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RESEARCH ARTICLE

IDENTIFICATION OF NEW TYLCV RESISTANT SOURCES OF TOMATO (*Lycopersicon esculentum* MILL.)

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ABSTRACT

Tomato yellow leaf curl (TYLCV) is most the dreaded disease which causes yield losses up to 90 per cent in tropical and subtropical countries. The disease is transmitted by white flies (*Bemisiatabaci*). It is imperative to identify TYLCV resistant sources which could be incorporated in tomato improvement programme. The research work was carried out which resulted in identification of new resistant sources. Three highly resistant (null) and five highly resistant lines were reported out of 30 lines and CLN-3125 and Pusa Ruby were taken as a resistant and susceptible checks, respectively. The seedlings were transplanted 21 days after sowing in Randomized Block Design with three replications. The data were recorded for the characters like marketable fruit yield (t/ha), fruit set (%), average fruit weight (g), virus infected plants (%) for three consecutive years. Transplanting after 77 days in the field, the lines NTL-628, NTL-630 and M-108 were found to be highly resistant (null)and NTL-753 (6.89%), NTL-759 (7.55%), NTL-769 (9.25%), M-54 (6.66%) and M-134 (3.55%) were found to be highly resistant. The remaining lines and susceptible check showed high degree of infestation. The resistant lines were confirmed by inoculating virulent white flies under insect proof net.

INTRODUCTION

Tomato yellow leaf curl virus has become limiting factor for tomato production in tropical and sub tropical regions. This disease is induced by number of begomoviruses and which is being transmitted by white flies (*Bemisiatabaci*). The tomato leaf curl disease was known in the Middle East, North and Central Africa, in South-East Asia since long. Tomato yellow leaf curl virus (TYLCV) is manopartiteBegomovirus, mainly transmitted through large population of white flies and they are known to be done pesticides resistance, then vector control is not an ideal way of fighting the spread and damage caused by TYLCV. Also the chemical control methods have been only partially effective. Further more fine-mesh screens have been used as a protecting crop from white flies for the spreading of a disease. More recently, UV absorbent plastic sheets and screens have been used to inhibit the penetration of white flies into covered green houses. However, these screens create problems of shading, over heating and poor ventilation. Thus the best way to reduce losses due to TYLCV is to develop tomato genotypes that are resistant or tolerant to the tomato yellow leaf curl viruses (TYLCV).

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MATERIAL AND METHODS

The present investigation was carried out at Nirmal Agricultural Research Foundation (NARD), PachoraDist-Jalgaon (MS), India. The TYLCV resistant lines used in this study was collected mainly from AVRDC. It consist of the Pusa Ruby cultivar which was used as susceptible source. The research work was carried out during the summer seasons of the year 2014, 2015 and 2016. For the research work, thirty tomato genotypes were transplanted using randomized block design consisting resistant and susceptible source as a checks. The seedlings were transplanted at 21 days after sowing with spacing of 60 x 60 cm. The data was recorded on characters like marketable fruit yield (t/ha), average fruit weight (gm), fruit setting (%) and Per cent incidence of TYLCV. The incidence was recorded at 77 days after transplanting. Thirty plants of each source, the plant cultivars were used to record the observations. In the summer season, at Jalgaon conditions, the field population of white flies are usually high due to major cotton growing belt. Despite, high white flies population in the field, the occurrence of tomato yellow leaf curl virus (TYLCV) is low due to less viruliferous white flies population in the field. Depending upon the tomato yellow leaf curl virus (TYLCV) susceptible host from which the white flies were collected. Only 3-6 per cent white flies collected in the field were actually able to transmit the virus (Cohen *et a*l; 1966). Therefore, inoculation of viruliferous white flies were done in

45 days after transplanting under field condition. For the inoculated source and viruliferous white flies colonies were reared on cotton plants grown in muslin covered cages maintained in insect proof net.

RESULTS AND DISCUSSION

The total and marketable fruit yield was maximum in the genotype NTL-769 (29.06 t/ha) and minimum yield level was

Table 1. Marketable yield, fruit setting, fruit weight of tomato lines

Sr. No.	Entry	Marketable Yield (t/ha)	Fruit Setting (%)	Avg. Fruit Weight (gm)
1	NTL-111	15.25	41.3	56.8
2	NTL-129	16.35	42.2	71.0
3	NTL-206	15.99	44.7	51.8
4	NTL-208	18.75	48.1	68.6
5	NTL-213	16.97	38.3	90.0
6	NTL-216	18.48	49.7	76.6
7	NTL-240	13.86	38.5	63.0
8	NTL-320	21.06	53.8	83.2
9	NTL-344	16.62	45.0	73.2
10	NTL-374	17.77	44.8	69.2
11	NTL-416	17.86	45.2	73.1
12	NTL-444	19.64	52.1	81.4
13	NTL-471	25.95	62.3	83.8
14	NTL-472	18.57	48.7	82.2
15	NTL-474	26.57	63.8	73.4
16	NTL-475	15.82	37.2	70.4
17	NTL-502	14.75	34.2	79.6
18	NTL-585	24.70	58.6	85.4
19	NTL-586	26.84	65.0	82.2
20	NTL-595	28.26	67.4	90.6
21	NTL-608	26.75	62.7	78.2
22	NTL-630	25.86	60.9	75.8
23	NTL-753	24.88	59.2	95.7
24	NTL-759	28.17	65.4	88.6
25	NTL-769	29.06	68.3	85.9
26	M-3	18.93	47.5	79.2
27	M-25	17.25	45.7	74.8
28	M-54	27.64	66.6	94.8
29	M-108	26.30	64.8	92.4
30	M-134	27.45	65.3	87.6
31	CLN-3125	22.80	55.2	63.4
32	Pusa Ruby	15.20	39.6	70.5
	CD at 5%	9.20	13.8	11.5
	CV (%)	12.40	14.4	8.3

Table 2. Per cent incidence of TYLCV in tomato lines at NARD

Sr. No.	Entry	Per cent Incidence			
		Summer-2014	Summer-2015	Summer-2016	Mean
1	NTL-111	62.05	68.75	76.92	69.24
2	NTL-129	81.25	75.00	63.63	73.29
3	NTL-206	87.50	78.50	78.26	81.42
4	NTL-208	80.00	78.75	68.75	75.83
5	NTL-213	75.00	76.50	77.77	76.42
6	NTL-216	81.25	83.33	63.20	75.93
7	NTL-240	83.33	85.71	87.50	85.51
8	NTL-320	53.84	55.55	43.45	50.95
9	NTL-344	71.42	73.33	78.20	74.32
10	NTL-374	83.35	75.33	68.75	75.81
11	NTL-416	75.00	66.20	73.60	71.60
12	NTL-444	62.50	64.53	68.20	65.08
13	NTL-471	8.65	10.20	10.25	9.70
14	NTL-472	62.50	43.75	56.25	54.17
15	NTL-474	9.20	10.70	8.78	9.56
16	NTL-475	87.50	83.20	86.66	85.79
17	NTL-502	81.25	76.92	87.40	81.86
18	NTL-585	9.45	8.70	10.74	9.63
19	NTL-586	8.75	9.85	9.60	9.40
20	NTL-595	8.25	10.20	11.11	9.85
21	NTL-608	0.00	0.00	0.00	0.00
22	NTL-630	0.00	0.00	0.00	0.00
23	NTL-753	5.75	7.30	7.65	6.90
24	NTL-759	7.30	8.15	7.20	7.55
25	NTL-769	8.85	9.70	9.20	9.25
26	M-3	56.25	61.53	65.05	60.94
27	M-25	75.00	68.75	62.10	68.62
28	M-54	5.30	7.25	7.43	6.66
29	M-108	0.00	0.00	0.00	0.00
30	M-134	4.35	3.20	3.10	3.55
31	CLN-3125	0.00	0.00	0.00	0.00
32	Pusa Ruby	93.75	86.66	96.49	92.30
	CD at 5%	20.8	14.2	17.3	
	CV (%)	23.15	21.45	27.20	

recorded in NTL-240 (13.86 t/ha). The evaluation of data revealed that the six genotypes i.e. NTL-759, NTL-595, M-54, M-134, NTL-586 and M-108 produced 28.7 t/ha, 28.6 t/ha, 27.64 t/ha, 27.45 t/ha, 26.84 t/ha and 26.30 t/ha marketable fruit yield respectively and which showed higher than that of CLN-3125 (22.20 t/ha) and Pusa Ruby (15.20 t/ha). The per cent fruit set was maximum in genotype NTL-769 (68.3%), over all the genotypes. The results showed that higher significant variation was observed for per cent fruit setting among the genotypes. The significantly higher fruit set per cent was observed in NTL-759 (65.4%), NTL-595 (67.4%) and M-54 (66.6 %). Among the other genotypes M-134 (65.3 %) and M-108 (64.8 %) showed significantly higher fruit setting over the CLN-3125 and Pusa Ruby (55.2 % and 39.6 %, respectively). The highest fruit weight was recorded in NTL-753 (95.7 gm) followed M-54 (94.8 gm) and M-108 (92.4 gm). The genotype NTL-595 had also significantly higher fruit weight (90.69 gm) than CLN-3125 (63.49 gm).

Incidence of Tomato Yellow Leaf Curl Virus (TYLCV)

The frequency of tomato yellow leaf curl virus (TYLCV) transmission differ significantly among the genotypes with the highest rate of transmission (92.3 %) achieved with white flies in susceptible cultivar Pusa Ruby (Table 2). The lower rate of transmission (0.0 %) was achieved with white flies in resistant cultivar CLN-3125. Among the 30 genotypes studied, three highly resistant (null) and five highly resistant lines were observed. In the present study, per cent incidence was recorded in three consecutive summer seasons i.e. 2014, 2015 and 2016. From the mean of three seasons, it was observed that the genotypes NTL-628, NTL-630 and M-108 were found to be highly resistant (null) for tomato yellow leaf curl virus (TYLCV). The per cent incidence on these three genotypes found 0 per cent infection in consecutive three years. The genotypes M-134, M-54, NTL-753, NTL-559, NTL-769, NTL-586, NTL-585 and NTL-595 shows 3.55, 6.66, 6.88, 7.55, 9.25, 9.40, 9.63 and 9.85per cent respectively, which is grouped under resistant genotypes. The genotypes NTL-475 (85.78 %), NTL-246 (85.51 %), NTL-502 (82.85 %), NTL-206 (81.42 %), NTL-213 (76.42 %), NTL-216 (75.92 %), NTL-208 (75.83 %), NTL-374 (75.81 %) and NTL-416 (74.93 %) had shown significantly more infestation of tomato yellow leaf curl virus over three seasons.

Conclusion

The tomato genotypes varied in major morphological characters (*i.e.* fruit set efficiency, marketable fruit yield) due to incidence of tomato yellow leaf curl virus (TYLCV). The study revealed that, the tomato genotype NTL-628, NTL-630 and M-108 were found to highly resistant (null) for tomato yellow leaf curl virus (TYLCV) and yielded significantly higher than the susceptible genotypes. Other genotypes M-134, M-54, NTL-753, NTL-759, NTL-586, NTL-474, NTL-585 and NTL-595 also showed highly resistance to tomato yellow leaf curl virus (TYLCV). The per cent infestation of tomato yellow leaf curl virus (TYLCV) was ranged from 0 to 92 per cent. Also in this study, the major issue concerning with white flies mediated inoculation and screening of tomato yellow leaf curl virus were summarized. For the spreading of TYLCV, the virulent white files was major pre-requisite. These 11 lines having high resistance to TYLCV will be utilized for heterosis breeding to develop TYLCV resistant hybrid for summer season tomato growing area in future.

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