

# Response of Tomato Cultivars Against Tomato Leaf Curl Virus (TLCV) Under Natural Field Conditions

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## SUMMARY

Tomato (*Lycopersicon esculentum* Mill.) is one of the most popular vegetable grown all over the world. This crop can be grown in a wide range of climatic conditions, during all the cropping seasons. India stands fifth in global production, where it is being grown in an area over 3.5 lakh ha with the estimated production around 53 lakh tones. Production of this crop is affected by a large number of biotic and abiotic stresses. Out of these many viruses attack this crop. Among the viruses tomato leaf curl virus (TLCV) is most destructive to this crop. TLCV of *Bgomovirus* has spherical bipartite particle with ss-DNA. The virus causes leaf curling, and leaf distortion symptoms on tomato which leads to considerable yield losses. Therefore, keeping this in view 22 cultivars of tomato were screened under field conditions at Student Instructional Farm, Narendra Deva University of Agriculture & Technology, Kumarganj, Faizabad, during *kharif* seasons of 2006-07 and 2007-08 to find out the source of resistance against the virus. Out of 22 cultivars screened, none of the variety was found resistant against TLCV. However cv. Hisar Anmol was found moderately resistant to this virus. Three cultivars were categorized as susceptible and 18 as highly susceptible to TLCV during both seasons.

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Tomato (*Lycopersicon esculentum* Mill.) belonging to the family *Solanaceae*, is one of the most important and widely grown vegetable crops in both tropics and sub-tropic area in the world. This is one of the rare crops, which can be grown in a wide range of climatic conditions. India stands fifth in its global production, where it is being grown in an area over 3.5 lakh ha with the estimated production around 53.0 lakh tones (Anonymous, 2007). It is a rich source of carbohydrate (3.6%), vitamin A (585 IU), Vitamin B<sub>1</sub> (0.12mg), Vitamin B<sub>2</sub> (0.06mg) and Vitamin C (26mg) in 100g of ripe fruit (Thamburaj and Singh, 2000). Tomato is affected by a large number of diseases causing substantial losses in yield and quality of fruits. Beside fungal, bacterial and phytoplasmal infections, it is also affected by large number of viral diseases. Among these, tomato leaf curl virus (Vasudeva and Samraj, 1948) is gaining more importance in recent years. Tomato leaf curl virus (TLCV) is one of the most devastating *Begomovirus* of tomato causing threat to tomato cultivation and reported from many parts of the country (Ratual and Brar, 1989). The occurrence of this disease is rising to alarming proportion in many tomato growing areas of the world. At present almost all the cultivated varieties are found to be susceptible

to TLCV (Joshi and Chaudhary, 1981, Muniappa *et al.*, 1991). Since no systematic studies were carried out to know the potential of cultivars against TLCV, an attempt was made to see the level of resistance of tomato cultivars under field conditions.

## MATERIALS AND METHODS

Tomato cultivars were screened against TLCV under natural epiphytotic conditions. The experiments were conducted during *kharif* seasons of 2006-07 and 2007-08 with a set of 22 cultivars obtained from Vegetable Farm, N.D. University of Agriculture and Technology, Kumarganj, Faizabad and Indian Institute of Vegetable Research, Varanasi, (U.P.). Seeds of all the cultivars were sown separately in nursery beds, in rows. All the recommended cultural practices were followed for raising good seedlings. One month old seedlings were transplanted in rows at 60x45cm spacing. Each cultivar was transplanted in two rows with 10 plants in each row. Two rows of TLCV susceptible check cultivar (Punjab Chuhara) were planted all around the field to create epiphytotic conditions. Recommended package of cultural practices were followed to raise the crop and to promote natural infection. Periodical fungicidal sprays were given to avoid fungal

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diseases. Five plants of each cultivar were selected at random for recording data on the disease incidence starting from transplanting till maturity. Disease scoring was done at 15<sup>th</sup>, 30<sup>th</sup>, 45<sup>th</sup>, 60<sup>th</sup>, and 90<sup>th</sup> days after transplanting. Disease incidence was recorded in all selected plants between October to January under natural field conditions to know the occurrence of TLCV in tomato cultivars during both years. The percent disease incidence was calculated using following formula-

$$\text{Disease incidence (\%)} = \frac{\text{Number of diseased plants}}{\text{Total number of plants}} \times 100$$

The cultivars were graded in different categories of resistance and susceptibility by using modified scale given by Sharma and Sharma (1984) as follows:

Response	Disease incidence (%)	Grade
Resistant (R)	00	I
Moderately resistant (MR)	01-30	II
Susceptible (S)	31-70	III
Highly susceptible (HS)	71-100	IV

## RESULTS AND DISCUSSION

Use of resistant varieties is considered to be the best method for the management of plant diseases. Therefore, available varieties were screened in open fields so as to find out the source of the resistance in tomato against tomato leaf curl virus disease under field conditions. Tomato cultivars tested under natural disease pressure showed varied reaction from moderately resistant to highly susceptible, while, no cultivar was found resistant to the virus. Minimum incidence of TLCV disease (25.00, 29.55%) was recorded in Hisar Anmol followed by BT-18 (64.40, 61.11%), Selection-18 (67.30, 72.22%), Avinash-2 (67.52, 58.33%), Flora Dade (73.34, 74.17%), Arka Meghali (73.40, 86.11%), Pusa Gaurav (74.14, 69.44%), Punjab Keshari (75.22, 69.44%), Arka Ashish (78.20, 66.66%), Utsav (78.57, 80.50%), NDT-3 (79.40, 79.44%), Pusa Ruby (80.51, 78.52%), NDT-73 (83.20, 80.00%), Selection-31 (84.00, 88.70%), NDT-96 (84.51, 75.00%), BT-12 (87.30, 78.20%), Hisar Arun (89.46, 80.55%), Sankranthi (90.70, 92.70%), Arka Alok (90.80, 93.30), Arka Vikash (92.73, 87.30%), Arka Abha (93.30, 88.88%) and Nandhi (94.23, 91.60%), during 2006-07 and 2007- 08, respectively. Out of 22 cultivars, only Hisar Anmol was found moderately resistant, 3 cultivars *viz.* Avinash-2, BT-18 and Selection-18 were categorized as susceptible and 18 *viz.* Arka Meghali, Arka Vikash, Arka Ashish, Arka Alok, Arka Abha, BT-12, Pusa Gaurav,

**Table1 : Response of tomato cultivars against tomato leaf curl virus disease under natural field conditions**

Cultivars	Disease incidence (%)		Reaction	
	2006-07	2007-08	2006-07	2007-08
Arka Vikash	92.73(74.36)	87.30(69.12)	HS	HS
Arka Ashish	78.20(62.17)	66.66(54.85)	HS	S
Arka Meghali	73.50(59.01)	86.11(68.34)	HS	HS
Avinash-2	67.52(55.26)	58.33(49.85)	S	S
Arka Alok	90.80(72.34)	93.30(75.00)	HS	HS
Arka Abha	93.30(75.00)	88.88(70.80)	HS	HS
BT-18	64.40(53.36)	61.11(51.44)	S	S
BT-12	87.30(69.17)	78.20(62.17)	HS	HS
Pusha Gaurav	74.17(59.43)	69.44(56.81)	HS	S
Selection-18	67.30(55.12)	72.22(58.25)	S	HS
NDT-3	79.40(63.00)	79.44(56.21)	HS	HS
Flora Dade	73.34(58.91)	74.17(59.43)	HS	HS
Punjab Keshari	75.22(60.14)	69.44(56.51)	HS	S
Pusha Ruby	80.51(53.62)	78.52(62.42)	HS	HS
Hishar Arun	89.46(71.05)	80.55(63.92)	HS	HS
NDT-96	84.51(66.82)	75.00(60.21)	HS	HS
Sankranthi	90.70(72.24)	92.70(74.36)	HS	HS
Nandhi	94.23(76.10)	91.60(76.38)	HS	HS
Utsav	78.57(62.42)	80.50(63.92)	HS	HS
Hisar Anmol	25.00(29.79)	29.55(53.49)	MR	MR
NDT-73	83.20(65.80)	80.00(63.92)	HS	HS
Selection-31	84.00(66.42)	88.70(70.80)	HS	S
Check variety: Punjab Chhuhara	88.40(70.08)	80.30(63.52)	HS	HS

Fig. in parentheses are sine arc transformed value

NDT-3, Flora Dade, Punjab Keshari, Pusa Ruby, Hisar Arun, NDT-96, Sankranthi, Nandhi, Utsav, NDT-73 and Selection-31 as highly susceptible during the both years. However, check variety Punjab Chhuhara (84.10, 88.40) also showed highly susceptible reaction to the virus. Some reports for identification of resistance sources against TLCV disease in tomato are also available in literatures. Kashina *et al.* (2004) screened tomato genotypes against TLCV and Ty-172 was resistant to the virus. Chakraborty *et al.* (2006) evaluated hybrid tomatoes against TLCV disease and none of the lines was found resistant or tolerant. Sannaulla *et al.* (2007) evaluated 29 tomato genotypes for resistance to the virus and found that none of the genotypes showed resistance reaction.

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