Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2019; 7(6): 1226-1229

Received: 24-09-2019
Accepted: 28-10-2019

Satish Tirkey
Department of Entomology, SHUATS Allahabad, Uttar Pradesh, India

Ashwani Kumar
Associate Professor, Department of Entomology, SHUATS Allahabad, Uttar Pradesh, India

Tripti Sahu
Department of Entomology, SHUATS Allahabad, Uttar Pradesh, India

Vikki Dada Patel
Department of Entomology, SHUATS Allahabad, Uttar Pradesh, India

Shashi Ekka
Department of Horticulture, SHUATS Allahabad, Uttar Pradesh, India

Corresponding Author:
Tripti Sahu
Department of Entomology, SHUATS Allahabad, Uttar Pradesh, India

Efficacy of selected insecticides against chilli thrips (*Scirtothrips dorsalis* (Hood)) and their cost benefit ratio in chilli crop

Satish Tirkey, Ashwani Kumar, Tripti Sahu, Vikki Dada Patel and Shashi Ekka

Abstract
Experiment were carried out under field conditions at the at Central research farm, SHUATS, Naini, Allahabad during *kharif* season of July to November 2016 revealed that among the seven different chemical insecticidal treatment, Among all the treatments Thiomethoxam 25 WP recorded highest reduction of *Scirtothrips dorsalis* population *i.e*. (84.14%) which was significantly superior over control followed by Spinosad 45 EC (80.77%), Fipronil 5 EC (76.71%) *var*. Abamactin 1.8 EC (70.97%), Imidacloprid 17.8 SL (65.12%), Profenophos 50 EC (60.47%) and Cypermethrin 25 EC was least effective among all the treatments. Among all treatments, the highest percent increase in yield over control was obtained from plots treated with Thiomethoxam 25 WP (198.64 q/ha), followed by Spinosad 45 EC (194.23 q/ha). 34.46%), The C: B ratio for all treatments was analyzed and found to be highest in case of Thiomethoxam 25 WP (1:9.09) whereas the lowest in case of Cypermethrin (1:6.59).

Keywords: Chilli thrips, insecticides, efficacy, yield, C:B ratio

Introduction
Chilli (*Capsicum annuum* L.) is an important crop due to its nutritional and medicinal values of the fruits. These are the excellent source of colours and antioxidants compounds, a wide spectrum of antioxidant and capsaicinods are present in chilli fruits. In India chilli crop was grown as cash crop.

The area occupied in India is 7.43 L ha in which the production is 14.53 L tons (Agricultural Statistics at a glance 2015) [1]. Uttar Pradesh occupy about 1.8 thousand ha area with 1.7 thousand tones production. The area occupied in Allahabad region is 2455 ha and the production is 2993 tones (Rai and Pandey 2007) [12].

Chilli crop is usually heavily infested by various insect pests. Insect pest problem is most important constraint for Chilli production. A total of 57 species insect and mite pests were recorded damaging Chilli (Puttaswamy, 1984) [11]. The yield range Sucking pest complex of Chilli include thrips, *Scirtothrips dorsalis* Hood, yellow mite, *Polyphagotarsonemus latus* (Banks) and aphid, *Aphis gossypii* Glover. The various factors are responsible for low yield of Chilli among which, insect and mite pest are of prime importance which significantly affects both the quality and production of chilli. The yield losses range from 50-90 per cent due to insect pest of chilli (Nelson and Natrajan, 1994 and Kumar, 1995) [8, 5].

Among the various factors responsible for low yield of chilli, the insect pests are of prime importance. Of these, Thrips (*Scirtothrips dorsalis* Hood) are considered the most destructive pest in Uttar Pradesh. Both nymph and adult of thrips rasp on terminal auxiliary tender shoot and suck the oozing cell sap from tender leaves, growing shoots, flowers and fruits. The economic yield loss was noticed to the extent of 11 to 32% (quantitative) and 88% (qualitative) in chilli. Many conventional insecticides are being used to manage this pest. Because of development of many fold resistance to existing insecticides, it has become difficult to manage this pest. Considering the above facts, studies were carried out to evaluated the some never molecules of insecticides to test their efficacy against thrips infesting chilli.

The present agricultural scenario in India indicates that it is very difficult to manage insect pests without use of chemical pesticides. However, we can at least minimize the use of chemical pesticides for producing healthy and good quality crop.

Keeping in these view, studies were carried out to evaluate the newer chemical insecticides Imidacloprid, Cypermethrin, Spinosad, Thiomethoxam, Fipronil, Abamectin and Profenophos pesticides for management of thrips infesting Chilli.

Materials and Methods

Experimental setup

The present investigation was conducted at the Agricultural Research Farm of "Sam Higginbottom University of Agriculture, Technology and Sciences" Allahabad, Uttar Pradesh during *Kharif* season, 2016. The research farm is situated on the right side of Allahabad Rewa road at 20 degree and 150 North, 600 East longitude cities and is about 129.2 cm above sea level. The site selected will uniform, cultivable with typical sandy loam soil having good drainage. In the experiment, the variety under supervision 'Suryamukhi' was grown for this study. Seedlings of Chilli variety-Suryamukhi. Seed rate 1-1.5kg/ha. The seedlings of the 35 days were transplanted. Row to row and plant to plant spacing will 45 X 30 cm. will be maintaine between bedlings. The experiment was laid out in a randomized block design with seven treatments (including control) and three replications.

Preparation and application of treatments

There was seven numbers of treatment *viz*. Imidacloprid 17.8 SL, Cypermethrin 25 EC, Spinosad 45 SC, Thiomethoxam 25 WP, Fipronil 5 SC, Abamactin 1.8 EC, Profenofos 50 EC, with one control plot (sprayed with normal water). The desired doses of insecticides were added in water and mix well before spraying. The first spraying of treatment were done when thrips population started crossing ETL level at about 27-30 days after transplanting and second spraying was done with the help Hand compression sprayer during evening hours when the air drift was less.

Observation and analysis of data

The incidence of Chilli thrips was recorded from the five randomly selected plants. Observations were recorded one day before spray and 3rd, 10th days after spraying. Observations were recorded at each plot five plants were selected and tagged further; detailed observations were made at weekly intervals on the incidence of thrips. The population of thrips, were recorded from three leaves one each from the upper, middle and lower position on five selected plants. The population was recorded under stereo binocular microscope on 2 × 2cm leaf bit area. Per cent the population reduction of different treatments was calculated by using (Henderson and Tilton 1955) formula describe as under:

Per cent reduction= {1-Ta X Cb/ Tb X Ca} X 100

Where,

Ta = Number of insects in treated plot after insecticides application

Tb = Number of insects in treated plot before insecticides application

Ca = Number of insect in untreated check after insecticide application

Cb = Number of insect in untreated check before insecticide application

The per cent reduction was transformed to angular values from which analysis of variance was for determining critical difference (CD) at 5 per cent 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 obtain are presented in table 1 (Overall mean 1st and 2nd spray). The incidence of chilli thrips was recorded from the five randomly selected plants. Observations were recorded one day before spray and 3rd, 10th 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. Economics of different were worked out based out based on yield and cost of treatments. The value of insecticides cost-benefit ratio obtained for different treatments are furnished in table 2.

For yield estimation

The red-ripe matured chilli fruits were harvested plot wise which were weighed manually by machine. The recorded weight was converted from kg/ha to t/ha. Rate of treatment yield over control increments were calculated by using the following formula (Tehri and Gulati 2014) [15].

$$\% \text{ increase in yield over control} = \frac{\text{Yield in treatment} - \text{Yield in control}}{\text{Yield in control}} \times 100$$

Benefit cost ration (BCR)

Treatment wise yield of healthy marketable fruits was recorded at each picking converted them in kg/ha and data thus obtained were statistically analyzed. Economics of different were worked out based out based on yield and cost of treatments. The value of insecticides cost-benefit -ratio obtained for different treatments are furnished in table 2.

Benefit cost ration (BCR)

The marketable yield obtained from different treatments was collected separately and weighed. The cost of chemical insecticides was included in the expenditure during *kharif* season of 2016. Expenses for the production were for treatments, sprayer rent and labour charge for the spray. Total income will be calculated by multiplying the yield per hectare by the current market price; while the net benefit is measured by subtracting the total cost of plant protection from total income. Benefit over the control for each sprayed treatment was counted by subtracting the income of the control treatment from that of each sprayed treatment (Ngbede *et al*., 2014) [9]. The B:C ratio can by calculated by formula-

$$\text{BCR} = \frac{\text{Net returns}}{\text{Cost of treatment}}$$

Where-

BCR = Benefit Cost Ratio

Results and Discussion

The data presented in table 1 on per cent population reduction of *Scirtothrips dorsalis* over control on first and second spray revealed that all the treatments were significantly super superior to control. among all the treatments Thiomethoxam 0.2ml/l recorded highest reduction of *Scirtothrips dorsalis* population *i.e*. (84.14%) which was significantly superior over control followed by Spinosad 0.3ml/l (80.77%), Fipronil 2ml/l (76.71%) *var*. Abamactin 1ml/l (70.97%), Imidacloprid

0.2ml/l (65.12%), Profenophos 2ml/l (60.47%) and Cypermethrin 1.8ml (43.97%) was least effective among all the treatments. All the treatments were found to be significantly superior over control. Thiomethoxam was more effective in percentage reduction of thrips with (84.14%) reductions over control. similar finding made by Mandi and Senapati (2009) they reported that Thiomethoxam was found most effective in reducing the population of *Scirtothrips dorsalis* as well as in increasing yield. Ghosh *et al.,* (2009) [2] reported that Thiomethoxam was most effective reduce the thrips population and also increased the yield of green chilli. Jadhao *et al.,* (2015) [4] reported the results revealed that spinosad 45 SC @ 0.018% was found most effective to reduce the thrips population (67.3%) and it gave highest marketable green chilli yield (9.98 t/ha). Prasad and Ahmad (2009) [10] reported that Spinosad was effective against reducing the population of *Scirtothrips dorsalis.* Meena and Raju (2014) [7] reported that Fipronil 5% SC was most effective treatment of percent reduction of chilli thrips. Sumitha *et al.,* (2008) [14] reported that Fipronil 5 SC @ 0.01% was most effective against reducing the population of *Scirtothrips dorsalis.*

Table 1: Mean efficacy of treatments against Chilli thrips (*S. dorsalis*) on Chilli during -*kharif* season of 2016 (Overall mean).

Tr. No	Treatments	% Reduction over control population of *Scirtothrips dorsalis*		
		1st Spray Mean	2nd Spray Mean	Overall Mean
T_1	Imidacloprid 17.8 SL	63.34	66.91	65.12
	(0.2ml/lit)	(52.73)	(54.88)	(53.08)
T_2	Cypermethrin 25 EC	41.85	46.10	43.97
	(1.8ml/lit)	(40.30)	(42.76)	(41.53)
T_3	Spinosad 45 SC	81.57	79.98	80.77
	(0.3ml/lit)	(64.57)	(63.42)	(63.99)
T_4	Thiomethoxam 25 WP	84.22	84.06	84.14
	(0.2ml/lit)	(66.59)	(66.46)	(66.53)
T_5	Fipronil 5 SC	76.34	77.08	76.71
	(2ml/lit)	(60.89)	(61.39)	(61.14)
T_6	Abamactin 1.8 EC	68.19	73.75	70.97
	(1ml/lit)	(55.66)	(59.17)	(57.39)
T_7	Profenophos 50 EC	57.08	63.86	60.47
	(2ml/lit)	(49.07)	(53.04)	(51.04)
T_0	Control	0.00	0.00	0.00
		(0.00)	(0.00)	(0.00)

Figures in parenthesis are arc sin transformed values

Table 2: Economics of Cultivation

Tr. No.	Treatment	Yield q/ha	Cost of yield Rs/q	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	170.98	1500	256470	31185	2100	33285	223185	1:7.70
T_2	Cypermethrin	145.54	1500	218310	31185	1920	33105	185205	1:6.59
T_3	Spinosad	194.23	1500	291345	31185	3800	34985	256360	1:8.32
T4	Thiomethoxam	198.64	1500	297960	31185	1560	32745	265215	1:9.09
T_5	Fipronil	190.56	1500	285840	31185	1820	33005	252835	1:8.66
T_6	Abamactin	184.32	1500	276480	31185	2200	33385	243095	1:8.28
T_7	Profenophos	156.85	1500	235275	31185	2000	33185	202090	1:7.08
T_0	Untreated/Control	90.34	1500	135510	31185	0.00	31185	104325	1:4.34

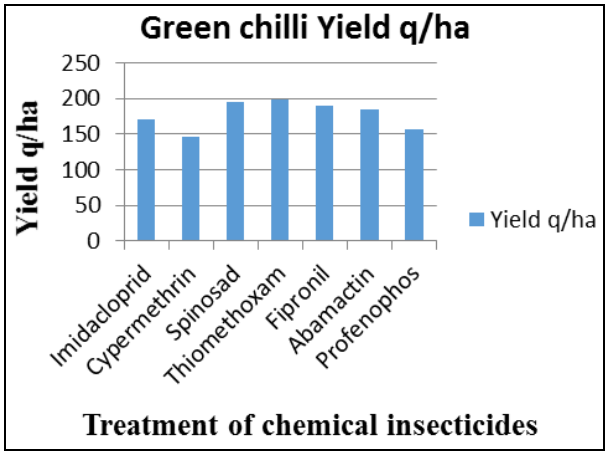

Fig 1: Effect of treatment on production of green Chilli during *kharif* season of 2016

The yields among the treatment were significant. The highest yield was recorded in Thiomethoxam 0.2ml/Lit. (198.64 q/ha), followed by Spinosad 0.3ml/Lit (194.23 q/ha), Fipronil 2ml/Lit. (190.56 q/ha), Abamactin 1ml/Lit. (184.32 %), Imidacloprid 0.2ml/Lit. (170.98 q/ha), Profenophos 2ml/Lit (156.85 q/ha) and Cypermethrin 1.8ml/Lit. (145.54 q/ha), as compared to control T_0 (90.34 q/ha).When cost benefit ratio was worked out, interesting result was achieved. Among the treatment studied, the best and most economical treatment was Thiomethoxam 0.2ml/Lit. (1:9.09) followed by Fipronil 2ml/Lit. (1:8.66), Spinosad 0.3ml/Lit. (1:8.32), Abamactin 1ml/Lit. (1:8.28), Imidacloprid 0.2ml/Lit. (1:7.70), Profenophos 2ml/Lit. (1:7.08) and Cypermethrin 1.8ml/Lit. (1:6.59) as compared to control T_0 (1:4.34). Higher yield (198.64 q/ha) and higher cost benefit ratio of 1:12.22 was obtained from Thiomethoxam treated plots and the lowest (90.34 q/ha) in control plot and proved to be best among treatments. Mandi and Senapati (2009) reported that Thiomethoxam was found most effective in reducing the population of *Scirtothrips dorsalis* as well as in increasing yield. Reported that application of Spinosad 45 SC @ 0.01 percent recorded the highest yield (30050 kg ha-1).

Conclusion

The use of chemical insecticides is more effective than other methods for the management of chilli thrips. The main purpose of this research is to find out the performance of chemical insecticides and cost of benefit ratio. For this, seven different insecticides were used for thrips management. In which Thiomethoxam 25 WP (84.77%) thrips population reduction was recorded in all treatments. After this 80.77% thrips population reduction of Spinosad 45 SC treatment was recorded. The lowest Cypermethrin 25 EC (43%) thrips population reduction has been recorded.

In all treatment, the cost of benefit ratio has been analyzed, in which the highest Thiomethoxam 25 WP (1:9.09) and lowest Cypermethrin 25 EC (1:6.59) have been recorded. The highest treatment of all chemical insecticides has recorded a thrips population reduction of Thiomethoxam 25 WP (84.14%). Thus, Thiomethoxam 25 WP is the best superior treatment for thrips management.

References

1. Agricultural Statistics at a glance, 2015. http/: www.agricoop.nic.in
2. Ghosh A, Chatterjee ML, Chakraborti K, Samanta A. Field Evaluation of Insecticides against Chilli thrips *Scirtothrips dorsalis* (Hood). Annals Plant Protection Science. 2009; 17: 69-71.
3. Henderson CF, Tilton EW. Tests with acaricides against the brow wheat mite. Journal Economic Entomology. 1955; 48:157-161.
4. Jadhao AV, Patil SK, Kulkarni SR. Evaluation of insecticides against Chilli thrips, *Scirtothrips dorsalis* (Hood). Annals Plant Protection Science. 2016; 24(1):27-30.
5. Kumar NKK. Yield loss in chilli and sweet pepper due to *Scirtothrips dorsalis* Hood. (Thysanoptera: Thripidae). Pest Management Horticulture Ecosystem. 1995; 1(2):61-69.
6. Mandi N, Senapati AK. Integration of chemical botanical and microbial insecticides for control of thrips, *Scirtothrips dorsalis* (Hood) infesting Chilli. Journal of Plant Protection Sciences. 2009; 1(1):92-95.
7. Meena LK, Raju SVS. Bio-efficacy of insecticides against whitefly and leaf hopper of tomato under field conditions. Annals of Plant Protection Science. 2014; 22:14-17.
8. Nelson SJ, Natarajan S. Economic threshold level of thrips in Semi-dry Chilli. South Indian Horticulture. 1994; 42(5):336-338.
9. Ngbede SO, Nwanguma EI, Ibekwe HN, Onyegbule UN, Okpara SC, Uwalaka OA. Cost: benefit analysis of botanical insecticides use in watermelon production in Okigwe, Southeastern Nigeria. International Journal of Scientific & Technology Research. 2014; 3(9):16-18.
10. Prasad N, Khalid A. Efficacy of Spinosad 45 SC against thrips *Scirtothrips dorsalis* (Hood) and pod borer, *Spodoptera exigua* (Hubner) on Chillies. Pesticide Research Journal. 2009; 21(1):49-51.
11. Puttaswamy, Studies on the ecology of *Tetranychus ludeni* Zacher (Acari: Tetranychidae) and its interaction with predator, *Typhlodromus tetranychus* Gupta (Acari: Phytoseiidae). Ph.D., Thesis, University Agriculture Sciences, Bangalore (India), 1984.
12. Rai M, Pandey AK. Towards a rainbow revolution. The Hindu Survey of Indian Agriculture, 2007, 112-119.
13. Ravikumar A, Chinniah C, Manisegaran S, Irulandi S, Mohanraj P. Effect of biorationals against the thrips, *Scirtothrips dorsalis* (Hood) infesting chilli. International Journal Plant Protection. 2016; 9(1):158-161.
14. Sumitha ND, Jagginavar SB, Patil DR, Kambrekar DN. Management of thrips complex in grape ecosystem. Annals Plant Protection Science. 2008; 16:83-86.
15. Tehri K, Gulati R. Field efficacy of some biorationals against the two spotted spider mite *Tetranychus urticae* Koch (Acari: Tetranychidae). Journal of Applied and Natural Sciences. 2014; 6(1):62-67.