



Bio-efficacy of Chemical Insecticides Against *Spodoptera litura* Infesting Soybean

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Abstract: The bio-efficacy of chlorantraniliprole, quinolphos, lambda cyhalothrin, diflubenzuron, endosulfan, triazophos and indoxacarb were evaluated against tobacco leaf eating caterpillar *Spodoptera litura* infesting soybean. The soybean was sprayed twice with respective insecticides at 10 days interval starting from 35 days after germination. The experimental studies revealed that, the larval population of leaf eating caterpillar was significantly reduced by the treatment of quinolphos 25 EC @ 1000 ml.ha⁻¹ followed by endosulfan 35 EC @ 1000 ml.ha⁻¹ and lambda cyhalothrin 5 EC @ 300 ml.ha⁻¹, which were at par with each other. Highest yield was recorded with the treatment of lambda cyhalothrin 5 EC @ 300 ml ha⁻¹ (2500 kg.ha⁻¹) followed by triazophos 40 EC @ 800 ml.ha⁻¹ (2451 kg.ha⁻¹), diflubenzuron 25 WP @ 400 g.ha⁻¹ (2400 kg.ha⁻¹).

Keywords: *Spodoptera litura*, Soybean, Insecticides

1. Introduction

Soybean is a unique crop with high nutritional value, providing 40% protein and 20% edible oil, besides minerals and vitamins. It is playing an important role in augmenting both the production of edible oil and protein simultaneously under the circumstances in which the shortage of these commodities are being experienced by people. It also supports many industries; soybean oil is used as raw material in manufacturing of antibiotics, paints, varnishes, adhesive, lubricants, etc. Soybean meal is used as protein supplement in human diet, cattle and poultry feed [1]. Soybean is reported to be attacked by 273 species of insects [2] and in India 20 insect pest species have been recorded infesting soybean crop [3]. Some common insect pest complex infecting soybean crops are green semilooper, tobacco leaf eating caterpillar, white fly, girdle beetle etc. [4]. 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 and to know the suitable control measure for the management of the pest.

2. Material and Methods

Field experiment was conducted during *kharif* season of 2011 at the farm of All India Co-ordinated Research Project on Soybean, Vasant Rao Naik Marathwada Krishi Vidyapeeth, Parbhani (Maharashtra), India. All the recommended cultural and agronomical practices were carried out to raise a good crop. The experiment was laid out in Randomised Block Design (RBD) replicated triple with gross plot size 4.00 m × 3.60 m. and net plot size 3.00 m × 3.00 m. The soybean variety MAUS-158 was sown at a spacing 45 cm × 5 cm. The crop was sprayed with respective insecticide at an interval of 10 days starting from 35 days after germination.

2.1. Treatment Details

- T₁- Chlorantraniliprole 20 SC 40 g a.i.ha⁻¹
- T₂- Quinalphos 25EC 250 g a.i.ha⁻¹
- T₃- Lambda cyhalothrin 5 EC 15 g a.i.ha⁻¹
- T₄- Diflubenzuron 25 WP100 g a.i.ha⁻¹
- T₅- Endosulfan 35 EC 350 g a.i.ha⁻¹
- T₆- Triazophos 40 EC 320 g a.i.ha⁻¹

T₇- Indoxacarb 14.5 SL 72.5 g a.i.ha⁻¹

T₈ - Untreated control.

2.2. Statistical Analysis

The per cent infestation of *Spodoptera litura* was calculated and subjected to angular transformation. The average number of *Spodoptera* larvae per plant was worked out and transferred by using Poisson formula $\sqrt{x + 0.5}$ before analysis. The data pertaining to infestation, larval count, after their transformation were statistically analysed by standard analysis of variance method [5].

3. Result and Discussion

3.1. Efficacy of Chemical Insecticides on Larval Population of *S. litura* After First Spraying

The data from the Table 1 revealed that per cent infestation

of *Spodoptera* larvae were observed in the range of 7.54 to 9.90 before first spraying and no significant differences were found in all the treatments. After 3 days of first spraying the insecticidal treatments were significantly superior in reducing larval population over untreated control. The treatment (T₂) quinalphos 25 EC @ 1000 ml.ha⁻¹ recorded lowest infestation (6.26%) followed by (T₅) endosulfan 35 EC @ 1000 ml ha⁻¹ (6.54%), (T₃) lambda cyhalothrin 5 EC @ 300 ml ha⁻¹ (6.73%), (T₄) diflubenzuron 25 WP @ 400 ml.ha⁻¹ (6.75%), (T₁) chlorantraniliprole 20 SC @ 200 ml.ha⁻¹ (6.89%), (T₆) triazophos 40 EC @ 800 ml.ha⁻¹ (6.96%) and (T₇) indoxacarb 14.5 SL @ 500 ml.ha⁻¹ (7.09%) which were at par with each other. The highest infestation was observed with the treatment T₈ untreated control (8.71%). Similar trend of results were observed after 7th and 10th day of first spraying as observed in after 3 days of first spraying and all the insecticidal treatments were found significantly superior over untreated control.

Table 1. Efficacy of chemical insecticides against *Spodoptera litura* and its effect on seed yield of soybean crop.

Treatments	Infestation of <i>Spodoptera</i> larvae (%) (days after second spraying)				Infestation of <i>Spodoptera</i> larvae (%) (days after second spraying)				Seed Yield kg.ha ⁻¹
	1 Day before	3 DAS	7 DAS	10 DAS	1 Day before	3 DAS	7 DAS	10 DAS	
T ₁ Chlorantraniliprole 20 SC	8.74 (17.18)	6.89 (15.21)	6.55 (14.82)	6.42 (14.67)	7.47 (15.85)	4.77 (12.61)	4.55 (12.31)	4.22 (11.85)	1670
T ₂ Quinalphos 25 EC	7.54 (15.93)	6.26 (14.48)	6.01 (14.16)	5.87 (14.00)	6.57 (14.80)	4.45 (12.17)	4.01 (11.55)	3.92 (11.41)	1570
T ₃ Lambda cyhalothrin 5 EC	8.89 (17.34)	6.73 (15.03)	6.77 (15.07)	6.41 (14.65)	7.98 (16.40)	4.62 (12.40)	4.77 (12.61)	4.14 (11.73)	2500
T ₄ Diflubenzuron 25 WP	8.96 (17.37)	6.75 (15.04)	6.11 (14.30)	6.92 (15.24)	7.69 (16.09)	4.88 (12.75)	4.11 (11.69)	4.29 (11.95)	2400
T ₅ Endosulfan 35 EC	7.79 (16.13)	6.54 (14.81)	6.05 (14.23)	6.07 (14.26)	6.70 (14.99)	4.57 (12.34)	4.05 (11.60)	4.00 (11.53)	1730
T ₆ Triazophos 40 EC	9.27 (17.72)	6.96 (15.28)	6.61 (14.89)	6.74 (15.04)	8.22 (16.59)	4.69 (12.50)	4.61 (12.38)	4.47 (12.19)	2451
T ₇ Indoxacarb 14.5 SL	7.93 (16.31)	7.09 (15.43)	6.60 (14.88)	6.33 (14.56)	6.89 (15.21)	4.90 (12.77)	4.60 (12.30)	4.30 (11.96)	1930
T ₈ Untreated	9.90 (18.33)	8.71 (17.15)	8.56 (17.00)	8.34 (16.78)	8.90 (17.31)	5.75 (13.87)	5.66 (13.74)	5.49 (13.54)	802
S. E.(m) ±	0.67	0.32	0.20	0.23	0.66	0.23	0.41	0.23	110.24
C. D. at 0.05%	N. S.	0.97	0.62	0.72	N. S.	0.70	1.26	0.69	313.37

* Figures in parentheses are angular transformed values

3.2. Efficacy of Chemical Insecticides on Larval Population of *S. litura* After Second Spraying

There were no significant differences were found amongst all the treatments including control before 1 day of second spraying. The results obtained in 3rd, 7th and 10th days after second spraying that all the treatments were found significantly superior over control in reducing the per cent infestation of *Spodoptera* larvae (Table 1). Data regarding observations on 3 days after second spraying treatment (T₂) quinalphos 25 EC @ 1000 ml.ha⁻¹ recorded lowest per cent infestation (4.45) followed by (T₅) endosulfan 35 EC @ 1000 ml.ha⁻¹ (4.57%), T₃, T₆, T₁, T₄ and T₇ which were at par with each other. All the insecticidal treatments were significantly superior over untreated control (5.75%). The results obtained from 7 days after second spraying recorded that, (T₂) quinalphos 25 EC @ 1000 ml.ha⁻¹ was most effective and

was significantly superior over all the rest treatments followed by (T₅) endosulfan 35 EC 1000 ml ha⁻¹, T₅, T₄, T₇, T₁, T₆ and T₃ which were at par with each other. All the insecticidal treatments were significantly superior over untreated control (5.66%). Ten days after second spraying treatment (T₂) quinalphos 25 EC 1000 ml.ha⁻¹ was significantly superior over all the treatments followed by (T₅) endosulfan 35 EC @ 1000 ml.ha⁻¹, T₃, T₁, T₄ and T₇ which were at par with each other. Also, all the treatments were found significantly superior over untreated control (5.49%).

Maximum protection and reduction in leaf damage was found with the insecticidal treatment of profenophos 0.1% [6] while flubendiamide 480 SC 0.2 ml lit⁻¹, most effective in managing leaf eating caterpillar [7]. [8] Evaluated the various insecticides against *S. litura* and found chlorantraniliprole 30 g a.i. ha⁻¹, methomyl 300 g a.i. ha⁻¹ and spinosad 75 g a.i. ha⁻¹ were most effective insecticides in protecting the soybean

crop from infestation of *S. Litura*. Flubendiamide 480 SC @ 200 ml.ha⁻¹ was the superior treatment and recorded minimum population of *S. litura* (0.30 larva plant⁻¹) and also relatively safe to natural enemies [9] [10] while [11] evaluated all IPM techniques *viz.*, trap cropping, inter cropping, bird perches and IPM modules were superior over control. [12] Evaluated insecticides like quinolphos, chlorpyrifos, carbonyl, methomyl and found effective in reduction of larval population of leaf eating caterpillar. [13] Evaluated seven insecticides and recorded emamectin benzoate 5 SG significantly highest per cent larval reduction over rest of the treatment.

3.3. Yield

Highest yield was obtained from the experimental plots treated with T₃ lambda cyhalothrin 5 EC @ 300 ml ha⁻¹ (2500 kg.ha⁻¹) followed by T₆ triazophos 40 EC @ 800 ml ha⁻¹ (2451 kg.ha⁻¹), diflubenzuron 25 WP @ 400 g ml.ha⁻¹ (2400 kg.ha⁻¹), Indoxacarb 14.5 SL @ 500 ml.ha⁻¹ (1930 kg.ha⁻¹), endosulfan 35 EC @ 1000 ml.ha⁻¹ (1730 kg.ha⁻¹), chlorantraniliprole (E2Y45) @ 200 ml.ha⁻¹ (1670 kg.ha⁻¹). The lowest yield (807 kg.ha⁻¹) was reported in untreated control.

[14] Reported that, the highest yield was obtained from experimental plots treated with chlorpyrifos 20 EC and triazophos 40 EC. [15] Reported maximum yield in the experimental plots treated with lambda cyhalothrin 5 EC and triazophos 40 EC @ 0.8 lit.ha⁻¹. [6] Recorded highest grain yield with the treatment of profenophos 0.1% while [7] and [9] recorded highest seed yield with the treatment of flubendiamide 480 SC followed by indoxacarb and lambda cyhalothrin.

References

- [1] Khanzada, S. R., M. S. Khanzada, G. H. Abro, T. S. Sayed, S. Anwar and N. Shakeel, 2013. Relative resistance of soybean cultivars against sucking insect pests. *Pakistan J. Sci.* 65(2): pp. 97-201.
- [2] Rawat, R. R. and R. H. Kapoor, 1968. Arthropod pest of soybean in M. P. *Conference on soybean production and marketing*. September 20-23. Proceedings, NJKVV, Jabalpur. pp. 62-65.
- [3] Singh, O. P. and K. J. Singh, 1990. Insect pest of soybean and their management. *Indian Farming*. 39(10): pp. 9-14.
- [4] Uttam, K., P. Sharma, and S. Shrivastva, 2012. Spectrum of insect pest complex of soybean (*Glycine max* L. Merrill) at Lambapeepal village in kota region, India. *J. Bio. Sci.* 1(1): pp. 80-82.
- [5] Panse, V. G. and P. V. Sukhatme, 1967. *Statistical Methods for Agricultural Workers*, ICAR, New Delhi.
- [6] Hole U. B., S. R. Jadhav and V. S. Teli, 2009. Bio-efficacy of insecticides against *Spodoptera litura* infesting soybean. *Annals of Plant Protec. Sci.* 17(2): pp. 322-324.
- [7] Nayaka P. 2013. Studies on defoliators and stemfly pests of soybean and their management. Ph. D. (Agri.) Thesis, U.A.S., Dharwad.
- [8] Patil M., A. V. Kulkarni and O. Gavkare, 2014. Evaluating the efficacy of novel molecules against soybean defoliators. *The Bioscan*. 9(1): pp. 577-580.
- [9] Manu N., R. H. Patil and R. A. Balikai, 2014. Efficacy of newer insecticides, biopesticides and poison baits against leaf eating caterpillars of soybean. *Karnataka J. Agric. Sci.* 27(2): pp. 139-144.
- [10] Patil P. P., P. B. Mohite and A. J. Chormule, 2015. Bioefficacy of some newer insecticides against leaf eating caterpillar (*Spodoptera litura* Fab.) infecting soybean. *Pesticide Res. J.* 27(2): pp. 271-276.
- [11] Sharma P. K., S. Sharma and S. Shrivastava, 2016. Management of *Spodoptera litura* population in soybean crop: An eco-friendly approach. *Intern. J. Pharmacol. Bio. Sci.* 10(1): pp-39-42.
- [12] Divya D., 2016. Management of *Spodoptera litura*. *Imperial J. Interdisciplinary Res.* 2(5): pp. 285-289.
- [13] Sharma A. K., A. Kumar and B. L. Kumhar, 2017. Effective control measure of tobacco caterpillar (*Spodoptera litura*) on soybean through various insecticides. *Chemical Science Review and Letters*. 6(21): pp. 533-537.
- [14] Virkar, A. R., 2004. Studies on chemical control and economics of major insect pests of soybean (*Glycine max* L. Merrill) M. Sc. (Agri.) Thesis, MAU, Parbhani.
- [15] Jogdand, S. B. 2005. Efficacy of newer insecticides against major insect pests of soybean. M. Sc. (Agri.) Thesis, MAU, Parbhani.