Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
www.entomoljournal.com
JEZS 2020; 8(4): 669-673

Received: 22-05-2020
Accepted: 24-06-2020

Kotresh S
Department of Agriculture Entomology and Zoology, Institute of Agricultural Sciences, Banaras Hindu University, Uttar Pradesh, India

Dr. Raghuraman M
Department of Agriculture Entomology and Zoology, Institute of Agricultural Sciences, Banaras Hindu University, Uttar Pradesh, India

Srushtideep A
Department of Agriculture Entomology and Zoology, Institute of Agricultural Sciences, Banaras Hindu University, Uttar Pradesh, India

Corresponding Author:
Kotresh S
Department of Agriculture Entomology and Zoology, Institute of Agricultural Sciences, Banaras Hindu University, Uttar Pradesh, India

Management of chilli thrips using newer formulations

Kotresh S, Dr. Raghuraman M and Srushtideep A

Abstract
Chilli (*Capsicum annuum* L.) native of Mexican region which is an important part of world and Indian culinary. It has therapeutic uses. India is chief grower and exporter of chilli in world. The present research was held at vegetable research farm, Institute of agricultural sciences, Banaras Hindu University, Varanasi. o study "management of thrips of chilli (*Capsicum annuum* L.) with newer combination product*"*. The newer molecules used to determine bio-efficacy of thrips are spirotetramat, fenpropathrin and diafenthiuron along with combination of spirotetramat + diafenthiuron in different doses, it was observed that (spirotetramat 30g/l +diafenthiuron 120 g/l w/v SC) @ (75+300) g a.i./ha, reduced 65.73% of thrips population. Along with bio-efficacy of insecticide, its yield treatment wise found that the plot treated with spirotetramat + diafenthiuron @ (75+300) g a.i./ha gave maximum yield 4.35 tonnes/ha and about 39.04% increase in yield compared to untreated plot. These combination products can be used in the insect pest management programme of chilli.

Keywords: Chilli, thrips, spirotetramat, diafenthiuron, fenpropathrin, bio-efficacy

Introduction
Chilli *Capcicum annuum* L is one of the most cultivated vegetable crop across the globe which is a undivided component in culinary world, it not only known for its spiciness but also the medicinal values, which act as anti-inflammatory also it used in self defense sprays [1, 2]. It is observed that many insect pest species attack the chilli crop along with the non-insect pests like mite, pests can comprise about 77% of losses among which 34% loss is caused by thrips and mites combined [3].

Chilli thrips *Scirtothrips dorsalis* Hood (Insecta: Thysanoptera: Thripidae) is a important pest in various vegetables, fruits and ornamental crops of southern and eastern Asia. It's believed that chilli thrips have originated from either Southeast Asia or from India. These are small sized (< 2mm) size and are swift in there movement which make it hard to identify them in natural vegetation, the eggs are laid in the leaf tissue and the egg stage lasts for one week, these qualities increase the chances of transportation of thrips to other lands via plant material. Chilli thrips are pale in colour the length of 1st instar is about 0.37-0.39 mm, pupae measures about 0.78-0.8 mm and adults are around 1.2 mm long. More than 100 specious of genus *Scirtothrips* have been reported worldwide among these 10 are known as sever threat to agricultural production [4].

Thrips has piercing and sucking type of mouth part which help them to lacerate the epidermal tissue of plant leaf which leads to necrosis. Thrips create damaging feeding scars, distortion of leaves and discoloration of buds, thrips feed on the tender plant parts above the ground. Usual symptoms of thrips damage are silvering of leaf surface, linear thickening of leaf lamina, necrotic spots on leaves and tender fruits, fruit distortion and early senescence of leaves. These are vector for many viral diseases in plants like chilli leaf curl virus, groundnut necrosis virus, tobacco streak virus, melon yellow tospovirus, watermelon silver mottle virus, and capsicum chlorosis virus [5].

Main objective of research is to find bio-efficacy of newer insecticide combination on thrips of chilli. Hence protective measures at right time can avoid such huge losses, there is always need of newer insecticides as many old insecticides either banned due to their long residue effect or harmful to human health or the pest may grow resistance to it The trail was more concentrated on the efficacy of the newer molecules in potentiation mixture in different concentration and the individual trails on thrips (*Scirtothrips dorsalis*) on chilli crop (*Capsicum annum* L.).

Materials and Method

The experiment was conducted during academic year 2018-19 at vegetable research farm, Institute of Agricultural Science, Banaras Hindu University, Varanasi. The experiment was done in a randomized block design. The trail was more concentrated on the efficacy of the newer molecules from Bayer company like spirotetramat (15.31% OD) in potent mixture with diafenthiuron (50% WP) in various concentration viz.(45+180), (60+240), (75+300), along with fenpropathrin (30% EC).

The experimental plot was added with FYM @ 150-200 quintals thoroughly and mixed well in the soil 15-20 days before sowing and 56cm of spacing is used between ridges and furrows. The 40-45 days samplings are transplanted after irrigating the furrows.

Table 1: Details of layout plan of the experiment

Sl. No.	Particular	Details
1	Design of experiment	RBD
2	No. of treatments	7
3	No. of replications	3
4	Plot size (net)	2.9×3.4 m
5	Distance between replication	1 m
6	Distance between plot to plot	0.40
7	Irrigation channel (width)	1m
8	Block border space	1 m
9	Row to row spacing	56cm
10	Plant to plant spacing	56cm

Chilli seeds (*Capsicum annum* L.) verity Kashi Anmol were raised in the nursery of the vegetable research farm, BHU, Varanasi. Forty two day old seedling were transplanted in well prepared main field of 56X56 cm spacing, before transplanting the seedling were treated with Bavistin (Carbendazim) 0.1% solution to protect from the initial fungal damage to the seedling.

The fertilizer used are Urea, Single Super Phosphate (SSP) and Muriate of Potash (MOP) are applied according to recommended dose of 60 kg N, 75 Kg P_2O_5 and 60 Kg K_2O / ha. Nitrogenous fertilizer was applied in three split doses. At the time of transplantation one-third of the urea, total dose of SSP and total dose of MOP were applied in all the plots as basal application. The remaining dose of nitrogen was applied in two splits in form of foliar application, one after first intercultural operation and second at 60 days after transplanting. After transplanting first irrigation was given, later at an interval of 10 days. Gap filling was done to maintain the plant population. Hand weeding was done at 20 and 40 days after transplanting. Weeding was done according to the crop season and hand hoeing was done at an interval of 20 and 45 days after transplanting. The spraying was done during evening hours with high volume knapsack sprayer (spray fluid 500 litres/ha approximately). The spraying was done when the mite population was at its peak i.e. at economic threshold level (ETL) and the crop was about the 2.5-month-old. During the time of spraying protective cloth, mask and gloves were used avoid the contact of chemicals drift from plot to plot. The spraying work was done just before the evening with minimal or zero drift to other plots. The amount of insecticide or proprietary ingredient required is calculated by using the following formula: -

A= B x C/D

Where: -

- A= Amount of pesticides in g/ml.
- B= Desired concentration.
- C= Amount of spray fluid required.
- D= per cent toxicant in formulation

The ANOVA of data recorded during the experiment was made for the insect pests under study and the calculated 'F' was compared with the tabulated 'F' at 5% level of significance. The significance of difference between treatments was judged by CD (Critical Difference) at 5% level of significance.

The data of percent reduction of mite population in field experiments after the spraying of chemicals were calculated into percent reduction by using following 'Henderson and Tilton formula'.

$$\text{corrected \%} = \left(1 - \frac{\text{n in C before treatment} * \text{n in T after treatment}}{\text{n in C after treatment} * \text{n in T before treatment}}\right) * 100$$

Where: n=population of pest C=control T= treatment

The percent reductions taken on insect population at various days were transformation of Arc Sine √ percentage.

Upper, middle and lower portion of the tagged plant and total of three leaves were collected from each plant that and total of 15 leaves collected from each plot for taking the observation. The collected leaves were kept in separate paper bags and brought to laboratory for further observation. The population comprised of eggs mass, alive adults and nymphal stages of mites and thrips. The population counted per single leaf area with the help of stereoscopic binocular microscope (LEICA EZ4) on pre-treatment, after 1, 3, 7, AND 10, days of spraying of chemicals.

Table 2: Bio-efficacy of newer molecules against *Scirtothrips dorsalis after* first insecticidal spray during Rabi 2018-19.

Sl. No.	Treatments	Dosage (g a.i./ha.)	Pre-count (thrips/leaf)	Mean % reduction of Thrips at Different Days After 1st Insecticidal Spray				% reduction mean
			1DBS	1DAS	3DAS	7DAS	10DAS	
1	Untreated control	0	6.84	-	-	-	-	-
2	Spirotetramat 30g/l +diafenthiuron 120 g/l w/v SC	45+180	4.64	71.78 (57.89)*	66.28 (54.48)	87.46 (69.23)	62.32 (52.11)	71.96
3	Spirotetramat 30g/l +diafenthiuron 120 g/l w/v SC	60+240	4.83	79.26 (62.89)	71.61 (57.78)	90.53 (72.05)	67.41 (55.17)	77.2
4	Spirotetramat 30g/l +diafenthiuron 120 g/l w/v SC	75+300	7	88.91 (70.52)	85.19 (67.34)	90.67 (72.19)	82.54 (65.27)	86.83
5	Spirotetramat 15.31% OD	75	3.5	46.38 (42.91)	39.73 (39.06)	60.73 (51.17)	33.2 (35.17)	45.01
6	Diafenthiuron 50% WP	300	6.08	74.01	72.52	81.63	70.63	74.7

				(59.33)	(58.36)	(64.6)	(57.16)	
7	Fenpropathrin 30% EC	75	4.28	52.76	43.55	61.88	40.78	49.74
				(46.56)	(41.28)	(51.85)	(39.67)	
S.Em. ±			NS	0.16	0.191	0.191	0.165	
C.D. at 5%			0.168	0.052	0.062	0.062	0.054	

* Figures in parenthesis are Arc Sine transformed values
DAS= Days after spraying
DBS= Days before spraying
NS : Non-significant

Table 3: Bio-efficacy of newer molecules against *Scirtothrips dorsalis* after second insecticidal spray during Rabi 2018-19

Sl. No.	Treatments	Dosage (g a.i./ha.)	Pre-count (thrips/leaf)	Mean % reduction of Thrips at Different Days After 2nd Insecticidal Spray				% reduction mean
			1DBS	1DAS	3DAS	7DAS	10DAS	
1	Untreated control	0	7.46	-	-	-	-	-
2	Spirotetramat 30g/l +diafenthiuron 120 g/l w/v SC	45+180	2.55	47.88	26.46	23.14	16.87	28.58
				(43.77)*	(30.95)	(28.74)	(24.24)	
3	Spirotetramat 30g/l +diafenthiuron 120 g/l w/v SC	60+240	1.72	65.2	41.82	36	22.88	41.47
				(53.83)	(40.28)	(36.86)	(28.57)	
4	Spirotetramat 30g/l +diafenthiuron 120 g/l w/v SC	75+300	1.33	70.48	44.97	37.18	25.87	44.62
				(57.07)	(42.09)	(37.56)	(30.56)	
5	Spirotetramat 15.31% OD	75	1.95	42.91	17.81	13.21	6.03	19.99
				(40.91)	(24.95)	(21.31)	(14.21)	
6	Diafenthiuron 50% WP	300	1.91	52.64	28.38	23.47	14.62	29.77
				(46.5)	(32.17)	(28.96)	(22.47)	
7	Fenpropathrin 30% EC	75	2.77	42.26	20.8	17.24	13.52	23.45
				(40.53)	(27.12)	(24.52)	(21.56)	
S.Em. ±			0.165	0.114	0.062	0.059	0.128	
C.D. at 5%			0.054	0.037	0.02	0.019	0.042	

* Figures in parenthesis are Arc Sine transformed values
DAS= Days after spraying
DBS= Days before spraying

Table 4: Overall efficacy of newer molecules against *Scirtothrips dorsalis* after two insecticidal spray during Rabi 2018-19.

Sl. No.	Treatments	Dosage (g a.i./ha.)	% mean reduction of Thrips		Overall % reduction of population
			1st spray	2nd spray	
1	Untreated control	0	-	-	-
2	Spirotetramat 30g/l +diafenthiuron 120 g/l w/v SC	45+180	71.96	28.58	50.27
3	Spirotetramat 30g/l +diafenthiuron 120 g/l w/v SC	60+240	77.2	41.47	59.34
4	Spirotetramat 30g/l +diafenthiuron 120 g/l w/v SC	75+300	86.83	44.62	65.73
5	Spirotetramat 15.31% OD	75	45.01	19.99	32.50
6	Diafenthiuron 50% WP	300	74.7	29.77	52.24
7	Fenpropathrin 30% EC	75	49.74	23.45	36.60

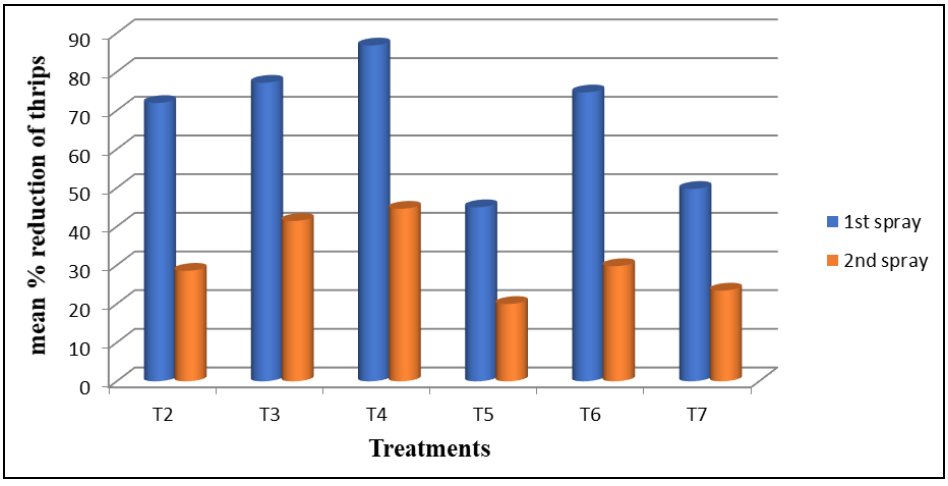

Fig 1: Mean percent reduction of *S. dorsalis* population after first and second spray during Rabi 2018-19.

Results and Discussion

There are few research works which show that newer molecules like fenpropathrin, diafenthiuron and spirotetramat gave a significant reduction in sucking pest population viz. thrips. Spirotetramat is reported to be active against piercing-sucking insects, by acting as an Acetyl CoA Carboxylase

inhibitor, interrupting lipid biosynthesis in the insects. It is a systemic insecticide that penetrates plant leaves and transported both upwards and downwards through vascular bundles/ Similarly, difenthiuron is a pro-insecticide, is converted to its active form. The active compound acts on a specific part of the energy-producing enzymes in the mitochondria, resulting in immediate paralysis of the pest after intake or contact with the product. The increased efficacy of the mixture may be attributed to the aforesaid facts [6-13]

Bio-efficacy of newer molecules on *Scirtothrips dorsalis* (first spray)

The result of experiment (table-2) reveals that after first day of application of insecticide, maximum reduction in thrips population was shown (spirotetramat 30g/l +diafenthiuron 120 g/l w/v SC) @ (75+300) g a.i./ha, and (spirotetramat 30g/l +diafenthiuron 120 g/l w/v SC@ (60+240) g a.i./ha. The insecticides were ranked as following order based on their overall performance in reduction of thrips population from chilli plant, after first spray (spirotetramat 30g/l +diafenthiuron 120 g/l w/v SC) @ (75+300) g a.i./ha > (spirotetramat 30g/l +diafenthiuron 120 g/l w/v SC@ (60+240) g a.i./ha. > diafenthiuron 50% WP @ 300 g a.i./ha > (spirotetramat 30g/l +diafenthiuron 120 g/l w/v SC) @ (45+180) g a.i./ha > (fenpropathrin 30% EC) @ 75 g a.i./ha > (spirotetramat 15.31% OD) @ 75 g a.i./ha. The study on efficacy of insecticide against chilli mite *Scirtothrips dorsalis* on chilli crop indicates that, the maximum mean per reduction of chilli was occurred when treated with (spirotetramat 30g/l +diafenthiuron 120 g/l w/v SC) @ (75+300) g a.i./ha, (86.83%), and (spirotetramat 30g/l +diafenthiuron 120 g/l w/v SC) @(60+240) g a.i./ha (77.2%), diafenthiuron 50% WP @ 300 g a.i./ha (74.7%), (spirotetramat 30g/l +diafenthiuron 120 g/l w/v SC) @ (45+180) g a.i./ha (71.96%), Moderate control or reduction in population was obtained with application of (fenpropathrin 30% EC) @ 75 g a.i./ha (49.74%), and spirotetramat 15.31% OD @ 75 g a.i./ha (45.01%) and the experiment also revealed that, the decrease in chilli thrips population by the chemicals is statistically significant at 5 per cent probability level in comparison to control.

Bio-efficacy of newer molecules on *Scirtothrips dorsalis* (second spray)

Maximum reduction in thrips population (table-3) was shown (spirotetramat 30g/l +diafenthiuron 120 g/l w/v SC) @ (75+300) g a.i./ha, and (spirotetramat 30g/l +diafenthiuron 120 g/l w/v SC@ (60+240) g a.i./ha. The insecticides were ranked as following order based on their overall performance in reduction of thrips population from chilli plant, after first spray (spirotetramat 30g/l +diafenthiuron 120 g/l w/v SC) @ (75+300) g a.i./ha > (spirotetramat 30g/l +diafenthiuron 120 g/l w/v SC@ (60+240) g a.i./ha. > diafenthiuron 50% WP @ 300 g a.i./ha > (spirotetramat 30g/l +diafenthiuron 120 g/l w/v SC) @ (45+180) g a.i./ha > (fenpropathrin 30% EC) @ 75 g a.i./ha > (spirotetramat 15.31% OD) @ 75 g a.i./ha. The study on efficacy of insecticide against chilli mite *Scirtothrips dorsalis* on chilli crop indicates that, the maximum mean per reduction of chilli was occurred when treated with (spirotetramat 30g/l +diafenthiuron 120 g/l w/v SC) @ (75+300) g a.i./ha, (44.62%), and (spirotetramat 30g/l +diafenthiuron 120 g/l w/v SC) @ (60+240) g a.i./ha (41.47%), diafenthiuron 50% WP @ 300 g a.i./ha (29.77%), (spirotetramat 30g/l +diafenthiuron 120 g/l w/v SC) @ (45+180) g a.i./ha (28.58%), Moderate control or reduction in population was obtained with application of (fenpropathrin 30% EC) @ 75 g a.i./ha (23.45%), and spirotetramat 15.31% OD @ 75 g a.i./ha (19.99%) and the experiment also revealed that, the decrease in chilli thrips population by the chemicals is statistically significant at 5 per cent probability level in comparison to control.

Overall impact of newer insecticides in per cent reduction of chilli thrips

When we compare percent reduction of thrips population with different insecticidal concentration treatments (table-4) (figure-1) after first and second spray during *Rabi* 2018-19 it was observed that (Spirotetramat 30g/l +diafenthiuron 120 g/l w/v SC) @ (75+300) g a.i./ha, and (Spirotetramat 30g/l +diafenthiuron 120 g/l w/v SC) @ (60+240) g a.i./ha were 65.73% and 59.34% overall percent reduction respectively. Both of the treatments found to be effective in both first and second spray.

Conclusion

Yield plays an major role in agricultural production, and it noted that pest incidence causes up to 40% of yield loss if not managed properly in time hence timely spraying can save from huge loss occurring. Along with bio-efficacy of insecticide we also noted its yield treatment wise and found that the plot treated with spirotetramat + diafenthiuron @ (75+300) g a.i./ha gave maximum yield 4.35 tonnes/ha and about 39.04% increase in yield compare to that of noncontrolled plot. It state that spirotetramat, fenpropathrin and diafenthiuron used in their studies help increasing yield to a significant level. Due to the potentiation effect of the mixture, which significantly suppressed the pest population, and conversely increased the chilli yield.

References

1. Dasgupta, Reshmi R. Indian chilli displacing jalapenos in global cuisine – The Economic Times. The Times of India, 2011.
2. Kosuge S, Inagaki Y, Okumura H. Studies on the pungent principles of red pepper. Part VIII. On the chemical constitutions of the pungent principles. Nippon Nogei Kagaku Kaishi (J. Agric. Chem. Soc.), 1961; 35:923-927.
3. Ahmed K, Mohamed MG, Murthy NSR. Yield losses due to various pests in hot pepper. *Capsicum* Newsletter. 1987; 6:83-84.
4. Maity C, Santra A, Mandal L, Mondal P. Management of chilli thrips with some newer molecules of chemicals. International Journal of Bio-resource, Environment and Agricultural Sciences, 2015; 1(3):119-125.
5. Jeyarani S, Chandrasekaran M. Bioefficacy of certain acaricides against chilli mite, *Polyphagotarsonemus latus* (Banks). Agricultural Science Digest. 2006; 26(2):132-134.
6. Nagaraj T, Sreenivas AG, Patil BV, Nagangoud A. Preliminary evaluation of some new molecules against thrips *Scirtothrips dorsalis* hood and *Polyphagotarsonemus latus* banks mites in chilli under irrigated ecosystem. Pest Management in Horticultural Ecosystems, 2007, 13(2).
7. Sujay YH, Giraddi RS, Udikeri SS. Efficacy of New Molecules and Botanicals against Chilli (*Capsicum annuum* L.) Pests. Madras Agricultural Journal, 2015,

102.
8. Sarkar PK, Timsina GP, Vanlaldiki H, Chakraborty S. Arylpyrrole acaro- insecticide chlorfenapyr-a tool for managing yellow thrips *Scirtothrips dorsalis* Hood) and broad mite (*Polyphagotarsonemus latus* Banks) of chilli. Journal of Crop and Weed. 2013; 9(1):188-192.
9. Samanta A, Sen K, Basu I. Incidence study of yellow mite and thrips and their natural enemies in relation to weather parameters on chilli. Journal of Entomology and Zoology Studies. 2017; 5(4):1213-1216.
10. Patil VM, Patel ZP, Gurav SS, Patel RK, Thorat SS. Bioefficacy of various insecticides against chilli thrips (*Scirtothrips dorsalis* Hood International Journal of Chemical Studies. 2018; 6(1):313-316.
11. Roy D, Sarkar PK. Field evaluation of new generation insecto-acaricides against thrips, yellow mite and fruit borer complex of Chilli. Annals of Plant Protection Sciences. 2017; 25(1):66-73.
12. Nagaraj T, Sreenivas AG, Patil BV, Nagangoud A. Preliminary evaluation of some new molecules against thrips *Scirtothrips dorsalis* hood and *Polyphagotarsonemus latus* banks mites in chilli under irrigated ecosystem. Pest Management in Horticultural Ecosystems, 2007, 13(2).
13. Brück E, Elbert A, Fischer R, Krueger S, Kühnhold J, Klueken AM *et al*. Movento ®, an innovative ambimobile insecticide for sucking insect pest control in agriculture: biological profile and field performance. Crop Protection. 2009; 28(10):838-844.