)	Sugars (g/L)	Total acidity (g/L tartaric acid)	Gluco-Acidimetric Index	Pulp consistency
Gelu	515	188	3.9	4.8	Crunchy
Paula	390	180	4.4	4.1	Semi-crunchy
Muscat timpuriu de București	505	170	3.9	4.3	Crunchy
Timpuriu de Pietroasa	403	164	4.0	4.1	Crunchy
Auriu de Ștefănești	487	166	4.1	4.0	Crunchy
Argessis	562	160	4.0	4.0	Crunchy
Mara	260	178	4.5	3.9	Semi-crunchy

The sugar accumulations at the time of harvest exceeded 160 g/L for all varieties, while the acidity expressed in g/L of tartaric acid ranged from 3.9 to 4.5, typical for table grape varieties, ensuring a harmonious and pleasant balance highlighted by the value of the gluco - acidimetric index. The pulp consistency was semi-crunchy for the Paula and Mara varieties and crunchy for the other studied varieties.

The qualitative value of the grapes was also assessed through physical-mechanical analyses of one kilogram of grapes (Table 6). The mechanical composition varied from one variety to another, being a genetic characteristic influenced by the specific climatic conditions of the 2023–2024 viticultural year.

Table 6

Physical-mechanical analysis of one kilogram of grapes

Determinations	Gelu	Paula	Muscat timpuriu București	Timpuriu Pietroasa	Auriu de Ștefănești	Argessis	Mara
No. of berries, of which	229	252	354	256	191	158	386
- normal	215	238	220	228	164	130	374
- small, underdeveloped	14	14	134	28	27	28	12
Mass of berries, g	975.02	969.5	980.2	970.8	978.8	962.8	975.2
Mass of rachis (stem), g	24.98	30.5	19.8	29.2	21.2	37.2	24.8
Mass of must, g	703.91	689.3	640.0	580.1	704.0	638.9	704.0
Volume of must, cm^3	654	665	610	540	640	590	700

Mass of pomace, g	269.09	280.2	340.2	390.7	274.8	332.9	271.2
Number of berries/ 100 g of bunch	21	29	21	21	23	14	40

The number of berries per kilogram of grapes ranged from 191 for Auriu de Ștefănești to 386 for the Mara variety, with their total mass being between 962.8 g and 980.2 g. The volume of must obtained from micro vinification of the berries ranged from 540 to 700 cm^3.

The data obtained allowed for the assessment of the technological characteristics of the studied varieties by calculating indices that express their technological, economic, and commercial value, complementing their quality attributes (Table 7).

Table 7

Technological indices of grapes at harvest

Variety name	Bunch Structure Index	Berry Index	Berry Composition Index	Yield Index
Gelu	39.03	21	13.1	2,6
Paula	31.79	29	10.5	2.5
Muscat Timpuriu de București	49.51	21	4.70	1.9
Timpuriu de Pietroasa	33.25	21	5.96	1.5
Auriu de Ștefănești	46.17	23	7.0	2.6
Argessis	25.88	14	14.3	1.9
Mara	39.21	40	9.8	2.6

The values of the technological indices place the studied genotypes in the category of valuable table grape varieties, both quantitatively and qualitatively.

CONCLUSIONS

1. The studied table grape varieties went through the entire phenological spectrum under the conditions of the Copou Iași viticultural ecosystem, specific to the 2023–2024 viticultural year.

2. Fertility and productivity fell within the specific limits for table grape varieties, particularly highlighting the genotypes created at SCDVV Iași. The values of the elements defining quality, especially the size of the bunches, the gluco-acidimetric index, as well as the technological indices, demonstrate that these varieties have adapted well to the eco climate conditions.

3. The production potential realized under the climatic conditions of the 2023–2024 viticultural year confirms the productive capacity of the studied table grape varieties and underscores the need to continue research to highlight the most valuable varieties that are well adapted to climatic conditions, to expand the assortment of recommended and authorized table grape varieties in the Iași vineyard and in the viticultural areas of North-Eastern Romania.

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