ACHIEVEMENTS AND OBJECTIVES FOR TOMATO BREEDING IN ROMANIA

REALIZĂRI ŞI OBIECTIVE DE VIITOR ÎN AMELIORAREA TOMATELOR ÎN ROMÂNIA

VÎNĂTORU C.[1], SCURTU I.[2]
e-mail: costel_vinatoru@yahoo.com

Abstract. *Tomatoes are the most important vegetable species, both în the world and in our country. In the last decades, the breeders have obtained hundreds of cultivars (open pollinated and hybrids) for growing in open field, plastic tunnels or glasshouse. In 1975-1990 period, at Research Institute for Vegetables and Flowers Growing were drawn up breeding teams that have achieved some new valuable cultivars. After 1990 year, breeding activity were decresed and only stayed at Research Station for Vegetable Buzău. Breeders of this station have obtained new outstanding cultivars with high yielding potential and good quality. For the future, it is necessary to form new teams well prepared and should more funds, with clear objectives in order to obtain new required cultivars for growers and consumers.The new cultivars have to be more resistent pathogens and adverse environmental conditions.*
Key words: *breeding, F1 hybrids, new lines, cherry tomato, processing tomato*

Rezumat. *Tomatele reprezintă cea mai importantă specie legumicolă cultivată, atât pe plan mondial cât şi în ţara noastră. În ultimele decenii, specialiştii în ameliorarea plantelor au obţinut sute de soiuri şi hibrizi destinaţi fie pentru cultura în câmp deschis, fie pentru cultura în sere sau solarii. În perioada 1975-1990, la Institutul de Cercetare-Dezvoltare şi la staţiunile de cercetări legumicole s-au format echipe de cercetare care au obţinut câteva rezultate notabile în obţinerea de soiuri noi de tomate. După 1990, activitatea de ameliorare a continuat o perioadă la ICDLF Vidra, apoi a fost transferată la SCDL Buzău. Specialiştii de aici au obţinut soiuri şi hibrizi remarcabili sub aspectul potenţialului de producţie şi al calităţii. Pentru viitor este necesar să se îmbogăţească fondul de germoplasmă, să se formeze o echipă de amelioratori bine pregătită şi să fie stabilite obiectivele de ameliorare în funcţie de destinaţie(consum proaspăt sau industrializare) şi de modul de cultivare (seră, solar sau câmp deschis).*
Cuvinte cheie: *ameliorare, hibrizi F1, linii noi, tomate Cherry, tomate pentru industrie*

INTRODUCTION

Tomatoes are the most important vegetable cultivated species, both in the world and in our country. One of the breeding purpose is to adapt to extreme environmental conditions (Atherton, 1986). A new breeding tomato strategy aim to

[1] Vegetable Research and Development Station of Buzau, Romania
[2] „Constantin Brancoveanu" University of Piteşti, Romania

obtain cultivars for proccesing, even in the off season of the classic production system (Hanson, 2013).

In recent decades, the breeders have obtained hundreds of cultivars both for open field or greenhouse and solaria crops. During 1975-1990, at the Vegetable Research and Development Station Buzau and others have formed research teams that have had some notable results in getting the new tomato varieties (Vînătoru, 2008). After 1990, the breeding work continued at a ICDLF Vidra, then was transferred to the SCDL Buzau. The breeders here have obtained remarkable hybrids and varieties in terms of yield potential and quality, a major flaw was scored at protected spaces cultivars (Scurtu,1999).

Most autochtonous varieties in this species contained in the official catalogue have generic destination for fresh consumption and processing. After 1990, when the claims consumers have increased, researchers have understood to deepen research in order to obtain new cultivars strictly specialized to match the direction of use: for fresh consumption, for pasta and tomato sauce, juice, ketchup, pickles and even ornamental and decorative (Prohens, 2008).

The aim of the work is to obtain and patent of clear destination cultivars: tomatoes for fresh consumption, processing tomato and cherry type.

MATERIAL AND METHOD

The germplasm resource of S.C.D.L. Buzău currently contains in this species a number of over 700 genotypes with distinct expressiveness. Annually,it is made an evaluation of each cultivar and the data recorded are analyzed with the aid of chromosome map. In terms of genetic stability, the material collected was grouped on the three fields as follows: segregant lines, homozygous and genetically stable lines. The stabilised genetic material was separated in two fields: the basic collection, which are kept in the maintenance the new lines and work field, which are subject to intensive breeding programme corresponding lines.

The main objectives were imposed in the experience: to obtain protected spaces cultivars for fresh consumption, obtaining processing cultivars and cherry type cultivars for fresh consumption and processing.

The genetic material used in the experience comes from the local population, romanian and foreign creations, hibridizations, segregation and mutant lines derived from different sources.

RESULTS AND DISCUSSIONS

In order to obtain hybrids for fresh consumption and for protected areas, have been detained 60 lines that have undergone the general combining ability and special combining ability. Lines that have stood the test, have been subjected to hybridization, thus achiveing 134 hybrid combinations. After the hybridization process were detained eight valuable genitors. The eight genitors were dialel crossed for testing the combining specific ability, resulting 16 simple in hybrid combinations. After a careful research of combining and specific ability on yield, earliness and yield quality were obtained the following hybrid combinations:

L10 ♀ x L23 ♂ = H1Bz

L66 ♀ x L165 ♂ = H2Bz

L19 ♀ x L64 ♂ = H3Bz

L22 ♀ x L15 ♂ = H4Bz

The four hybrid combinations have shown genetic superiority compared to genitors, showing heterosis (table 1). H2 Bz ranked first concerning yield and the lowest yields were recorded by H3 Bz.

Table 1

Average yield (tones / ha) of new tomato hybrids compared to genitors

GENOTYPE		CROP SYSTEM			All crop systems average	Hybrid heterosis (% compared to genitors average)
		Greenhouse	Solarium	Field		
H1 Bz hybrid genitors	L10♀	52,8	48,0	50,4	50,4	-
	L23♂	67,2	62,4	60,0	63,2	-
	Genitors average	60,0	55,2	55,2	56,8	-
H1 Bz hybrid		84,0	76,8	65,2	75,3	132,6
H2 Bz hybrid genitors	L66♀	52,8	55,2	55,2	54,4	-
	L165♂	57,6	62,4	45,6	55,2	-
	Genitors average	55,2	58,8	50,4	54,8	-
H2 Bz hybrid		93,6	84,0	67,2	81,6	148,9
H3 Bz hybrid genitors	L19♀	45,6	48,0	38,6	44,1	-
	L64♂	36,0	38,4	50,4	40,9	-
	Genitors average	40,8	43,2	44,5	42,8	-
H3 Bz hybrid		52,8	60,0	52,8	55,2	130,0
H4 Bz hybrid genitors	L22♀	57,6	53,2	40,8	50,5	-
	L1♂	45,6	48,0	50,4	48,0	-
	Genitors average	51,6	51,6	45,6	49,6	-
H4 Bz hybrid		79,2	74,4	62,8	72,1	145,4
Genitors average		51,9	52,2	49,9	51,3	-
4 hybrids average		77,4	73,8	62,0	70,1	136,6

The average heterosis of the four hybrids compared to the average of the 8 parental forms in the three crop systems (greenhouse and field) was 136.6%.

The most pronounced heterosis was determined by H2 Bz hybrid, which has achieved a 148,9 yield percent compared to the average of the two parental lines. H1 Bz hybrid was tested for a longer period of time, and patented as Siriana F1, currently being cultivated on a large scale both in protected areas and in the field for fresh consumption.

To achieve the objective of obtaining processing cultivars were selected 31 lines with determined growth in advanced state of breeding.

Special attention was given to the fruit content in dry weight (d.w.), being retained lines that were over 6% d.w., small number of seeds (under 80 seeds/fruit), giving them high-efficiency processing.

Also, there was not neglected the importance of fruit acidity, being retained lines with low acidity in order not to create problems in the process of storage.

Comparative crops were made , and Rio Grande was used as reference cultivar. L 55 shown superiority which has been patented as Darsirius.

The yield results obtained in six vegetable areas, characterized by distinct climatic conditions, have demonstrated the superiority of the Darsirius variety in terms of productivity and yield quality.

The new variety has obtained an extra yield from witness of 12.2%, record registered at Calafat, where the new variety has reached a record of 82 t/ha, compared to 68, 3 t/ha of reference cultivar. 3 field lines are for patenting with determined growth among which LV6 for processing, respectively for the tomato paste.

The third objective was a premiere for Romania, the first varieties of cherry type tomato were made at S.C.D.L. Buzau.

S.C.D.L. Buzau holds a rich genetic heritage to this group, composed of over 82 lines in the advanced state of breeding and a very large number of lines, over 200 stabilized lines. As a result of intensive work of breeding and assesment of genetic material, eight lines proved to be superior in terms of yield and yield quality.764 line was certified as Ema of Buzău (table 3).

Table 2

Testing the yield potential (t/ha) of Darsirius in comparative crop, in six vegetable areas

Variety	Area						Average		STAS from total**	Early yield from total***
	Tc.	Ov.	Cl.	Cf.	Tu,	Tg.	t/ha	%	%	%
Rio Grande Mt	52.2	22.9	44.2	68.3	9.8	37.5	39.2	100	77.2	5.4
Darsirius	41.8	29.2	50.3	82,0	20.4	40.3	44	112.2	86.9	21.2

*area: Tc.=Tecuci; Ov.= Ovidiu; LSD 5%=8,8 t/ha
Cl.= Calarasi; Cf.= Calafat; Tu.= Turda LSD 1%=13,8 t/ha
Tg= Targoviste LSD 0,1%=23,5 t/ha
**fruits weight over 33 g;
***yield until 31 july-south area
10 august- other areas

Table 3

The main characteristics of the 8 lines

Main features	Line							
	L2M	L3M	L4M	L6A	L2C	L34	L35	L764
Number of leaves/plant	31,5	32,2	36,5	32,5	32,1	38,3	34,2	25,4
Leaf lenght (cm)	30,7	35,4	30,7	35,6	30,8	36,4	28,7	32,1
Inflorescences no./plant	13	10	11	10	11	9	10	11
Fruit weight (g)	5,18	22,85	20,4	25,7	32,1	38,8	17,6	3,87
Fruit no./inflorescence	59	14	12	15,5	16	11	16	100
Fruit diameter (cm)	2,08	3,6	3,34	3,67	3,93	3,97	2,87	1,87

The future objectives aim to form a team for breeding that can address complex studies of genetics, biochemistry and plant protection. Future cultivars obtained in the country will have to hold specific genes for resistance to the most dangerous pathogens races, but also to the abiotic stress.

The breeding objectives should take into account the purpose for which the cultivars are grown: tomato grown for the fresh consumption (that is, mainly hybrids F1 for protected crops) towards processing tomatoes (grown in the field, but also the share of hybrids will increase).

They must have indefinite growth, high potential of yield precocity, the external quality of the fruit, the internal quality and nutritional value, storage possibility for a longer period of adaptation to different crop system and resistance to biotic and abiotic stress factors. More recently has increased the demand for harvested tomato and delivered in the bunch. They must have the uniformity of size and ripening fruit of the same inflorescence and maintaining green color of calyx and peduncle.

For tomatoes intended for other industry specific objectives (suitability for mechanized, the dry matter content and others). To achieve these objectives it is necessary to strengthen and improve ecipa be allocated more funds for the work of field and laboratory equipment.

CONCLUSIONS

1. The breeding programme and preservation of the biodiversity at S.C.D.L. Buzău at tomato holds a rich germplasm base that can be successfully harnessed in improvement process for directions required by the market in the future.

2. have been obtained and approved three distinct cultivars with precise destination of use: Siriana, for fresh consumption, Darsirius, processing tomato and Ema of Buzău, cherry type.

3. Research continues through approval of strictly specialized cultivars for both different crop system and new directions of use.

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