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Evaluation of newer insecticides against stem fly in soybean

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Abstract

An experiment entitled “evaluation of newer insecticides against stem fly and girdle beetle in soybean” was conducted at College of Agriculture, Warora Dist. Chandrapur in Randomized Block Design with seven treatments and three replications. The insecticidal treatment viz., Chlorantraniliprole 18.5% SC, Thiacloprid 21.7% SC, Indoxacarb 15.8% EC, Beta cyfluthrin 8.49% + Imidacloprid 19.81% 300 OD, Thiamethoxam 12.6% + Lambda Cyhalothrin 9.5% ZC, Chlorantraniliprole 10% + Lambda Cyhalothrin 5% ZC including control were evaluated during *kharif* 2021. The results showed that treatment with spraying of Chlorantraniliprole 10% + Lambda Cyhalothrin 5% ZC @ 150 ml/ha found to be most effective in minimizing the stemfly infestation (1.65%), with maximum seed yield. Whereas, the highest incremental cost benefit ratio was obtained in treatment of Thiamethoxam 12.6% + Lambda Cyhalothrin 9.5% ZC @ 125 ml/ha (1:16.36) followed by Beta cyfluthrin 8.49% + Imidacloprid 19.81% 300 OD @ 350 ml/ha (1:11.12).

Keywords: Soybean, stem fly, girdle beetle, newer insecticides

Introduction

Soybean (*Glycine max*, L. Merrill) is one of the most important leguminous crops belonging to family Leguminosae syn. Fabaceae. The crop is in high demand all over the world because of its high oil (20%) and rich protein (40%) contents. Soybean has lush green, soft, succulent and nutritive dense foliage and is attacked by more than 273 types of insects from sowing till harvesting. Out of these, only two dozen insects are of economic importance causing serious losses. The stem fly (*Melanagromyza sojae*) and girdle beetle (*Obereopsis brevis*) are the main borers appearing on soybean crop. The stem fly attacks the soybean throughout the growing season, but the most vulnerable period is within three to four weeks after germination. The maggot may tunnel up to 70% of the stem length (Singh and Singh, 1990) [6] and may reduce the grain yield about 33% (Singh and Singh, 1992) [5]. A good amount of work has already been done on the seasonal activity and management of major pests of soybean with various group of insecticides, even though, pesticides are always center of controversy right from the beginning of their use due to problems like cost, pest resurgence, pest resistance, and contamination of environment (Parmar and Devkumar, 1993) [3], but still pesticides are the most potential tool for managing the insect pests. In recent years some major advances have been made in chemical control of insect pests due to manufacture of new insecticides belonging to new groups by different private companies.

Materials and Methods

A field trial with six different insecticides along with untreated control were carried out in Randomized Block Design with three replications, during *kharif* 2021 at Research Farm of Department of Agril. Entomology, College of Agriculture, Warora (Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola) -India for the management of stem fly on soybean. The seeds of soybean variety ‘JS-9305’ were sown in month of June in a plot size 6.0 x 4.5 m². with plant spacing 45 x 5 cm. Total four sprays were undertaken at an interval of 15 days starting from 21 days after sowing of the crop. The treatments are illustrated in (Table 1). In order to find out effective insecticide for control of stem fly on soybean, five spots were selected from each plot of one meter row length and seedling and tagged for recording the observations, damage due to stem fly was counted and percentage infestation was calculated. Pre-treatment observation on incidence of insect pests of soybean was recorded one day before treatment. Post treatment observations was recorded at 7 and 14 days after spraying. The yield data was recorded at the time of threshing. The cumulative per cent infestation of stem fly larvae per meter row length

(mrl) were worked out on the basis of average of all observations and economics of various treatments were also calculated.

Table 1: Treatment details

Sr. No.	Treatments	Trade name	Formulations ml/ha or gm/ha	Formulations ml/l or gm/l
T ₁	Chlorantraniliprole 18.5% SC	Coragen	150	0.3
T ₂	Thiacloprid 21.7% SC	Alanto	750	1.5
T ₃	Indoxacarb 15.8% EC	Ascend	333	0.6
T ₄	Beta cyfluthrin 8.49% + Imidacloprid 19.81% 300 OD	Solomon	350	0.7
T ₅	Thiamethoxam 12.6% + Lambda Cyhalothrin 9.5% ZC	Alika	125	0.25
T ₆	Chlorantraniliprole 10% + Lambda Cyhalothrin 5% ZC	Ampligo	250	0.5
T ₇	Untreated Control			

Results and Discussion

It is revealed from the pooled data (Table -2-3), that all the treatments were found significantly superior over untreated control.

The cumulative mean data shown in Table 2 clearly shows that the most effective treatment for minimising the stem fly infestation was Chlorantraniliprole 10% + Lambda Cyhalothrin 5% ZC @ 150 ml/ha recorded the lowest percent of infestation (1.65%). However, this treatment was Beta cyfluthrin 8.49% + Imidacloprid 19.81% 300 OD @ 350 ml/ha (2.30%). The treatment of Thiamethoxam 12.6% + Lambda Cyhalothrin 9.5% ZC @ 125 ml/ha (2.86%) was the next effective treatment, and it was on par with Chlorantraniliprole 18.5% SC @ 150 ml/ha (3.58%), Indoxacarb 15.8% EC @ 333 ml/ha (3.81%) and Thiacloprid 21.7% SC @ 750 ml/ha (4.05%). The untreated control group had a maximum percentage infestation of stem fly (10.82%). The present study revealed that among all the treatments Chlorantraniliprole 10% + Lambda Cyhalothrin 5% ZC @ 150 ml/ha was found superior which is in conformity with the findings of Kambrekar *et al.* (2020) [1]. The findings of Punithavalli and Sharma (2020) [4] revealed, Beta cyfluthrin

8.49% + Imidacloprid 19.81% 300 OD @ 350 ml/ha were highly effective against internal feeder girdle beetle, *Obereopsis brevis* and stem fly *Melanagromyza sojae* (Zehnt) in soybean under field conditions which support the present investigation.

Table 3 revealed that the treatment Thiamethoxam 12.6% + Lambda Cyhalothrin 9.5% ZC @ 125 ml/ha found to be most economical treatment with ICBR of (1:16.36) and net profit of Rs 65,302/ha followed by Beta cyfluthrin 8.49% + Imidacloprid 19.81% 300 OD @ 350 (1:11.12), Indoxacarb 15.8% EC @ 333 ml/ha (1:8.31), Chlorantraniliprole 10% + Lambda Cyhalothrin 5% ZC @ 150 ml/ha (1:8.27), Chlorantraniliprole 18.5% SC @ 150 ml/ha (1:5.06), Thiacloprid 21.7% SC @ 750 ml/ha (1:2.52). Present investigation of the research work is collaborated with the earlier finding Patel *et al.* (2019) [2] who reported that highest ICBR rank obtained in Thiamethoxam 12.6% + Lambda Cyhalothrin 9.5% ZC @ 125 ml/ha (1:10). The results on the influence of Beta cyfluthrin 8.49% + Imidacloprid 19.81% 300 OD @ 350 against the ICBR rank could not be compared due to want of literature.

Table 2: Cumulative effect of different treatments on per cent infestation of stem fly

Tr. No.	Treatments	7 DAS	14 DAS	Mean
T ₁	Chlorantraniliprole 18.5% SC	2.78 (1.66)	4.38 (2.09)	3.58 (1.89)
T ₂	Thiacloprid 21.7% SC	3.29 (1.80)	4.81 (2.19)	4.05 (2.01)
T ₃	Indoxacarb 15.8% EC	3.06 (1.73)	4.56 (2.14)	3.81 (1.95)
T ₄	Beta cyfluthrin 8.49% + Imidacloprid 19.81% 300 OD	1.62 (1.26)	2.98 (1.15)	2.30 (1.52)
T ₅	Thiamethoxam 12.6% + Lambda Cyhalothrin 9.5% ZC	2.26 (1.50)	3.47 (1.86)	2.86 (1.69)
T ₆	Chlorantraniliprole 10% + Lambda Cyhalothrin 5% ZC	1.17 (1.08)	2.14 (1.46)	1.65 (1.28)
T ₇	Control	10.04 (3.17)	11.60 (5.79)	10.82 (3.29)
	'F' Test	Sig	Sig	Sig
	SE (m)±	0.13	0.07	0.10
	CD at 5%	0.42	0.23	0.33
	CV %	13.21	11.13	10.17

Figures in parentheses are square root transformation. DAS - day after spray

Table 3: Incremental cost benefit ratio of various treatment in soybean

Tr. No.	Treatments	Qty. of insecticides req./ ha	Cost of treatment (Rs /ha)		Total cost (A)	Yield (q/ha)	Increased yield over Control (q/ha)	Value of increase yield @ 5110 (Rs. /ha) (B)	Increment benefit (C) = (B- A)	ICBR (C/A)	Rank
			Cost of insecticides for 4 sprays	Labour + sprayer charges							
T1	Chlorantraniliprole 18.5% SC	150	7400	2840	10220	20.96	12.14	62035	51815	1:5.06	5
T2	Thiacloprid 21.7% SC	750	9000	2840	11840	16.99	8.17	41749	29909	1:2.52	6
T3	Indoxacarb 15.8% EC	333	2864	2840	5704	19.22	10.40	53144	47440	1:8.31	3
T4	Beta cyfluthrin 8.49% + Imidacloprid 19.81% 300 OD	350	3080	2840	5920	22.87	14.05	71795	65875	1:11.12	2
T5	Thiamethoxam 12.6% + Lambda	125	1150	2840	3990	22.38	13.56	69292	65302	1:16.36	1

	Cyhalothrin 9.5% ZC										
T ₆	Chlorantraniliprole 10% + Lambda Cyhalothrin 5% ZC	250	7000	2840	9840	26.68	17.86	91264	81424	1:8.27	4
T ₇	Control	-	-	-	-	8.82	-	-	-	-	7

Labour charges Rs 330/day. 2) Spray pump charges Rs 50/day. 3) Two labour/spray. 4) Chlorantraniliprole 18.5% SC @ 12333/L. 5) Thiacloprid 21.7% SC @ 3000/L. 6) Indoxacarb 15.8% EC @ 2150/L. 7) Beta cyfluthrin 8.49% + Imidacloprid 19.81% 300 OD @ 2200/L. 8) Thiamethoxam 12.6% + Lambda Cyhalothrin 9.5% ZC 9) Chlorantraniliprole 10% + Lambda Cyhalothrin 5% ZC @ 150 ml/ha @ 7000/L. 10) Sale of price of soybean seed @ 5110/q.

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