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Field Efficacy of Certain Bio-Pesticides against Chilli Thrips *Scirtothrips dorsalis* (HOOD) on Chilli (*Capsicum annuum* L.)

Rakesh Kumar Meena and Anoorag R. Tayde*

Department of Entomology, Naini Agriculture Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad - 211 007, India
**Corresponding author*

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A B S T R A C T

A field experiment on the efficacy of certain biopesticides for control of chilli thrips, *Scirtothrips dorsalis* Hood conducted at the Central field, Sam Higginbottom University of Agriculture Technology and Sciences, Allahabad, Uttar Pradesh, India during July 2016 to November 2016. Results revealed that among the different treatments, Spinosad (73.21%) proved to be the most effective treatments followed by Imidacloprid (67.58%), Pongima oil (55.78%), Neem oil (55.64%), NSKE (53.03%) and Garlic sap extract (50.03%), whereas, *Beauveria bassiana* (33.36%) was found to be least effective against this pest. The plots treated with Spinosad show highest (272.33q/ha) yield was followed by Imidacloprid (250.88q/ha), Pongamia oil (192.62q/ha), Neem oil (185.70q/ha), NSKE (165.66q/ha) and Garlic sap extract (142.32q/ha), and *Beauveria bassiana* (133.80q/ha). Economics of different treatments showed appreciable Incremental Cost-Benefit Ratio obtained in case of Spinosad (1:11.36) followed by Imidacloprid (1:10.88), Pongima oil (1:8.19), Neem oil(1:7.92), NSKE (1:6.52) Garlic sap extract(1:5.69), *Beauveria bassiana* (1:5.30) as compared to control (1:3.74) respectively.

Introduction

Chilli (*Capsicum annum* L.) popularly known as ‘mirch’ in Hindi. It belongs to the family Solanaceae. Chilli is one of the important vegetable and commercial spice crops. Green fruits are a good source of vitamin A and C besides traditional use of chillies in vegetables, spices, sauces and pickles (Mondal *et al., 2012*). The pungency in chillies is due to crystalline volatile alkaloid ‘Capsaicin’. The red color of chillies is due to the presence of pigment ‘Capsanthin’ (Choudhary *et al.,* 2009)**.** In India Andhra Pradesh is the major chilli growing state in the country, contributing 33 per cent of national production with an area of 2.35 lakh hectares (Reddy and Sreehari 2009). The area occupied in India is 14.5m ha and the production is 8.2 lakhs or 0.8 million tons and Uttar Pradesh occupies about 1.8 thousand ha area and 1.7 thousand tons production respectively (Rai and Pandey, 2007). The area occupied in Allahabad region is 2455 ha and the production is 2993 tons (Kumar *et al.,* 2012)**.** These days use of botanicals is one of the most common and popular methods for its management. So, by using the botanicals having a novel mode of action with higher bioefficacy on insect control environment and mammals will be saved. Bioefficacy of bio-pesticides needs to be studied for formulating

effective and economical management strategies of the chilli thrips in Allahabad region. Therefore, the present study was undertaken and the results obtained are discussed here.

Materials and Methods

The experiment was conducted during Kharif season 2016 at the Central Field of Sam Higginbottom University of Agriculture, Technology and Sciences Allahabad, Uttar Pradesh, India, in a randomised block design with eight treatments, using variety Suryamukhi in a plot size of (2m x 1m) at a spacing of (45x30cm) with recommended package of practices excluding plant protection.

The spraying was done after the population reaching its ETL (5 thrips/plant). The observation of the pests was recorded from three tender leaves of five randomly selected plants from each net plot area and three leaves (top, middle, and bottom) from each plant were selected. The average percent reduction of pest population of all three sprays was worked out by using Henderson and Tilton's formula described as under:

Percent reduction = 100(1-Ta x Cb / Tb x Ca)

Where,

Ta = number of insects in treated plot after insecticide application.

Tb = number of insects in treated plot before insecticide application.

Ca = number of insects in untreated check after insecticide application.

Cb = number of insects in untreated plot check before insecticide application.

The percent reduction was transformed to angular values from which analysis of variance was calculated for determining the critical difference (CD) at 5 percent level of significance.

The data on thrips population thus converted to the percentage of mortality and were subjected to statistically analysis after arcsine transformation. The data on percentage reduction obtained are presented in table 1 (overall mean 1^{st} 2^{nd} 3^{rd} spray). The insecticide treatments include Spionsad, Imidacloprid, NSKE, Garlic sap extract, neem oil, Pongamia oil, *Beauveria bassiana* along with untreated control. The incidence of the chilli thrips was recorded from the five randomly selected plants. Observations were recorded one day before spray and 3^{rd}, 10^{th} days after spraying. Treatment wise yield of healthy marketable fruits was recorded at each picking, converted them in Kg/ha and data thus obtained were statistically analyzed (steel and Torrie, 1980).Economics of different treatments were worked out based on yield and cost of treatments. The values of Insecticides cost-benefit ratio obtained for different treatments are furnished in table 2.

Results and Discussion

The data presented in table 1 on percent population reduction of *Scirtothrips dorsalis* over control on first, second and third spray revealed that all the treatments were significantly superior to control. Among all the treatments Spinosad 0.015% recorded highest reduction of *Scirtothrips dorsalis* population *i.e.* (71.21%) which was significantly superior to control followed by Imidacloprid 0.005% (67.58%), Pongamia oil 4% (55.78%) Neem oil 2.5ml/l (55.64%), Garlic sap extract 10g/Lit. (53.03%), NSKE 5% (50.03%) and *Beauveria bassiana* 2gm/Lit (33.36%) was least effective among all the treatments. The population reduction

was recorded with Spinosad ranked first followed by imidacloprid. All the biopesticides significantly reduced thrips population over control. Spinosad was more effective in percentage reduction of thrips with 71.21 reductions over control similar finding made by Vanisree *et al.,* (2013), Vijaya *et al.,* (2016) and Seal *et al.,* (2006) they reported that Spinosad was found most effective in reducing the population of *Scirtothrips dorsalis* as well as in increasing yield. Seal *et al.,* also found that spinosad and imidacloprid most effective in reducing the density of *Scirtothrips dorsalis.* Tommasini *et al.,* (2007) reported acrinathrin and spinosad proved to be most effective against thrips, particularly where a high relative abundance of thrips was present and this result also supported by Larral and Ripa (2007). Imidacloprid 0.005% was the next most effective treatment in percentage reduction of chilli with 67.58 % reduction over control also reported by Patel *et al.,* (2009) and Seal *et al.,* (2006).

Table.1 Field efficacy of certain biopesticides against Chilli thrips (*Scirtothrips dorsalis*) on Chilli (*Capsicum annuum* L.) during *Kharif* season, 2016 (Overall mean)

Treatment No.	**Treatment**	**% Reduction over control population of *Scirtothrips dorsalis.***			
		1st Spray Mean	**2nd spray Mean**	**3rd Spray Mean**	**Overall Mean**
T_1	Imidacloprid (0.005%)	55.84 **(48.35)**	70.25 **(56.95)**	76.67 **(61.12)**	67.58 **(55.47)**
T_2	Spinosad (0.015%)	60.84 **(51.26)**	71.56 **(57.77)**	81.24 **(64.33)**	71.21 **(57.78)**
T_3	NSKE (5%)	43.17 **(41.17)**	54.55 **(47.61)**	53.24 **(46.86)**	50.32 **(45.18)**
T_4	Garlic sap Extract (10g/lit)	42.17 **(40.50)**	51.67 **(45.95)**	65.27 **(53.89)**	53.03 **(46.78)**
T_5	Neem oil (2.5 ml)	44.83 **(42.03)**	56.71 **(48.85)**	65.38 **(53.96)**	55.64 **(48.28)**
T_6	Pongamia Oil (4%)	47.34 **(43.47)**	52.92 **(46.68)**	67.10 **(55.00)**	55.78 **(48.38)**
T_7	*Beauveria Bassiana* (2g/lit)	33.00 **(35.06)**	31.57 **(34.19)**	35.53 **(36.59)**	33.36 **(35.28)**
T_0	Control	0	0	0	0
	F-Test	S	S	S	S
	S.Ed(±)	3.34	3.39	2.77	4.09
	C.D.(P= 0.05)	7.09	7.19	5.89	8.67

*Figures in parenthesis are arc sin transformed values.

Table.2 Economics of cultivation

Tr. No:	Treatment	Yield q/ha	Total cost of yield in Rs	Common cost in Rs	Treatment cost in Rs	Total cost in Rs	Net returns in Rs	C:B ratio
T_1	Imidacloprid (0.005%)	250.88	376320	29885	1980	31865	344455	1:10.80
T_2	Spinosad (0.015%)	272.33	408495	29885	3150	33035	375460	1:11.36
T_3	NSKE (5%)	165.66	247500	29885	3000	32885	214615	1:6.52
T_4	Garlic sap extract (10g/lit)	142.32	213480	29885	1980	31865	181615	1:5.69
T_5	Neem oil (2.5ml/l)	185.70	278550	29885	1500	31385	248665	1:7.92
T_6	Pongima oil (4%)	192.62	288930	29885	1560	31445	257545	1:8.19
T_7	*Beauvria bassiana* (2gm/l)	133.80	200730	29885	1950	31835	168895	1:5.30
T_0	Untreated/Control	94.5	141750	29885	-	29885	111865	1:3.74

*Cost of yield Rs/q - 1500

The yields among the treatment were significant. The highest yield was recorded in Spinosad 0.015% (272.33 q/ha), followed by Imidacloprid 0.005% (250.88 q/ha), Neem oil 2.5ml/l (185.70 q/ha), NSKE 5% (165.65 q/ha) and Garlic sap extract (142.32 q/ha), Pongima oil (192.62), *Beauveria bassiana* (133.80) as compared to control T_o (95.54 q/ha). When the cost-benefit ratio was worked out, an interesting result was achieved. Among the treatment studied, the best and most economical treatment was Spinosad 0.015% (1:11.36) followed by Imidacloprid 0.005% (1:10.88), Pongamia oil (1:8.19), Neem oil 2.5ml/l (1:7.92), NSKE 5% (1:6.52) and Garlic sap extract (1:5.69), *Beauveria bassiana* (1:5.30)as compared to control T_o (1:3.74) Vanisree *et al.*,(2013) and Vijaya *et al.,* (2016). They reported that Spinosad was found most effective in reducing the population of *Scirtothrips dorsalis* as well as in increasing yield. Among all the treatment Spinosad 0.015% proved to be the best treatment followed by Imidacloprid 0.005%, Pongamia oil, Neem oil 2.5ml/l, NSKE 5% and Garlic sap extract, *Beauveria bassiana* also effective in managing *Scirtothrips dorsalis* reduction. Recommended dose of biopesticides may be useful in devising proper integrated pest management strategy against chilli thrips.

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