

## EXPERIMENTAL RESULTS IN THE OBTAINING OF NEW PERSPECTIVE LINE IN TOMATO

### REZULTATE EXPERIMENTALE ÎN OBTINEREA UNEI POPULAȚII NOI DE TOMATE

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**Abstract.** *The present paper is focused on the main morpho-physiological characteristics of a new tomato line, suitable for large scale cultivation and raw consumption, obtained at the Institute of Genetics, Physiology and Plant Protection of the Academy of Sciences from Moldavia. The newly obtained line, which will be forwarded for omologation, was studied in a CPCT with 10 perspective lines obtained in the tomato improvement programe, during 2010-2012, then in a CC along with 2 cultivars from The Republic of Moldavia as controls, during 2013-2015. The research highlights the newly created line – L-28 – which complements the tomato assortment cultivated in the Republic of Moldova.*

**Key words:** *Lycopersicon esculentum* L., cultivar, Comparative Perspective Crops Trial (CPCT), Competitive Crop (CC).

**Rezumat.** *Lucrarea de față se axează pe prezentarea principalelor caracteristici morfo-fiziologice a unei linii noi de tomate pentru industrializare și consum în stare proaspătă obținută la Institutul de Genetică, Fiziologie și Protecția Plantelor din cadrul Academiei de Științe a Moldovei. Linia nou obținută, ce va fi propusă spre omologare, a fost studiată într-o CCO cu zece linii de perspectivă obținute în programul de ameliorare a tomatelor, în perioada 2010-2012, apoi într-o CC cu două soiuri cultivate în Republica Moldova ca martori, în perioada 2013-2015. Cercețările au evidențiat linia nou creată – L-28, linie ce completează sortimentul de tomate cultivat în Republica Moldova.*

**Cuvinte cheie:** *Lycopersicon esculentum* L., cultivar, Cultură Comparativă de orientare (CCO), Cultură de Concurs (CC).

## INTRODUCTION

Tomato crop is one of the most important of the vegetable plants spectrum, as demonstrated by the cultivated area of about 3.2 million hectares and a delivery of about 95 million tons. Also, in terms of food, tomatoes are products with a high nutraceutical value, based on a sugar content of 4-6%, 0.5-0.6% ash and vitamins, of which 4.5-8 mg / 100 g provitamin A (Patron, 1992; Munteanu, 2003).

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Tomato fruits are preferred by consumers due to the multiple uses and accessible price. Also, they are considered profitable economic crops by growers.

In the practice of an efficient technology that ensure competitiveness, an important role is to choose a valuable cultivar (Munteanu, 2000). Knowing this, the Institute of Genetics, Physiology and Plant Protection of the Academy of Sciences from Moldavia, a high priority should be given to tomatoes breeding, in particular, those with determinated growth for industrial processing. The new achievements shall correspond to market requirements and have a high level of novelty.

In this regard, we improve our program aimed at obtaining cultivars for processing and consumption of fresh yellowish-orange fruits, less known vegetable market in the Republic of Moldova.

The objectives of the research reported in this paper were (1) evaluation of biological material culture in a comparative perspective crops trial (CPCT) and study of biological material promoted in CPCT (2) in a competitive crop (CC).

## MATERIAL AND METHOD

The research was carried out at the Institute of Genetics, Physiology and Plant Protection Academy of Sciences from Chisinau, during 2010-2015, in the laboratory of Genetics, Physiology and Plant resistance.

CPCT consists of ten perspective lines achieved in tomato breeding program in 2010-2012.

CC was accomplished with one of the lines promoted in CPCT (L-28) and two cultivars grown in Moldova as controls (Luci and Slava Moldavii), 2013-2015 (fig. 1).



a.

b.

c.

**Fig. 1** Tomato cultivars in CC

a. Line L-28; b. Luci cultivar; c. Slava Moldavii cultivar

CPCT and CC evaluations were made based on observations and biometric indicators on the main morphological, physiological and agronomical features.

Cultivation technology in both fields was the recommended literature (Atherton and Rudich, 1994; Chaux and Foury, 1994; Munteanu, 2003). Crop establishment was carried out by the seeding product in open field beds (about 500 seeds/m<sup>2</sup>), sown on 18-20 of April. The seedlings of 30 days old, having 3-4 true leaf stage were planted in the field at 20-25 May, following planting scheme 70 x 30 cm, with a density of approximately 50,000 plants/ha.

## RESULTS AND DISCUSSIONS

Our results regarding lines from CPCT revealed high diversity of evaluated biological material (tab. 1).

Table 1

The morphological characterization of the CPCT lines

Nr. crt.	Line	Type of growth	Vigour	Foliage colour	The joint peduncle	The fruit						
						Size	The h / d ratio	Fruit shape	Number of vacuoles	Green spot in the peduncular area	Color before maturity	Color at maturity
1.	L-28	*	medium-high	green	articulated	medium-high	1,1	spherical-high	4	green spot (unstressed)	green	yellow-orange
2.	L-04	*	medium-high	green	inarticulated	medium-high	1,2	ovoid	3-4	spotless	dark green	red
3.	L-14	*	medium-high	dark green	articulated	medium-high	1,1	spherical-high	3-4	spotless	dark green	dark red
4.	L-23	*	medium-high	dark green	inarticulated	medium-high	1,2	rectangular	2	spotless	dark green	light red
5.	L-48	**	medium-high	light green	inarticulated	medium-high	1,3	pear-shaped	2	spotless	light green	light red
6.	L-58	*	medium	green	inarticulated	medium	0,9	spherical	3-4	green spot	green	dark red
7.	L-63	*	medium	dark green potato	inarticulated	medium	0,9	spherical	4	green spot	dark green	pink
8.	L-77	*	medium-high	green	inarticulated	medium	1,2	ovoid	3-4	spotless	green	red
9.	L-83	*	medium-high	dark green	articulated	medium	1,3	pear-shaped	2-3	green spot	dark green	red
10.	L-95	*	medium	light green	articulated	medium	1,0	spherical	4	spotless	light green	red

\* – determinated; \*\* – undetermined

Growth type of increase shows that nine of the ten studied lines of have determinated growth pattern, which shows that the line of research is directed to cultivars intended for cultivation in open field for processing, but also to fresh consumption.

Vigour of the plants is variable, four lines having a medium to medium-to a medium-high. Three lines have a medium vigour (L-58, L-63 and L-95) and high-medium are the other seven lines (L-28, L-04, L-14, L-23, L-48, L-77, L-83).

Foliage color is green of different shades: dark green - four lines, light green - two lines and green-usual - four lines.

The joint peduncle is particularly important, introduced relatively recently (20-30 years) in the world assortment of tomatoes for processing. In our CPCT four lines have joint peduncle (original character, ancestral) and six ones have

jointless peduncle (mutant character, mutation).

The fruit is the most important organ for the estimation the agronomic characters cultivars of CPCT: size, ratio h/d (height/diameter), shape, number of vacuoles, green spot in the peduncular area, color before maturity and color at maturity.

In terms of size, the assortment comprises five lines with fruits medium-large (L-28, L-04, L-14, L-23 and L48) and five fruit average (L-58, L-63, L-77, L-83 and L-95). The h / d ratio and fruit shape are mutually correlated characters. Considering these characters, lines from assortment have fruits of the following shapes: spherical (3) spherical-high (2), ovoid (2) pear-shaped (2), rectangular (1).

Green character at the peduncular area divides the range into two groups: green spot (4) and spotless (6).

Fruit color is green until normal physiological maturity it is green - three lines, dark green - five lines and light green - two lines. When they have reached physiological maturity, the fruits consolidate a number of features, but the color is more noticeable. Most lines are red of different shades - eight lines, one is yellow-orange and one is pink.

Regarding the physiological characterization (tab. 2), this refers to the specific period of three distinct phenophases: blooming, first fruit ripening (start ripening fruit) and fruit ripening last (end of the growing season).

Table 2

**Physiological characterization of lines in CPCT**  
(number of days in the changes of phenological events, from the East )

Nr. crt.	Line	Blooming	Maturation of the first fruit	Maturation of the last fruit
1.	L-28	57	125	170
2.	L-04	58	130	176
3.	L-14	55	126	187
4.	L-23	48	120	178
5.	L-48	53	123	179
6.	L-58	55	109	193
7.	L-63	48	116	163
8.	L-77	43	106	186
9.	L-83	53	134	178
10.	L-95	44	90	165

The period from plant raising to bloom lasts under CPCT from 43 days (L-77) to 58 days (L-04). The importance of this characteristic is that it is directly involved in earliness of cultivars. The first fruit matures in about 90 days after emergence, L-95 is the earliest line in the assortment. The delayed lines are L-04 and L-83, the first fruit maturation being carried out for 130 or 134 days after emergence.

The ripening of the final fruit provides the information on the length of the ripening period and the length of the growing season. Time of ripening lasts between 45 to 84 days, and the growing season lasts between 163 and 193 days.

A great variability may be noted, with large limits: fruit maturation period has an amplitude of 39 days (84-45 days), and the vegetation has an amplitude of 30 days (193-163 days). These features indicate that the studied lines are intended both for processing and for fresh consumption.

During 2013-2015, the new created line L-28, considered for perspective, was compared with two varieties grown in The Republic of Moldova, Luci and Slava Moldovii considered as control in the culture of competition (CC). These control were chosen because they have similar color and fruit are part of the same group of precocious line proposed for plant introduction (tab. 3, tab. 4).

Table 3

## Morphological characteristics in CC

Nr. crt.	Cultivar	Type of growth	Vigour	Foliage colour	The joint peduncle	The fruit						
						Size	The h / d ratio	Fruit shape	Number of vacuoles	Green spot in the peduncular area	Color before maturity	Color at maturity
1.	L-28	*	medium-high	green	articulated	medium-high	1,1	spheric-high	4	green spot (unstressed)	green	orange-yellow
2.	Luci	*	medium	green	inarticulated	medium	1,3	elongated	3	spotless	green	yellow
3.	Slava Moldovii	*	medium	green	inarticulated	medium	1,0	spheric	4	green spot	green	yellow

Distinguishing features of the line L-28 are: plant vigor is medium-high, higher than of the control ones, the fruits have joint peduncle, size being medium to high, shape is spherical-high, the green spot is present, but unstressed and the fruit is an orange-yellow colour.

Regarding the physiological characteristics (Table 4) of the CC cultivars we can see that all belong to the same group of precocity - semilate, first fruits ripening during the period from 2 to 8 August, after 105-111 days from germination. The growing season is between 165 and 170 days, and maturation period between 59 and 61 days.

Table 4

## Physiological characterization in CC

Nr. crt.	Cultivar	Blooming		The maturation of the first fruit		The maturation of the last fruit	
		date	n.z.	date	n.z.	date	n.z.
1.	L-28	15 VI	57	08 VIII	111	6 X	170
2.	Luci	13 VI	55	04 VIII	107	4 X	168
3.	Slava Moldovii	08 VI	50	02 VIII	105	01 X	165

\*n.z. – number of days from the East

Also, agroproductivity ability was evaluated expressed by major quantitative characters: the average number of fruits per plant (NFP), average fruit weight (AFW) and average fruit weight per plant (AFWP) (tab. 5).

Table 5

#### Agro-productive capacity in CC

Nr. crt.	Cultivar	NFP	AFW (g.)	AFWP (g.)
1.	L-28	10-12	190-210	2100
2.	Luci	14-16	90-110	1500
3.	Slava Moldovii	13-14	120-130	1700

In line L-28 NFP was lower versus control in the study (10-12 fruits, compared with 13-14 or 14-16 fruit per plant), but AFW was superior, with L-28 values between 190-210 g compared to 120-130, respectively, 90-110 g, the control, while AFWP also registered higher values (2100 g/plant), in comparison with controls (1700 g or 1500 g).

### CONCLUSIONS

Research in a comparative perspective crop trial and a culture of competition highlighted the perspective line L-28 that complements the assortment of tomatoes grown in Moldova;

Line L-28 is characterized by medium-high vigour, medium-large fruit size, spherical-tall yellow-orange with a production of 2100 g/plant.

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