

RESEARCH ON THE BEHAVIOR OF THE LONG PEPPER GENOTYPE 'BOGDAN' (*CAPSICUM ANNUUM L.*) IN SANDY SOIL CONDITIONS AT DĂBULENI RDSPCS

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Abstract

Among the vegetable species, the long pepper (*Capsicum annuum L.*) is one of the most important crops globally, due to its flavor, high nutritional value, high content of vitamins (C, A, E, B, etc.) as well as an excellent source of natural colorants and antioxidant compounds (Howard et al. 2000). The success of long pepper cultivation is conditioned, to a large extent, by the cultivar used. In this sense, at Dăbuleni Research-Development Station for Plant Culture on Sands, research was carried out in 2023 regarding the variability of the main quantitative characters in the long pepper genotype 'Bogdan'. Fruit weight (g), fruit diameter (cm), pericarp thickness (mm) and shape index were analyzed. 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 ($k = \bar{x} \pm s$), frequency of individuals (%).

The calculation and analysis of variability showed, on average, over the three years of the study, a medium variability for the characters analyzed (fruit weight s% = 24.35; fruit height s% = 13.06; pericarp thickness s% = 20.97; shape index s% = 15.84). The statistical analysis of the recorded data showed that for the long pepper genotype 'Bogdan', they are uniform in terms of the variability of the main characters, the coefficient of variability having high and medium values for most of the analyzed characters, and it represents a valuable material for the improvement of this species in the conditions of sandy soils from the south of Oltenia.

Key words: long pepper, variability, genotype, sandy soils.

INTRODUCTION

Among the vegetable species, the long pepper (*Capsicum annuum L.*) is one of the most important crops globally, due to its flavor, high nutritional value, high content of vitamins (C, A, E, B, etc.) as well as an excellent source of natural colorants and antioxidant compounds (Howard et al. 2000). Currently, one of the most interesting properties of natural products is their antioxidant content. In recent years, pepper cultivation has grown in popularity, and a large number of varieties and hybrids are now available on the domestic and foreign markets. The chemical composition of pepper fruits has been quite well studied, mainly regarding the content of vitamin (C, E), β -carotene and carotenoid pigments

(Minguez-Mosquera & Hornero-Mendez, 1994, Palevitch & Craker, 1995).

Well-adapted local populations, with specific characteristics of shape, color, taste and biological value (Masheva, 2014), have been used as starting material for conventional breeding programs aimed at developing genotypes with improved economic and agronomic traits (Todorov & Todorova, 2002).

Genetic diversity is the essential source of genetic progress in plant breeding. This has caused considerable interest in the characterization of genetic resources for most cultivated plant species, both nationally and internationally, since the middle of the last century.

In the last 30 years, new germplasm has been obtained as a result of the use of various local and foreign genotypes and the application of various breeding methods, including hybridization, repeated individual selection, male sterility, etc. Newly developed breeding materials were evaluated for the presence of valuable agronomic traits, bioactive components and resistance to biotic and abiotic stress factors.

Genetic restructuring of long pepper germplasm is needed to increase productivity taking into account consumers' preference for fruits of different shapes and moderate sizes. For this, the first and most important step is to assess the variability available in the germplasm to identify potential genotypes for their use either directly as cultivars or as parents in the future breeding program.

Diversity studies are an essential step and prerequisite in plant breeding and could yield valuable knowledge for crop improvement breeders (Pujar et al., 2017). The presence of genetic variability in crops is essential for its further improvement, providing options for breeders to develop new varieties and hybrids (Shimeles, 2018).

MATERIALS AND METHODS

The research was carried out within the Research-Development Station for Plant Culture on Dăbuleni Sands on a sandy soil in the specific climatic conditions of 2023. The experiment was established in an open field. The long pepper genotype under study 'Bogdan' was sown in alveolar cubes filled with peat on March 15, 2023 and planted on May 8, 2023, at a distance of 40 cm between plants in a row and 70 cm between rows.

The pepper genotype obtained as a result of the breeding process was subjected to a rigorous selection, in order to maintain the characters. The pepper genotype 'Bogdan'

was subjected to an analysis regarding the variability of the main quantitative characters of the fruits. The weight of the fruit (g), the height of the fruit (mm), the thickness of the pericarp (mm) and the diameter of the fruit (cm) were analyzed. 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

The analysis of thermal and water resources in the area of sandy soils highlighted the tendency of increasing drought in the last two decades, with unfavorable effects on the culture in the south of Oltenia (Burzo, 2014), which is why a program of pepper cultivation was implemented breeding for the creation of new genotypes and for maintaining the varietal purity of existing genetic creations. Following the studies carried out in 2023, the aim was to maintain the authenticity and biological uniformity of the long pepper genotype 'Bogdan'.

The results obtained for the long pepper genotype 'Bogdan' regarding the variability of fruit weight are presented in table 1.

Table 1. Variability of fruit weight (g) at long pepper genotype 'Bogdan'

The year of the study	Statistical indices				
	\bar{x}	S	S%	$K = \bar{x} \pm S$	f%
2023	100.23	24.41	24.35	75.82-124.64	67

In the long pepper genotype 'Bogdan', the weight of the fruit (g) showed a high variability (24.35%), the mean of the

character being 100.23 g. In the range of variability $k=75.82-124.64$ g were comprised 67% of the analyzed fruits. This property is a main characteristic because it indicates the economic value of the genotype (table 1).

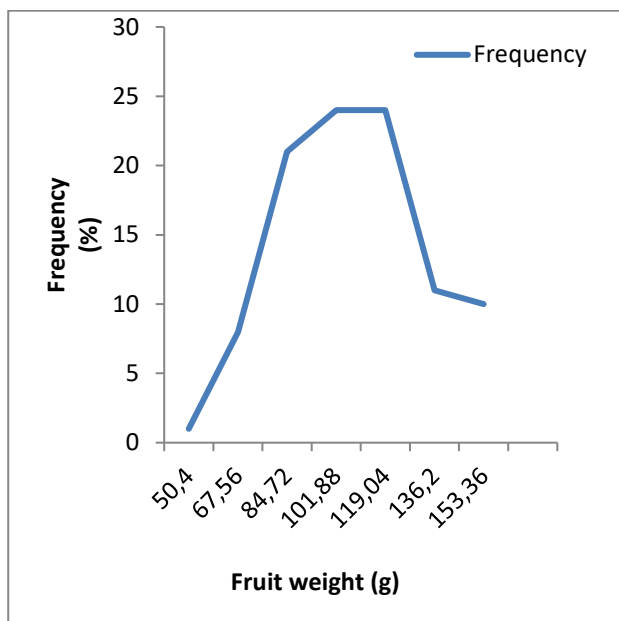


Figure 1. The unimodal histogram curve of the fruit weight character variation string, in the year 2023



Figure 2. Long pepper genotype 'Bogdan'

From the graphic representation of the string of variation of the character fruit weight, a unimodal curve was highlighted, slightly shifted to the right, towards high values for this character (figure 1).

Table 2. Variability of fruit height (cm) at long pepper genotype 'Bogdan'

The year of the study	Statistical indices				
	\bar{X}	S	S%	$K=\bar{X}\pm S$	f%
2023	14.35	1.87	13.06	12.47-16.22	74

Regarding fruit height (cm), the value of the coefficient of variability was medium (13.06%) which demonstrated its genetic determinism and good stability for this character (table 2). In the interval of variability $k= 12.47-16.22$ are contained 74% of the analyzed fruits.

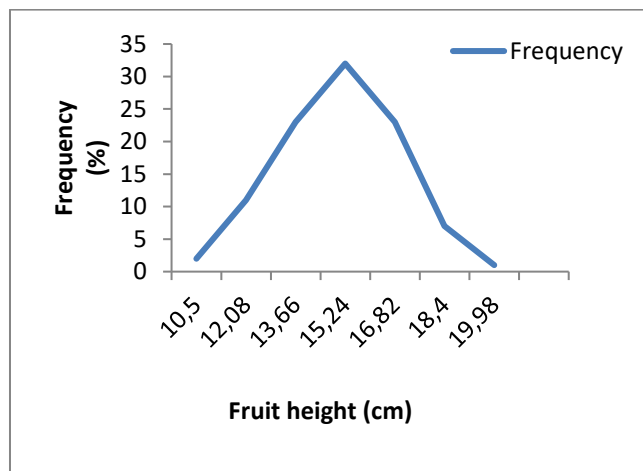


Figure 3. The unimodal histogram curve of the fruit height character variation string, in the year 2023



Figure 4. Long pepper genotype 'Bogdan'

The dispersion of values around the mean is uniform, the variation curve being unimodal, slightly asymmetric (figure 3). Most of the fruits recorded heights within the range of variability $k=12.47-16.22$.

Table 3. Variability of the pericarp thickness (mm) at long pepper genotype 'Bogdan'

The year of the study	Statistical indices				
	\bar{X}	S	S%	$K=\bar{X}\pm S$	f%
2023	4.31	0.90	20.97	3.40-5.21	54

The thickness of the pericarp (mm) varies between 2.73 mm and 7.28 mm, the average being 4.31 mm. The value of the coefficient of variability is high (20.97%). The thickness of the pericarp gives the quality, the firmness of the fruit, and the number of individuals included in the interval of variability, $k= 3.40-5.21$ is 54%. It is an important character for determining

the nutritional and economic value of pepper fruits (table 3).

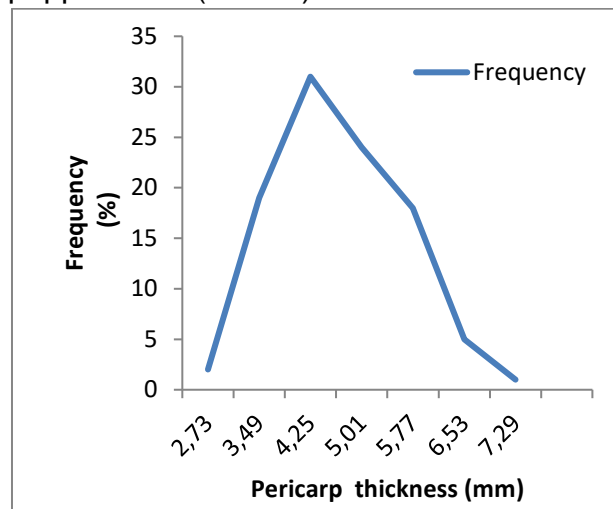


Figure 5. The unimodal histogram curve of the variation string of the pericarp thickness character, in the year 2023



Figure 6. Long pepper genotype 'Bogdan'

The graphical representation of the variation series revealed a unimodal curve, with the peak oriented to the right towards high values of the character (figure 5).

Table 4. Variability of fruit diameter (cm) at long pepper genotype 'Bogdan'

The year of the study	Statistical indices				
	\bar{X}	S	S%	$K=\bar{X}\pm S$	f%
2023	4.96	0.60	12.11	4.36-5.56	78

The diameter of the fruit (cm) varies between 3.04 cm and 7.04 cm, the average being 4.96 cm. The fruits were uniform regarding this character, and the value of

the coefficient of variability is medium (12.11%) (table 4).

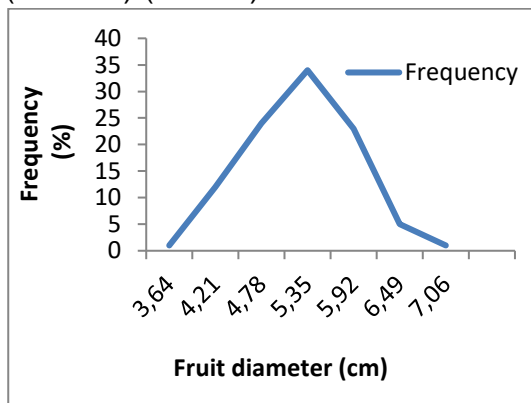


Figure 7. The unimodal histogram curve of the variation string of the pericarp thickness character, in the year 2023



Figure 8. Long pepper genotype 'Bogdan'

The graphical representation of the variation series revealed a unimodal curve, with the peak oriented to the right towards high values of the character (figure 7).

CONCLUSIONS

In order to maintain the authenticity and biological uniformity of the long pepper genotype 'Bogdan', it was aimed to restrict the variability of the main characters analyzed within the limits of small and medium coefficients of variation.

The calculation and analysis of the variability of the characters studied in the long pepper genotype 'Bogdan' revealed a medium variability for the height of the fruit and for the diameter of the fruit, high for the weight of the fruit and the thickness of the pericarp.

The values of the calculated statistical indices, of the characters taken in the study, require the continuation of the selection process in order to maintain them within the limits of variability specific to the long pepper genotype 'Bogdan'.

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