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Efficacy of selected insecticides against chilli thrips (*Scirtothrips dorsalis* Hood)

Madhu Thuppukonda and Ashwani kumar

Abstract
A field trail was conducted at the Central Research Field (CRF), Department of Entomology, SHUATS, Prayagraj during *Kharif* 2021 with an investigation entitled "Efficacy of selected insecticides against chilli thrips (*Scirtothrips dorsalis* Hood)'' Seven treatments were evaluated against *Scirtothrips dorsalis*, i.e., Acetamiprid 20% SP (T1), Imidacloprid 70% WG (T2), Azadirachtin 1% EC (T2), Thiamethoxam 25% WG (T3), Fipronil 5% SC (T4), Diafenthiuron 50% WP (T5), Indoxacarb 14.5 SC (T6), Neem oil 1500ppm (T7) and untreated Control (T8) were evaluated against chilli thrips (*Scirtothrips dorsalis*). Results revealed that, Among the different treatments, the lowest per cent population reduction of chilli thrips was recorded in Imidacloprid 70% WG (94.523%) followed by acetamiprid 20% SP (92.313%), Indoxacarb 14.5 SC (90.98%). It is followed by Fipronil 5% SC (88.57%) and Diafenthiuron 50% WP (85.92%), Thiamethoxam 25% WG (84.40%) and Neem oil 1500ppm (81.78%) was the least effective among all treatments. While, the highest yield 130.4 q/ha was obtained from the treatment Imidacloprid 70% WG as well as B:C ratio 1:10.64 was obtained high from this treatment. It was followed by acetamiprid 20% SP (1:10.08), Indoxacarb14.5 SC (1:9.16), Fipronil 5% SC (1:8.45), Diafenthiuron 50% WP (1:7.32), Thiamethoxam 25% WG (1:6.97), Neem oil 1500ppm (1:5.64), as compared to Control (1:3.41).

Keywords: Acetamiprid, benefit cost ratio, imidacloprid, insecticide

Introduction
Chilli (*Capsicum annuum* L.) is one of the most important spice as well as vegetable crop of India belongs to the family solanaceae which represents a diverse plant group. The genus name *Capsicum* is derived from the Latin word '*capsa*' meaning chest or box because of the shape of fruit which encloses seeds very neatly, as in the box (Berke and Shieh, 2000) [4].
Chilli is valued for its characteristic pungency due to the oleoresin Capsaicin' (a volatile alkaloid and its acridity is due to Capasicin) contained in the skin and the septa of the fruit. It is also valued for colour and aroma. It is one of the chief sources of vitamin A, C, E, oleoresin and red pigment. Chilli is also known to have medicinal value, as it prevents heart attack by dilating the bloo The world area and production of chilli is around 14 lakh ha and 71 lakh tone, respectively (Kraft *et al.*, 2014) [6].
India is the largest producer and largest consumer of chilli in the world. In India, chilli is cultivated over an area of 775 thousand ha during 2014 with an annual production of 1492 million tones green chillies. It is the most common spice cultivated in all States and Union Territories of India contributing about 36% to the world total production. Andhra Pradesh is the largest chilli producer in India followed by Maharashtra, Karnataka other states contributing nearly 22% to the total area under chilli cultivation. (Anonymous, 2014) [2].
In India, total area and production of chilli is 9, 21, 610 Ha and 21, 49, 230 MT in the year of 2019-2020. Uttar Pradesh occupy an area of 16,780 ha and production of 14,390 MT. (Source: Horticulture Statistics Division, Department of Agriculture, Coopn & Farmers Welfare). The area occupied in Prayagraj is 2,455 ha and the production is 2,715.2 MT. (Satish *et al.*, 2017) [18].
Nearly 25 insects have been recorded attacking chilli in India. The major pests are aphids. *Myzus persicae* Sulzer: *Aphis gossypi* Glover; Whitefly, *Bemisia tabaci* (Genn.): thrips, *Scirtothrips dorsalis* (Hood): yellow mite, *Polyphagotarsonemus latus* Banks; fruit borer. *Helicoverpa armigera* (Hardwick) and leaf eating cater pillar. *Spodoptera litura* (Fab.). Of these, thrips, *S. dorsalis* (Thripidae: Thysanoptera) is considered as the most serious and important pest.

Both nymphs and adults of thrips cause damage by scraping the epidermis of the leaves and suck the cell sap from the leaves resulting in the margin of the leaves rolled upwards and the leaf size reduced (Rangarajan *et al*., 1973) [10]. The damage is resulted by desapping leading to crinkling and curling of leaves and loss of plant vigour. The incidence of thrips starts from nursery and continues till harvest of the produce (Kareem *et al.* 1977 and Saivaraj *et al.*, 1979) [1, 13]

Materials and Methods

The experiment was conducted during *kharif* season 2021 at Central Research Field (CRF) of Sam Higginbottom University of Agriculture, Technology and Sciences, Naini, Prayagraj, Uttar Pradesh, India, in a randomized block design with eight treatments replicated three times using variety G4, Surajmukhi seeds in a plot size of 2m×2m at a spacing of 45cm ×30cm with a recommended package of practices excluding plant protection. The soil of the experimental site was well drained and medium high

The observations on population of sucking pest was recorded visually using a magnifying lens early on three leaves at top, middle and bottom canopy from five randomly selected and tagged plants in each plot.

The populations was recorded a day before spray, 3, 7 and 14 days after the spray and the percent reduction was worked out using the formula.

$$\text{Percent reduction} = \frac{\text{Population in control} - \text{Population in treatment}}{\text{Population in control}} \times 100$$

The average percent reduction of pest population of all second sprays was worked out by using Henderson and Tilton formula described as under:

$$\text{Percent reduction} = 1 - \frac{Ta}{Tb} \times \frac{Cb}{Ca} \times 100$$

Where,

Ta = number of insects in treated plot after insecticides application

Tb=number of insects in treated plot before insecticides application

Ca= number of insects in Untreated check after insecticide application

Cb= number of insects in untreated check before insecticide application

(Patel, V.D. and Kumar, A. 2017) [11]

Benefit Cost Ratio

Benefit over the control for each sprayed treatment was obtained by subtracting the income of the control treatment from that of each sprayed treatment. The B:C ratio can be calculated by formula…

$$\text{BCR} = \frac{\text{Gross Returns}}{\text{Total Cost of Cultivation}}$$

(Kumar *et al.* 2017) [11]

Results and Discussion

Results revealed that, among the different treatments, the lowest per cent population reduction of chilli thrips was recorded in Imidacloprid 70% WG (94.523%) followed by acetamiprid 20% SP (92.313%), Indoxacarb 14.5 SC (90.98%). It is followed by Fipronil 5% SC (88.57%) and Diafenthiuron 50% WP (85.92%), Thiamethoxam 25% WG (84.40%) and Neem oil 1500ppm (81.78%) was the least effective among all treatments

The data on the mean per cent population reduction of first spray and second spray overall mean revealed that all the treatments except untreated control are effective and at par. Among all the treatments lowest per cent reduction of chilli thrips was recorded in Imidacloprid 70% WG (94.52%). Similar findings made by Nayak *et al*., (2014) [7], Sangle *et al.*, (2017) [15], Tripati and ashwani (2018) [20], Babu *et al*., (2021) [3] and Santharam *et al.*, (2003) [16]. Acetamiprid 20% SP (93.14%) is found to be the next best treatment which is in line with the findings of Samota *et al*., (2017) [17], Mandi and Senapati (2009) [9] they reported that Acetamiprid 20% SP was found most effective in reducing percent population reduction of *Scirtothrips dorsalis* as well as increasing the yield.

Indoxacarb 14.5 SC (90.98%) is found to be the next best treatment which is in line with the findings of Babu *et al*. (2021) [20]. Fipronil 5% SC (88.57%) is found to be the next effective treatment which is in line with the findings of Maity *et al*., (2015) [8], Tukaram *et al*., (2017) [21] and Diafenthiuron 50% WP (85.92%) is found to be the next effective treatment which is in line with the findings of Pathipati *et al*. (2018) [12]. The result of Thiamethoxam 25% WG (84.40%) which is in support with Sujay *et al.*, (2015) [19], Satish and Ashwani (2017) [18], Samota *et al*., (2017) [17]. Neem oil 1500ppm (81.78%) is found to be least effective but comparatively superior over the control, these findings are supported by Barot and patel (2012) [5].

To evaluate the efficacy of selected insecticides against chilli thrips, *Scirtothrips dorsalis* (Hood). (First spray)

Table 1: To evaluate the efficacy of selected insecticides against chilli thrips, *Scirtothrips dorsalis* (Hood). (First spray)

S. No	Treatments	Population of *S. dorsalis* / 3 leaves	Percent population reduction of *S. dorsalis* / 3 leaves			
		One day Before spraying	3DAS	7DAS	10DAS	Mean
T1	Acetamiprid 20% SP	9.066	93.11	93.54	90.29	92.313
T2	Imidacloprid 70% WG	8.8	95.85	94.12	93.60	94.523
T3	Thiamethoxam 25% WG	8.466	84.74	78.21	80.11	81.020
T4	Fipronil 5% SC	8.733	89.55	86.29	86.57	87.470
T5	Diafenthiuron 50% WP	8.866	81.92	82.42	84.51	82.950
T6	Indoxacarb 14.5% SC	8.466	91.63	91.20	88.86	90.563
T7	Neem oil 1500 ppm	8.733	79.18	76.31	75.32	76.937
T8	Control	9.333	0	0	0	0.000
	F-test	NS	S	S	S	S
	S. Ed. (±)	0.27	1.83	2.17	2.01	1.28
	C.D. (P = 0.05)	____	3.918	4.658	4.319	2.743

To evaluate the efficacy of selected insecticides against chilli thrips, *Scirtothrips dorsalis* (Hood). (Second spray)

Table 2: To evaluate the efficacy of selected insecticides against chilli thrips, *Scirtothrips dorsalis* (Hood). (Second spray)

S. No	Treatments	Population of *S. dorsalis* / 3 leaves	Percent population reduction of *S. dorsalis* / 3 leaves			
		Before spraying	3DAS	7DAS	10DAS	Mean
T1	Acetamiprid 20% SP	12.267	95.56	93.85	92.48	93.963
T2	Imidacloprid 70% WG	12.933	96.07	94.11	93.25	94.477
T3	Thiamethoxam 25% WG	12.267	88.67	87.79	86.89	87.783
T4	Fipronil 5% SC	12.000	90.18	89.70	89.11	89.663
T5	Diafenthiuron 50% WP	12.800	89.17	88.73	88.78	88.893
T6	Indoxacarb 14.5 SC	12.333	92.67	91.26	90.26	91.397
T7	Neem oil 1500 ppm	12.733	86.72	87.01	86.12	86.617
T8	Control	13.133	0	0	0	0
	F-test	NS	S	S	S	S
	S. Ed. (±)	0.46	1.28	0.98	0.55	0.50
	C.D. (P = 0.05)	____	2.744	2.112	4.319	1.079

To evaluate the efficacy of selected insecticides against chilli thrips, *Scirtothrips dorsalis* (Hood). (Mean)

Table 3: To evaluate the efficacy of selected insecticides against chilli thrips, *Scirtothrips dorsalis* (Hood). (Mean)

S. No	Treatments	Percent Population Reduction (%)		
		First spray	Second spray	Mean
T1	Acetamiprid 20% SP	92.313	93.963	93.138
T2	Imidacloprid 70% WG	94.523	94.477	94.5
T3	Thiamethoxam 25% WG	81.020	87.783	84.401
T4	Fipronil 5% SC	87.470	89.663	88.566
T5	Diafenthiuron 50% WP	82.950	88.893	85.921
T6	Indoxacarb 14.5 SC	90.563	91.397	90.98
T7	Neem oil 1500 ppm	76.937	86.617	81.777
T8	Control	00	00	00
	F-test	S	S	S
	S. Ed. (±)	1.28	0.50	2.56
	C.D. (P = 0.05)	2.743	1.079	3.05

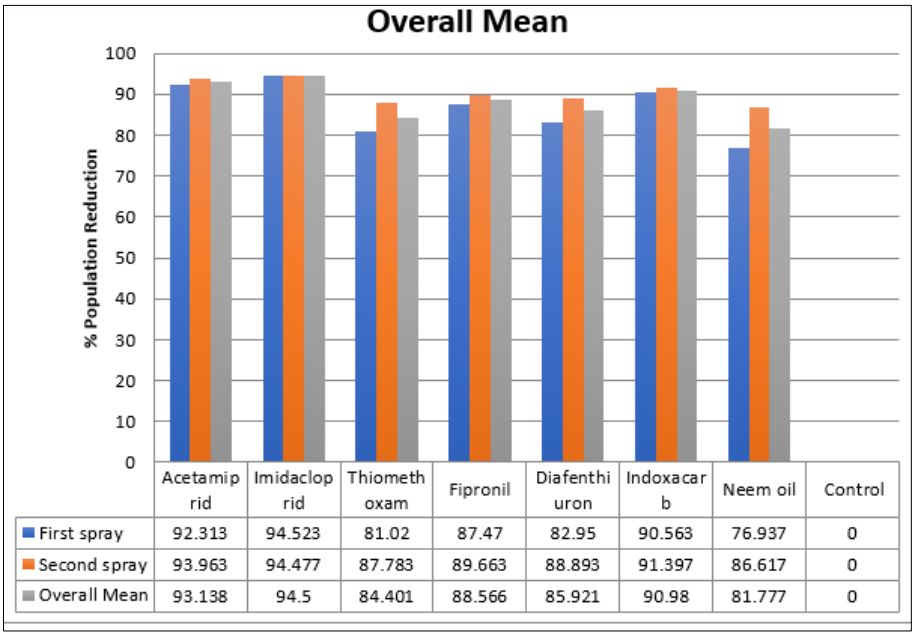

Fig 1: the efficacy of selected insecticides against chilli thrips, *Scirtothrips dorsalis* (Hood). (Mean)

Benefit cost ratio
Economics of treatments

Table 4: Economics of treatments

S. No	Treatments	Yield of q/ha	Cost of yield INR/qtl	Total cost of yield (INR)	Common cost (INR)	Treatment cost (INR)	Net return	Total cost (INR)	C:B ratio
1	Acetamiprid 20% SP	122.5	2500	306250	29,345	1040	275865	30385	1:10.07
2	Imidacloprid 70%WG	130.4	2500	326000	29,345	1304	295351	30649	1:10.64
3	Thiamethoxam 25% WG	84.7	2500	211750	29,345	1040	181365	30385	1:6.96
4	Fipronil 5% SC	103.6	2500	259000	29,345	1300	228355	30645	1:8.45
5	Diafenthiuron 50% WP	92.8	2500	232000	29,345	2360	200295	31705	1:7.31
6	Indoxacarb 14.5 SC	115.9	2500	289750	29,345	2300	258105	31645	1:9.16
7	Neem oil 1500ppm	69.2	2500	173000	29,345	1300	142355	30645	1:5.64
8	Control	40	2500	100000	29,345	0	70655	29345	1:3.41

Effect of different treatments on chilli yield of chilli thrips, *Scirtothrips dorsalis*

Economics of various treatments

The increased percent yield over control treatment was different. All the treatments were superior over control. The highest yield was recorded in Imidacloprid 70%WG (90.4 q/ha) followed by Acetamiprid 20% SP (82.5 q/ha), Indoxacarb 14.5 SC (75.9 q/ha), Fipronil 5% SC (63.6 q/ha), Diafenthiuron 50% WP (52.8 q/ha), Thiamethoxam 25% WG (44.7 q/ha), Neem oil 1500ppm (29.2 q/ha), as compared to control plot (40 q/ha).

When cost benefit ratio was worked out, interesting result was achieved. Among the treatments studied, the best and most economical treatment was Imidacloprid 70% WG (1:10.64) followed by Acetamiprid 20% SP (1:10.07), Indoxacarb 14.5 SC (1:9.15), Fipronil 5% SC (1:8.45), Diafenthiuron 50% WP (1:7.31), Thiamethoxam 25% WG (1:6.96), Neem oil 1500 ppm (1:5.64), as compared to Control (1:3.40).

When cost benefit ratio was worked out, interesting result was achieved. Among the treatments studied, the best and most economical treatment was Imidacloprid 70% WG (1:10.64) followed by Acetamiprid 20% SP (1:10.07), Indoxacarb 14.5 SC (1:9.15), Fipronil 5% SC (1:8.45), Diafenthiuron 50% WP (1:7.31), Thiamethoxam 25% WG (1:6.96), Neem oil 1500ppm (1:5.64), as compared to Control (1:3.40). The highest yield and cost benefit ratio was recorded in Imidacloprid 70% WG (130.4 q/ha & 1:6.02) followed by Acetamiprid 20% SP (122.5 q/ha & 1:10.08). These findings are supported by Sandeep *et al*. (2017) [14] and Samota *et al*. (2017) [17].

Conclusion: Result showed that among all the treatments T_2 Imidachlopride 70% WG recorded highest reduction of *Scirtothrips dorsalis* population *i.e.*, (94.5%) which was significantly superior over control followed by T_1 Acetamiprid 20% SP (93.1%) in controlling the chilli trips due to their mode of action compare to other selected insecticides.

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