
Evaluation of tomato cultivars against Leaf Curl Virus and White fly population under terai zone of West Bengal

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The study of relative susceptibility of different cultivars of tomato to leaf curl virus revealed that the varieties showing lower leaf curl incidence also showed higher yield than rest of the varieties. The varieties NS-53, US-620 and NS-812 showed lower disease incidence but some other varieties like Trisha, Punjab Chauhara was found highly susceptible to leaf curl virus infection. The symptoms appeared much later in case of US-620, NS-812 and Punjab Chauhara than other varieties. The co-efficient of infection which depends on percentage of infection was found lower in the cultivars like NS-53, US-620, NS-812 and Raja than others. The population of white fly in different cultivars was found to increase gradually up to 60 days after transplanting. After 90 days of transplanting no whitefly population was found in US-620, Raja, NS-812 and Lehar.

Key words : Tomato, cultivar, Leaf curl, white fly

INTRODUCTION

Tomato (*Lycopersicon esculentum* Mill.) is now a day's one of the most widely grown vegetable in India. Nearly 60-70% of the tomato is used as vegetable and the rest are used as Purre, Ketchup, Jam, Jelly and Sauce etc. In India, average yield is much lower than the expected yield. Loss in yield is mainly due to the incidence of several pests and diseases caused by fungi, bacteria, viruses and root knot nematodes. There are at least 36 types of virus diseases that can infect tomato, but in India, only 8 types have so far been recorded. These include tomato leaf curl, tomato big bud, tomato mosaic, tomato smalling and severe mottling, tomato symptoms less virus, potato virus-x and PVY and tomato blackening. Among these virus diseases only few have been studied in detail (Mukhopadhyay, 1974). The ever increasing use of toxic chemicals along with their injudicious application has its attendant hazards and poses environmental problems, as many of them may disturb the fine ecological balance that exists in nature. The use of resistant varieties is the best alternative for the control of plant diseases and cultivation of resistant

varieties not only eliminates losses for disease but also reduces the environmental hazards created by the use of chemical pesticides. Therefore, the present investigations have been made to select the resistant cultivar among different cultivars of tomato against tomato leaf curl disease and the relative occurrence of white fly.

MATERIALS AND METHODS

The experiments were started by raising the seedlings in trays and transplanting was done at 21 DAS. The Randomized Block Design (RBD) was used in the experiment with 11 cultivars and 3 replications. The plot size was 6 m × 4 m with spacing of 60 cm × 45 cm. The usual agronomic practices were adopted to grow the crops except pesticide application. The observations were recorded on the disease incidence at 15 days intervals and it was continued up to 90 DAS. The yield was recorded separately for each variety. The population of white fly was also recorded at 15 days interval. The cultivars were collected from Local market, Pundibari, Varietal collection centre, UBKV, and some seeds were collected from All India

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Grading the severity of tomato leaf curl disease

Observations on severity of infection were recorded by employing grades as given in following table.

The criteria for grading the severity of TLCV disease

Severity grade	% of infection	Criteria	Response value
-	0-10	Leaf curl symptoms absent	0.00
+	10.1-20	Mid curling of occasional leaves	0.25
++	20.1-30	Curling, puckering symptoms on nearly 50% leaves with no other effects.	0.50
+++	30.1-50	Severe curling, puckering symptoms nearly 75% leaves with stunting of the plants and shortening of leaves	0.75
++++	50.1-100	Complete leafy growth showing curling, puckering symptoms accompanied by severe stunting of plants, bushy appearance pronounced shortening of leaves with clustering	1.00

Co-efficient of infection (C.I.) was then calculated by multiplying the percentage of infection by response value assigned to severity grade, thus combining the amount and severity of infection effectively.

Observation for the study of white fly population on different tomato cultivars were made by counting the population of white fly (*Bemisia tabaci*) visually, early in the morning on upper, middle and lower leaves of 5(five) randomly selected plants, at 15 days interval, starting from 30 days after transplanting to 90 days after transplanting.

RESULTS AND DISCUSSION

Screening of different tomato cultivars under field condition

The data obtained on relative susceptibility of different cultivars have been presented in the Tables 1 & 2. The variety NS-53 (14.41) showed lowest incidence of disease followed by US-620 (15.85) and NS-812 (16.66). The highest percentage of infection was found in cultivar Trisha (56.67) followed by Punjab Chauhara (L) (46.67). Moderate percentage of infection was found in case of BSS-

Table 1 : Studies on relative susceptibility of different cultivars of tomato leaf curl viral disease

Variety	Percentage of infection (Days after transplanting)					Yield (q/ha)
	30	45	60	75	90	
US-620	2.52 (9.13)	4.48 (12.21)	8.78 (17.23)	15.18 (23.42)	15.85 (23.46)	220.33
Raja	3.33 (10.51)	6.66 (14.95)	13.33 (21.41)	16.66 (24.08)	20.00 (26.56)	234.44
S-41	0.00 (0.00)	3.33 (14.95)	10.00 (18.43)	23.33 (28.88)	26.66 (31.08)	204.00
NS-53	2.73 (0.51)	7.70 (16.11)	10.93 (19.30)	13.01 (21.14)	14.41 (22.30)	227.80
BSS-422	0.00 (0.00)	13.33 (21.41)	16.66 (24.08)	23.33 (28.88)	33.33 (35.26)	194.33
NS-812	2.53 (9.15)	6.79 (15.10)	10.00 (18.43)	13.33 (21.41)	16.66 (24.08)	207.37
Samurai	0.00 (0.00)	3.33 (10.51)	13.33 (21.41)	23.33 (28.88)	33.33 (35.26)	198.00
Punjab Chauhara L.	6.66 (14.95)	10.00 (18.43)	23.33 (28.88)	43.33 (41.16)	46.67 (43.09)	188.25
Rocky	0.00 (0.00)	3.33 (10.51)	6.67 (14.95)	16.67 (24.09)	23.33 (28.88)	208.25
Lehar	0.00 (0.00)	6.67 (14.96)	23.33 (28.88)	26.67 (31.09)	33.33 (35.26)	189.66
Trisha	6.67 (14.96)	20.00 (26.56)	26.66 (31.08)	53.33 (46.90)	56.67 (48.83)	182.33
CD (P=0.05)	2.0752	3.1220	3.9041	7.5352	3.9698	7.9157
SEm (±)	0.7035	1.0583	1.3234	2.5543	1.3457	2.6833

Table 2 : Co-efficient of tomato leaf curl virus infection with respect to different varieties of tomato

Variety	Percentage of initial infection	Percentage of final infection	Time taken of 1st appearance of symptoms (days)	Time taken of final appearance of symptoms (days)	Co-efficient of infection (C.I.)
US-620	2.52 (9.13)	15.85 (23.46)	33	98	3.96
Raja	3.33 (10.51)	20.00 (26.56)	31	93	5.00
S-41	3.33 (14.95)	26.66 (31.08)	26	101	13.33
NS-53	2.73 (9.51)	14.41 (22.30)	30	105	3.60
BSS-422	13.33 (21.41)	33.33 (35.26)	29	90	24.99
NS-812	2.53 (9.15)	16.66 (24.08)	40	98	4.16
Samurai	3.33 (10.51)	33.33 (35.26)	28	94	24.99
Punjab	6.66 (14.95)	46.67 (43.09)	41	91	35.00
Chauhara (L)	3.33 (10.51)	23.33 (28.88)	23	93	11.66
Rocky	6.67 (14.96)	33.33 (35.26)	25	103	24.99
Lehar	6.67 (14.96)	57.67 (48.83)	23	105	56.67
Trisha	3.2531	3.9698	—	—	—
CD (P=0.05)	1.1027	1.3457	—	—	—
SEm (±)					

Table 3 : Studies on population of white fly in different tomato cultivars

Variety	No. of white fly/plant				
	30 DAT	45 DAT	60 DAT	75 DAT	90 DAT
US-620	4.00	5.33	7.33	4.33	0.00
Raja	3.66	4.00	6.00	3.33	0.00
S-41	6.00	8.00	9.33	5.00	2.00
NS-53	5.33	7.33	8.66	5.66	2.00
BSS-422	8.00	11.33	11.33	7.00	2.66
NS-812	3.33	4.33	6.00	2.00	0.00
Samurai	5.66	10.00	12.00	5.66	3.33
Punjab	6.33	9.33	11.66	8.66	3.33
Chauhara(L)					
Rocky	5.33	9.00	10.00	7.00	3.66
Lehar	5.66	8.00	9.66	4.66	0.00
Trisha	11.00	14.33	16.66	7.33	3.33
CD (P=0.05)	2.0896	1.7609	2.1696	2.2137	1.6401
SEm (±)	0.7084	0.5969	0.7355	0.7504	0.5560

DAT = Days after transplanting

422 (33.33), Samurai (33.33) and Lehar (33.33). It was found from the Table 1 that first visible symptoms of the disease were recorded at 23 DAT in Trisha and Rocky where as the corresponding time was 41 DAT in case of NS-812. It was also observed that the incidence of the disease was increased with the age of the plant. Regarding fruit yield, Raja showed highest yield (227.8 q/ha) followed by NS- 53(227.8 q/ha), US-620(220.33 q/ha) and NS-812(207.37 q/ha) and the lowest yield was recorded in case of Trisha (182.33 q/ha) which was the most susceptible cultivar.

Many workers have made similar attempts to screen different varieties of tomato against leaf curl virus. Ragupathi *et al.* (1997) have tested the reaction of some tomato genotypes to tomato leaf curl virus in which Punjab Chuhara has been found to be susceptible. Bhagat and De (2001) have tested eight cultivars of tomato, collected from different sources for resistance to tomato leaf curl virus of which none of the cultivars has been found to be immune to the virus, two are fairly resistant and one is the most susceptible to the virus.

Co-efficient of tomato leaf curl virus infection

A co-efficient study of Tomato leaf curl virus infection with respect to different varieties of tomato indicated a wide variation among the different cultivars (Table 2). The percentage of initial infection ranged from 2.52% to 13.33%, maximum initial infection observed in case of BSS-422 and minimum initial infection was recorded in case of US-620. It was further to note that the variety NS-812 took the maximum time i.e. 41 days for the first appearance of disease symptoms where as the 23 DAT required by cultivars Rocky and Trisha. Remaining cultivars recorded 25 to 41 DAT for their first appearance of disease symptoms. The coefficient of infection

ranged from 3.60 to 56.67 among the cultivars. The variety NS-53 had least CI and highest value of CI was recorded by Trisha.

Incidence of white fly in different tomato cultivars

Population of white fly in different cultivars was recorded at 15 days intervals and it was continued from 30 DAT to 90 DAT. From the Table 3, it was found that there was a gradual increase in population of white fly, the maximum population at 60 DAT and later a decline trend was noticed. At 90 DAT, when final population was counted, some cultivars especially US-620, Raja, NS-812 and Lehar showed no white fly population. The maximum population recorded in case of Trisha (16.66) followed by Samurai (12.00) with a significant difference among them. Lowest white fly population was found in case of Raja (6.00) and NS-812 (6.00) followed by US-620 and NS-53. Rogon *et al.* (2001) have conducted the screening of tomato to examine their resistance or tolerance to whitefly and TLCV. They have found variation among tomato cultivars in respect of their resistance/ tolerance to whitefly population and TLCV infection.

REFERENCES

- Bhagat, S. and De, B. K. 2001. Reaction of tomato varieties to mosaic and leaf curl viruses in plains of West Bengal. *Environment and Ecology*. **19(4)**: 865-867.
- Mukhopadhyay, S. 1974. Virus disease of vegetable crop. *In Curr. Trend. In Pl. Path.* (eds. S. P. Roychaudhury and J. P. Verma) Pp. 66-68.
- Ragupathi, N., Thiruvadainambi, S. and Thamburaj, S. 1997. Reaction of tomato varieties to leaf curl virus. *South Indian Horticulture*. **45(5-6)**: 277-288.
- Rogon, D., Bird, J., Idris, A. M. and Brown, J. K. 2001. Introduction of exotic tomato yellow leaf curl virus-Israel in Tomato to Puerto Rico. *Plant disease*. **85(9)**: 1028.

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