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Field efficacy of selected insecticides and botanicals against chilli thrips, *Scirtothrips dorsalis* (Hood) under field conditions

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Abstract
The present investigation was conducted at the research plot of the Department of Agricultural Entomology at Central Research Farm (CRF), Sam Higginbottom University of Agriculture Technology and Sciences, Prayagraj during the *Kharif* season of 2023-24. The experiment was conducted in Randomized Block Design (RBD) with three replications eight treatments, were evaluated against *Scirtothrips dorsalis ie*, (T_1) Spinosad 45% SC 0.3 ml/ha, (T_2) Diafenthiuron 47.8% SC 1 ml/lit, (T_3) Azardirachtin 1% 3 ml/l, (T_4) Nisco sixer plus 2 ml/lit, (T_5) Imidacloprid 17.8% SC 1 ml/lit, (T_6) Abamectin 2 ml/ha, (T_7) Fipronil 5% SC 1 ml/ha, untreated control (T_0) were evaluated against chilli thrips (*Scirtothrips dorsalis*). Among the insecticides evaluated, (T_5) Imidacloprid (0.47) proved to be most effective treatments followed by Spinosad 45% SC 0.3 ml/ha (0.68), Abamectin 0.9 ml/ha, (0.76), Fipronil 5% SC 2 ml/ha (1.25), Diafenthiuron 47.8% SC 1 ml/lit (1.53), Nisco sixer plus 2 ml/lit (1.84) and Azardirachtin 1% 3 ml/lt (2.26). The plots treated with T_5 Imidacloprid showed highest yield (130 q/ha) followed by Spinosad (125 q/ha), Abamectin (110 q/ha), Fipronil (100 q/ha), Diafenthiuron 47.8% SC (75 q/ha) as compared to control T_0 (45 q/ha). When cost benefit ratio worked out, interesting result was achieved, among the treatment studied, the best and most economical treatment Imidacloprid 17.8 SL (1:10.65) followed by Spinosad 45% SC (1:10.35), Abamectin (1:9.02), Fipronil (1:8.19), Diafenthiuron 47.8% SC (1:7.45). Nisco sixer plus (1:7.01), Azardirachtin 1% (1:6.13) as compared to control to (1:3.40).

Keywords: *Capsicum annum*, cost–benefit ratio, efficacy, insecticides, *Scirtothrips dorsali*

Introduction
Chilli (*Capsicum annuum*: Solanaceae) is one of the most important profitable spices crop grown all over India (Sarkar *et al*., 2014) [11]. It is an important condiment used for imparting pungency and colour to the food being rich in vitamin A, B, C, oleoresin and red pigment (Hossain *et al.,* 2020) [3]. The Indian chilli is considered to be world famous for two important commercial qualities namely, its colour and pungency levels (Balraj and Arockiasamy, 2018) [1]. The world production of chilli crop to around 7 million tones, which is cultivated on 1.5 million hectares of land. India is the world leader in chilli production followed by China and Pakistan (Balraj and Arockiasamy, 2018) [1]. In India, chilli is cultivated in an area of 7.67 lakh hectares and the production is estimated at 12.34 lakh tones (Priyadarshini *et al*., 2019) [7].

The thrips was first collected by Ramakrishna Ayyar on shoots and fruit of chilli in Coimbatore (India) in 1916 and sent to Hood, who described it is a new species in 1919 under the name of *Scirtothrips dorsalis* Hood. Since then, there has been no nomenclatural change for this insect. It has been called thrips (Sujay *et al.,* 2015) [10], Dreaded chilli thrips, scab thrips of grape (Prathyusha *et al.,* 2018) [6], Assam thrips or tea thrips or chilli thrips.

The pest spectrum of chilli crop is complex with more than 293 insects and mite species debilitating the crop in the field as well as in storage. One of the practical means of increasing chilli production is to minimize losses caused by major sucking pests like aphid *(Aphis gossypii* Glover) and thrips (*Scirtothrips dorsalis* Hood) (Maity *et al*., 2014) [4].

Economic yield loss due to these pests may be 11-75% quantitatively and 60-80% qualitatively in the event of serious infestation, The yield loss due to chilli thrips is estimated to be to the tune of 50-90 percent (Priyadarshini *et al.* 2019) [7].

In recent years, various types of insecticides belonging to different chemical group were used as spray to manage the pest complex. Sometimes we don't know about best insecticide for thrips control, so best one can be identified for the management of thrips in chilli by potential evaluation of few selected insecticides through their comparative effectiveness. The insecticide gives the instant relief to the crop from pest. Chemicals are also a part of integrated pest management and are apply when the population of pest reaches up to ETL.

Materials and Methods

The experiment was carried out at Sam Higginbottom University of Agriculture, Technology and Sciences, Central Research Fram (CRF) in Naini, Prayagraj, Uttar Pradesh. The research field is located around 98 m above mean sea level on the right side of Rewa road at 25º22' 15'.888" North Latitude and 81º51' 31.4712" East Longitude. Prayagraj experiences a typical subtropical climate, similar to that of the eastern region of Uttar Pradesh. Eight distinct treatments were arranged in a Randomized Block Design (RBD) during the *kharif* of 2023-2024, with three replications of each treatment. The plot measured 2x 1 m^2. The "Suvarna" type of chilli seeds were sowed on plots with a 45x30 cm gap between rows and plants.

All the insecticides employed in the experiment were applied as foliar spray. The treatments employed in the trial were (T_1) Spinosad 45% SC 0.5 ml /ha, (T_2) Diafenthiuron 47.8% SC 1 ml/lit, (T_3) Azardirachtin 1% 3 ml / lit, (T_4) Nisco sixer plus 2 ml/lit, (T_5) Imidacloprid 17.8% SC 1 ml/lit, (T_6) Abamectin 0.9 ml/ha, (T_7) Fipronil 5% SC 2 ml/ha, and untreated control T0. During the experiment, two sprays were performed at 15 days intervals to evaluate pesticides efficacy when the thrips population reached the ETL threshold.

The insect population was counted from randomly 5 selected plants in every plot and population per 5 plants was noted. After that mean of three replications was calculated for each treatment and the same was done with the untreated plot. The population of thrips was recorded prior to one day of spraying, as well as on the third, seventh, and foueteenth days following insecticide application. Healthy cobs were harvested and their weight from each treatment was expressed as marketable yield in quintal per hectare. Finally, the cost benefit ratio was estimated using the current market price of yield, pesticides, and spraying costs (Sarkar *et al*., 2014) [11].

$$\text{B: C Ratio} = \frac{\text{Gross returns}}{\text{Total cost incurred}}$$

(Priyadarshini *et al.* 2019) [7]

Results and Discussion

The results (Table-1) after the first and second sprays demonstrated that all treatments were significantly superior to the control. The data on the lowest mean population of thrips population on the third, seventh, and fourteenth days following the initial spray demonstrated that all chemical treatments outperformed the control group significantly. The treatments with the lowests thrips population were Imidacloprid 1 ml/ lt recorded effective in controlling larval of thrips population *ie*., (0.47) which was significantly superior over control followed by Spinosad 45% SC 0.3 ml/lt (0.68), Abamectin 0.9 ml/lt (1.25), Fipronil 5% SC 2 ml/lt (0.76), Diafenthiuron 47.8% SC 1 ml/lt (1.53), Nisco sixer plus 2 ml/lt (1.84) and Azardirachtin 1% 3 ml/l (2.26) was least effective among all the treatments.

The yields of the treatments varied significantly. The highest yield was recorded in The yields among the treatments were significant. The highest yield yield was recorded in Imidacloprid (130 q/ha), Spinosad followed by (118 q/ha), Abamectin (110 q/ha), Fipronil (100 q/ha), Diafenthiuron (90 q/ha), Nisco sixer plus (85 q/ha), and Azardirachtin (75 q/ha) as compared to control T0 (45 q/ha). When cost benefit ratio was worked out, interesting result was achieved.

Among the treatments studied, the best and economical treatment was Imidacloprid (1:10.65), followed by Spinosad (1:10.35), Abamectin (1:9.020), Fipronil (1:8.19), Diafenthiuron 47.8% SC (1:7.45), Nisco sixer plus (1:7.01), Azardirachtin 1% (1:6.13)) as compared to control T0.

All the treatments were found to be significantly superior over control. Imidacloprid was more effective in controlling larval population of thrips with (0.47) reductions over control. Similar finding made by Patel *et al.* (2017) [5] Tripati *et al.* (2018), Sahu and Kumar (2018) [13] and Yadav and Tayde (2020) reported the results revealed that Imidacloprid was found most effective in controlling larval population @0.55/plant and it gave highest marketable green chilli yield. Sandeep *et al.* (2017) and Sangle *et al.* (2017) [14] reported that Spinosad found to be best effective in controlling larval population of chilli thrips Vanisree *et al.* (2017) [15], Maity *et al.* (2015) [4] and Barot *et al.* (2012) [2] they reported that Abamectin and Fipronil was effective in controlling larval population of *Scirtothrips dorsalis 82.43%* as well as in increasing yield which is similar to present.Tirkey and kumar, (2017) [16] and Sujay, (2015) [10] that all the treatments were significantly superior over control among all the treatments Nisco sixer plus and Azardirachtin 1% was recorded larval population of *Scirtothrips dorsalis* population *ie.* 1.41 mean thrip population per plant.

Higher yield (130 q/ha) and higher cost benefit ratio of (1:10.65) was obtained from Imidacloprid treated plots and the lowest (45 q/ha) in control plot and proved to be best among treatments. Similar finding made by Lakshmi and kumar, (2021) [8] reported that Spinosad was most effective in reducing the population of *Scirtothrips dorsalis* as well as in increasing yield with benefit cost ratio (1:11.36). Patel *et al.* (2019) [7] reported that application of Spinosad recorded the highest yield with B:C ratio (1:11.55).

Table 1: Effect of selected insecticides and botanicals against chilli thrips, *Scirtothrips dorsalis* (Hood) 1st and 2nd spray:

S. No.	Treatments	Dosage	Population of *S. dorasalis*/ 3 leaves										Pooled mean	Yield (q/ha)	C:B Ratio
			First spray					Second spray							
			1 DBS	3 DAS	7 DAS	14 DAS	Mean	1 DBA	3 DAS	7 DAS	14 DAS	Mean			
T_1	Spinosad 45% SC	03 ml/l	8.20	0.80	0.60	0.59	0.66	0.59	0.66	0.46	1.00	0.706	0.68	118	1:7.46
T_2	Diafenthiuron 47.8% SC	1 ml/l	8.46	1.60	1.53	1.40	1.51	1.40	1.40	1.40	1.86	1.55	1.53	90	1:5.53
T_3	Azardirachtin 1%	3 ml/l	8.40	2.40	2.0	2.25	2.22	2.25	2.20	1.93	2.80	2.31	2.26	75	1:4.08
T_4	Nisco sixer plus	2 ml/l	8.66	2.00	1.60	1.86	1.82	1.86	1.80	1.53	2.26	1.86	1.84	85	1:4.84
T_5	Imidacloprid 17.8% SL	1 ml/l	8.46	0.53	0.40	0.47	0.46	0.47	0.46	0.26	0.73	0.48	0.47	130	1:8.06
T_6	Abamectin 1.9 EC	0.9 ml/l	8.93	1.00	0.80	0.93	0.91	0.93	0.93	0.73	1.40	1.02	1.25	110	1:6.72
T_7	Fipronil 5% SC	2 ml/L	8.26	1.20	1.00	1.06	1.08	1.06	1.13	0.93	1.60	1.22	0.76	100	1:6.17
T_8	Control	….	9.00	10.9	10.11	12.00	11.33	12.00	13.00	15.00	16.4	14.91	13.12	40	1:2.05
	F-test		NS	S	S	S	S	S	S	S	S	S	S		
	S. ED (±)		0.184	0.267	0.244	0.214	0.142	0.214	0.74	0.90	0.56	0.29	0.71		
	C.D. (P = 0.5)		0.55	0.81	0.74	0.358	0.583	0.358	2.24	2.75	1.70	0.90	1.69		

DBS** - Day Before Spray**, DAS*** - Day After Spray***

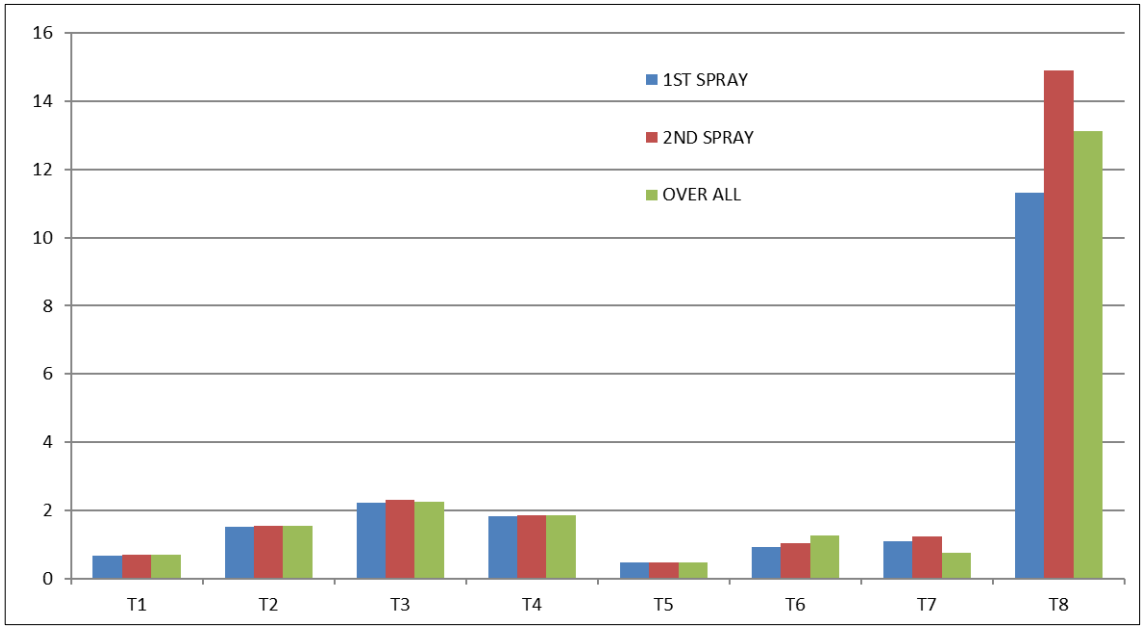

Fig 1: Effect of Insecticides and botanicals against on overall mean larval population *Scirtothrips dorsalis* of on chilli

Conclusion

From the above discussion it was found that, spraying of insecticides significantly reduced the thrips population in chilli. The present findings conclude that the new generation insecticides like**,** It is concluded among all the treatment all the treatments Imidacloprid 0.15 ml/lt recorded effective in controlling larval of thrips population. Which was significantly superior over control followed by Spinosad 45% SC 0.3 ml/l, Abamectin 0.9 ml/lt, Fipronil 5% SC 2 ml/l, Diafenthiuron 47.8% SC 1 ml/l, Nisco sixer plus 2 ml/l and Azardirachtin 1% 3 ml/l was least effective among all the treatments..lt was also effective in managing the *Scirtothrips dorsalis*. Recommended dose of chemicals may be useful in devising integrated pest management strategy against chilli thrips.

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