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RESEARCH ARTICLE

Bioefficacy of insecticides against sucking pests on soybean crop

■ HARISH KUMAR NETAM*[1] AND SUJEET SINGH KANWAR[2]

[1]Department of Entomology, Indira Gandhi Krishi Vishwavidyalaya, RAIPUR (C.G.) INDIA
[2]Department of Genetics and Plant Breeding, Indira Gandhi Krishi Vishwavidyalaya, RAIPUR (C.G.) INDIA

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*Corresponding author:
harish.netam15@gmail.com

ABSTRACT

A field experiment was laid out in Randomized Block Design with six treatments including untreated control replicated four times. This crop was sown on 4th July 2010 in plot size of 25 square meter. In this experiment numbers of sucking pests were counted on the randomly selected five plants on which five leaves were taken three from upper and two from bottom in each plot. Observations were recorded 24 hours before the spraying of insecticides and after 24 hours, 3 days, 5 days, 7 days and 10 days of spraying of insecticides. Thiacloprid 240 SC, when applied as foliar spray at the rate of 180 g a.i./ ha was most effective against the sucking pests with minimum 1.8 insects/ plant, highest grain yield of 32.4 q /ha, 42% avoidable losses and 1.74:1 benefit cost ratio. It was followed by Thiacloprid 240 SC @ 150 g.a.i./ha.

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INTRODUCTION

Soybean is a wonder crop of twentieth century. It is an excellent source of protein and oil. It is a two dimensional crop as it contains about 40-42 per cent high quality protein and 20-22 per cent oil. It also contains 20-30 per cent carbohydrates. The protein quality of soybean is equivalent to that of meat, milk products and eggs. Hence, it is well established fact that soybean is cheap source of protein and edible oil. These characteristics have made soybean to fit well in sustainable agriculture. During the late sixties and early seventies, the soybean crop was considered to be comparatively safe crop as regards to insect pest attack. As 275 insect species have been recorded attacking soybean crop in India. Researchers in many parts of India have confirmed that seed yield and seed quality are being adversely affected by major insect pests *viz.,* girdle beetle, tobacco caterpillar, green semilooper, *Helicoverpa armigera*, jassids and white fly.

MATERIALS AND METHODS

A Field experiment was laid out in Randomized Block Design with seven treatments including untreated control replicated four times. The crop was sown on 4th July, 2010 in plot size of 25 square meters. The crop management practices (*i.e.* field preparation, sowing, weeding, fertilizer application etc.) were adopted as per the recommended practices.

In this experiment, number of sucking pests was counted from five plants/plot at seven days interval starting from 30 days after sowing till harvest of the crop. To assess the efficacy of different insecticides against sucking pests in soybean crop, two sprayings were given by hand operated knapsack sprayer. Pre-treatment observations were recorded 24 hours before spaying and post treatment after 24 hours, 3 days, and 7 days of spraying. The observations were taken from top three leaves and two middle leaves of each plant. In this trial, the density of whiteflies was comparatively higher than that of jassids. The layout and other treatment details of this experiment are given in Table A.

Design : Randomized Block Design
Treatment : 6
Replication : 4
Plot size : 25 square meter

Table A: List of test insecticides against girdle beetle and sucking pests on soybean			
	Treatments	Dose (ml/ha)	Dose (ml/plots)
T_1	Untreated control	0	0
T_2	Thiacloprid 240 SC	500	5.00
T_3	Thiacloprid 240 SC	625	6.25
T_4	Thiacloprid 240 SC	750	7.50
T_5	Thiacloprid 240 SC	1500	15.00
T_6	Profenophos 50EC	2000	20.00
T_7	Triazophos 40 EC	625	6.25

Spacing between rows: 30 cm
Variety: JS-93-05.

RESULTS AND DISCUSSION

Bioefficacy evaluation of Thiacloprid 240 SC along with Quinalphos 25 EC, Profenophos 50 EC and Triazophos 40 EC as standard checks against sucking pests *viz.,* white fly and jassids on soybean crop was carried out during *Kharif*, 2010. Insect counts were recorded 24 hours before spray as pre-treatment and after 24 hours, 72 hours and 7days of spray as post-treatment observations. Observations were taken from the three top and two middle leaves of randomly selected five plants in each plot and presented in Table 1. It was noticed that the population of white flies was higher than that of jassids in the experimental field.

The sucking pest population in the pretreatment observation ranged from 23.8 to 26.8 pests per plant, it differed non-significantly among different treatments. After 24 hours of first spray, the sucking pests population in soybean crop ranged from 13.5 to 26.8 sucking pests per plant. The plot treated with Thiacloprid 240 SC @ 180 g a.i./ha with 13.5 sucking pests per plant was least infested by these pests. It was at par with Profenophos 50 SC @ 1000 g.a.i./ha and Thiacloprid 240 SC @ 150 g a.i./ha with 15.5 and 16.00 sucking pests/plant, respectively, but differed significantly from Triazophos 40 EC @ 250 g a.i./ha and Thiacloprid 240 SC @ 120 g a.i./ha with 17.6 and 21.4 sucking pests per plant and it was at par with

Table 1: Relative efficacy of thiacloprid 240 SC against *B. tabaci* and *E. kerri* on soybean during *Kharif*, 2010

Sr. No.	Treatments	Dose (g.a..i/ ha)	Mean population of sucking pests/ plant after 1st spray				2nd spray				Grain yield
			Pre-treatment 26.8.10	24 hr.	72 hr.	7days	Pre-treatment 18.9.10	24 hr.	72 hr.	7days	q/ha
1.	Untreated control	-	26.8 (5.4)	26.8 d (5.2)	24.6 c (5.0)	23.5 d (4.8)	18.6 (4.3)	19.0 d (4.4)	22.2 d (4.7)	18.3 d (4.2)	18.3 d
2.	Thiacloprid 240 SC	120	26.6 (5.2)	21.4 c (4.7)	19.4 c (4.7)	17.5 c (4.2)	14.5 (3.8)	11.6 bc 3.4	11.0 c	9.8 c (3.2)	21.4 c
3.	Thiaclopid 240 SC	150	25.0 (5.1)	16.0 ab (4.1)	8.0 ab (2.9)	3.5 a (2.0)	12.7 (3.6)	9.3 ab (3.1)	7.6 ab (2.8)	3.6 ab (2.0)	29.0b
4.	Thiacloprid 240 SC	180	24.5 (5.0)	13.5 a (3.7)	6.5 a (2.6)	2.2 a (1.6)	11.2 (3.4)	7.5a (2.5)	5.2 a (2.4)	1.8 a (1.5)	32.4 a
5.	Profenophos 50 EC	1000	24.2 (4.9)	15.5 ab (4.0)	12.2 b (3.5)	7.4 b (2.8)	13.4 (3.7)	9.0 ab (3.1)	6.7 ab (2.7)	2.8 ab (1.8)	28.2(1.8)
6.	Triazophos 40 EC	250	23.8 (4.8)	17.6 bc (4.2)	11.7b (3.4)	7.1 b (2.7)	15.3 (3.9)	12.2 c (3.5)	9.3 bc (3.1)	4.5 b (2.2)	26.6 b
C.D. at 5 %			NS	0.42	0.62	0.58	NS	0.39	0.52	0.65	3.3

Figures in parenthesis are under root transformed values, In a column, means followed by a common letter are not significantly different at 5 per cent level

Table 2: Assessment of avoidable losses and Benefit cost ratio due to *B tabaci* and *E. kerri* on soybean treated with different insecticides during *Kharif,* 2010

Sr. No.	Treatments	Dose (g a.i./ha)	Yield of controlled plot (Q/ha.)	Yield of untreated control plot (Q/ha.)	Actual increase in yield (Q/ha.)	Percentage increase in yield due to treatment	Avoidable loss (%)	Benefit cost ratio
1.	Thiacloprid 240 SC	120	21.4	18.6	2.8	15.06	13.08	1.15:1
2.	Thiaclopid 240 SC	150	29.0	18.6	10.4	55.91	35.86	1.55:1
3.	Thiaclopid 240 SC	180	32.4	18.6	13.8	74.19	42.49	1.74:1
4.	Profenophos 40 EC	1000	28.2	18.6	9.6	51.61	34.04	1.51:1
5.	Triazophos 40 EC	250	26.7	18.6	8.0	43.01	30.08	1.43:1

untreated control with 26.8 sucking pests per plant.

After 72 hours of first spray, the sucking pest population on soybean crop ranged from 6.5 to 24.6 sucking pests per plant. Thiacloprid 240 SC @ 180 g a.i./ha was most effective against the sucking pests with 6.50 sucking pests per plant. It was at par with the same insecticide when applied @ 150 g.a.i./ha but differed significantly from Profenophos 50 EC @ 1000 g a.i./ha and Triazophos 40 EC @ 250 g a.i./ ha with 12.2 and 11.7 sucking pests per plant, respectively. Thiacloprid 240 SC @ 120 g a.i./ha was least effective against the sucking pests and at par with untreated control with 24.6 sucking pests per plant.

After 7 days of first spray, the average sucking pest population on soybean crop ranged from 2.2 to 23.5 sucking pests per plant. Like the previous observations, Thiacloprid 240 SC @ 180 g a.i./ha with 2.2 sucking pest per plant continued to be most effective against the sucking pests. It was at par with Thiacloprid 240 SC @ 150 g a.i./ha with 3.50 sucking pests per plant, but differed significantly from Triazophos 40 EC @ 250 g.a.i./ ha and Profenophos 50 EC @ 1000 g.a.i./ha with 7.1 and 7.4 sucking pests per plant Thiacloprid 240 SC @ 120 g.a.i./ha with 17.5 sucking pests per plant was least effective among different insecticidal treatments but differed significantly from untreated control.

Twenty days after first spray, pre treatment observations were recorded which ranged from 11.2 to 18.6 sucking pests per plant, with non-significant differences among them. After 24 hours of second spray, the sucking pest population on soybean crop ranged from 7.5 to 19.0 sucking pests per plant. Plot treated with Thiacloprid 240 SC @ 180 g.a.i. /ha with 7.5 sucking pests per plant was least infested by sucking pests, it was at par with Thiacloprid 240 SC @ 150 g a.i./ha and Profenophos 50 EC @ 1000 g.a.i./ha with 9.3 and 9.0 sucking pests per plant. but differed significantly from Thiacloprid 240 SC @ 120 g.a.i./ha with 11.6 sucking pests per plant. Triazophos 40 EC @ 250 g.a.i. / ha with 12.2 insects per plant was least effective among all the treatments but varied significantly from untreated control.

After 72 hours of second spray, the sucking pest population on soybean crop ranged from 5.2 to 22.2 sucking pests per plant. Plot treated with Thiacloprid 240 SC @ 180 g a.i./ha with 5.2 sucking pests per plant was recorded least infested by sucking pests. It was at par with Thiacloprid 240 SC @ 150 g a.i./ha and Profenophos 50 EC @ 1000 g a.i./ha with 7.6 and 6.7 sucking pests per plant but differed significantly from Triazophos 40 EC @250 g.a.i./ha with 9.3 sucking pests/plant. Thiacloprid 240 SC @ 120 g.a.i./ha with 11.0 sucking pests/ plant was least effective against the sucking pests but varied significantly from untreated control.

After 7 days of second spray, the average sucking pest population on soybean crop ranged from 1.8 to 18.3 sucking pests per plant. Like the previous observations, Thiacloprid 240 SC @ 180 g.a.i./ha with 1.8 sucking pests per plant continued to be most effective against the sucking pests. It was at par with Thiacloprid 240 SC @ 150 g a.i./ha and Profenophos 50 EC @ 1000 g a.i/ha with 3.6 and 2.8 sucking pests per plant but differed significantly from Triazophos 40 EC @250 g a.i./ha with 4.5 sucking pests per plant. Thiacloprid 240 SC @ 120 g.a.i./ha with 9.8 sucking pests per plant was least effective among different insecticidal treatments but was significantly more effective than the untreated control (18.3 sucking pests/plant).

Yield recorded at harvest was subjected to statistical and economical analysis after converting these data from kg/ plot into q/ha. It revealed that Thiacloprid 480 SC, when applied at the rate of 180 g.a.i./ha, was most effective with 32.4 q/ha yield. There was 13.8q/ha increase in yield over untreated control which account for 74.19 per cent increase in yield with 42.49 per cent avoidable losses (Table 2). This treatment was significantly more effective than Thiacloprid 480 SC @ 150 g.a.i./ha, Profenophos 50 EC @ 1000 g.a.i/ha and Triazophos 40 EC @250 g.a.i./ha with 29.0, 28.2 and 26.6 q/ha yield, respectively. Thiacloprid 240 SC when applied at the rate of 120 g.a.i./ha was least effective with minimum 21.4 q/ha grain yield but was significantly superior over untreated control.

Thiacloprid 240 SC, when applied twice at the rate of 180 g.a.i./ha, was most economical with 1.74:1 benefit cost ratio and the same insecticide, when applied @ 120 g.a.i./ha with 1.15:1 benefit cost ratio, was least economical against sucking pests.

Shirale and Bidgire (2009) reported that two sprays of Triazophos were moderately effective against whiteflies. This is in agreement with the present finding where Triazophos produced 26.6 q/ha grain yield as compared to 32.4 q/ha in most effective treatment Thiacloprid 240 SC @180 g.a.i./ha and 18.3 q/ha in untreated control.

Venkatesan and Kundu (1994), however, reported Endosulphan effective against *Bemisia tabaci* recording highest grain yield among ten insecticides. Sutaria *et al.* (2010) observed Imidacloprid 0.01per cent most effective against jassids with highest net return.

Conclusion :

Thiacloprid 240 SC, when applied as foliar spray at the rate of 180 g a.i./ ha was most effective against the sucking pests with minimum 1.8 insects/ plant, highest grain yield of 32.4 q /ha, 42 per cent avoidable losses and 1.74:1 benefit cost ratio. It was followed by Thiacloprid 240 SC @ 150 g.a.i./ha.

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