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Evaluation of field efficacy of insecticides against brinjal thrips, *Thrips palmi* Karny

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Abstract
Field experiment on the efficacy of seven insecticides were conducted at Bihar Agricultural University Sabour, Bhagalpur against brinjal thrips, *Thrips palmi* Karny. It was found that all the insecticides showed significant reduction in infestation and increased yield. Thiacloprid 21.7% SC and Phorate 10% CG proved to be the most effective (88.62% and 83.35% in population reduction; 286.84 and 271.59 q ha-1 yield, respectively).

Keywords: *Thrips palmi* Karny, brinjal, insecticides, yield, phosphamidon, phorate, thiacloprid, chlorpyrifos, diafenthiuron and cypermethrin

Introduction
Brinjal, *Solanum melongena* Linn, is the most common vegetable crop of the family Solanaceae, grown in India. It is well known for its high medicinal as well as nutritional values. In India, it is grown over an acreage of 668.72 thousand hectares contributing 12,399.90 metric tonnes production with an average national productivity of 18.54 Mt/ha. In India, West Bengal, Andhra Pradesh, Bihar, Maharashtra and Uttar Pradesh were considered as major brinjal growing states among them the area under brinjal cultivation in Bihar is 58.20 thousand hectares which results in production of 1.148 thousand metric tonnes. Bihar ranks third in the production of brinjal in the country with average productivity of 19.74 Mt/ha (NHB Database, 2017) [10]. It is one the most-consumed vegetable in India, making it one of the main sources of cash for many farmers (Miller, 2007) [11]. Pest complex of brinjal is very high in Bihar and causes heavy yield loss and their control is very difficult. The crop is attacked by a number of insect pest *viz*., Brinjal shoot and fruit borer, Aphids, Jassids, Thrips etc. Among them, brinjal thrips, *Thrips palmi* is considerd as minor pest but its severe infestation has been detected on Solanaceae plants (eggplant, peppers and potato), Cucurbitaceae plants (cucumber, watermelon, cantloupe and squash) and Leguminosae plants (kidney, bean, broad bean, cowpea, soyabean and white clover) (Nakahara, 1984) [4]. In addition to the above host plants, *T. palmi* has been found on onion, cotton, avocado, citrus, peach, plum, muskmelon carnation and chrysanthemum in different countries (Ruhendi, 1979; Gutierrez, 1981; Wangboonkong, 1981; Yoshihara, 1982; Bournier, 1983) [5, 3, 6, 7, 2]. In addition, the melon thrips infests many weed species. Melon thrips feed on many hosts, included are over 50 plant species representing over 20 taxonomic families (Wang and Chu, 1986) [12]. The adults and larvae (nymphs) suck the plant sap mostly from foliage, sometimes on fruit. Heavy attacks lead to stunted leaf-growth, wilted shoots, reduced fruit size and in extreme cases, death of the plants which leads significant loss in yield. So, present study was under taken to evaluate the efficacy of different insecticides and manage the yield loss.

Materials and Methods
Field trial on efficacy of insecticides was conducted in randomised block design with seven treatments and three replications. The crop was sown on 03rd March, 2018 and raised as per the recommended package of practices. The plots were sprayed twice, first at 15 days after transplanting (13.05.2017) and second at 10 days after first spray (23.05.2017) with respective insecticides of which the details are as follow: Phosphamidon 40% SL (Kinadon plus) @ 250-300 a.i.(g)/ha, Phorate 10% CG (Hitatox) @ 1000 a.i.(g)/ha, Thiacloprid 21.7% SC (Alanto) @ 54-72 a.i.(g)/ha, Chlorpyrifos 20% EC (Lorsban®) @ 200 a.i.(g)/ha, Diafenthiuron 50%WP (Ujala) @ 300 a.i.(g)/ha and Cypermethrin 25% EC (Auzar) @ 35-50 a.i.(g)/ha. The observations on population of thrips were recorded at one day before and 3, 7 and 10 days after

each spray. The data on thrips population were recorded from five randomly selected plants in each plot by counting. In each plant 6 leaves were selected (covering 3 top and 3 middles). The data on yield were also recorded from each plot at different pickings and pooled all the picking and recorded as q/ha. Additionally, per cent increase in yield and percent reduction on incidence over control were also calculated. Data were subjected to ANOVA after transformation as Gomez and Gomez (1984) [9] with OPSTAT online statistical software package of Sheoran *et al*., 1998 [1]. The formulae used for calculating per cent increase in yield and per cent reduction in pest population are given below-

$$\text{Per cent increase in yield} = \frac{\text{Increased yield in treatment plot}}{\text{Yield in control plot}} \times 100$$

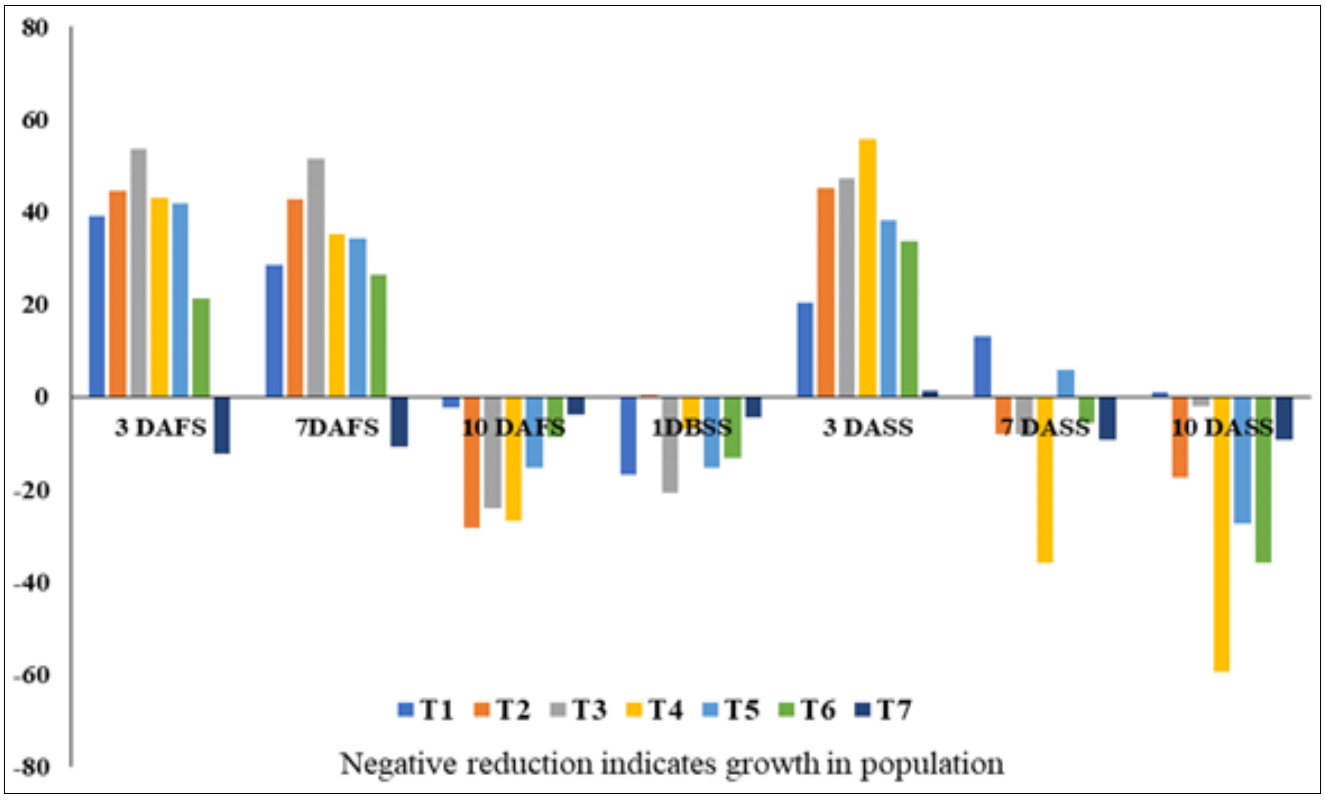
$$\text{Per cent reduction in population over control} = \frac{\text{Pest in control} - \text{Pest in treatment}}{\text{Pest in control plot}} \times 100$$

Results and Discussion

The data recorded on number of thrips during present investigation at pre and post spray periods are mentioned in table 1. Whereas, percent reduction in population during each spray is depicted in graph 1. The negative reduction in population of brinjal thrips, *Thrips palmi* indicates growth in population.

The data revealed that mean number of thrips before application of insecticides were not significantly different and were ranged between 7.22-8.15 thrips/6 leaves during the study. Three days after first spray of insecticides all the treatments were found to be significant in reducing the number of thrips population. Among them thiacloprid 21.7% SC @ 54-72 a.i.(g)/ha was found to be the most effective (53.58%) in populations reduction and were significantly different from other insecticides used. Whereas, Phorate 10% CG @ 1000 a.i.(g)/ha, Chlorpyrifos 20% EC @ 200 a.i.(g)/ha, Diafenthiuron 50%WP @ 300 a.i.(g)/ha, found to reduces the population of thrips by 42.72%, 43.01% and 41.76% respectively and were at par with each other. On the other hand, Cypermethrin 25% EC @ 35-50 a.i.(g)/ha was found to be least effective followed by Phosphamidon 40% SL @ 250-300 a.i.(g)/ha. Whereas, in untreated plot 12.36% increase in population of brinjal thrips had been observed. Similarly, 3 days after second spray, Chlorpyrifos 20% EC @ 200 a.i.(g)/ha, thiacloprid 21.7% SC @ 54-72 a.i.(g)/ha, Phorate 10% CG @ 1000 a.i.(g)/ha, Diafenthiuron 50%WP @ 300 a.i.(g)/ha, Cypermethrin 25% EC @ 35-50 a.i.(g)/ha and Phosphamidon 40% SL @ 250-300 a.i.(g)/ha were found be effective in reducing brinjal thrips by 55%, 47.29%, 45.06%, 38.20%, 33.81% and 20.49% respectively. Altogether, all the insecticides were found to be effect in reducing the thrips population over control in which thiacloprid 21.7% SC @ 54-72 a.i.(g)/ha (88.62%) was found to be most effective followed by Phorate 10% CG @ 1000 a.i.(g)/ha (83.35%). Whereas, Phosphamidon 40% SL @ 250-300 a.i.(g)/ha and Cypermethrin 25% EC @ 35-50 a.i.(g)/ha were at par with each and reduces the thrips population by 76.98% and 76.03% respectively. While, Chlorpyrifos 20% EC @ 200 a.i.(g)/ha (70.70%) was least effective.

Seal *et al*. (2012) [8] Spinosad provided high levels of control (80-95%) and was commonly used by the vegetable growers for the management of *T. palmi* in vegetable crops. Among the carbamates, formetanate hydrochloride was the most effective in providing highest level (85-98%) of *T. palmi* mortality, followed by methomyl and oxamyl. Seal *et al*. (1992) reported that abundance of thrips was low when combination of azinphos methyl and methomyl was rotated with abamectin (0.15 kg/ha) and formetanate hydrochloride (1 kg/ha).



Graph 1: Precent reduction in population of brinjal thrips after each spray

Table 1: Field efficacy of insecticides against thrips population on brinjal

Sl. No.	Population of Thrips (No.)										Reduction %	Yield (q/ha)	Increase in yield (%)
	Doses		First Spray				Second spray						
	a.i (gm)	Form. gm/ml	1 DBS	3 DAS	7 DAS	10 DAS	1 DBS	3 DAS	7 DAS	10 DAS			
Phosphamidon 40% SL	250-300	625-750	8.15 (3.02)	4.95 (2.43)	3.53 (2.12)	3.61 (2.14)	4.23 (2.27)	3.36 (2.08)	2.92 (1.97)	2.89 (1.95)	76.98	228.29	22.91
Phorate 10% CG	1000	10000	7.38 (2.89)	4.08 (2.25)	2.34 (1.82)	3.00 (1.99)	3.00 (1.98)	1.65 (1.62)	1.78 (1.65)	2.09 (1.71)	83.35	253.37	36.41
Thiacloprid 21.7% SC	54-72	225-300	7.31 (2.87)	3.39 (2.07)	1.64 (1.62)	2.03 (1.73)	2.46 (1.85)	1.30 (1.50)	1.40 (1.54)	1.43 (1.55)	88.62	268.62	44.62
Chlorpyrifos 20% EC	200	1000	7.68 (2.94)	4.38 (2.30)	2.84 (1.94)	3.6 (2.13)	3.85 (2.18)	1.70 (1.62)	2.31 (1.79)	3.68 (2.16)	70.69	209.29	12.68
Diafenthiuron 50%WP	300	600	7.96 (2.99)	4.64 (2.37)	3.05 (2.01)	3.52 (2.11)	4.07 (2.23)	2.51 (1.86)	2.36 (1.83)	3.01 (1.73)	76.03	220.2	18.55
Cypermethrin 25% EC	37-50	150-200	7.22 (2.86)	5.67 (2.58)	4.17 (2.27)	4.53 (2.33)	5.14 (2.46)	3.40 (2.08)	3.59 (2.13)	4.88 (2.41)	61.12	207.49	11.71
Untreated Control			7.9 (2.98)	8.88 (3.14)	9.83 (3.27)	10.20 (3.34)	10.66 (3.41)	10.52 (3.37)	11.4 (3.53)	12.5 (3.68)	-	185.73	
C.D.			N/A	0.392	0.379	0.459	0.52	0.474	0.432	0.484			
SE(m)			0.084	0.126	0.122	0.147	0.167	0.152	0.139	0.155			
C.V. %			4.933	8.893	9.776	11.312	12.33	13.026	11.63	12.03			

Effect on yield of brinjal after application of insecticides

Data on yield of different insecticides are presented in 1. The yield among the different treatments was found to be ranging from 185.73-268.62 q/ha. All the insecticides were found to be effective in increasing the yield over untreated check. Among the tested insecticides, thiacloprid 21.7% SC @ 54-72 a.i.(g)/ha registered the maximum yield (26.62 q ha-1) followed by Phorate 10% CG @ 1000 a.i.(g)/ha (257.37 q ha-1) with an incremental yield of 44.62% and 36.41% respectively. The moderate level of yield was obtained with Phosphamidon 40% SL @ 250-300 a.i.(g)/ha (228.29 q ha-1) with an increamental of 22.91%. Whereas, Cypermethrin 25% EC @ 35-50 a.i.(g)/ha (207.49 q ha-1; 11.71%) was found to be least effective in term of yield and percent increase in yield followed by Diafenthiuron 50%WP @ 300 a.i.(g)/ha (20.29 q ha-1; 18.55%) and Chlorpyrifos 20% EC @ 200 a.i.(g)/ha (209.29 q ha-1; 12.68%).

Conclusion

Among all the used insecticides thiacloprid 21.7% SC @ 54-72 a.i.(g)/ha was found to be most effective against thrips in brinjal followed by Phorate 10% CG @ 1000 a.i.(g)/ha. Whereas, Cypermethrin 25% EC @ 35-50 a.i.(g)/ha was least effective against brinjal thrips.

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