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Resistant Varieties of Tomato Against Root Knot Nematodes and Cladosporium in the Southern Parts of Uzbekistan

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Abstract: ***Article describes the investigation results conducted in CPE and KITI scientific-research stations of Surkhandarya region concerning the creating tomato varieties and lines with the qualities of high yielding, transportable and resistant to the root knot nematodes and cladosporium. Regarding the results of investigation the following lines: highest total yielding (60,3-71,9 t/ha): L-26-5, L 26-1, L- 30-1, L-42-1, L-44-4 and L-70-1; Resistant to root knot nematodes: L- 41-1, L-42-1, L-42-5, L-44-1, L-44-4, L-46-2, L- 47-5, L-47-5 L-59-2, L- 64-4 and L-70-1; resistant to cladosporium: L-63-2, L-63-4, L-63-5, L-64-4 and L-65-1; and selected the line which is resistant to root knot nematodes and cladosporium in a group L-64-4.***

Keywords: tomato, root knot nematodes, cladosporium, selection, line, select, resistance, variety, disease, generation, control sort, transportable, infected.

1. Introduction

Tomato is one of the favorite and most consumed vegetables in Uzbekistan and used in various purposes, annual gross product of yield make up 42-45%.

However, root knot nematodes which are spread among agricultural crops in Uzbekistan damaging the root system of plant and decreasing the yield quality and amount.

The following researchers O.M. Mavlyanov [6], Z.N. Narbayev [10], A.V. Alpatyev, V.F. Pivovarov, M.H. Aramov [1], M.H. Aramov, L.M. Djurayeva [2] identified that root knot nematodes in Uzbekistan have significant affect on yield from 30% to 100%.

Regarding the investigations of M.H. Aramov during the last decade of previous century diseases as cladosporium and grey spot started spreading in open fields as a result the yield and its quality decreased significantly.

Elimination of this problem demands from vegetable breeders creating new varieties and hybrids which are resistant to pests and diseases, with promising future and meets the requirements of market at present time.

During the experiments conducted at SPI and KITI of Surkhandarya scientific research station in 2003-2015 breeders were able to create new varieties of tomato with a high resistance to root knot nematodes, transportable, high yielding, with important agricultural remarks: Sugdiana 2, taramata, Bakalavr, Zakovat and Marjona, Osiy, Sovga, MJ-94/13 and Ofarin varieties have been created and tested. Among these varieties Zakovat has successfully passed from state variety control and in 2016 year has been admitted to state register. Osiyo and Ofarin varieties have been testing since 2016.

2. Materials and methods

During the years 2003-2016 at SPI and KITI scientific research stations of Surkhandarya region more than 900 high generation lines had been grown and tested for early maturing quality, transportability, resistance for root knot nematodes and cladosporium. The following varieties were used as control variety: Surkhon 142 resistant against root knot nematodes, L-133/80 variety as a complex resistant to root knot nematodes and cladosporium and for transportability as controlling variety has been selected TMK-22.

Scientific investigations “Methodical guidelines on studying and supporting world collection of vegetable and solanaceous crops (tomatoes, peppers, egg plants)” [8] ,“ Methodical guidelines on sort selection and hybrids of tomato for open and protected soil”[9] and OST 4671-78 realized regarding (II-step).

Non repeated experiment. The area of plot is 9,45 м^2, 30 piece of plants, planted in two lines.

Seeds were sawn on February 14 under film cover. Nurseries were transferred into open field on April 16.

Plant damages from root knot nematodes were estimated by methods of Kondakova, Kvasnikov, Ignatova [5].

3. Results and discussion

Successful results of tomato selection depend on proper evaluation of genetic basis and other reliable methods of studying of basic materials, moreover, selection varieties with needed genes [7], [4].

During the years of 2014-2016 after experiments conducted in tomato selection field offered morphobiological description of the most promising lines (Table -1)

Table 1: Agricultural and morphobilological description of high generation tomato lines and varieties, 2014-2016 years.

Variety and lines	Controlling period, Days	Plant		Fruit			
		type	height, см	shape	colour	weight, g	density, score
Surkhan 142, comparative sort	114		85	Oval round	Dark red	120	2,5
TMK-22, control variety.	120	simple	70	round	Dark red	110	4
L-773/30, Control variety	120	simple	60	Oval round	red	90	1,5
L- 24-1/15	110	simple	50		dark red	110	4,5
L- 25-1/15	111	simple	50	round	dark red	150	4,5
L- 26-5/15	108	simple	50	round	dark red	120	4,5
L- 26-1/15	104	simple	50	round	red	150	4,5
L- 27-4/15	107	simple	55	round	red	130	4,5
L- 30-1/15	106	simple	45	round	dark red	160	4,5
L- 40-1/15	118	simple	55	round	dark red	200	5,0
L- 41-1/15	119	simple	60	Oval round	dark red	160	4,5
L- 42-1/15	118	simple	65	Oval round	dark red	140	4,5
L- 42-5/15	119	simple	70	round	dark red	150	4,5
L-44-1/15	117	simple	65	round	dark red	170	5,0
L- 44-4/15	119	simple	65	round	red	220	4,5
L- 46-2/15	118	simple	65	round	dark red	160	4,5
L- 47-5/15	119	simple	70	round	dark red	150	4,5
L- 55-1/15	114	simple	120	round	dark red	180	4,5
L- 59-2/15	117	simple	75	round	dark red	200	4,5
L- 63-5/15	118	simple	60	Egg shaped	red	100	3,5
L- 64-3/15	120	simple	60	Egg shaped	red	100	4,0
L- 64-4/15	118	simple	55	Oval round	red	100	4,0
L- 70-1/15	117	simple	150	round	dark red	250	4,5

The shortest implementation period observed in lines L-24-1, L-25-1, L-26-5, L-26-1L-27-4 and L-30-1 and observations made up 104-111 days. It means these lines comparing to control variety matured earlier 3-10 days and they are identified as medium early maturing varieties. All the other lines needed 117-120 days and they are identified as medium maturing varieties.

All the observed lines had simple type plants.

The height of plants of the lines L-55-1, L-70-1 considered as the highest, they reached 120-150 см and are determinant.

The shape of fruit show spheric and oval spheric in 17 lines, lines L- 63-5, L- 64-3 have egg shape and line L-64-4 has oval shape fruits.

The weight of fruit of the lines as follows: L- 25-1/15, L- 26-5/15, L- 26-1/15, L-27-4/15, L-30-1/15, L- 40-1/15, L- 41-1/15, L-42-1/15,L-42-5/15, L-44-1/15, L- 44-4/15, L- 46-2/15, L-47-5/15, L-55-1/15, L-59-2/15 show highest results 120-250 g. The fruits of these lines identified as big size.

Especially weight of fruits of L-44-4 and L-70-1 lines reached 220-250 g, identicality of size and colour of fruits are also remarkable.

L-63-5, L-64-3 and L-64-4 lines show small size fruits (85-90 g), they are proper to use in reprocessing and canned food industry.

Identified yielding of 13 promising lines in selection plot. According to the obtained results the highest productivity were higher 111,0 -131,9 % on the lines L- 26-5, L 26-1, L-30-1, L-42-1, L-44-4 and L-70-1.

At the end of testing period estimation of plants with root knot nematodes were conducted only on lines with the resistant genes against this disease, table -2.

Table 2: Damaged degree of promising, transportable sorts of new tomato lines with root knot nematodes, 2014-2016 years

Varieties and lines	Plant amount, piece	Percentage of damaged plants, in scores					Damage degree, score.	C, %	R, %	RI,%
		0	1	2	3	4				
Surkhan 142, comperative variety	25	88,0	0	0	12,0	0	0,36	9,0	12,0	91,0
TMK- 22, control variety	28	0	0	0	5	82,1	3,8	95,5	100	4,5
L-773/30, control variety	30	100	0	0	0	0	0	0	0	100
L- 24-1/15	-	-	-	-	-	-	-	-	-	-
L -25-1/15	-	-	-	-	-	-	-	-	-	-
L- 26-5/15	30	84,0	16,0	0	0	0	0,16	4,0	16,0	96,0
L- 26-1/15	30	92,3	0	0	0	7,6	0,3	1,9	7,7	98,1
L- 27-1/15	30	100	0	0	0	0	0	0	0	100
L- 30-1/15	30	93,7	6,25	0	0	0	0,06	1,56	6,25	98,4
L- 40-1/15	30	63,3	16,6	20,0	0	0	0,56	14,2	36,7	85,8

L- 41-1/15	29	100	0	0	0	0	0	0	0	100
L- 42-1/15	30	100	0	0	0	0	0	0	0	100
L- 42-5/15	30	100	0	0	0	0	0	0	0	100
L- 44-1/15	30	100	0	0	0	0	0	0	0	100
L- 44-4/15	30	100	0	0	0	0	0	0	0	100
L- 46-2/15	29	100	0	0	0	0	0	0	0	100
L- 47-5/15	30	100	0	0	0	0	0	0	0	100
L- 55-1/15	28	92,8	7,2	0	0	0	0,07	1,72	7,1	98,3
L- 59-2/15	30	100	0	0	0	0	0	0	0	100
L- 63-5/15	27	74,1	22,2	3,7	0	0	0,29	7,41	25,9	92,6
L- 64-3/15	25	84,0	16,0	0	0	0	0,16	4,0	16,0	96,0
L- 64-4/15	26	100	0	0	0	0	0	0	0	100
L- 70-1/15	30	100	0	0	0	0	0	0	0	100

Remarks: ***C*** *– development of disease;* ***R*** *– spreading of disease;* ***RI****- index of resistanc.*

Table 3: Resistance degree of new promising, transportable tomato variety lines to cladosporium disease during 2014-2016 years.

Variety and lines	Number of plants in piece	Percentage of damaged plants						Damage degree	C, %	R, %	RI, %
		0	1	2	3	4	5				
Surkhan14comperative v	25	0	76,0	24,0	0	0	0	1,24	31	100	69,0
L-773/80, control variety	28	100	0	0	0	0	0	0	0	0	100
L-63-1/15	25	92,0	8,0	0	0	0	0	0,08	2,0	8,0	98,0
L -63-2/15	28	100	0	0	0	0	0	0	0	0	100
L -63-3/15	26	96,1	3,8	0	0	0	0	0,04	0,96	3,85	99,0
L -63-4/15	28	100	0	0	0	0	0	0	0	0	100
L -63-5/15	27	100	0	0	0	0	0	0	0	0	0
L -64-3/15	25	92,0	8,0	0	0	0	0	0,08	2,0	8,0	98,0
L -64-4/15	26	100	0	0	0	0	0	0	0	0	100
L -65-1/15	24	100	0	0	0	0	0	0	0	0	100

During the estimation following lines showed 100% resistance to the root knot nematodes: L-27-1, L-41-1, L-42-1, L- 42-5, L- 44-1, L-44-4, L- 46-2, L-47-5, L-47-5 L-59-2, L- 64-4 and L- 70-1. These are considered as resistant lines. Lines on the table L-40-1, L-55-1, L-63-5 and L-64-3 show average damage degree 0,07-0,56, index of resistancy made up 85,8-98,3%, these are considered as practical resistant lines.

Compared tomato variety Surkhan 142 which is resistant to root knot nematodes were damaged with root knot disease at the end of experimental period damage degree estimated 1,24 point and it is explained by newly appeared aggressive seedlings.

During 2014-2015 years in last ten days of June observations in experimental fields show that among tomato appeared cladosporium disease. During the mid August damage degree of plants reached 2-3 points. Promising lines which are resistant to cladosporium are given on table 3.

According to table results lines, L-63-2, L-63-4, L-63-5, L-64-4, L-65-1 and control variety L-773 showed 100% resistance to cladosporium disease. The other lines L-63-1, L-63-3, L 64-3 which had resistance genes to cladosporium disease average damage degree estimated as 0,04-0,08 points, disease development 0,96-2,0 %, resistance index 98-99 % and these lines are evaluated as practical resistant against up above mentioned diseases.

Damage degree of infected plants in comparative varieties and irresistant varieties in experimental fields evaluated 2,0-3,0 points and they are considered as irresistant to this disease.

Thus, regarding the results of experiments conducted during 2014-2016 years varieties with the following qualities: high yielding, resistant to root knot nematodes and cladosporium are identified as follows:

- The highest yielding lines (60,3-71,9 t/ha) L- 26-5, L-26-1, L-30-1, L- 42-1, L- 44-4 and L-70-1;
- Resistant to root knot nematodes, L- 41-1, L-42-1, L- 42-5, L- 44-1, L- 44-4, L- 46-2, L- 47-5, L-47-5 L-59-2, L-64-4 and L-70-1;
- Resistant to cladosporium L-63-2, L-63-4, L-63-5, L-64-4 and L-65-1;
- Group resistance to root knot nematodes and cladosporium observed in the line L-64-4.

The following selected lines in our region which are resistant to root knot nematodes and cladosporium with valuable agricultural qualities could serve as a base for creating new varieties and hybrids.

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