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Research Article

Effective Control Measure of Tobacco Caterpillar (*Spodoptera Litura*) on Soybean Through Various Insecticides

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Abstract

The present investigation carried out at Agricultural research farm, SHIATS, Allahabad. Among the pesticides evaluated, Emamectin benzoate 5 SG recorded highest percentage larvae reduction (68.45%) at 3rd, 7th, 10th and 15th days after spraying (DAS) and proved significantly superior to rest of the treatments. Spinosad 45 EC was recorded (49.15 %) larvae reduction. Minimum per cent of larvae reduction by tobacco caterpillar were observed in Emamectin benzoate 5 SG (0.02%) with 68.45 per cent, which are followed by Spinosad 45 EC (0.02 %) 49.15 per cent, Indoxacarb 14.5 EC (0.00725%) 44.70 per cent, Cypermethrin 25 EC (0.006%) 40.91 per cent Dichlorovos 76 EC (0.8%) 38.98 per cent, Profenophos 50 EC (0.8%) 35.12 per cent and Triazophos 40 EC (0.8%) 15.51 per cent larvae reduction.

Keywords: Tobacco caterpillar (*Spodoptera litura* Fab.), Soybean and insecticide

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Introduction

India is one of the largest producers of oilseeds in the world. Soybean is one of the most popular and widely grown oilseeds in the world. Although soybean is not new to India, commercial cultivation of yellow seeded soybean is comparatively of recent origin. Earlier, low yielding black seeded shattering type of soybean varieties were grown under different names in hills and scattered pockets in plains. Initiation of efforts to popularise yellow soybean in early sixties faced considerable controversies about Ii its usefulness in India which undoubtedly retarded the II progress of commercial exploitation of this miraculous gift of nature. The origin of soybean although North-eastern China is generally considered as the original home.

Apart from high yield potential, soybean possesses a very high nutritional value. It contains about 20 % good quality edible oil and 43 % high quality protein. Soybean protein is rich in the high nutritional value. It contains about 20 % good quality edible oil and 34 % high quality protein. Soybean protein is rich in the valuable amino acid lysines (5 %) in which most of the cereals are deficient. In addition, it contains good amount of minerals, salts and vitamins. Its sprouting grain contains a considerable amount of vitamin C. Vitamin A is present in the form of carotene. Various utilities of soybean are in the form of bread, kachori, pastries, high-protein food for children, food for diabetic, milk, biscuits, sweets, fermented food, chhole, khoa, paneer rabdi, powdered food material, chocolate, ice cream, edible oil, vanaspati ghee, butter, glycerine, oil for light, varnish paints, celluloid, green fodder and green manuring.

Soybean is one of the most important crops of the World cultivated over an area of 19.2 million/ha with a production of 206.5 million tonnes. The important soybean raising countries are U.S.A., China, Brazil, Mexico, Russia and, India. Even though the area under soybean in India is about 9.21 million/ha and production of soybean 9.81 million tone along with productivity was 1065 kg ha (Anonymous, 2011).

In Utter Pradesh area of 106.948 lakh/ha, production 126.775 lakh MT with productivity was 1185 kg/ha. (SOPA, 2012).

The tobacco caterpillar is found throughout the tropical and sub-tropical parts of the world. It is widespread in India and besides tobacco (*Nicotiana tabacum* L.), feeds on castor (*Ricinus comminis* L.), groundnut (*Arachis hypogaea* L.), tomato, sunflower, cabbage, Soybean and various other cruciferous crops. The damage is done only by the caterpillar, which measure 35-40mm in length at maturity. They are velvety black with yellowish –green dorsal stripes and lateral white bands. The moths are about 22 mm long and measure 40 mm across the spread wings. The fore wings have beautiful golden and greyish brown patterns (Srivastava *et al.* 2007).

This crop regularly suffers heavy damage from *Spodoptera litura* Fabricius is reported to cause damage to soybean. The larvae cause serious damage by voracious feeding on foliage as well as by nibbling pods in the fields, if

pest infestation persists till pod formation (Srivastava *et al.* 2007). The luxuriant crop growth, soft and succulent foliage of soybean attracts many insects and provides unlimited source of food, space and shelter. About 65 insect species have been reported to attack soybean form cotyledon to harvesting stage in Karnataka (Adimani 1976). The defoliators, *Spodoptera litura* Fab. To avoid losses caused by these defoliator pests indiscriminate use of chemicals led to the problems like pest outbreak, development of resistance by pest to insecticides, elimination of natural enemies, risk to human and animal health besides environmental pollution. Hence, in the present investigation indigenous components were used to manage major defoliator pests of soybean.

The Tobacco caterpillar *Spodoptera litura* (Fab.) is serious and regular pest in U.P. & M.P. It damages soybean form mid August to October in *Kharif* (Anon. 2007). Higher population was noticed in Dharwad and Belgaum districts of Karnataka and the pest was active during grand growth stage of the crop (Patil, 2002). After damaging the leaves, they start feeding on younger part, subsequently damaging 30-50 per cent of the pods (Anon. 2007).

Several chemical insecticides belonging to various groups are recommended for the management of Tobacco caterpillar *Spodoptera litura* (Fab.) on soybean crop. Indiscriminate use of several pesticides create problem in the natural ecosystem, environmental pollution, pest resistance and health hazards *etc.* Due to this, only selective chemical insecticides are used in order to avoid indiscriminate use of pesticides and as they having instant affect than botanicals.

Materials and Method

A field experiment was conducted at Agricultural research farm, SHIATS, Allahabad on "Effective control measure of tobacco caterpillar (*Spodoptera litura*) on soybean through various Insecticides'' cultivar *i.e.* JS-9560 during July, 2012 to November, 2012 with random block design (RBD). The treatments details were T_1 Spinosad 45%EC (Conc. 0.02%), T_2 Indoxacarb 14.5% EC (0.00725%), T_3 Emamectin benzoate 5SG (0.02%), T_4 Dichlorvos 76% EC (0.05%), T_5 Profenofos 50% EC (0.1%), T_6 Triazophos 40% EC (0.05%), T_7 Cypermethrin 25% EC (0.006%) and T_0 Control.

$$\text{Population reduction \%} = 1 - \frac{\text{Post treatment population treatment}}{\text{Pretreatment population in treatment}} \times \frac{\text{Pre} - \text{treatment population in check}}{\text{Post treatment population in check}} \times 100$$

Figure 1 General view of experimental field

Results and Discussion

After three days spray

Among the pesticides evaluated, Emamectin benzoate 5 SG recorded highest percentage larvae reduction (71.42%*)* at 3rd days after spraying (DAS) and proved significantly superior to rest of the treatments followed by Spinosad 45 EC, Indoxacarb 14.5 EC, Cypermethrin 25 EC, Profenophos 50 EC were recorded (50.00%), (46.42%) and (41.41%) larvae reduction respectively. Profenophos 50 EC, Dichlorvos 76 EC and Triazophos 40 EC were next in the order of effectiveness by recording (35.71 %), (29.28%) and (14.28%) larvae reduction respectively. Among all insecticides Triazophos 40 EC was the least effective but all the insecticides were superior over control (**Table 1**). Similarly results found by Hole, *et al.* 2009 Joshi and Patel, 2010,Prabhu, *et al.* 2012,Satyanarayna *et al*. 2010 and Adeel *et al.* 2011.

After seven days spray

Among the pesticides evaluated, Emamectin benzoate 5 SG recorded highest percentage larvae reduction (66.66%) at 7th days after spraying (DAS) and proved significantly superior *to rest* of the treatments. Spinosad 45 EC recorded (46.66%) larvae reduction. Indoxacarb 14.5 EC at par with Cypermethrin 25 EC and Profenophos 50 EC were recorded (43.33%), (40.66%) and (38.66%) followed by Dichlorvos 76 EC and Triazophos 40 EC were recorded (33.33%) and (13.33%) larvae reduction (Table 1). Similar results revealed by Joshi and Patel, 2010, Prabhu, *et al.* 2012, Rao *et al.* 2006, Taggar, *et al.* 2011and Srivastava *et al.*2007.

Table 1 Effect of the control measure of tobacco caterpillar (*Spodoptera litura)* on soybean through various Insecticides

Treatments	% Reduction over control					Overall Mean
	Days after spraying					
	Before	3 DAS	7 DAS	10 DAS	15 DAS	
T_1 **Spinosad 45 EC**	10.25 (18.67)*	50.00 (45.00)*	46.66 (43.08)*	48.75 (44.28)*	51.17 (45.67)*	49.15 (44.51)*
T_2 **Indoxacarb 14.5 EC**	10.00 (18.90)*	46.42 (42.94)*	43.33 (41.16)*	43.75 (41.40)*	45.29 (42.29)*	44.70 (41.95)*
T_3 **Emamectin benzoate 5 SG**	10.00 (18.90)*	71.42 (57.68)*	66.66 (54.73)*	67.50 (55.24)*	68.23 (55.69)*	68.45 (55.82)*
T_4 **Dichlorvos 76 EC**	12.50 (20.70)*	29.28 (32.75)*	40.66 (39.61)*	41.87 (40.32)*	44.11 (41.61)*	38.98 (38.63)*
T_5 **Profenofos 50 EC**	11.75 (20.04)*	35.71 (36.69)*	33.33 (35.26)*	34.37 (35.89)*	37.05 (37.49)*	35.12 (36.34)*
T_6 **Triazophos 40 EC**	13.00 (21.13)*	14.28 (22.20)*	13.33 (21.41)*	15.62 (23.27)*	18.82 (25.71)*	15.51 (23.19)*
T_7 **Cypermethrin 25 EC**	11.0 (19.36)*	41.42 (40.05)*	38.66 (36.44)*	40.62 (39.59)*	42.94 (40.94)*	40.91 (39.76)*
T_0 **Control**	14.00 (21.97)*	0.00	0.00	0.00	0.00	0.00
Overall Mean	**11.63**	**36.07**	**35.33**	**36.56**	**38.45**	**36.60**
F- test	NS	S	S	S	S	S
S. Ed. (±)	3.432	1.435	1.717	1.156	1.156	3.432
C. D. (P = 0.05)	7.275	3.043	3.640	3.341	3.341	7.275

After ten days spray

Scrutiny the Table 1, Emamectin benzoate 5 SG recorded highest percentage larvae reduction (67.50%) at 10th days after spraying (DAS) and proved significantly superior to rest of the treatments. Spinosad 45 EC recorded (48.75%) larvae reduction. Indoxacarb 14.5 EC at par with Dichlorvos 76 EC and Cypermethrin 25 EC which recorded (43.75%), (41.87%) and (40.62%) larvae reduction. Profenophos 50 EC (34.37%) followed by Triazophos 40 EC (15.62%) larvae reduction (Table 1). Similar results revealed by Chaudhary, *et al.* 2007, Chavan, *et al.* 2006, Hole, *et al.* 2009 and Joshi, and Patel, 2010.

After fifteen days spray

Among the pesticides evaluated, Emamectin benzoate 5 SG recorded highest percentage larvae reduction (67.50%) at 15th days after spraying (DAS) and proved significantly superior *to rest* of the treatments. Spinosad 45 EC at par with Indoxacarb 14.5 EC and Dichlorvos 76 EC were recorded (51.17%), (45.29%) and (44.11%) followed by Cypermethrin 25 EC, Profenophos 50 EC and Triazophos 40 EC which recorded (42.94%), (37.05%) and (18.82%) larvae reduction respectively (Table 1). Similar results revealed by Chaudhary, *et al.* 2007, Chavan, *et al.* 2006, Hole, *et al.* 2009, Prabhu, *et al.* 2012, Rao *et al.* 2006 and Taggar, *et al.* 2011.

Mean reduction of insect on soyabean

Among the pesticides evaluated, Emamectin benzoate 5 SG recorded highest percentage larvae reduction (68.45%) at 3rd, 7th, 10th and 15th days after spraying (DAS) and proved significantly superior to rest of the treatments. Spinosad 45 EC were recorded (49.15) at par with Indoxacarb 14.5 EC, Cypermethrin 25 EC, Dichlorvos 76 EC and Profenophos 50 EC followed by Triazophos 40 EC were recorded (49.15%), (44.70%), (40.91%), (38.98%), (35.12%) and (15.51%) larvae reduction respectively. Among all insecticides Triazophos 40 EC was the least effective but all the insecticides were superior over control. Emamectin benzoate proved to be the most efficient insecticide in new chemistry insecticide found was Emamectin. Spinosad and Indoxacarb have almost similar LC50 and LT50 values (Ahmad *et al.*2006). Effectiveness of Emamectin benzoate 5SG was higher than the other insecticides in reducing larvae and recorded significantly higher healthy plant and it was reported by Harish *et al.* (2009).

Conclusion

From the critical analysis of the present findings it was concluded that among the chemicals Emamectin benzoate 5 SG @ 0.02% conc. proved to be the best treatment followed by Triazophos 40 EC @ 0.08 litters/ha. Among the chemical insecticides Emamectin benzoate 5 SG proved to be the best treatment in managing Spodoptera litura reduction. Therefore, insecticides of short residual effect like Triazophos 40 EC may be useful in devising proper chemical insecticides strategy against *Spodoptera litura*.

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