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TOXICITY OF SOME INSECTICIDES AGAINST THRIPS INFESTING TOMATO

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ABSTRACT

Bean dip bioassay was performed with six insecticides on the mortality response in tomato thrips- *Thrips palmi* Karny and *Scirtothrips dorsalis* Hood. The LC_{50} values ranged from 1.591 to 17.018 ppm, and spinosad with the least LC_{50} value of 1.591 ppm at 95% confidence limit was the most toxic. It was followed by cyantraniliprole (2.425 ppm), diafenthiuron (2.396 ppm), imidacloprid (5.110 ppm), fipronil (13.560 ppm) and dimethoate (17.018 ppm). Thus, spinosad, diafenthiuron and cyantraniliprole were observed to be more toxic.

Key words: Tomato, thrips, tospoviruses, vectors, *Thrips palmi*, *Scirtothrips dorsalis*, insecticides, bioassay, LC_{50}, spinosad, cyantraniliprole, diafenthiuron, imidacloprid, fipronil, dimethoate

The plant viruses cause enormous economic losses, and diverse agroclimates in India favour their spread with their vectors, among which tospoviruses are most threatening (Anupam Varma, 2007). Thrips are the vectors of tospoviruses in most of the vegetable and pulse crops causing significant yield loss in South East Asian countries (Mound, 2001; Whitfield et al., 2005). *Groundnut Bud Necrosis Virus* (GBNV) in solanaceous and pulse crops and *Watermelon Bud Necrosis Virus* (WBNV) in cucurbits are widely distributed and most devastating in India, and these are difficult to manage. Indirect methods like cultural practices (resistant planting material, avoidance of virus infection, use of reflective mulch, crop rotation, etc) and chemical control of insect vectors are followed to manage these (Sastry and Zitter, 2014). Most of the time, improper insecticidal sprays cannot reach thrips, because of their cryptic living habit (feed and reside in unopened shoot and flower buds). Correct diagnosis of thrips infestation at early stage and selection of suitable insecticide at right time are critical to manage viral diseases in tomato. The present study evaluates the toxicity of some insecticides against tomato thrips viz., *Thrips palmi* Karny and *Scirtothrips dorsalis* Hood.

MATERIALS AND METHODS

Bioassay study was conducted at the toxicology laboratory, Division of Entomology, Indian Agricultural Research Institute, New Delhi. After series of host preference and mass rearing experiments with selected hosts (groundnut cv. Kadri-9, cowpea cv. Pusa Komal, watermelon cv. Arka Manik and brinjal cv. Pusa Hybrid 9), it was concluded that the one-month-old brinjal plants are suitable for rearing and mass multiplication of the tomato thrips- *T. palmi* Karny and *S. dorsalis*. Thrips were collected from tomato crop during morning hours- plant shoots were tapped on to a white paper and fallen thrips were collected using aspirator. Collected thrips were released on one-month-old brinjal plants raised in sterile pot mixture (soil: cocopit: vermiculite at 3:1:1 ratio) and kept under transparent and ventilated acrylic cages. Six commercial grade insecticides recommended against thrips and other sucking pests (Anonymous, 2017) were subjected to bioassay as given in Table 1. Bioassay was carried out on adult thrips (5 days old) of F1 and F2 generations with bean dip method (Insecticide Resistance Action Committee-IRAC susceptibility test method 10). The experiments were started with % of required dose of the insecticides, and preliminary screening done with non-replicated experiment called bracketing (approximation of 20-80% mortality with wide range of concentrations). Eight concentrations were prepared in each insecticide for calculation of median lethal concentration (LC_{50}) and repeated thrice. Mean mortality data obtained were subjected to statistical analysis to calculate the LC_{50} using log dose probit analysis (Finney, 1947, PoloPlus 2.0 of LeOra Software, Petaluma, CA). Data in which the probit

Table 1. Toxicity of insecticides against tomato thrips

Insecticide	DF	Slope± SE	χ^2	LC_{50} (ppm) (95% CI)	Fiducial limits Lower limit	Fiducial limits Upper limit
Fipronil 5SC	6	3.311± 0.449	2.086	13.560	11.602	15.287
Imidacloprid 17.8SL	6	3.627± 0.675	3.033	5.110	3.966	5.896
Spinosad 45SC	6	2.015± 0.307	2.737	1.591	1.127	1.990
Diafenthiuron 50WP	6	2.561± 0.338	6.859	2.396	1.590	3.091
Dimethoate 30EC	6	3.118 ± 0.489	1.809	17.018	14.766	19.221
Cyantraniliprole 10.26OD	6	2.782± 0.377	4.198	2.425	1.807	2.949

analysis did not calculate the confidence interval (CI) or when the resulting $\chi 2$ statistic/ and non-significant ($p < 0.05$) were discarded.

RESULTS AND DISCUSSION

Bioassay results indicated that the evaluated insecticides exhibited varied mortality response with the LC_{50} values ranging from 2.396 to 17.018 ppm; spinosad with least LC_{50} value (1.591 ppm) at 95% CI followed by diafenthiuron (2.396 ppm), cyantraniliprole (2.425 ppm), imidacloprid (5.110 ppm), fipronil (13.560 ppm) and dimethoate (17.018 ppm) (Table. 1). These results indicated, spinosad is the most toxic to thrips. These results are in conformity with earlier ones of Greenberg et al. (2011) on spinosad as most toxic against onion thrips and *Frankliniella occidentalis* (Shan et al., 2012). Present findings are also in conformity with those of Buli et al. (2018) on cyantraniliprole as the most toxic followed by spinosad and imidacloprid; and the latter was the most toxic after spinosad (Walter et al., 2018). Thus, spinosad and cyantraniliprole are more toxic, and these results can facilitate the selection of suitable insecticides for the management thrips and associated viral diseases in tomato.

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