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T Tamilnayanagan

Department of Agricultural
Entomology, Tamil Nadu
Agricultural University,
Coimbatore, Tamil Nadu, India

M Suganthy

Department of Agricultural
Entomology, Tamil Nadu
Agricultural University,
Coimbatore, Tamil Nadu, India

P Renukadevi

Department of Plant Pathology
Tamil Nadu Agricultural
University, Tamil Nadu, India

VG Malathi

Department of Plant Pathology
Tamil Nadu Agricultural
University, Coimbatore, Tamil
Nadu, India

Correspondence

T Tamilnayanagan

Department of Agricultural
Entomology, Tamil Nadu
Agricultural University,
Coimbatore, Tamil Nadu, India

Survey and Monitoring the Incidence of Thrips and Ground Nut Bud Necrosis Virus (GBNV) infected Tomato (*Solanum lycopersicum* L.) and Pesticides usage pattern of Tamil Nadu

T Tamilnayanagan, M Suganthy, P Renukadevi and VG Malathi

Abstract

Tomato is one of the important vegetable crops cultivated in throughout the world. It is affected by many causal agents such as fungal, bacterial, viral and nematodes. Among viral diseases, tomato leaf curl and groundnut bud necrosis disease are causing considerable damage to the crop and yield. The groundnut bud necrosis virus is a Tospovirus group, which could be transmitted by many thrips species in the field on various crops. Result revealed that the maximum number of 4.0 thrips per plant was recorded in Krishngiri district and minimum number 0.8 thrips per plant was recorded in Perambalur district. Correspondingly, maximum GBNV incidence of 82 per cent was recorded in Krishnagiri district and the minimum of 44 per cent disease incidence was observed in Perambalur district and usage of pesticide pattern revealed that the Imidacloprid 17.8 % SL (62.5 per cent), followed by Thiomethxam 25 % WG, Dimethoate 30 EC (50 per cent) and Azadirachtin 1% (37.5 per cent) pesticides are frequently used in major tomato growing districts of Tamil Nadu.

Keywords: Tomato, *Groundnut Bud Necrosis virus* (GBNV), Pesticides, Tamil Nadu.

1. 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) [11]. The major tomato producing states are Bihar, Karnataka, Uttar Pradesh, Orissa, Andhra Pradesh, Maharashtra, Madhya Pradesh, Assam & Tamil Nadu. Currently, more than twenty Tospoviruses have been reported globally (Mandal *et al.*, 2008) [7]. The Tospoviruses (family *Bunyaviridae*) are enveloped isometric RNA viruses with three genomes designated as small (S), medium (M), and large (L) segments of ssRNA. Thrips (*Frankliniella fucusa* Hinds, *F. occidentalis* Pergande) are the main vector for Tospovirus transmission (Mandal *et al.*, 2012) [8]. In India, *Groundnut bud necrosis virus* (GBNV) was reported in 1968 (Mandal *et al.*, 2012) [8]. Subsequently, new viruses were reported like; *Peanut yellow spot virus* and *Watermelon bud necrosis virus* (WBNV) were reported in 1990 on groundnut and watermelon respectively (Jain *et al.*, 1998) [5] while, *Iris yellow spot virus* and *Capsicum chlorosis virus* reported on onion and capsicum during 2002-2006 (Krishnareddy *et al.*, 2008; Mandal *et al.*, 2012) [6] [8]. Globally, twenty Tospoviruses have been reported on various crops like tomato, groundnut, watermelon, cucurbits, pepper, cowpea, mungbean, potato, chili and soybean and currently, five Tospovirus have been reported from India: GBNV, PBNV, WBNV, *Capsicum chlorosis virus*, *Iris yellow spot virus* and *Peanut yellow spot virus* on various crops like capsicum, groundnut, onion and watermelon (Mandal 2008; Mandal *et al.*, 2012) [7] [8]. 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) [14] [1] and Manjunath, 2008) [9]. With this background we conducted survey and monitoring the incidence of thrips and *Ground Nut Bud Necrosis Virus* (GBNV) infected tomato growing major districts of Tamil Nadu.

2. Materials and methods

Survey was carried out in major tomato growing district of Tamil Nadu during 2015 *viz.*, Dharmapuri, Krishnagiri, Salem, Erode, Thiruppur, Dindugul Coimbatore and Perambalur district to monitor the incidence of thrips, Ground Nut Bud Necrosis Virus (GBNV) infesting tomato crop and pesticide usage pattern of in the farmer's holding areas (Table 1).

To assess the population of thrips in different locations, 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 begomovirus 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) [13].

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

3. Results and discussion

Field survey was conducted to monitor the incidence of thrips, *Ground Nut Bud Necrosis Virus* infected tomato crop and pesticides usage pattern in tomato growing major districts of Tamil Nadu *viz.*, Dharmapuri, Krishnagiri, Salem, Erode, Thiruppur, Dindugul Coimbatore and Perambalur districts. The results revealed that the minimum number 0.8 thrips per plant was recorded at Perambalur district and maximum number of 4.0 thrips per plant was recorded at Krishnagiri district and followed by Salem (3.2 thrips/ Plant), Dharmapuri (2.7 thrips/ plant), Dindugul (1.7 thrips/ plant), Coimbatore

(1.5 thrips/ plant), Erode (1.1 thrips/ plant) and Thiruppur (1.0 thrips/ plant) (Table 1). Correspondingly, minimum of 44 per cent disease incidence was observed in Perambalur district and maximum GBNV incidence of 82 per cent was recorded in Krishnagiri district and the followed by Salem (68 per cent), Dharmapuri (62 per cent), Dindugul (56 per cent), Coimbatore (48 per cent) and Erode (45 per cent) (Table 1). Gupta and Shukla (2011) [3] reported groundnut bud necrosis virus infection on groundnut up to 70% in Indian Agricultural Research Institute experimental farm, New Delhi on different varietal trials. The survey conducted in 14 states in the major vegetable-growing areas in India representing southern, north-western, north-eastern and central regions from 2002 to 2009 in tomato and chilli and bell peppers revealed the presence of *Peanut bud necrosis virus* (PBNV) *Watermelon bud necrosis virus* (WBNV) *Capsicum chlorosis virus* (CaCV), and Iris yellow spot virus (IYSV), predominantly detected in watermelons and cucurbits in all regions except northeastern regions were reported by Suresh *et al.* (2011) [15]. Raja and Jain (2006) [12] revealed that groundnut bud necrosis virus causing bud blight disease in hybrid tomatoes in Karnataka, Kerala, Maharashtra, Tamil Nadu and Uttar Pradesh and reported disease incidence ranged from 19 to 34 per cent. Nagaraja, (2004) [10] reported that the disease incidence of GBNV is more in kharif and summer season as compared to rabi season (Anon, 2004) [2]. In surveyed fields of groundnut, the GBNV disease incidence was 1.5 to 22.5 per cent in Karnataka and 2.0 to 23.4 per cent in Andhra Pradesh. Sreekanth *et al.* (2003) [14] surveyed in different districts of Andhra Pradesh for the occurrence of thrips and incidence of peanut bud necrosis virus Green gram. Thrips infestation and PBNV incidence was much higher in *kharif* than *rabi* and summer season. PBNV infection and thrips population was widespread in Greengram in Nalgonda, Khammam, Warangal, Karimnagar and Medak districts of Telangana region, and in Srikakulam, Vizianagaram and East Godavari districts of the north coastal region of Andhra Pradesh. Usage of pesticides pattern revealed that the Imidacloprid 17.8 % SL (62.5 per cent), followed by Thiomethxam 25 % WG, Dimethoate 30 EC (50 per cent) and Azadirachtin 1% (37.5 per cent) pesticides are frequently used in tomato growing areas of Tamil Nadu.

Table 1: Survey and monitoring the incidence of thrips and *Groundnut bud necrosis virus* and pesticides usage pattern of Tamil Nadu.

S. No.	District	GIS co-ordinate	Variety/ Hybrid	Stage of the crop	No. of. thrips/ 3 leaves/plant	PDI	Pesticide usage pattern
1.	Krishnagiri	12°37'32.45"N 78° 1'10.34"E	Paiyur 1	Fruiting	4.0	82.00	Dimethoate 30 EC@2 ml/litre Imidacloprid 17.8% SL@4ml/tank
2.	Dharmapuri	12° 6'23.50"N 78° 8'10.11"E	Sivam	Harvesting	2.7	62.00	Imidacloprid 17.8% SL @4ml/tank Thiomethxam 25 % WG @ 0.2g/litre
3.	Salem	11°39'51.57"N 78° 8'45.65"E	Sivam	Flowering	3.2	68.00	Dimethoate 30 EC@2 ml/litre
4.	Erode	11°20'27.73"N 77°43'1.79"E	Sagar	Fruiting	1.1	46.00	Azadirachtin 1% @ 2.5ml/litre Imidacloprid 17.8% SL@ 4ml/tank
5.	Triuppur	11° 6'30.69"N 77°20'27.84"E	PKM 1	Flowering	1.0	45.00	Thiomethxam 25 % WG@ 0.2g/litre Dimethoate 30 EC@ 2 ml/litre Imidacloprid 17.8%SL@ 4ml/tank
6.	Dindugul	10°22'2.33"N 77°58'49.04"E	PKM 1	Harvesting	1.7	52.00	Thiomethxam 25 % WG@ 0.2g/litre Azadirachtin 1% @ 2.5ml/litre
7.	Coimbatore	11° 1'0.64"N 76°57'21.00"E	Co 3	Flowering	1.5	48.00	Imidacloprid 17.8% SL @ 4ml/tank
8.	Perambalur	10°47'25.74"N 78°42'16.82"E	PKM 1	Fruiting	0.8	44.00	Dimethoate 30 EC@ 2 ml/litre Thiomethxam 25 % WG@ 0.2g/litre Azadirachtin 1% @2 .5ml/litre

4. Conclusion

Based on the result of the survey it is concluded that maximum number of 4.0 thrips per plant and GBNV incidence of 82 per cent was recorded at Krishngiri district and maximum usage of pesticide pattern revealed that the Imidacloprid 17.8% SL (62.5 per cent) pesticide are frequently used in major tomato growing districts of Tamil Nadu.

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