THE BEHAVIOR OF SOME PEPPER GENOTYPES IN SANDY SOIL CONDITIONS IN SOUTHERN OLTENIA

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Abstract

The pepper genotypes taken in the study (Bogdan, Înșalnița 85V, L-28 and L-15) were subjected to an analysis of the variability of the main quantitative characteristics of the fruit (fruit weight, fruit height and diameter, pericarp thickness, shape index, number of seminal lobes, peduncle length and diameter).

The registered biometric data were statistically processed, calculating for each analyzed character the mean ($\bar{x}$), the standard deviation (s), the coefficient of variability (s%), the range of variability ($k = \bar{x} \pm s$) and the frequency of individuals in the range of variability (f%).The statistical analysis of the recorded data showed that the four pepper genotypes are uniform in terms of the variability of the main characters, the coefficient of variability having medium and small values for most of the analyzed characters, and represent a valuable material for the improvement of this species in the conditions of sandy soils in the south of Oltenia.

Key words: *genotypes, variability, sandy soil.*

INTRODUCTION

Sweet pepper (*Capsicum annuum L*.) is one of the most popular vegetable species worldwide (Lodhi et al.,2014). Peppers are consumed fresh, dehydrated and processed, but also as a spice. Peppers are consumed more and more, due to the fact that they are a major source of carotene, vitamin E, and vitamin C. Peppers are rich in carotenoids, compounds with anticancer and antioxidant capacity, but also a lot of essential nutrients (Hervert-Hernandez et al., 2010; Mateos et al., 2013; Rodriguez-Burruezo et al., 2009). It is considered the third most important species in the *Solanaceae* family after potatoes and tomatoes.Peppers are among the vegetable species that are considered to be naturally abundant in phytochemicals and their composition has beneficial effects on human health (O'Sullivan et al., 2011; Pellegrini et al., 2003). In various studies, it has been reported that climate change has had a negative impact on the yield of agricultural crops and ecological systems in developing and developed countries (IPCC, 2014).Temperature is considered the environmental factor that affects the entire phenomenon of growth and plant development, from seed germination to seed maturation.

The optimum temperature for seed germination is 25-30 °C. High temperatures above 35 °C affect vegetative growth, flowering, fruit formation and, consequently, sweet pepper yield (Erickson and Markhart, 2001). Pollination is severely reduced below 15 °C and above 32 °C due to the poor ability to release pollen grains.

Optimum planting date in sweet pepper production is the key to better yield as it determines the period of maximum potential of the crop, efficient use of resources and less competition of the crop with weeds and insect pests (Saqib & Akbar Anjum, 2021). Pepper crops have adapted well to the hot climate, and areas with temperatures in the range of 21-29 °C

are necessary for growth and fruit quality (Nonnecke, 1989).

In peppers, as in other horticultural species, it has generally been pursued to obtain crop varieties by evaluating and selecting promising genotypes within existing populations and genetic diversity, or by following classical genetic improvement and hybridization schemes (Meneses-Lazo et al. 2018; Lopez-Espinosa et al., 2018). In this sense, it is important to use the existing genetic diversity to produce improved pepper varieties that can adapt to new agro-climatic conditions. Pepper breeding is aimed at obtaining high-productivity varieties and hybrids, with a high content of dry matter and ascorbic acid, with multiple resistances to diseases and adverse environmental conditions, tolerant to the conditions of sandy soils in southern Oltenia

MATERIALS AND METHODS

The study was carried out within the Research-Development Station for Plants Crops on Sandys Soils Dăbuleni, on a sandy soil, in the year 2022. The experiment was established in an open field, in a single repetition, placed in a linear floor. The pepper genotypes studied *Bogdan, Işalnița 85V, L-28* and *L-15* were sown in alveolar cubes filled with peat on March 17, 2022 and were planted on May 6, 2022, at a distance of 30 cm between plants per row and 70 cm between rows. The pepper genotypes *Bogdan, Işalnița 85V, L-28* and *L-15* were subjected to an analysis regarding the variability of the main quantitative characters of the fruits (fruit weight, fruit height and diameter, pericarp thickness, shape index, number of seminal lobes, length and peduncle diameter). The registered biometric data were statistically processed, calculating for each analyzed character the mean ($\bar{x}$), the standard deviation (s), the coefficient of variability (s%), the degree of dispersion ($k= \bar{x} \pm s$) and the frequency of the individuals included in the interval of variability (f%)

RESULTS AND DISCUSSIONS

In a world of climate change, the creation of new pepper genotypes is one of the necessary solutions to face the challenges related to agriculture and food. On the sandy soils of southern Oltenia, these climate changes began to be felt, which directly influenced the growth and development of pepper plants (Table 1).In May, out of the total number of days, in 19 days temperatures over 25^0C were recorded, of which in 12 days the maximum temperatures were between 25-30^0C and in 7 days temperatures were recorded between 30-35^0C. June's monthly average was 22.9^0C, 1.5^0C higher than the multi-year average. In 29 days temperatures over 25^0C were recorded, in 18 days the maximum temperatures were between 30-35^0C and in only one day there were temperatures between 35^0C-40^0C. The maximum in June was 35.7^0C.

Table 1.Temperature level during in the period May-August 2022 (weather station of R & DSPCS Dăbuleni)

Specification	The month			
	May	June	July	August
Number of days with maximum temperatures between 25-30^0 C	12	10	6	5
Number of days with maximum temperatures between 30-35^0C	7	18	11	16
Number of days with maximum temperatures between 35^0C-40^0C	0	1	11	9
Number of days with maximum temperatures above 40^0C	0	0	2	1
The monthly average (^{0}C) Average monthly temperature	18.3	22.9	25.2	25.1
The monthly maximum (^{0}C) Maximum monthly temperature	31.8	35.7	41.6	40.8
Multiannual average temperatures (1956-2020)	17.5	21.4	23.2	22.6

July was unusually warm, with monthly average temperatures of 25.2 °C, 2.0 °C higher than the 66 year average.

In 6 days maximum temperatures between 25-30 °C were recorded, in 22 days temperatures exceeded 30^0C, and in 2 days temperatures of 40 °C were recorded.

The month of August was particularly warm, the average monthly temperature being 2.5 °C above the multi-year average. In August, in 9 days the maximum temperatures exceeded 35 °C, the maximum of the month being 40.8 °C. The temperatures in 2022 showed an increasing trend, and the absolute maximum temperature recorded significant increases days in a row with values above 35 °C and sometimes even above 40 °C with adverse effects for pepper plants. High temperatures coincided with the period of flowering, setting and fruit growth, which caused a decrease in fruit number and weight.

Table 2.Variability of the main quantitative characters of the pepper genotype *Bogdan*

The analyzed character	x̄	s	s%	The range of variability k=x̄±s	Frequency of individuals (%)
Fruit weight (g)	154.29	21.74	14.09	132.55 - 176.03	60
Fruit height (cm)	15.58	0.99	6.39	14.58 - 16.57	70
Fruit diameter (cm)	5.48	0.65	11.87	4.83 - 6.13	60
Pericarp thickness (mm)	4.38	0.85	19.45	3.53 - 5.23	80
Number of seminal lodges	2.70	0.67	25	2.03 - 3.37	90
Peduncle length (cm)	4.29	0.62	14.47	3.67 - 4.91	80
Peduncle diameter (mm)	7.61	0.95	12.52	6.65 - 8.56	80
Shape index	2.88	0.36	12.34	2.52 - 3.23	80

In the *Bogdan* pepper genotype, the weight of the fruit (g) showed a medium variability (14.07%), the mean of the character being 154.29 g. In the range of variability k=132.55-176.03 g, there were 60% of the analyzed fruits. This characteristic indicated the economic value of the genotype (Table 2).

The thickness of the pericarp (mm) varied between 3 mm and 6 mm, the average being 4.38 mm, the coefficient of variability being medium (19.45%). The thickness of the pericarp in pepper fruits was a character that contributes to fruit weight and implicitly to increase the productivity of the genotype, being another defining character for the selection and keeping the pepper genotype in a pure state. This character can be improved by choosing fruits with high values regarding the thickness of the pericarp. The shape index (IF=H/D) was given by the ratio between the height of the fruit and the diameter of the fruit, it has the value of 1.82 indicating an elongated shape. The fruits were uniform regarding this character, the coefficient of variability being medium (12.52%). In the range of variability k=2.52-3.23, 80% of the analyzed fruits were included. The statistical processing of the recorded data highlighted the fact that the fruits of the pepper genotype *Bogdan* were uniform in terms of the variability of the main characters, and the values of the coefficients of variability are small and medium for most of the analyzed characters, except for the number of seminal lobes.

The fruits of *Işalnița 85V* peppers had a weight between 73-170.30g. In the range of variability k= 77.51-130.55 g, 80% of the analyzed fruits were included (Table 3). The thickness of the pericarp (mm)

varies between 4.39 mm and 6.83 mm, the average being 5.67 mm. The fruits were uniform regarding this character, and the value of the coefficient of variability is medium (13.33%). The thickness of the pericarp gives the quality and firmness of the fruit.

Table 3.Variability of the main quantitative characters of the pepper genotype *Işalnița 85V*

The analyzed character	x̄	s	s%	The range of variability k=x̄±s	Frequency of individuals (%)
Fruit weight (g)	104.03	26.52	25.49	77.51 - 130.55	80
Fruit height (cm)	9.10	0.95	10.44	8.15 - 10.05	70
Fruit diameter (cm)	6.13	0.51	8.37	5.61 - 6.64	60
Pericarp thickness (mm	5.67	0.76	13.33	4.91 - 6.42	70
Number of seminal lodges	3.60	0.52	14.34	3.08 - 4.12	90
Peduncle length (cm)	2.94	0.55	18.86	2.38 - 3.49	70
Peduncle diameter (mm)	6.20	0.68	10.92	5.52 - 6.87	70
Shape index	1.49	0.19	12.54	1.30 - 1.68	70

The shape index (IF=H/D) is given by the ratio between the height of the fruit and the diameter of the fruit, it has the value of 1.49, indicating a conical shape. The fruits were uniform regarding this character, the coefficient of variability being medium (12.54%). In the interval of variability k=1.30-1.68 were included 70% of the analyzed fruits.

The statistical processing of the recorded data highlighted the fact that the fruits of the pepper genotype *Işalnița 85V* present a medium and small variability for all the analyzed quantitative characters, except for the weight of the fruit (s%=25.49).

In the case of genotype *L-28*, the weight of the fruit (g) showed a medium variability (16.97%), the fruits having an average weight of 43.37 g (Table 4). In the range of variability k=36.09-50.84 g were contained in 70% of the analyzed fruits.

Table 4. Variability of the main quantitative characters of the pepper genotype *L-28*

The analyzed character	x̄	s	s%	The range of variability k=x̄±s	Frequency of individuals (%)
Fruit weight (g)	43.37	7.37	16.97	36.09 - 50.84	70
Fruit height (cm)	12.85	2.05	15.98	10.79 - 14.90	60
Fruit diameter (cm)	3.01	0.43	14.32	2.58 - 3.44	70
Pericarp thickness (mm)	2.46	0.28	11.56	2.18-2.75	80
Number of seminal lodges	2.80	0.3	22.59	2.17-3.43	90
Peduncle length (cm)	4.12	0.67	16.29	3.45 - 4.79	70
Peduncle diameter (mm)	4.21	0.61	14.60	3.59 - 4.82	60
Shape index	4.31	0.69	15.98	3.62 - 5.00	80

The average height of the fruit was 12.85 cm, and the average diameter of the fruits of genotype *L-28* was 3.01 cm, giving it a flattened shape. The thickness of the pericarp (mm) varies between 2.10 mm and 2.96 mm, the average being 2.46 mm. The coefficient of variability for this character was medium (11.56%).

Regarding the shape index, the value of the coefficient of variability is medium (15.98%), and the range of variability k= 3.62-5.00 includes 80% of the analyzed fruits.

The fruits of genotype *L-28* showed a medium variability for almost all the characters analyzed.

Regarding the weight of the fruit in genotype L-15, the value of the coefficient of variability was high (24.17%) (Table 5).

The shape index is given by the ratio between the height of the fruit and the

diameter of the fruit, which defines the shape of the fruit, being a defining character in the selection of the pepper genotype. The value of 1.24 of this character indicated an elongated shape of the genotype.

Table 5.Variability of the main quantitative characters of the pepper genotype *L-15*

The analyzed character	x̄	s	s%	The range of variability k=x̄±s	Frequency of individuals (%)
Fruit weight (g)	120.57	29.15	24.17	91.42-149.72	70
Fruit height (cm)	8.21	1.37	16.72	6.83-9.58	60
Fruit diameter (cm)	6.62	0.69	10.48	5.92-7.31	70
Pericarp thickness (mm)	5.58	0.73	13.15	4.84-6.31	70
Number of seminal lodges	3.10	0.31	10	2.79-3.41	90
Peduncle length (cm)	2.38	0.57	23.83	1.81-2.95	60
Peduncle diameter (mm)	8.05	1.00	12.40	7.05-9.05	70
Shape index	1.24	0.18	14.55	1.06-1.42	70

The calculation and analysis of the variability of the characters studied in the *L-15* pepper genotype revealed a medium and high variability for the quantitative characters studied.

CONCLUSIONS

In order to maintain the authenticity and biological uniformity of the pepper genotypes, it was aimed to limit the variability of the main characters analyzed within the limits of medium and small coefficients of variation.

Among the four studied pepper genotypes, the *Ișalnița 85V* and *L-15* genotypes stood out for their pericarp thickness (mm).

The climatic conditions of the study year 2022 left their mark on some characteristics of pepper fruits.

All four analyzed genotypes showed resistance to the special climatic conditions of 2022 and represent valuable material for the improvement of this species.

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