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THE BEHAVIOR OF ′VALIN 24′ PUMPKIN CULTIVAR IN THE PEDOCLIMATIC CONDITIONS OF SANDY SOILS FROM DĂBULENI RDSPCSS

Felicia-Constantina FRĂTUȚU, Loredana-Mirela SFÎRLOAGĂ, Ștefan NANU, Maria-Diana ILINA

Dăbuleni Research-Development Station for Plant Cultivation on Sandy Soils,
217 Petre Baniță Street, Călărași, Dolj County, Romania

Corresponding author email: ditaloredanamirela@yahoo.com

Abstract

During the two years 2024-2025 the 'Valin 24' pumpkin cultivar was studied at the Dăbuleni Research and Development Station for Plant Cultivation on Sandy Soils (RDSPCSS), as a result of the creative breeding process. The characters that play a determining role in the agronomic value of a cultivar, such as fruit weight and pulp thickness, remained constant during the study period. Also, the pumpkin cultivar presented good stability for characters like fruit height, fruit diameter, seminal cavity diameter, and shape index, given by the ratio between the height of the fruit and its diameter. Regarding the biochemical content of pumpkin fruits analyzed during the 2024-2025 study period, it was found that the highest average values were recorded in 2024 in terms of total dry matter content (%), soluble dry matter (%), starch (%), titratable acidity (g malic acid/100 g fresh matter) and vitamin C (mg/100 g fresh matter). Following statistical analysis of the characters measured over the two years of study, it was found that the pumpkin variety developed at Dăbuleni RDSPCSS performed well under the pedoclimatic conditions in the sandy soil area.

Key words*: pumpkin, cultivar, sandy soils, conservative selection.*

INTRODUCTION

Pumpkin (*Cucurbita maxima*) belongs to the Cucurbitaceae family and is a vegetable with green leaves and fruits of different sizes, colors, shapes, and weights. The Cucurbitaceae family is one of the most important botanical families for humans, constituting a favorable crop. Pumpkin (*n*=20) exhibits great variability in shape and color depending on species, being a member of the Cucurbitaceae family, which includes zucchini, cucumbers, and melons (Nanu et al., 2022).

There are three species of *Cucurbita*: *Cucurbita pepo* L., *Cucurbita maxima* Duch., and *Cucurbita moschata* Duch., which have different climatic adaptations and are widely distributed in agricultural regions worldwide (Robinson & Decker-Walters, 1997; Paris & Brown, 2005; Wu et al., 2007).

Cucurbita spp. is collectively ranked among the top 10 vegetable crops worldwide (Rakcejeva et al., 2011).

In Brazil, the breeding programs carried out by Embrapa were based on a varied germplasm of pumpkin collected from the northeastern region of the country (Borges et al., 2019).

In Romania, the first writings mentioning pumpkin were identified in "Practical Agriculture" by D. Alexandrescu, published in 1973, in which the following varieties were listed: yellow pumpkins with hard skin and white pumpkins with thin skin (Vînătoru et al., 2019).

Edible pumpkin is cultivated for its fruits, which are consumed at physiological maturity in various forms: baked, boiled, candied, jellied, and used for the preparation of pies, cakes, juices, etc. (Ciofu et al., 2003).

Because pumpkin cultivars differ in terms of nutritional values, producers and researchers are searching for the most valuable and nutritionally appropriate genotypes (Dinu et al., 2016, Frătuțu et al., 2024).

The genetic diversity of germplasms and of *Cucurbita* populations, including shape, size, and color variation of fruit, seed number and size, fruit quality, and fruit pulp thickness, is high (Montes-Hernandez et al., 2005).

Traditional local pumpkin crops represent important genetic resources for plant breeding

due to their considerable genotypic variability. These variations are maintained through the deliberate selection of specific traits by farmers (Nanu et al., 2022).
Selection is a recommended method to streamline and improve the characteristics of a population and to maintain genetic variability (Wilyanne et al., 2024).
The constantly changing climatic conditions in southern Oltenia require the creation of new genotypes that are notable for their earliness, quality, and resistance to area-specific climatic factors.
In order to maintain the authenticity and biological uniformity of the pumpkin genotype ′Valin 24′, the aim was to restrict the variability of the main characters analyzed within the limits of small and medium coefficients of variation. The purpose of this study was the selection and maintenance of the genetic structure within the limits established by the author/maintainer of the pumpkin cultivar 'Valin 24'.

MATERIALS AND METHODS

The study was carried out at the Dăbuleni Research and Development Station for Plant Cultivation on Sandy Soils during 2024-2025 and aimed to improve the pumpkin cultivar 'Valin 24' (Figure 1).



Figure1. ′Valin 24′ pumpkin cultivar

The biological material used to set up the experiment was represented by the pumpkin seedlings obtained from the selected elites of the ′Valin 24′ variety. When setting up the experiment in the research field, the seedlings were planted at a distance of 100 cm between plants per row and 180 cm between rows.
The biometric determinations and morphological observations were carried out on the main quantitative and qualitative characters of 100 fruits obtained in a selection field.
The physical properties of the fruits, determined in the two years, were represented
by the height and diameter of the fruits (cm), the diameter of the seminal cavity (cm), the shape index, fruit weight (kg) and pulp thickness (cm), according to the methodology described by Ionică (2014).
The chemical properties of pumpkin fruits were determined according to the methodology described by Croitoru (2021).
Soluble dry matter (SUS) was determined by the refractometric method, the results being expressed as percentages (%). To determine the content of total dry matter (SUT), the gravimetric method was applied based on the removal of water by evapotranspiration from the average analytical sample used, keeping it in the oven at a temperature between 85-105°C.
The results were expressed as a percentage of total dry matter (%).
The determination of titratable acidity (TA) was carried out using the method described by Ionică (2014), the results were expressed in grams of malic acid/100 g of fresh substance.
For the determination of vitamin C content, the iodometric method described by Croitoru (2021), which is based on the oxidation of ascorbic acid with excess iodine, and the results were expressed in mg of ascorbic acid.
Carbohydrates were determined according to the Fehling Soxhelt method described by Croitoru (2021), the result being expressed in percentages.
The obtained data were processed statistically using the statistical analysis program (StatPoint Technologies, Warrenton, VA, USA), calculating for each character the arithmetic mean (X), the standard deviation (SD), and the coefficient of variation (CV; 0-15 very low variability; 15-30 medium variability; >30 very high variability).
Relationships between fruit physical characteristics were quantified using correlations.

RESULTS AND DISCUSSIONS

The data in Table 1 show that the variability of fruit height is small, with average values between 8.83 cm (2025) and 9.97 cm (2024), which indicates the uniformity of the pumpkin cultivar ′Valin 24′ from this point of view.

Table 1. Variability of physical characteristics of fruits from the pumpkin cultivar, ′Valin 24′

Characteristics	Statistical indicators	Year of observation	
		2024	2025
Fruit height (cm)	Mean	9.97	8.83
	Standard Deviation	1.11	1.09
	Minimum/ Maximum	7.90 / 13.00	7.00 / 12.20
	CV %	11.15	12.29
Fruit diameter (cm)	Mean	19.90	22.30
	Standard Deviation	1.99	1.85
	Minimum/ Maximum	16.70 / 26.50	13.40 / 28.30
	CV%	10.00	8.29
Seminal cavity diameter (cm)	Mean	13.03	14.84
	Standard Deviation	1.98	1.69
	Minimum/ Maximum	10.00 / 18.00	11.00 / 23.80
	CV%	12.20	11.37
Shape index	Mean	0.50	0.40
	Standard Deviation	0.05	0.06
	Minimum/ Maximum	0.40 / 0.66	0.29 / 0.67
	CV%	10.13	15.22

The cultivar ′Valin 24′ also shows good stability in terms of fruit diameter, with average values between 19.90 cm (2024) and 22.30 cm (2025), the diameter of the seminal cavity between 13.03 cm (2024) and 14.84 cm (2025) and the shape index with 0.50 cm (2024) and 0.40 cm (2025).

Thus, the year 2025 stands out with the highest values recorded for fruit diameter, seminal cavity diameter, and shape index, and the year 2024 for the highest average value of fruit height. In both study years, a small coefficient of variation was calculated for the characteristics analyzed.

Table 2 presents the variability of fruit weight and fruit pulp thickness. Fruit weight in 2024 had an average value of 2.60 kg, and in 2025 of 3.47 kg, which shows a very high variability for this characteristic. The results obtained regarding fruit weight are similar to those reported by Nanu et al. in 2022, namely 2.46-3.70 kg. This highlights the need to continue the selection process for standardizing the material through repeated purifications of the plant material, both at the seedling stage with 2-3 true leaves and in the selection field by removing diseased or non-compliant plants, but also by taking into account the shape, size, and external appearance of the fruits, the color of the pulp, and the shape, size, and color of the seeds of the elites.

Another characteristic of particular importance is the pulp thickness, which recorded close average values in the 2 years of study: 3.92 cm in 2024 and 3.95 cm in 2025, the coefficient of variation having an average value in 2024 (17.90%) and low in 2025 (13.36%).

The results obtained during the studied period are relatively similar to those reported by Nanu et al. in 2022, who reported an average value of pulp thickness between 3.55-4.31 cm.

On average over the 2-year study, the coefficient of variation ranged from 15.63% (pulp thickness) to 24.68% (fruit weight), indicating that for these characters the ′Valin 24′ genotype is uniform (stable).

Table 2. Variability of quantitative characteristics of fruits from pumpkin cultivar′Valin 24′

Characteristics	Statistical indicators	Year of observation		Average / years of study
		2024	2025	
Fruit weight (kg)	Mean	2.60	3.47	3.03
	Standard Deviation	0.78	0.67	0.72
	Minimum/Maximum	1.61 / 5.57	2.23 / 6.08	1.92/5.83
	CV %	29.94	19.43	24.68
Pulp thickness (cm)	Mean	3.92	3.65	3.79
	Standard Deviation	0.70	0.49	0.60
	Minimum/Maximum	2.00 / 6.40	2.50 / 4.80	2.25/5.60
	CV%	17.90	13.36	15.63

The relationships between the main characteristics analyzed in pumpkin fruits in the two years of study were quantified using correlations. Thus, according to the data in Table 3, for the study period, positive correlations were calculated between weight and the length and diameter of the fruit (r=0.61 in 2024) and between weight and the diameter of the fruit (r=0.90 in 2024, r=0.71 in 2025).

Table 3. Correlations between the main characteristics of the fruits of the cultivar ′Valin 24′ studied in the period 2024-2025

Characteristics	Fruit weight (kg)		Fruit height (cm)		Fruit diameter (cm)		Seminal cavity diameter (cm)		Pulp thickness (cm)		IF	
The year	2024	2025	2024	2025	2024	2025	2024	2025	2024	2025	2024	2025
Fruit weight (kg)	1	1										
Fruit height (cm)	0.61	0.14	1	1								
Fruit diameter (cm)	0.90	0.71	0.54	0.06	1	1						
Seminal cavity diameter (cm)	0.45	0.41	0.19	0.11	0.54	0.56	1	1				
Pulp thickness (cm)	0.53	0.38	0.31	-0.11	0.51	0.37	0.10	0.03	1	1		
IF	-0.18	-0.29	0.58	0.76	-0.36	-0.57	-0.30	-0.23	-0.17	-0.28	1	1

Positive cor relation was also calculated between the seminal cavity diameter and the the fruit weight (r=0.45 in 2024 and r=0.41 in 2025), and fruit diameter (r=0.54 in 2024 and r=0.56 in 2025). The shape index was positively cor related with fruit length during study period, with r=0.58 in 2024 and r=0.76 in 2025. Tables 4 and 5 present the distribution of pumpkin fruits of the cultivar ′Valin 24′, in terms of the fruit weight values recorded in the study years 2024-2025.

Table 4. Distribution of ′Valin 24′ pumpkin fruits selected according to fruit weight in 2024

Bin	Frequency	Cumulative, %
1.605	1	1.00%
2.001	19	20.00%
2.397	34	54.00%
2.793	14	68.00%
3.189	11	79.00%
3.585	13	92.00%
3.981	3	95.00%
4.377	1	96.00%
4.773	1	97.00%
5.169	1	98.00%
More	2	100.00%

Based on the data in Table 4, over 90% of the analyzed fruits had weights between 2.00 kg and 5.169 kg. Most fruits, namely 78, weighed between 2.397 kg and 5.169 kg in 2024.

In 2025, according to Table 5, over 90% of the analyzed fruits had weights between 2.23 kg and 4.912 kg.

Based on the data in Table 5, over 90% of the analyzed fruits had weights between 2.23 kg and 4.912 kg. Most fruits, namely 86, weighed between 2.99 kg and 4.537 kg.

Tables 6 and 7 present the distribution of pumpkin fruits of the elites ′Valin 24′, in terms of the thickness of the pulp of the fruits analyzed in the period 2024-2025.

Analyzing the data in Table 6, it is observed that in 2024, 82 of the 100 fruits analyzed had a pulp thickness between 3.32 cm and 4.64 cm, and 14% had a thickness between 4.64 cm and 5.96 cm.

Table 5. Distribution of fruits of the pumpkin variety ′Valin 24′ selected according to fruit weight in 2025

Bin	Frequency	Cumulative, %
2.23	1	1.00%
2.6145	7	8.00%
2.999	18	26.00%
3.3835	24	50.00%
3.768	22	72.00%
4.1525	11	83.00%
4.537	11	94.00%
4.9215	5	99.00%
5.306	0	99.00%
5.6905	0	99.00%
More	1	100.00%

Table 6. Distribution of ′Valin 24′ pumpkin fruits selected according to pulp thickness in 2024

Bin	Frequency	Cumulative, %
2	1	1.00%
2.44	0	1.00%
2.88	2	3.00%
3.32	12	15.00%
3.76	33	48.00%
4.2	23	71.00%
4.64	14	85.00%
5.08	11	96.00%
5.52	1	97.00%
5.96	2	99.00%
More	1	100.00%

Based on the data in Table 7, it can be concluded that in 2025, 82 of the analyzed fruits had pulp thicknesses between 2.614 cm and 4.115 cm, and 5% had thicknesses between 4.537 cm and 5.306 cm.

Table 7. Distribution of fruits of the pumpkin variety ′Valin 24′ selected according to pulp thickness in 2025

Bin	Frequency	Cumulative, %
2.23	1	1.00%
2.6145	7	8.00%
2.999	18	26.00%
3.3835	24	50.00%
3.768	22	72.00%
4.1525	11	83.00%
4.537	11	94.00%
4.9215	5	99.00%
5.306	0	99.00%
5.6905	0	99.00%
More	1	100.00%

Regarding the biochemical composition of pumpkin fruits, Table 8 presents data on their quality collected during the 2024-2025 study period.

Analyzing the data in Table 8, it was found that during the study period, the year 2024 stood out with the highest average values in terms of total dry matter content (22.17%), soluble dry matter (17.32%), starch (14.03%), titratable acidity (0.38 g malic acid/100 g fresh matter) and vitamin C (26.22 mg/100 g fresh matter).

From the point of view of the coefficient of variability calculated for each characteristic in both years of the study, it ranged between 2.92% and 21.38% in 2024 and between 2.53% and 17.62% in 2025.

These data indicate low variability in the characteristics of the analyzed fruits, suggesting the uniformity of the cultivar' Valin 24' and, at the same time, its good stability.



Figure 2. ′Valin 24′ pumpkin cultivar in section

Table 8. Biochemical characteristics of pumpkin fruits from the ′Valin 24′ elites analyzed in the period 2024-2025

Year	Statistical analysis	Characteristicics					
		Water (%)	Total dry matter (%)	Soluble dry matter (%)	Starch (%)	Titratable acidity (g malic acid/100 g of fresh matter)	Vitamin C (mg/100 g of fresh matter)
2024	Mean±SD	77.83±2,31	22.17±2,13	17.32±3,70	14.03±1,18	0.38±0,05	26.22±3,49
	Variation limits	75.85/81.05	18.95/24.15	11.60/20.40	12.46/15.15	0.32/0.45	22.00/30.80
	CV%	2.97	10.42	21.38	8.41	12.84	13.30
2025	Mean±SD	78.05±1.98	21.95±1.98	17.08±3.01	13.83±1.12	0.31±0.05	25.42±2.69
	Variation limits	75.96/81.15	18.85/24.04	12.60/20.20	12.45/15.15	0.23/0.36	22.00/28.80
	CV%	2.53	9.00	17.62	8.13	15.60	10.57

CONCLUSIONS

In the process of conservative selection, the pumpkin cultivar ′Valin 24′ recorded the highest average fruit weight of 3.47 kg in 2025, with variation limits between 2.23 kg and 6.08 kg.

The results obtained with the pumpkin cultivar ′Valin 24′ showed that both the fruit weight and the pulp thickness have constant values from year to year.

The pumpkin cultivar ′Valin 24′ presents low variability in the fruit height characteristic, with average values between 8.83 cm (2025) and 9.97cm (2024), which indicates the uniformity of the pumpkin cultivar ′Valin 24′ from this point of view.

The analysis of the characteristics measured over 2 years (2024-2025) demonstrates that the pumpkin cultivar ′Valin 24′ can be recommended to growers passionate about pumpkin cultivation.



Figure 3. ′Valin 24′ pumpkin cultivar at physiological harvest maturity

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