THE STUDY OF INITIAL BREEDING MATERIAL WITH HIGH GENETIC VARIABILITY, IN ORDER TO OBTAIN NEW TOMATO CULTIVARS, SUITABLE FOR ORGANIC FARMING

STUDIUL MATERIALULUI INIȚIAL DE AMELIORARE CU VARIABILITATE GENETICĂ RIDICATĂ, PENTRU OBTINEREA UNOR CULTIVARE NOI DE TOMATE PENTRU AGRICULTURĂ BIOLOGICĂ

BREZEANU P.M.[1], BREZEAN[1] Creola, AMBARUS Silvica, MUNTEANU N.[2]
e-mail: brezeanumarian@yahoo.com

Abstract. *The main purpose of research was to develop a new semi early cultivar of tomato for industrialization and fresh consumption, with a broad genetic base: increased productivity (2.0-3.0 kg / plant), with improved quality of fruit (high content of in soluble solids, uniformity of fruit's shape and color), shape index between 0.98-1.02, average weight 120 g/ fruit, with tolerance and / or resistance to pathogen attack, adapted to specific environmental conditions, with increased chances of achieving, screening and selection biotype. Thus, we proceeded to identify and collect useful sources of germplasm for tomato breeding programme.*
Key words: genotype, resistance, quality, ecological system culture

Rezumat. *Scopul principal al cercetarii a fost de a obține un soi nou, semitimpuriu de tomate destinat industrializarii si consumului în stare proaspată, cu o bază genetică largă, productivitate sporită (2,0-3,0 kg/planta), cu calitate îmbunătățită a fructului (conținut crescut în substață uscată solubilă, uniformitate a formei şi a culorii fructului la maturitate), indice de formă cuprins între 0,98-1,02, greutate medie a fructului 120 g, cu toleranțe şi/sau rezistențe la atacul agenților patogeni, adaptat la conditii specifice de mediu, cu şanse mărite de realizare, depistare şi selecție a biotipului. In acest sens s-a procedat la identificarea şi colectarea surselor de germoplasmă de tomate, utile lucrărilor de ameliorare.*
Cuvinte cheie: genotip, rezistenta, calitate, sistem ecologic de cultură

INTRODUCTION

Cultivar is a defining quality standard that consumers are accustomed. Standard cultivars generally have qualities that are valued at a time. Newer cultivars with similar qualities are tested and studied in culture compared to the standard being the most effective information on the achievements and potential in creating new vegetable open pollinated or hybrid cultivars. Knowledge of morphological and physiological characteristics of the parents is a prerequisite

[1] Vegetable Research and Development Station Bacău, Romania
[2] University of Agricultural Sciences and Veterinary Medicine Iasi, Romania

condition for breeding and especially for obtaining new cultivars with high level of performance. Cubero (1982) reported no significant genetic correlations between yield and fruit weight. Estimates of variance components and heritability have been determined in tomato for fruit weight, fruit size, and fruit set in studies (Cuartero, 1982).

The aim of our study was to save precious resources by collecting local native populations, old, primitive varieties, which are under risk in order to reduce genetic erosion and save entire material obtained by breeding. The study presents six promising tomato genotypes (superior plant characteristics, such as fruit firmness, color, and resistance to crack, pathogens, and storage)

MATERIAL AND METHOD

A selection criterion was individual positive selection followed by selection of lines and mass selection.

As a calculation method, we used sequence variations, considering values of s%:

- s <10 – the traits is less variable,
- 10 <s> 20 - the traits present middle variability,
- 20 - the traits is very variable.

Biological material consists of six lines that have met stabilized features over the time. As control was used „Moldoveanca", a variety developed in breeding programme at Vegetable Research and Development Station, Bacau.

Our studies on the main features were promoted from field base (collection - which holds over thirty cultivars), in work field, six genitors, with indeterminate growth. Promoting the genitors from the field of basic in work field was based on genetic stability of the main features.

There were performed biometric measurements and observations, using the evaluation criteria UPOV standards in case of all promoted to work field genitors.

The main characteristics investigated for all genitors (SP) were: plant height (cm); the number of shoots per plant; the number of leaves (below the first inflorescence and per plant); type and structure of inflorescence; presence of pedicle, pedicle length; average weight of fruit; the total weight of fruit per plant; fruit firmness, crack and storage resistance; number of seeds in fruit; predominant shape of the fruit; fruit height, fruit diameter; external color of immature and mature fruit; the aspect of fruit surface; number of seminal lodges; skin and flesh color of fruit.

RESULTS AND DISCUSSIONS

Synthesis of all phenological observation and biometrical measurements permitted us a concise characterization of studied material. Four from six lines presents bifurcate type of inflorescence. The structure of inflorescence was lax in five cases at L12, L75, L73, L83, L53 and compact at L68. The pedicle was absent only at L12, in rest was present and long (tab. 1).

The total number of shoots per plant varies from 5 at L12 to 12 at L83. The number of leaves below the first inflorescence was 3 at L12, 5 at L68, 6 at L75 and 8 at L73, L83 and L53. We registered a large variation in case of total number of leaves per plant form 18 at L12 to 85 at L83. Plant height varies in small limits form 60 cm at L12, L75 and L68 to 75 cm at L73 and 80 cm at L73 (fig. 1).

Table 1

The main characteristics of tomatoes plants at genitors

No.	Type of inflorescence	Inflorescence structure	Pedicle	Length pedicle
L12	compose	lax	absent	-
L75	compose	lax	present	long
L68	bifurcate	compact	present	long
L73	bifurcate	lax	present	long
L83	bifurcate	lax	present	long
L53	bifurcate	lax	present	long

Comparing each of the studied lines were noticed two: L12 with the lowest plant height – 18 cm, the smallest number of shoots - 5 and leaves (per plant – 18 and below the first inflorescence - 3) and L83 with the biggest number of shoots - 10 and leaves (per plant –85 and below the first inflorescence - 8).

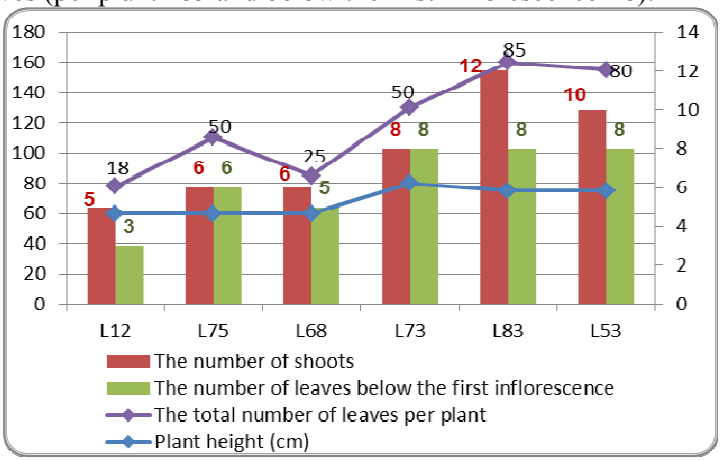

Fig. 1 - Variation of plant height, number of leaves (below the first inflorescence and per plant), number of shoots

The shape of fruits was round, easy flattened and flattened. All lines presented at maturity fruits colored in light to dark red. The highest content of lycopene was in fruits of L 75 (the fruit flesh color was dark red) (tab. 2).

Table 2

The main characteristics of tomatoes fruits at genitors

No.	Dominant fruit shape	Immature fruit color	Mature fruit color	Fruit surfaces	Skin color	Flesh color
L12	round	light green	red	smooth	red	red
L75	round	light green	dark red	least cost	red	dark red
L68	easy flattened	light green	red	smooth	red	red
L73	easy flattened	with lid	dark red	least cost	dark red	red
L83	flattened	light green	light red	cost	bright red	red
L53	round	with lid	dark red	cost	dark red	red

The fruit height and fruit diameter registered a small variation in limit of one cm: between 4,5 and 5,5 cm at fruit height and from 5,5 cm to 6,5 in case of fruit diameter. The number of seminal loges varies from 4 at L12 to 8 at L75 and L73 (fig. 2).

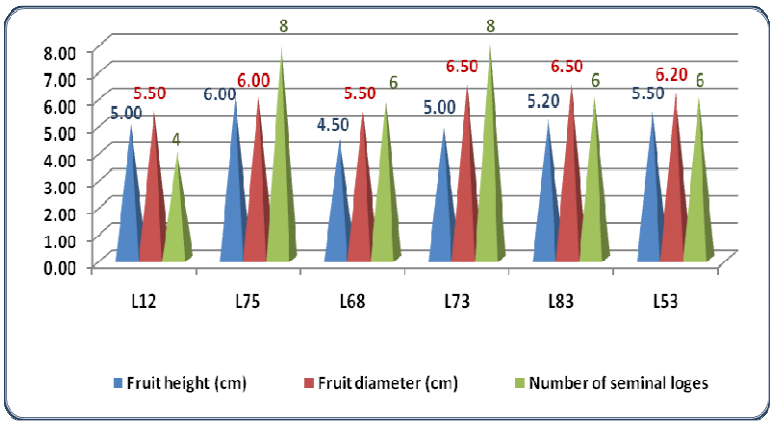

Fig. 2 - Variation of fruit height, fruit diameter and number of seminal loges

L 68 noted by the largest amount of fruit harvested from a plant, 3,1 kg and also by a highest number of fruits per plant, 28 (fig. 3). L83 registered the lowest yield of fruits per plant. The heaviest fruits were the fruits of L75, 140g.

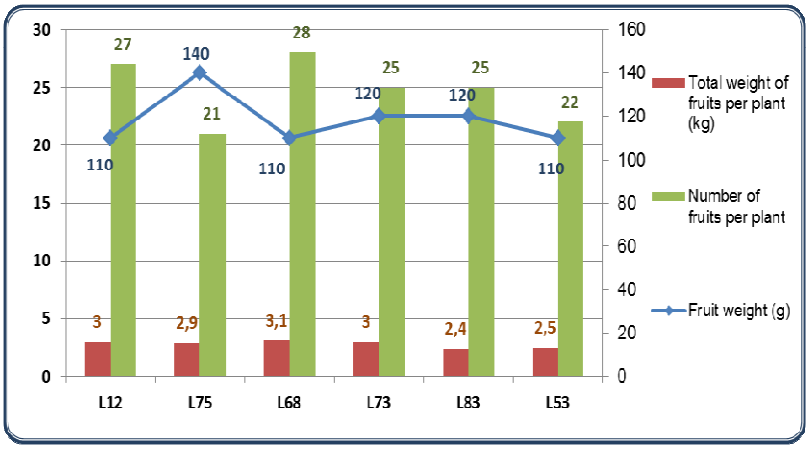

Fig. 3 - Variation of fruit weight, weight of fruits per plant and number of fruits per plant

For successful production of tomatoes, yield and fruit size (measured as weight) must be considered (Wessel-Beaver, 1992).

Genotypes L12 and L75, were distinguished by firmness of fruits and resistance to crack and storage (tab. 3). L83 presented a low level of fruit firmness and medium resistance to crack and storage.

Table 3

The main characteristics of tomatoes fruits at SP genitors

No.	Fruit weight (g)	Total weight of fruits per plant (kg)	Number of fruits per plant	Fruits firmness	Crack resistance	Store resistance	Number of seeds in fruit
L12	110	3,0	27	good	very good	very good	277
L75	140	2,9	21	very good	very good	very good	165
L68	110	3,1	28	good	good	good	190
L73	120	3,0	25	medium	good	medium	380
L83	120	2,4	25	low	medium	medium	220
L53	110	2,5	22	good	medium	medium	180

Regarding resistance to pest and disease four lines presents very good resistance: L12, L75, L68 and L73, and two lines were resistant to pest attack and disease (tab. 4).

All lines obtained a proper yield, quantitative superior to control variant, "Moldoveanca", as follows: 90 t/ha at L12 and L73, 87 t/ha at L75, 75 t/ha at L53 and 72 t/ha at L83. The best yield was registered to L68, 93 t/ha (33 t/ha more than witness variant). The witness variant registered the lowest level of yield, 60 t/ha (Fig 4).

Table 4

Synthesis of results regarding yield

Variant	Total yield		Difference on (control)	Signification of differences	Resistance to disease	Pest resistance
	%	t/ha				
L12	150	90	+30	***	very good	very good
L75	145	87	+27	***	very good	very good
L68	155	93	+33	***	very good	very good
L73	150	90	+30	***	very good	very good
L83	120	72	+12	***	good	good
L53	125	75	+15	***	good	good
Moldo-veanca (control)	100	60	-		medium	medium

DI 5% = 2,6 t/ha
DI 1% = 3,7 t/ha
DI 0,1% = 4,8 t/ha

Although the obtained yield is in accordance with the primary objective of tomato growers, to maximize the harvest of fruit per cultivation area, consumers put a great pressure on growers to improve both tomato yield and quality (Žnidarčič et al, 2003).

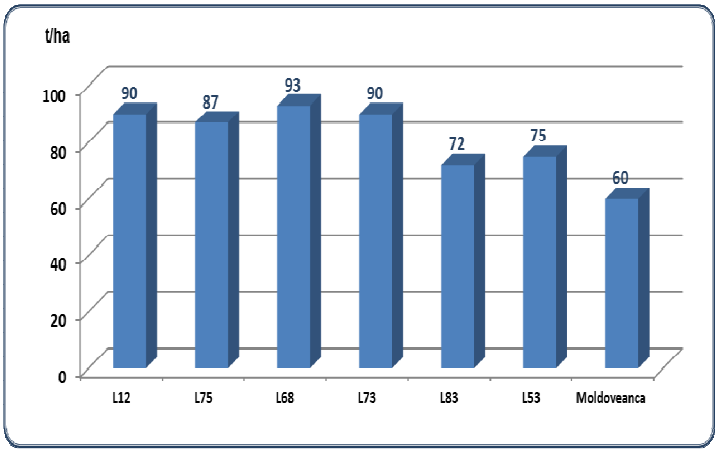

Fig. 4 - Comparison of yield of six cultivars and witness variant

CONCLUSIONS

The study aimed to relive the effect of cross between a large number of breaded genitors, in order to establish their combinative ability and a correlation between the factors that contribute to obtain valuable cultivars. Combinative ability of parents is one of the most important attributes that determine the value of new created cultivars.

The data presented indicates that total production increase and decrease compared with the maternal genitor, but depending on paternal used genitors.

All six lines achieved total production of over 70 t / ha in organic system culture (more with 12-33 t/ha comparing with control „Moldoveanca").

Four of the lines have a very good resistance to attack of pests and pathogens, which entitles us to conclude that they are suitable for organic culture.

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