ANNALS OF THE UNIVERSITY OF CRAIOVA

Series: ✔*Biology*
✔*Horticulture*
✔*Food products processing technology*
✔*Environmental engineering*

Vol. XXIX (LXV) – 2024

THE GENETIC VARIABILITY IN TOMATO GENOTYPES L-11/53 AND V 5 GROWN IN PROTECTED SPACES

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Keywords*: genotype, tomato, characters.*

ABSTRACT

The tomato genotypes (L-11/53 and V 5) were subjected to an analysis regarding the variability of the main quantitative fruit characters (fruit weight, fruit height, pericarp thickness). 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%) and the range of variability ($k = \bar{x} \pm s$).

The calculation and analysis of the variability of the characters studied in the tomato genotypes L-11/53 and V 5, revealed on average in the two years of the study a small variability for the height of the fruit (s% = 9.37% for L-11/53 and 7.52% for V 5) and medium for pericarp thickness (s% =16.59% for L-11/53 and 15.47% for V 5).

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 specific limits of variability.

INTRODUCTION

Tomatoes (*Solanum lycopersicum L*.) are one of the versatile vegetable crops belonging to the *Solanaceae* family. Tomatoes, popularly known as the "apple of love" in Europe are one of the most commonly grown vegetables in gardens and households. It is a unique crop because it is used both in fresh, processed form and for its nutritional value. Tomatoes are an excellent source of nutrients and bioactive antioxidant compounds that are important for human health, including minerals, vitamins C and E, β-carotene, lycopene, flavonoids, organic acids, phenolics, and chlorophyll (Weisburger, 2002; Siddiqui et al., 2015). Some of the aforementioned tomato components have antioxidant properties (Navarro-Gonzales & Periago, 2016), while others, such as sodium, potassium, magnesium, calcium, manganese, copper, zinc, and iodine, may reduce the risk of cardiovascular disease (Mertz, 1982) and its organic acids that can contribute to maintaining the acid-base balance (Adedeji et al., 2006). Tomatoes have become popular as a cash crop. Traditional varieties are an essential component of agricultural biodiversity, guaranteeing agricultural production adapted to the territory and ensuring the means of subsistence of a large part of the population that depends on agriculture (Johns et al., 2013). Genetic diversity within crop species is wide. Germplasm grown under local environmental conditions can be optimized for small regional production areas that adapt to prevailing environmental and climatic conditions. However, in recent years there has been the phenomenon of genetic erosion within species, i.e. "the

loss of individual genes and the loss of certain combinations of genes, such as those manifested in locally adapted varieties" (FAO, 2019).

For breeding and crop improvement programs to be effective, it is essential to study and partition the total variability existing in a germplasm into genetic, phenotypic and environmental components. The presence of genetic variability is an essential prerequisite for the genetic improvement of a crop. This allows the breeder to choose an appropriate breeding program. So variability is a key factor, which determines the degree of progress expected from selection. The potential for improvement is directly proportional to the extent of genetic variability present in the germplasm of the crop The greater the genetic variability present in a crop, the wider would be the scope of its improvement and vice versa.

Phenotypic and genotypic coefficients of variation are useful in detecting the amounts of genetic variability present in germplasm.

On the other hand, heredity and genetic advance help to determine the influence of the environment in the expression of characters and the extent to which improvement is possible after selection. Genetic parameters such as genotypic coefficient of variation, phenotypic coefficient of variation, heritability and genetic lead are useful biometric tools for determining genetic variability.

MATERIAL AND METHODS

The studies of genetic variability in tomato genotypes were carried out at the Research-Development Station for Plant Culture on Dăbuleni Sands in the period 2023-2024, in protected greenhouse-solar conditions.

The tomato genotypes studied *L-11/53* and *V 5* were sown in alveolar cubes filled with peat on March 17, 2023, respectively March 15, 2024 and were planted on May 9, 2023, respectively May 16, 2024 at distance of 30 cm between plants in a row and 70 cm between rows.

The tomato genotypes obtained as a result of the breeding process were subjected to rigorous selection. The selection of genotypes was made according to the phenotypic manifestation of the main quantitative characters that characterize each individual genotype. The tomato genotypes (*L-11/53* and *V 5*) were subjected to an analysis regarding the variability of the main quantitative fruit characters (fruit weight, fruit height, pericarp thickness).

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 ($k= \bar{x} \pm s$).

RESULTS AND DISCUSSIONS

In breeding, the abundant diversity of genetic resources is of great importance for biological evolution to cope with abiotic stress (Ayenan et al., 201; Nevo et al., 2012). Although the quality and performance of vegetables under high temperature summer conditions have been partially improved, further genetic breeding attempts should be made to cultivate vegetables more resistant to high temperatures.

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 tomato 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 2023-2024, it was aimed to maintain the authenticity and biological uniformity of the tomato genotypes *L-11/53* and *V 5*. The results obtained with the tomato genotypes *L-11/53* and *V 5* regarding the variability of the fruit weight are presented in table 1.

In the tomato genotype *L-11/53*, in the two years of the study, the weight of the fruit (g) showed a medium variability (18.08%), the character average being 25.50 g., and in the genotype *V 5*, the weight of the fruit revealed a high variability (22%), the mean of the character being 44.16 g, This characteristic indicated the economic value of the tomato genotypes.

Table 1

Variability of fruit weight (g) in tomato genotypes *L-11/53* and *V 5*

Statistical indices	The genotype	The years of the study		Average
		2023	2024	
$\bar{X}$	L-11/53	30.97	20.04	25.50
	V 5	44.90	43.42	44.16
S	L-11/53	5.59	3.62	4.60
	V 5	5.24	14.03	9.63
S%	L- 11/53	18.06	18.10	18.08
	V 5	11.69	32.31	22.00
$K= \bar{X}\pm S$	L- 11/53	25.37-36.56	16.41-23.67	20.89-30.11
	V 5	39.65-50.14	29.38-57.45	34.51-53.79

Fig.1 – The tomato genotypes *V 5* and *L-11/53*

The height of the fruit (mm) in the tomato genotypes varies between 11.63 and 50.68 mm, the average being 41.41 mm in the genotype *L-11/53*, and in the genotype *V 5* values between 31, 22 and 50.68 mm, the average being 76.95 mm. The fruits are uniform regarding this character for the tomato genotypes studied (*L-11/53* and *V 5*), the coefficient of variability being small (9.37%, respectively 7.53%).

The thickness of the pericarp (mm) varied between 2.06 mm and 6.64 mm, the average of the years being 4.67 mm for the genotype *L-11/53*, and for the genotype *V 5*, the thickness of the pericarp in the two years of the study was of 4.30 mm. The fruits were uniform regarding this character, and the value of the coefficient of variability is medium (16.59%, respectively 15.47%) (Table 3).

Table 2

Variability of fruit height (mm) in tomato genotypes *L-11/53* and *V 5*

Statistical indices	***The genotype***	***The years of the study***		***Average***
		2023	***2024***	
X̄	*L -11/53*	*45.56*	*37.27*	*41.41*
	V 5	*82.80*	*71.11*	*76.95*
S	*L- 11/53*	*3.45*	*4.16*	*3.80*
	V 5	*6.90*	*4.76*	*5.83*
S%	*L -11/53*	*7.58*	*11.16*	*9.37*
	V 5	*8.34*	*6.70*	*7.52*
K= X̄±S	*L- 11/53*	*42.10-49.01*	*33.11-41.43*	*37.60-45.22*
	V 5	*75.89-89.71*	*66.34-75.88*	*71.11-82.79*

Fig. 2- The genotype *L-11/53*

Fig.3 – The genotype *V 5*

The thickness of the pericarp confers the quality and firmness of the fruit, being a character that contributes to the weight of the fruit and implicitly to the increase in the productivity of the genotype. This is a defining character for selection and keeping the tomato genotype pure. Also, this character can be improved by choosing fruits representative of pericarp thickness.

Table 3

Variability of pericarp thickness (mm) in tomato *genotypes L-11/53* and *V 5*

Statistical indices	**The genotype**	**The years of the study**		**Average**
		2023	**2024**	
X̄	L -11/53	5.56	3.78	4.67
	V 5	4.65	3.95	4.30
S	L -11/53	0.64	0.81	0,72
	V 5	0.42	0.86	0.64
S%	L -11/53	11.55	21.64	16.59
	V 5	9.09	21.85	15.47
K= X̄±S	L- 11/53	4.92-6.21	2.96-4.59	3.94-5.40
	V 5	4.23-5.07	3.08-4.81	3.65-4.94

Fig.4 – The genotype *V5*

Fig.5 –The genotype *L-11/53*

CONCLUSIONS

From this study, it is concluded that the information generated by this research can be exploited for subsequent tomato breeding programs.

In order to maintain the authenticity and biological uniformity of the tomato genotypes *L-11/53* and *V 5*, 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 tomato genotypes *L-11/53* and *V 5,* revealed on average during the two years of the study a small variability for the height of the fruit (s% = 9.37% for *L-11/53* and 7.52% for *V 5*) and medium for pericarp thickness (s% =16.59% for *L-11/53* and 15.47% for *V 5).*

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 specific limits of variability.

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