The Bioscan 8(2): 429-431, 2013
AN INTERNATIONAL QUARTERLY JOURNAL OF LIFE SCIENCES
www.thebioscan.in

EVALUATION OF INSECTICIDES FOR THE MANAGEMENT OF BIHAR HAIRY CATERPILLAR, *SPILOSOMA OBLIQUA* WALK. (LEPIDOPTERA: ARCTIIDAE) IN BLACK GRAM (*VIGNA MUNGO* L.)

DIPAK MANDAL[1]*, PARAMITA BHOWMIK[1] AND KANCHAN BARAL[2]
[1]Department of Agricultural Entomology, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur - 741 252
[2]Department of Plant Protection, Visva - Bharati, Palli Siksha Bhavana, Sriniketan, Birbhum - 731 236
West Bengal, INDIA
e-mail: dipakagri.mandal@gmail.com

KEY WORDS
Black gram
Bihar hairy caterpillar
Triazophos
Lambda-cyhalothrin
Cost benefit ratio .

Received on :
19.10.2012

Accepted on :
19.02.2013

***Corresponding author**

ABSTRACT
An experiment was conducted at Institute of Agriculture (Palli Siksha Bhavana) farm, Visva-Bharati, Sriniketan, Birbhum, West Bengal during the summer season of 2008 to study on the evaluation of insecticides for the management of bihar hairy caterpillar (*Spilosoma obliqua* Walk.) in black gram. Insecticides used in the experiment were azadirachtin 1500ppm @3ml/l, endosulfan 35EC @ 300g a.i/ha, triazophos 40 EC @ 250g a.i/ha, thiamethoxam 25 WG @ 40g a.i/ha, ë-cyhalothrin 5 EC @ 40g a.i/ha, indoxacarb 14.5 SC @ 75g a.i/ha and imidacloprid17.8 SL @ 30g a.i/ha. Two sprays of insecticides were applied at fifteen days interval. The most effective insecticide in controlling the borers was triazophos followed by ë-cyhalothrin. Per cent reduction of hairy caterpillar over untreated plot after final sprays was followed this order of efficacy: triazophos (90.64%) > ë-cyhalothrin (83.71%) > indoxacarb (78.76%) > endosulfan (69.53%) > imidacloprid (62.31%) > thiamethoxam (57.40%). Azadirachtin was found to be least effective in controlling of hairy caterpillar. Highest cost benefit ratio (1:21.69) was observed in triazophos 40 EC @ 250g a.i/ha.

INTRODUCTION

Pulses are the second most important crops after cereals. In 2009, the global pulse production was 61.5 million tonnes from an area of 70.6 million hectare with an average yield of 871 kg/ha. Developing countries contribute about 74%, among which 25% is shared by India alone in respect of global pulse production (Anon, 2011). Black gram (*Vigna mungo* L., Family-Leguminosae) popularly known as urd bean or *mash kalai* or black bean is native of India and the fourth most important pulse crop with high nutritive value (Singh, 2004). It is grown over on an area of 3.10 million hectare with a production of 1.40 million tonnes and yield 451 kg/ha in 2010 in India (Anon, 2011). In India, quantitative avoidable losses (7-35%) caused by insect pest complex both in black gram and green gram varied with different agro-climatic condition (Hamad and Dubey, 1983). On an average, 2.5 to 3.0 million tonnes of pulses are lost annually due to pest problems (Rabindra *et al.,* 2004). The annual yield loss due to the insect pests has been estimated at about 30 per cent in urd bean and mung bean. Among them, bihar hairy caterpillar is a serious pest in Bihar, Uttar Pradesh, Punjab, Madhya Pradesh, Manipur and some other states. The third and onward instar larvae cause serious damages and significant reduction in yield (Hussain and Begum, 1995; Gupta and Bhattacharya, 2008). It is known fact that bihar hairy caterpillar showed certain levels of behavioral resistance to different class of insecticides, hence successful control of this pest is to some extent difficult. Keeping this in view, studies were under taken to test the effectiveness of some insecticides against bihar hairy caterpillar in Black gram (*Vigna mungo* L.).

MATERIALS AND METHODS

The field experiment was conducted at the Institute of Agriculture (Palli Siksha Bhavana) farm, Visva-Bharati, West Bengal, during summer season of 2008. This farm is situated at 23º39´ North latitude and 87º42´ East longitude and 58.90m above the main sea level. The soil of the experimental site was sandy loam in texture with high percent of sand and low percent of clay and dry sub-humid and subtropical climate. The soil was acidic in nature with pH range 5.1- 6.1. The weather conditions during the period of investigation is characterized by the temperature range of maximum 26.3-34.49ºC and minimum 12.67- 22.67ºC and maximum RH 72.6- 94% and minimum 22.29- 51.57% and total rainfall 8.70 mm during crop growth period. Attempts were made to evaluate the effect of seven insecticides viz. azadirachtin 1500 ppm @ 3ml/l, endosulfan 35 EC @ 300g a.i/ha, triazophos 40 EC @ 250g a.i/ha, thiamethoxam 25 WG @ 40g a.i/ha, ë-cyhalothrin 5 EC @ 40g a.i/ha, indoxacarb 14.5 SC @ 75g a.i/ha and imidacloprid17.8 SL @ 30g.a.i/ha with untreated control against bihar hairy caterpillar, *Spilosoma obliqua* Walk. of black gram (cultivar B-76). The experiment was laid out in Randomized Block Design (RBD) with eight treatments including control and each treatment was replicated three

Table 1: Effect of insecticidal treatments on bihar hairy caterpillar, *Spilosoma obliqua* (Walk.) population

Treatment	Dose (g a.i/ ha)	Pre-treatment counts/plants	Percent reduction and increase(+) of bihar hairy caterpillar After First spray 5 DAS*	10DAS*	15DAS*	Mean	After Second spray 5DAS*	10DAS*	15DAS*	Mean	Overall mean % reduction
Azadirachtin 15 ppm	1.5 Lit.	11.33	49.95(44.94)	76.43(60.94)	35.30(36.45)	53.89	45.42(42.36)	59.07(50.59)	45.42(42.36)	49.98	51.93
Endosulfan 35 EC	300	12.66	68.94(56.10)	89.64(71.19)	58.59(49.89)	72.39	66.75(54.76)	75.00(60.00)	58.25(49.72)	66.67	69.53
Triazophos40 EC	250	15.33	100.00(90.00)	93.87(75.58)	71.40(57.67)	88.42	100.00(90.00)	100.00(90.00)	78.58(62.37)	92.86	90.64
Thiamethoxam25 WG	40	13.33	52.51(46.43)	79.96(63.36)	42.46(40.60)	58.31	52.15(46.2)	65.18(53.79)	52.15(46.20)	56.49	57.40
ë-cyhalothrin5 EC	40	11.00	75.72(60.47)	87.90(69.64)	68.63(55.92)	75.75	100.00(90.00)	100(90.00)	75.00(60.00)	91.67	83.71
Indoxacarb14.5 SC	75	15.66	70.17(56.85)	91.50(73.05)	63.79(52.95)	75.15	82.36(65.12)	94.17(75.94)	70.54(57.10)	82.36	78.76
Imidacloprid 17.8 SL	30	10.67	62.51(52.24)	81.25(64.30)	53.13(46.78)	65.63	60.00(50.77)	66.67(57.82)	53.40(46.95)	60.00	62.81
Control	Water	14.66	+31.85	+36.42	+84.17	+50.81	+44.44	+70.37	+88.89	+67.90	+59.35
S.Em (±)		N.S	1.34	1.48	2.47		2.32	2.04	2.78		
C.D. at 5%			4.45	4.91	8.20		7.70	6.77	9.23		

DAS = Days after Spray, Values in parentheses are angular transform. * Significant at 5% level

times. The control plot was sprayed with water. The experimental plot was 5m x 3m size and the crop was grown on a row spacing of 30cm. The spraying on crop for testing efficacy of different pesticide formulations was started with the incidence of pest. All the sprayings were done using knapsack sprayer at an interval of 15 days. Three plants of each row out of selected six rows were randomly selected and tagged. The population of bihar hairy caterpillar was recorded before and 5, 10 and 15 days after each spray. Statistical analysis of all the recorded data were subjected to analysis of variance in randomized block design with the procedure followed by Panse and Sukhatme (1984).

RESULTS AND DISCUSSION

The number of bihar hairy caterpillar was varied from 10.67 to 15.33 per plant before application of insecticides. The variation among the treatments was not significant, but after each spray significant reduction of hairy caterpillar was noted (Table 1), it is evident that all the insecticides were capable of keeping the population of caterpillars at the minimum level and significant differences were noted among the treatments after different days of observation and spraying. Highest mean percent reduction of hairy caterpillar after each spray was found in triazophos treated plot (88.42 and 92.86%) followed by ë-cyhalothrin (75.75 and 91.67%). Similarly, the overall mean percent reduction of hairy caterpillar over control was noted in triazophos (90.64%) and ë-cyhalothrin (83.71%) treated plots. Endosulfan, imidacloprid and thiamethoxam showed less effective to check the caterpillar population as triazphos, ë-cyhalothrin and indoxacarb. Azadirachtin showed poor efficacy at all levels. This was possibly due to luxurious tuft of hairs grown on the body of the larvae, which deboned the droplets to contact with the cuticle and made it ineffective. Triazophos is one of the broad spectrum quasi systemic insecticide with translaminar action and showed high efficacy against bihar hairy caterpillar in our study.

In case of yield, all the treatments showed significant increase of yield. Highest grain yield was recorded in triazophos treated plot (13.80 q/ha) closely followed by ë-cyhalothrin (13.00 q/ ha). In case of azadirachtin treated plot, the yield was comparatively lower (9.41q/ha) than endosulfan (10.04 q/ha) and imidacloprid (10.67 q/ha), whereas in control plot, the yield was severely low (6.80 q/ha).

Highest cost benefit ratio was observed in triazophos (1: 21.69) followed by ë-cyhalothrin (1: 18.78) and thiamethoxam (1: 13.53). The lowest cost benefit ratio was found in azadirachtin (1: 6.73) as shown in Table 2.

The outcome of our experiments were different from the findings of Gupta *et al.* (2004) who reported endosulfan can effectively control the larva of *Spilosoma obliqua*. In 1990 Nagia *et al.* reported that trizophos was effective against second instar larvae of *Spilosoma obliqua* (Walk.) in laboratory. Singh and Singh (2000) noted that ë-cyhalothrin had shown highly toxic effect whereas endosulfan and azadirachtin showed less toxic effect in laboratory condition for controlling the caterpillars and these findings are similar with our findings. Nair *et al.* (2007) studied the effectiveness of different insecticides against the bihar hairy caterpillar and they found that indoxacarb was highly toxic whereas endosulfan was

Table 2: Cost Benefit ratio analysis of insecticides against *Spilosoma obliqua* on black gram

Name of the insecticide	Dose (g a.i/ ha)	Yield seed (q/ha)	Increased seed yield over control (q/ha)	*Value of increased seed yield / ha (Rs)	Cost of treatments / ha				Cost Benefit Ratio
					Cost of insecticide for two sprays/ha	**Labour charge / ha	Total cost	Net return /ha	
Azadirachtin1500 ppm	1.5 Lit.	9.41	2.61	10440.00	450.00	900.00	1350.00	9090.00	1: 6.73
Endosulfan 35 EC	300	10.04	3.24	12960.00	500.00	900.00	1400.00	11560.00	1: 8.26
Triazophos40 EC	250	13.80	7.00	28000.00	334.00	900.00	1234.00	26766.00	1: 21.69
Thiamethoxam25 WG	40	11.34	4.54	18160.00	350.00	900.00	1250.00	16910.00	1: 13.53
ë-cyhalothrin5 EC	40	13.00	6.20	24800.00	354.00	900.00	1254.00	23546.00	1: 18.78
Indoxacarb 14.5 SC	75	12.30	5.50	22000.00	833.00	900.00	1733.00	20267.00	1: 11.69
Imidacloprid 17.8 SL	30	10.79	3.99	15960.00	442.00	900.00	1342.00	14618.00	1: 10.89
Control	Water	6.80	-	-	-	-	-	-	-

* Price of seed Rs. 4000.00/q** Labour charges Rs. 100 /day/ man

moderately toxic in laboratory condition. Nath and Singh (1996) reported that endosulfan was moderately toxic to hairy caterpillar. Kodandaram *et al*. (2012) reported that indoxacarb was highly toxic to bihar hairy caterpillar in laboratory condition. Muthusamy *et al*. (2011) showed that imidacloprid and neem were less toxic to hairy caterpillar.

ACKNOWLEDGEMENT

Thanks to Visva- Bharati University for financial support and to farm manager for providing all facilities and effective co-operation during research work.

REFERENCES

Anonymous 2011. Vision 2030. Director, Indian Institute of Pulses Research (Indian Council of Agricultural Research), Kanpur, India, 1-42.

Gupta, A. K., Kaushik, U. K. and Dixit, S. A. 2004. Studies on chemical control of *Spilosoma obliqua* (Walker) under laboratory condition. *J. Maharashtra Agricultural Universities*. **29:** 228-29.

Gupta, G. and Bhattacharya, A. K. 2008. Assessing toxicity of post-emergence herbicides to the *Spilarctia obliqua* Walker (Lepidoptera: Arctiidae). *J. Pest Science*. **81:** 9- 15.

Hamad, S. E. and Dubey, S. L. 1983. Loses due to insect pests in North Bihar. *Indian J. Entomology*. **1:** 136- 46.

Hussain, M. and Begum, M. 1995. Food preference of jute hairy caterpillar *Spilosoma obliqua* (Walk.) on some varieties of jute. *Bangladesh J. Entomology*. **5(1 and 2):** 57- 59.

Kodandaram, M. H., Rai, A. B. and Halder, J. 2012. Toxicological investigation on the newer biorational and plant origin insecticides against major insect pests of vegetables. IIVR Annual Report 2011-12, Indian Institute of Vegetable Research, Baranasi. pp. 77- 79.

Muthusamy, R., Karthi S. and Shivakumar, M. S. 2011. Baseline susceptibility of five classes of insecticides on bihar hairy caterpillar, *Spilosoma obliqua* (Walk.) (Lepidoptera: Arctiidae). *Resistant Pest Management Newsletter*. **21(1):** 11- 13.

Nair, N., Sekh, K., Debnath, M., Chakraborty, S. and Somchoudhury, A. K. 2007. Relative toxicity of some chemicals to bihar hairy caterpillar, *Spilarctia obliqua* Walker (Arctiidae, Lepidoptera). *J. Crop and Weed*. **3(1):** 1- 2.

Nagia, D. K., Kumar, S. and Saini, M. L. 1990. Relative toxicity of some important insecticides to Bihar hairy caterpillar, *Spilosoma obliqua* (Walker). *Entomological Research*. **14(1):** 1-4.

Nath, P. and Singh, A. K. 1996. Biology and insecticidal management of Bihar hairy caterpillar, *Spilosoma obloqua* infesting groundnut. *Annals of Plant Protection Sciences*. **4:** 42- 46.

Panse, V. G. and Sukatme, P. V. 1984. Statistical methods for Agricultural Workers. ICAR, New Delhi, pp. 152- 161.

Rabindra, R. J., Ballali, C. R. and Ramanujan, B. 2004. Biological options for insect pests and nematode management in pulses. *Kalyani Publishers, New* Delhi, India, p. 487.

Singh, D. S. and Singh, J. P. 2000. Study of pyrethroid and non pyrethroid insecticides to the larva of bihar hairy caterpillar, *Spilosoma obliqua*. *Indian J. Entomology*. **62:** 141- 45.

Singh, S. S. 2004. Crop Management, 3rd Ed. Kalyani Publishers, New Delhi, p. 574.