

Bioefficacy of Insecticides Against Tobacco Leaf Eating Caterpillar (*Spodoptera litura*) of Soybean

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ABSTRACT

The investigations on “Bioefficacy of insecticides against tobacco leaf eating caterpillar (*Spodoptera litura*) of soybean” was carried out at AICRP on soybean, V.N.M.K.V Parbhani, Maharashtra (India) during Kharif 2024. The experiment was laid out in Randomized Block Design (RBD) with nine treatments. Assessment of insecticidal efficacy at 7 DAT after 2nd spraying, *Spodoptera* larvae were not observed in treatment T₆ Spinetoram 11.70 % SC. and T₇ Chlorantraniliprole 18.50 % SC. However, it was found at par with treatments T₃ Flubendiamide 39.35 % w/w SC & T₈ Tetraniliprole 18.18% SC (0.11 larvae/mrl, each), T₄ Emamectin benzoate 1.90 % EC (0.22 larvae/mrl), T₃ Indoxacarb 15.80 % EC (0.33 larvae/mrl) and T₂ Lambda-cyhalothrin 4.90 % (0.33 larvae/mrl). These treatments were followed by treatment T₁ Profenofos 50 % EC (0.44 larvae/mrl). However at 14 DAT after second spray revealed that *Spodoptera* larvae were not observed in treatments T₄ Emamectin benzoate 1.90 % EC, T₃ Flubendiamide 39.35 % w/w SC, T₆ Spinetoram 11.70 % SC, T₇ Chlorantraniliprole 18.50 % SC and T₈ Tetraniliprole 18.18% SC. However, these treatments were found at par with treatments T₃ Indoxacarb 15.80 % EC (0.11 larvae/mrl), T₂ Lambda-cyhalothrin 4.90 % CS (0.22 larvae/mrl) and T₁ Profenofos 50 % EC (0.33 larvae/mrl). Highest of 0.89 larvae/mrl were observed in untreated control.

Keywords: Soybean, Bioefficacy, *Spodoptera litura*, Tobacco leaf eating caterpillar

1 | INTRODUCTION

Soybean [*Glycine max* (L.) Merrill], a member of the family Leguminosae and sub-family Papilionaceae, is recognized as one of the most important oilseed crops globally. Nearly all parts of the plant are utilized, with significant use in livestock and poultry feed (Singh, 1983). However, its productivity at both national and state levels remains low, primarily due to various abiotic and biotic constraints such as drought, weed infestation, insect pests, and diseases. Among these, insect pests are particularly destructive as they not only escalate the cost of cultivation but also reduce yield and quality of produce (Singh *et al.*, 2000). The lush growth, tender foliage and abundant food resources of soybean make it highly vulnerable to numerous insect pests. One of the major threats is the tobacco caterpillar (*Spodoptera litura*), which inflicts heavy damage during the vegetative stage by feeding on foliage, and under severe infestation, can cause complete defoliation leading to substantial yield reduction. This pest is prevalent across soybean fields in Maharashtra during the Kharif season. Apart from leaf damage, it also attacks tender pods, causing 30–50% pod loss in severe cases.

Insect pests contribute to significant losses in soybean production, with annual yield reductions of about 15 to 20 percent (Biswas, 2008). Loss in the yield by semiloopers and *S. litura* varied from 42.20 to 42.68 per cent on JS-335 and JS-95-60, respectively (Ramesh Babu *et al.*, 2018). Taking in consideration the seriousness of the pest infestation and damage to soybean crop, the present study was undertaken to manage the pest with the help of chemical insecticides.

2 | MATERIALS AND METHODS

The present investigation was conducted at the research farm of AICRP on soybean, Vasant Rao Naik Marathawada Krishi Vidyapeeth, Parbhani (Maharashtra) during the Kharif season of 2024. The trial was laid out in Randomized block design (RBD) with two replications and nine treatments. Each gross plot consisted of 5 meter length, spaced at 45 cm x 5 cm. The sowing was carried out on 29th June, 2024. Soybean Variety MAUS 612 was used for the trial, which was made available from AICRP on Soybean, VNMKV Parbhani. All the necessary Agronomic practices were carried out to raised good crop.

Table 1: Treatment Details

T. N.	Treatment details	Dose/ha (ml)
T1	Profenofos 50% EC	1000
T2	Lambda-cyhalothrin 4.90% CS	300
T3	Indoxacarb 15.80% EC	333
T4	Emamectin Benzoate 1.90% EC	425
T5	Flubendiamide 39.35% w/w SC	150
T6	Spinetoram 11.70% SC	450
T7	Chlorantraniliprole 18.50% SC	150
T8	Tetraniliprole 18.18% SC	250
T9	Control	–

2.2 | Spray schedule

First foliar spray was given when the pests reached the ETL (18.08.2024) & the second spray was given at 15 days interval (03.09.2024).

2.3 | Method of recording observation

Observations were recorded on total number of defoliator's larvae per meter row length from three randomly selected places per replication at before spray, 3, 7 and 14 days after 1st and 2nd spray.

2.4 | Statistical Analysis

The data obtained from the different treatments were computed to determine the mean values. The mean values after suitable transformation were subjected to statistical analysis to test significance as per Gomez and Gomez (1984) for interpretation of the results using OPSTAT software.

3 | RESULTS AND DISCUSSION

An experiment was conducted in *Kharif* 2024 to evaluate the bioefficacy of insecticides against insect pests of soybean. Observations were recorded on total number of defoliator's larvae per meter row length from three randomly selected places per replication at before spray, 3, 7 and 14 days after 1st and 2nd spray.

3.1 | Bioefficacy of insecticides against Tobacco leaf eating caterpillar (*S. litura*) of soybean

1st Spray: The Data presented in Table 2, Fig.1 & 2 revealed that before 1st spray and after 3 DAT (Days after treatment) there were no significant differences in the larval population of *Spodoptera* pest among the treatments and untreated control.

At 7 DAT, all the treatments were found significantly superior over untreated control in reducing the pest population of Tobacco leaf eating caterpillar (*S. litura*). Among treatments, lowest population of 0.22 *Spodoptera* larvae/mrl were recorded in treatment T₆ Spinetoram 11.70 % SC. However, it was found at par with treatments T₇ Chlorantraniliprole 18.50 % SC (0.44 larvae/mrl), T₅ Flubendiamide 39.35 % w/w SC (0.56 larvae/mrl), T₈ Tetraniliprole 18.18% SC (0.67 larvae/mrl), T₄ Emamectin benzoate 1.90 % EC (0.78 larvae/mrl) and T₃ Indoxacarb 15.80 % EC (0.89 larvae/mrl).

These treatments were followed by treatments T₂ Lambda-cyhalothrin 4.90 % CS (1.11 larvae/mrl) and T₁ Profenofos 50 % EC (1.22 larvae/mrl) which were found at par with each other. Highest *Spodoptera* larvae were observed in untreated control (2.00 larvae/mrl).

At 14 DAT, significantly lowest of 0.22 larvae/mrl were recorded in treatment T₆ Spinetoram 11.70 % SC. However, it was found at par with treatments T₇ Chlorantraniliprole 18.50 % SC (0.33 larvae/mrl), T₅ Flubendiamide 39.35 % w/w SC & T₈ Tetraniliprole 18.18% SC (0.44 larvae/mrl, each), T₄ Emamectin benzoate 1.90 % EC (0.56 larvae/mrl), T₃ Indoxacarb 15.80 % EC (0.67 larvae/mrl) and T₂ Lambda-cyhalothrin 4.90 % (0.78 larvae/mrl). These treatments were followed by treatment T₁ Profenofos 50 % EC (0.89 larvae/mrl). Highest *Spodoptera* larvae were observed in untreated control (1.56 larvae/mrl).

2nd Spray: At 3 DAT, after 2nd spraying, *Spodoptera* larvae were not observed in treatment T₆ Spinetoram 11.70 % SC. However, it was found at par with treatments T₇ Chlorantraniliprole 18.50 % SC (0.11 larvae/mrl), T₅ Flubendiamide 39.35 % w/w SC & T₈ Tetraniliprole 18.18% SC (0.22 larvae/mrl, each), T₄ Emamectin benzoate 1.90 % EC (0.33 larvae/mrl) and T₃ Indoxacarb 15.80 % EC (0.44 larvae/mrl). These treatments were followed by treatments T₂ Lambda-cyhalothrin 4.90 % CS (0.56 larvae/mrl, each) and T₁ Profenofos 50 % EC (0.67 larvae/mrl) which were found at par with each other. Highest *Spodoptera* larvae were observed in untreated control (1.44 larvae/mrl).

At 7 DAT after 2nd spraying, *Spodoptera* larvae were not observed in treatment T₆ Spinetoram 11.70 % SC. and T₇ Chlorantraniliprole 18.50 % SC. However, it was found at par with treatments T₅ Flubendiamide 39.35 % w/w SC & T₈ Tetraniliprole 18.18% SC (0.11 larvae/mrl, each), T₄ Emamectin benzoate 1.90 % EC (0.22 larvae/mrl), T₃ Indoxacarb 15.80 % EC (0.33 larvae/mrl) and T₂ Lambda-cyhalothrin 4.90 % (0.33 larvae/mrl). These treatments were followed by treatment T₁ Profenofos 50 % EC (0.44 larvae/mrl). Highest *Spodoptera* larvae were observed in untreated control (1.44 larvae/mrl).

At 14 DAT after 2nd spraying, *Spodoptera* larvae were not observed in treatments T₄ Emamectin benzoate 1.90 % EC, T₅ Flubendiamide 39.35 % w/w SC, T₆ Spinetoram 11.70 % SC, T₇ Chlorantraniliprole 18.50 % SC and T₈ Tetraniliprole 18.18% SC. However, these treatments were found at par with

treatments T₃ Indoxacarb 15.80% EC (0.11 larvae/mrl), T₂ Lambda-cyhalothrin 4.90 % CS (0.22 larvae/mrl) and T₁ Profenofos 50 % EC (0.33 larvae/mrl). Highest of 0.89 larvae/mrl were observed in untreated control.

The mean of 1st & 2nd sprays indicate that the lowest/negligible *Spodoptera* larvae were noticed in the treatments T₆ Spinetoram 11.70 % SC (0.09 larvae/mrl). It was followed by treatments T₇ Chlorantraniliprole 18.50 % SC (0.18 larvae/mrl), T₅ Flubendiamide 39.35 % w/w SC (0.27 larvae/mrl), T₈ Tetraniliprole 18.18% SC (0.29 larvae/mrl), T₄ Emamectin benzoate 1.90 % EC (0.37 larvae/mrl), T₃ Indoxacarb 15.80 % EC (0.49 larvae/mrl), T₂ Lambda-cyhalothrin 4.90 % CS (0.60 larvae/mrl) and T₁ Profenofos 50 % EC (0.71 larvae/mrl). Highest *Spodoptera* larvae were recorded in untreated control (1.46 larvae/mrl). The present investigation are in close conformity of Suryawanshi *et al.*, (2024) who reported that Chlorantraniliprole 20 SC, Emamectin benzoate 5 SG, novaluron 5.25% + indoxacarb 4.50% against *Spodoptera litura* of soybean. Boka *et al.*,

(2021) revealed that chlorantraniliprole 18.5 SC @ 30 g a.i./ha was the most effective followed by spinetoram 11.7 SC @ 15 g a.i./ha, which was followed by the next effective treatment viz., emamectin benzoate 5 SG @ 11 g a.i./ha, flubendiamide 39.35 SC @ 48 g a.i./ha, indoxacarb 15.8 EC @ 30 g a.i./ha and lambda cyhalothrin 4.9 CS @ 15 g a.i./ha. Chaudhari *et al.*, (2020) found that chlorantraniliprole 18.5 % SC was most effective treatment against Tobacco-caterpillar which was found at par with Flubendiamide 39.35 SC & Emamectin benzoate 5 SC. Sapekar *et al.*, (2020) observed that Flubendiamide 39.35% SC was the best insecticide followed by spinosad 45 SC, chlorantraniliprole 18.5% & lambda-cyhalothrin 5% CS. Rathore *et al.*, (2020) reported the effectiveness of Emamectin benzoate 5% SG against *Spodoptera litura* of soybean. Sonkamble *et al.*, (2018) reported the effectiveness of chlorantraniliprole 18.5% EC after spinosad 45% SC against *Spodoptera litura* of soybean. Mishra & Gupta (2017) and Natikar *et al.*, (2016) reported the effectiveness of Flubendiamide 480 SC against *Spodoptera litura* of soybean.

Table 2. Bioefficacy of insecticides against *Spodoptera* of Soybean (Kharif 2024)

T. N.	Treatment details	Dose / Ha (ml)	Spodoptera litura							
			No. of larvae/MRL				No. of larvae/MRL			Mean of two sprays
			1 st spray				2 nd spray			
			Before Spray	3 DAT	7 DAT	14 DAT	3 DAT	7 DAT	14 DAT	
T ₁	Profenofos 50 % EC	1000	1.67 (1.63)	1.56 (1.59)	1.22 (1.48)	0.89 (1.37)	0.67 (1.27)	0.44 (1.20)	0.33 (1.14)	0.71
T ₂	Lambda-cyhalothrin 4.90 % CS	300	1.56 (1.59)	1.44 (1.56)	1.11 (1.45)	0.78 (1.33)	0.56 (1.24)	0.33 (1.14)	0.22 (1.10)	0.60
T ₃	Indoxacarb 15.80 % EC	333	1.67 (1.63)	1.33 (1.52)	0.89 (1.35)	0.67 (1.28)	0.44 (1.20)	0.33 (1.14)	0.11 (1.05)	0.49
T ₄	Emamectin benzoate 1.90 % EC	425	1.56 (1.59)	1.11 (1.43)	0.78 (1.32)	0.56 (1.24)	0.33 (1.15)	0.22 (1.09)	0.00 (1.00)	0.37
T ₅	Flubendiamide 39.35 % w/w SC	150	1.44 (1.54)	1.00 (1.38)	0.56 (1.24)	0.44 (1.18)	0.22 (1.09)	0.11 (1.05)	0.00 (1.00)	0.27
T ₆	Spinetoram 11.70 % SC	450	1.67 (1.62)	0.67 (1.28)	0.22 (1.09)	0.22 (1.10)	0.00 (1.00)	0.00 (1.00)	0.00 (1.00)	0.09
T ₇	Chlorantraniliprole 18.50 % SC	150	1.56 (1.59)	0.89 (1.37)	0.44 (1.20)	0.33 (1.14)	0.11 (1.05)	0.00 (1.00)	0.00 (1.00)	0.18
T ₈	Tetraniliprole 18.18% SC	250	1.56 (1.59)	1.00 (1.37)	0.67 (1.28)	0.44 (1.18)	0.22 (1.10)	0.11 (1.05)	0.00 (1.00)	0.29
T ₉	Control	—	1.67 (1.63)	1.89 (1.69)	2.00 (1.73)	1.56 (1.59)	1.44 (1.56)	1.44 (1.54)	0.89 (1.36)	1.46
	S.Em.±		—	—	0.08	0.08	0.06	0.06	0.05	—
	C.D. at 5%		NS	NS	0.26	0.25	0.20	0.18	0.16	—
	CV (%)		—	—	11.18	11.40	9.81	9.44	8.94	—

Figures in parentheses are $\sqrt{x + 0.5}$ transformed values, DBT = Day before treatment, DAT = Days after treatment, NS = Non significant.

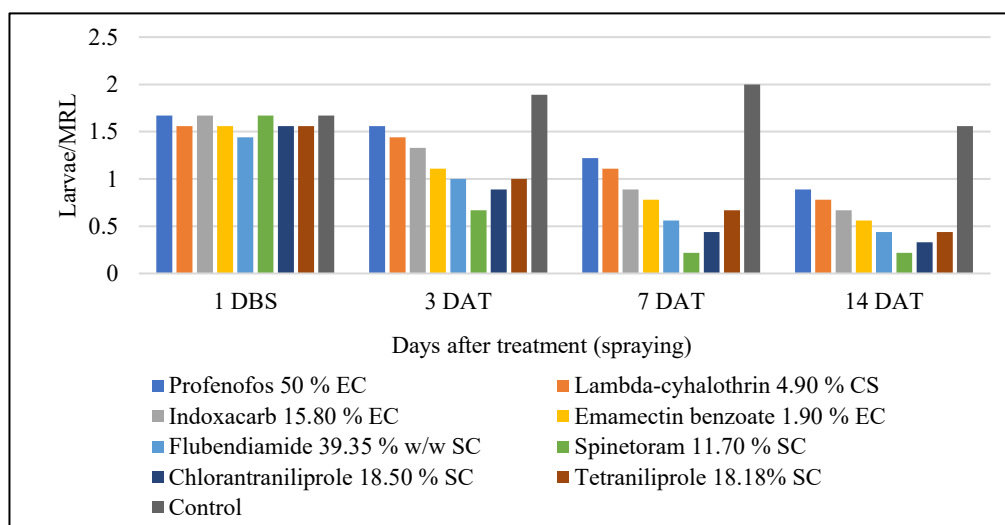


Fig. 1: Effect of insecticides against Spodoptera of soybean after first spray

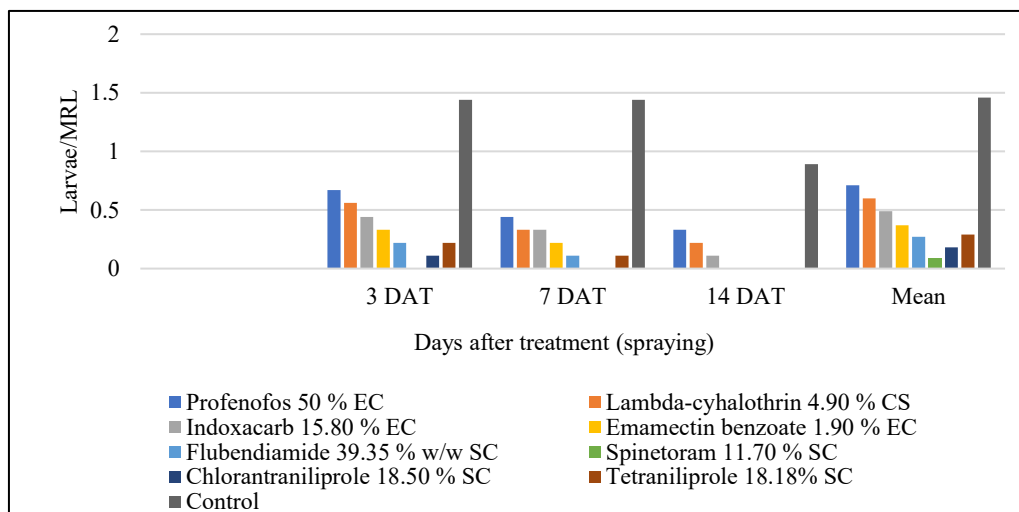


Fig. 2: Effect of insecticides against Spodoptera of soybean after second spray

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