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Screening of tomato varieties against viral diseases under natural field conditions

Abhishek*, R. B. Singh and Shiwangi
Department of Plant Pathology, N.D. University of Agriculture & Technology, Faizabad-224 229, India
***e-mail:** abskscrp@gmail.com

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Abstract: Tomato Mosaic and leaf curl diseases caused by mosaic virus and leaf curl virus, are the most important disease and caused upto 50 and 92 per cent yield losses, respectively. A total number of 50 varieties of tomato evaluated during *Kharif* season, 2013-14 and 2014-15 against tomato mosaic and tomato leaf curl disease. None of the variety found resistant or highly susceptible against tomato mosaic disease. Forty two varieties (Arka Vikash, Arka Ashish, Arka Meghali, Avinash-2, Arka Alok, Arka Abha, BT-18, BT-12, Pusa Gaurav, Selection-18, NDT-3, Flora Dade, Punjab Keshari, Pusa Ruby, Hisar Arun, Sankranthi, Nandhi, Hisar Anmol, NDT-73, Selection-31, H-24, Trishul, Abhilash, NTH-2530, INDAM-3001, Best of All, Lakshmi, US-485, Navoday, Badshah, S-22, Omni, PKM-1, INDAM-9502, Shivam, Marglob, Pusa Rohini, Rajshri, NS-585, NS-592, NDT-1, NDT-6 and Punjab Chhuhara.) showed moderately resistant reaction against tomato mosaic disease. Seven varieties were rated as susceptible against tomato mosaic disease. On the other hand, out of 50 varieties, none of the variety found resistant against tomato leaf curl disease. Three varieties (Hisar Anmol, H-24 and NTH-2530) showed moderately resistant reaction against tomato leaf curl disease. Eight varieties rated as susceptible and thirty eight varieties showed as highly susceptible reaction against leaf curl disease. Punjab Chhuhara was a susceptible variety which used as check for uniform spread of disease.

Key words: Tomato, mosaic, Leaf curl, Virus and Screening

Introduction

Tomato (*Lycopersicon esculentum* Mill.) is one of the most important vegetable crops grown all over the world. Over all, tomato becomes more important among vegetables due to its wide variety of uses e.g. like salad, paste, puree, syrup, sauce, juice, ketchup, soup and drinks etc. are prepared on a large scale. Tomato is a very good appetizer and its soup is said to be a good remedy for patients suffering from constipation. It is a rich source of carbohydrate (3.6%), vitamin A (585 IU/100g), vitamin B_1 (Thiamine, 0.12 mg/100g), vitamin B_2 (Riboflavin, 0.06 mg/100g), and vitamin C (26 mg/100g of fruit weight) (Thamburaj and Singh, 2000). India stands fifth in global production, where it is being grown in an area over 4.5 lakh ha with the estimated production around 55.3 lakh tones (Anonymous, 2013). The major tomato producing states are Uttar Pradesh, Assam, Bihar, Orissa, Maharashtra, West Bengal and Karnataka.

A large number of fungi, bacteria, viruses, nematodes and insects attack this crop. Among viral diseases, tomato mosaic disease caused by tomato mosaic virus belongs to genus Tobamovirus, family unknown and tomato leaf curl disease caused by tomato leaf curl virus belongs to genus Begomovirus, family Geminiviridae. Production of this crop is affected by a large number of biotic and abiotic stresses. More than 20 viruses are known to infect tomato around the world and losses up to 20-90% by different viruses have been reported (Hameed, 1995). Among them important are tomato mosaic (Desai, 1933), tomato leaf curl (Vasudeva and Samraj, 1948). In India, tomato mosaic and tomato leaf curl are the major viral diseases causing considerable yield losses depending on the severity of disease and susceptibility of cultivars (Sastry and Singh, 1973). The loss in yield due to mosaic caused by tomato mosaic virus varies from 20 to 30 per cent commonly, but at times it is more than 50 per cent (Oshima, 1978). Sastry and Singh (1973) estimated the losses in fruit yield upto 92.3 per cent if the plants are injected with tomato leaf curl virus in 20 days after transplanting. Tomato mosaic virus is readily transmitted mechanically and by seeds. The use of resistant varieties is the best practical approach for the effective method of disease management. Keeping the importance of crop and viral diseases in view the present study was carried the objective like screening of tomato varieties against viral diseases in natural field conditions.

Materials and Methods

The seeds of 50 tomato varieties were obtained from Delhi and different districts of Uttar Pradesh. Seven varieties obtained from Indian Agricultural Research Institute, New Delhi, 14 varieties obtained from Bulandshahr district, 22 varieties obtained from Faizabad district and 7 varieties obtained from Vegetable farm of N.

D. University of Agriculture & Technology, Kumarganj, Faizabad (U.P.). Seeds of each variety were sown on nursery bed with the size of 7.5 m long, 2.0 m wide and 10-15 cm high. Twenty five days old and healthy seedlings of each variety were transplanted in the field with plant to plant and row to row distance of 60 x 60 cm following augmented design in *Kharif* season, during 2013-14 and 2014-15 at Student's Instruction Farm of Narendra Deva University of Agriculture and Technology. After two rows of every variety, one row of susceptible check (Punjab Chhuhara) was planted and the experimental plot was also surrounded by two rows of check variety (Punjab Chhuhara) to ensure uniform spread of the disease. The observations were recorded with first appearance of symptoms till the maturity of crop. Observations of disease incidence were recorded at 15 days intervals. For data collection 5 plants were randomly selected and tagged in each row. All recommended agronomical practices were followed for raising a good crop. The incidence of tomato mosaic and leaf curl disease was calculated and grading on the basis of mean percentage infection of two years as described by Sharma and Sharma (1984) as given in table-1.

Results and Discussion

Use of resistant varieties is considered the best method for the plant diseases management. Therefore, available genotypes were screened so as to find out the source of the resistance in tomato against mosaic and leaf curl disease under natural field conditions. It is clear from table-2 that out of 49 varieties none of the varieties were found resistant or highly susceptible against tomato mosaic disease. Forty two varieties namely, Arka Vikash, Arka Ashish, Arka Meghali, Avinash-2, Arka Alok, Arka Abha, BT-18, BT-12, Pusa Gaurav, Selection-18, NDT-3, Flora Dade, Punjab Keshari, Pusa Ruby, Hisar Arun, Sankranthi, Nandhi, Hisar Anmol, NDT-73, Selection-31, H-24, Trishul, Abhilash, NTH-2530, INDAM-3001, Best of All, Lakshmi, US-485, Navoday, Badshah, S-22, Omni, PKM-1, INDAM-9502, Shivam, Marglob, Pusa Rohini, Rajshri, NS-585, NS-592, NDT-1 and NDT-6 showed moderately resistant reaction to the disease.While 7 varieties namely, NDT-96, Utsav, Sundaram, Amrutha, Satyam-45, NDT-2 and NDT-4 were rated as susceptible. The check variety (Punjab Chhuhara) showed susceptible reaction to the disease.

Like wise, out of 49 varieties, none was found resistant against tomato leaf curl disease. While, 3 varieties *viz*., Hisar Anmol, H-24 and NTH-2530 was moderately resistant. Eight varieties *viz*., Avinash-2, BT-18, Selection-18, Trishul, Best of All, US-485, Navoday and PKM-1 were rated as susceptible and thirty eight varieties *viz*., Arka Vikash, Arka Ashish, Arka Meghali, Arka Alok, Arka Abha, BT-12, Pusa Gaurav, NDT-3, Flora Dade, Punjab Keshari, Pusa Ruby, Hisar Arun, NDT-96, Sankranthi, Nandhi, Utsav, NDT-73, Selection-31, Sundaram, INDAM-3001, Abhilash, Lakshmi, Amrutha, Badshah, S-22, Omni, Satyam-45, INDAM-9502, Shivam, Marglob, Pusa Rohini, Rajshri, NS-585, NS-592, NDT-1, NDT-2, NDT-6 and NDT-4 as highly susceptible to leaf curl disease. The check variety (Punjab Chhuhara) was rated as highly susceptible reaction to the disease during both the years (Table-2). Concurrent with present findings have also been reported earlier by Bhagat and De (2001) tested eight cultivars of tomato for

Table-1: Rating scale (I-IV) for scoring the disease incidence of tomato mosaic and leaf curl disease

Disease incidence %	Grade	Reaction
0-0	I	Resistant (R)
1-30	II	Moderately resistant (MR)
31-70	III	Susceptible (S)
71-100	IV	Highly susceptible (HS)

Table-2: Reaction of tomato cultivars against viral disease(s) under natural field conditions (Pooled data of 2013-14 and 2014-15)

Disease incidence %	Grade	Reaction	Varieties	
			Tomato mosaic	Tomato leaf curl
0-0	I	Resistant	Nil	Nil
1-30	II	Moderately resistant	Arka Vikash, Arka Ashish, Arka Meghali, Avinash-2, Arka Alok, Arka Abha, BT-18, BT-12, Pusa Gaurav, Selection-18, NDT-3, Flora Dade, Punjab Keshari, Pusa Ruby, Hisar Arun, Sankranthi, Nandhi, Hisar Anmol, NDT-73, Selection-31, H-24, Trishul, Abhilash, NTH-2530, INDAM-3001, Best of All, Lakshmi, US-485, Navoday, Badshah, S-22, Omni, PKM-1, INDAM-9502, Shivam, Marglob, Pusa Rohini, Rajshri, NS-585, NS-592, NDT-1, NDT-6 and Punjab Chhuhara.	Hisar Anmol, H-24 and NTH-2530.
31-70	III	Susceptible	NDT-96, Utsav, Sundaram, Amrutha, Satyam-45, NDT-2 and NDT-4.	Avinash-2, BT-18, Selection-18, Trishul, Best of All, US-485, Navoday and PKM-1.
71-100	IV	Highly susceptible	Nil	Arka Vikash, Arka Ashish, Arka Meghali, Arka Alok, Arka Abha, BT-12, Pusa Gaurav, NDT-3, Flora Dade, Punjab Keshari, Pusa Ruby, Hisar Arun, NDT-96, Sankranthi, Nandhi, Utsav, NDT-73, Selection-31, Sundaram, INDAM-3001, Abhilash, Lakshmi, Amrutha, Badshah, S-22, Omni, Satyam-45, INDAM-9502, Shivam, Marglob, Pusa Rohini, Rajshri, NS-585, NS-592, NDT-1, NDT-2, NDT-6, NDT-4 and Punjab Chhuhara.

resistance to TMV and TLCV. None of the cultivar was immune for both the viruses; CO-3 and Sel-7 were fairly resistant against both viruses. Pusa Rubi was the most susceptible cultivar to the viruses. Muhammad *et al*. (2009) evaluated that three lines/varieties (Money maker, VRI-5 and VRI-29) were sown for screening against ToMV. Money maker, VRI-29 and VRI-5 indicated the HS (Highly Susceptible), S (Susceptible) and MS (Moderately Susceptible) disease response respectively. Kumar and Shahnaz (2005) screened 29 genotypes accessions against TLCV. Result showed, 4 entries were resistant, 3 were moderately resistant, 16 were susceptible and 6 were highly susceptible to TLCV. Akram *et al*., (2014) evaluated fifteen tomato germplasm along with five verities were used in this investigation against tomato leaf curl virus. None of the tomato entry was found to be 100 percent resistant against viral attack.

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References

Anonymous: The hindu survey of indian agriculture. National Press, Kasturi Building, Chennai, p. 186 (2013).

Bhagat, S. and De, B.K.: Reaction of tomato varieties to mosaic and leaf curl viruses in plains of West Bengal. *Environ. Ecol*., **19**: 865-867 (2001).

Desai, S.V.: Studies on the nature of causative agent of the mosaic disease of tomato. *Indian J. Agric. Sci.*, **3**: 626-639 (1933).

Hameed, S.: Leaf curl virus resistance in tomato and chilies. Final Report, South Asian Vegetable Research Network. Virology Section (CDRI), NARC, Islamabad (1995).

Kumar, K. and Shahnaz, E.: Screening of *Lycopersicon* spp. for resistance against tomato leaf curl virus. *Progressive Horti.*, **37**: 231-234 (2005).

Muhammad Imran, Muhammad, A., Khan, Muhammad Fiaz, Muhammad Azeem and Muhammad Mustafa: Influence of environmental conditions on tomato mosaic virus disease development under natural conditions. *Pak. J. Phytopathol*, **25**: 117-122 (2009).

Oshima, N.: Incidence of tobacco mosaic virus in tomatoes. Int. *Symp. Trop. Tomato*, 124-127 (1978).

Sastry, K.S.M. and Singh, S.J.: Assessment of losses in tomato caused by tomato leaf curl virus. *Indian J. Mycol. Pl. Pathol.*, **3**: 50-54 (1973).

Sharma, B.R. and Sharma, O.P.: Field evaluation of okra germplasm against yellow vein mosaic virus. *Punjab Hort. J*., **24**: 131-133 (1984).

Thamburaj, S. and Singh, N.: Test book of vegetables, tuber corps and spices. ICAR, New Delhi, p. 10-28 (2000).

Vasudeva, R.S. and Samraj, J.: A leaf curl disease of tomato. *Phytopathology*, **38**: 364-359 (1948).

Waheed Akram, Tehmina Anjum, Sana Hanif, Sabin Fatima, Asrar Mahboob and Asmat Ali Javed: Screening of Native and Exotic Tomato Germplasm for Their Susceptibility to Tomato Yellow Leaf Curl Virus and its Effect on their Agro-Economic Performance Under Field Conditions. *Sch. J. Agric. Vet. Sci*., **1**: 305-309 (2014).