

Original Research Article

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Screening of Different Germplasm against Groundnut Bud Necrosis Virus (GBNV) and Thrips in Tomato

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ABSTRACT

The field experiment on screening of tomato lines for GBNV infection was carried out Horticultural College and Research Institute, Tamil Nadu Agricultural University and Coimbatore. Totally 25 hybrids/varieties were screened in *Rabi* season during 2015. None of the varieties/hybrids screened were resistant or immune to GBNV during *Rabi* season. However, average disease incidence ranged from 7.55 to 25.25 percent indicating moderately resistant to highly susceptible. Tomatoes cultivar namely, PKM-1, PKM-2, PKM-3, VRG-17, VRG-95 and IVRC-1 were found moderately resistant to GBNV recording average disease incidence range is 6.88 to 9.88 and thrips population range from 0-2 per plant. In Sivarna, VRG-89, VRG-155, HAT-20, Co-3, WFM-1, ATL-019, DVR-2, LRC-1, DVRT-2, Yellow fruit, Uttakumari and CE-2004 were found moderately susceptible to GBNV recording average disease incidence range is 10.55 to 13.88 and thrips population range from 2-3 per plant. In CE-12, VRG-90, HN-2, H-24, WFF-1 and CLNR-2 were found susceptible to GBNV recording average disease incidence range is 16.77 to 19.75 and thrips population range from 3-5 per plant were recorded.

Keywords

Germplasm, GBNV, Thrips and Tomato.

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Introduction

Tomato (*Lycopersicon esculentum* L.) belongs to the genus *Lycopersicon* under Solanaceae family. It is a native to Peruvian and Mexican region. Tomato is one of the most important "protective foods" because of its special nutritive value. It is one of the most versatile vegetable with wide usage in Indian culinary tradition. Tomatoes are used for soup, salad, pickles, ketchup, puree, sauces and in many other ways. It is also used as a salad vegetable. Tomato has very few competitors in the value addition chain of processing. It is the world's largest vegetable crop after potato and sweet potato, but it tops the list of canned vegetables. Tomato crop is

grown in an area of 79900 hectare with the production of 19542 metric tonnes in India (NHB 2016). The major tomato producing states are Bihar, Karnataka, Uttar Pradesh, Orissa, Andhra Pradesh, Maharashtra, Madhya Pradesh, Assam and Tamil Nadu. Tomato is reported to be susceptible to over 40 viruses belonging to Alfamo, Luteo, Carla, Cucumo, Gemini, Poty, Iilar, Nepo, Tombus, Tobamo and Tospovirus groups (Allen and Gibbs, 1990). Among these tomato leaf curl and Tospoviruses are very important. The incidence of Tospoviruses in vegetable crops is increasing year by year and more so in tomato (Krishna Reddy *et al.*, 1997). In the

world, tomato is known to be naturally infected by four different tospoviruses such as *Tomato spotted wilt virus* (TSWV), *Tomato chlorotic spot virus* (TCSC), *Groundnut ring spot virus* (GRSV) (Heinze *et al.*, 1995). Tomato Tospovirus was reported from Taiwan, which was serologically closely related to *Watermelon silver mottle virus* (WSMoV) and *Peanut bud necrosis virus* (PBNV) (Adam *et al.*, 1993).

In India, Tospovirus on tomato was observed for the first time from Nilgiris in 1975 and reported as TSWV, later it was reported from Andhra Pradesh (Prasada Rao *et al.*, 1980) Karnataka (Sastry, 1982) Maharashtra (Joi and Summanvar, 1986) and Tamil Nadu (Doraiswamy *et al.*, 1984). The PBNV is widely distributed in India and is one of the most devastating diseases affecting peanut, vegetables like, tomato, chilli, brinjal and pulses, *viz.*, green gram, black gram, soybean and watermelon (Gopal *et al.*, 2010a). *Groundnut bud necrosis virus* infecting tomato, showed chlorotic, necrotic spots on young leaves and drying of young bud or growing tip followed by necrotic streaks on stem and petioles. Few plants had purple appearance and bronzing of leaves was observed. Early infection in plants resulted yellowing of leaves, stunted growth, finally wilting and death of the plants. Some infected plants set fruits with chlorotic concentric rings with reduced size. Similar type of symptoms was observed by several workers in Karnataka (Hemalatha, 1999, Anjaneya Reddy *et al.*, 2008) and Manjunath, 2008). In India, *Groundnut bud necrosis virus* (GBNV), *Peanut yellow spot virus* (PYSV), and *Watermelon bud necrosis virus* (WBNV) have been reported to infect broad range of vegetables (tomato, potato, chilli, peppers and watermelon) However *groundnut bud necrosis virus* (GBNV) disease in tomato, a Tospovirus group is causing considerable damage on both crop and yield in tomatoes. The disease occurs at high proportion in some

states especially in Tamil Nadu, Karnataka, Maharashtra and Andhra Pradesh. The losses due to this disease in tomatoes depend mainly on the level of infection, stage of the crop, thrips population and severity of the disease. Early stage of the crop, i.e. 15-20 days after transplanting and flowering stage is highly susceptible for the virus. Considering the importance research study was conducted on screening different germplasm entries against *Groundnut Bud Necrosis virus* (GBNV) and thrips in tomato.

Materials and Methods

The field experiment on screening of tomato lines for GBNV infection was carried out Horticultural College and Research Institute, Tamil Nadu Agricultural University and Coimbatore. Totally 25 hybrids and varieties were screened in Rabi season during 2015. Tomato cultivars namely PKM-1, PKM-2, PKM-3, VRG-17, VRG-89, VRG-90, VRG-95, VRG-155, IVRC-1, Sivarna, HAT-20, Co-3, WFM-1, ATL-019, DVR-2, DVRT-2, LRC-1, Yellow fruit, Uttakumari, CE-12, CE-2004, CLNR-2, HN-2, H-24 and WFF-1. The seeds were sown in nursery beds separately and transplanted in the main field 28 days after sowing with a spacing of 75 X 60cm during *Rabi* of 2015. The observation on symptom appearance and percent disease incidence was recorded at weekly intervals up to twelve weeks after planting. The following scale (Joi and Summanvar, 1989) was employed for scoring the disease reaction in tomato for TSWV.

To assess the population of thrips in field and observations were made on three leaves per plant, one each from top, middle and bottom region from ten randomly selected plants per farm leaving border rows.

To work out per cent disease incidence (PDI), total number of plants and number of plants infected with GBNV were counted leaving the outs of two rows on all the four sides in

each farm. PDI was calculated by adopting the following formula (Salam *et al.*, 2010).

$$\text{Per cent disease incidence} = \frac{\text{Number of infected plants}}{\text{Total number of plant}} \times 100$$

Results and Discussion

In order to evaluate tomato varieties and hybrids for GBNV disease and thrips population screening was carried out under field condition. Totally 25 hybrids /varieties were screened during summer *rabi* 2015. The disease reaction was calculated based on the scale employed for scoring disease reaction in varieties and hybrids and expressed as per cent disease incidence of *rabi* season. The field experiment results revealed that none of the varieties/hybrids screened were resistant or immune to GBNV during *Rabi* season.

However, average disease incidence ranged from 7.55 to 25.25 percent indicating moderately resistant to highly susceptible. Tomatoes namely, PKM-1, PKM-2, PKM-3, VRG-17, VRG-95 and IVRC-1 were found moderately resistant to GBNV recording average disease incidence range is 6.88 to 9.88 (Table 1) and thrips population range from 0-2 per plant. In Sivarna, VRG-89, VRG-155, HAT-20, Co-3, WFM-1, ATL-019, DVR-2, LRC-1, DVRT-2, Yellow fruit, Uttakumari and CE-2004 were found moderately susceptible to GBNV recording average disease incidence range is 10.55 to 13.88 and thrips population range from 2-3 per plant (Table 1). In CLNR-2, CE-12, VRG-90, HN-2, H-24, WFF-1 and CLNR-2 were found susceptible to GBNV recording average disease incidence range is 16.77 to 19.75 and thrips population range from 3-5 per plant were recorded (Table 1).

Table.1 Screening of tomato cultivar and hybrids for GBNV under field condition

S.No.	Cultivars/ Hybrids	Per cent Disease Incidence (PDI)						Disease reaction
		August	September	October	November	December	Mean	
1	PKM-1	7.99	5.55	8.33	8.17	9.33	7.874	MR
2	PKM-2	6.12	8.02	12.33	9.55	7.88	8.78	MR
3	PKM-3	8.12	10.33	9.56	9.02	8.98	9.20	MR
4	VRG-17	7.33	11.56	10.88	9.46	7.77	9.4	MR
5	VRG-89	10.66	12.88	17.12	15	13.33	13.79	MS
6	VRG-90	19.12	16.78	14.56	14.33	19.88	16.93	S
7	VRG-95	7.66	7.43	8.85	12.12	9.67	9.14	MR
8	VRG-155	14.12	11.11	16.78	15.99	14.88	14.57	MS
9	IVRC-1	9.44	7.2	9.45	11.55	10.44	9.61	MR
10	HAT-20	11.22	14.78	12.22	13.88	12.33	12.88	MS
11	Co-3	14.44	11.33	13	16.33	11.33	13.28	MS
12	WFM-1	13.12	14.78	10.88	12.98	15.12	13.37	MS
13	ATL-019	11.33	16.33	15.12	11.33	12.33	13.28	MS
14	DVR-2	15.12	14.78	13.88	11.22	13.00	13.6	MS
15	LRC-1	12.33	16.33	11.22	14.44	15.99	14.06	MS
16	DVRT-2	10.98	13.56	14.78	15.78	14.56	13.93	MS
17	Yellow fruit	12.98	13.88	11.33	14.44	14.78	13.48	MS
18	Uttakumari	16.12	16.78	15.78	13.78	12.12	14.91	MS
19	CE-2004	15.89	13.12	14.56	16.34	14.99	14.98	MS
20	CLNR-2	16.99	15.99	19.56	19.98	21.67	18.83	S
21	CE-12	19.12	16.78	14.56	14.33	19.88	16.93	S
22	HN-2	19.9	18.78	23.56	21.12	15.78	19.82	S
23	H-24	22.14	21.11	18.34	19.55	17	19.62	S
24	WFF-1	20.12	21.78	19.56	19.15	18.23	19.76	S
25	Sivarna	13.45	11.33	14.34	16.12	14.88	14.02	MS

Scoring the disease reaction in tomato for TSWV

Grade	PDI	Category	Symptoms
A	0.00	Immune (I)	No symptoms
B	0.1 to 5.00	Resistant(R)	Initial symptoms on younger leaf lets
C	5.1 to 10.00	Moderately Resistant(R)	Symptoms extended up to petioles
D	10.1 to 15.0	Moderately susceptible (MS)	Necrosis of growing branch including buds
E	15.1 to 25.0	Susceptible (S)	Necrosis extended up to stem, covering all plants.
F	25.1 and above	Highly susceptible (HS)	Severe necrosis and wilting

Anjaneya Reddy *et al.*, (2008) reported that the thirty three varieties/ hybrids of tomato were screened against Tospovirus, none was immune to Tospovirus, two were resistant (1-5%) and ten were found moderately susceptible (10-15%). Tomato variety, Marikrit showed moderately resistant and NS-2535 had moderately susceptible reaction. Remaining 20 were highly susceptible in the field screening (Manjunath, 2008). Venkata Ramana *et al.*, (2006) screened 63 tomato entries consisting of 20 cultivars, 36 genotypes and 7 wild species in field condition during *kharif* 2003. The test entries were grouped into six categories based on final per cent PBNV disease incidence at 75 days after transplanting. Only one entry EC 5888 showed a highly resistant reaction, while EC 8630 and EC 26512 were resistant. Pusa uphar, EC 251709, EC 35446, EC 165700, LE 23, IIHR 2187, IIHR 2272, IIHR 2273 and IIHR 2274 were moderately resistant. Lal *et al.*, (2002) screened 48 soybean genotypes in field conditions in three trials of *kharif* 2001 to identify the resistance against bud blight caused by a strain of ground nut bud necrosis virus. Gopal *et al.*, (2004) reported that the 242 groundnut genotypes screened under field condition, 89/93-32, ICCV 92269, 83/151-7 and 85/203-06 were found most promising sources of resistance for groundnut bud necrosis virus disease. Jaya Jasmine and

Seemanthini, (1994) observed that none of the varieties screened were fully resistant. However, they showed varied response to the infection. ARTH-4 among the hybrids and CO-3 among the varieties showed less susceptibility while the rest were highly susceptible. *L. peruvianum* appears to be the best resistance source for TSWV, NPH accessions 201 and 374, LA accessions 111372, 385, 4441-1 and 1113-1, PI accessions 126928, 126930, 126, 944, 126946, 128657, 128600 and 129146 have been found resistant or immune in screening trials (Paterson *et al.*, 1989; Maluf *et al.*, 1991; Iizuka *et al.*, 1993 and Krishna Kumar *et al.*, 1993).

Based on the result of the survey it is concluded that the none of the varieties/hybrids screened were resistant or immune to GBNV during *rabi* season. However, PKM-1, PKM-2, PKM-3, VRG-17, VRG-95 and IVRC-1 were found moderately resistant to GBNV and CLNR-2, CE-12, VRG-90, HN-2, H-24 and WFF-1 were found susceptible to GBNV.

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