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EFFECT OF SOME NOVEL INSECTICIDES ON LARVAL POPULATION OF GRAM POD BORER, *HELICOVERPA ARMIGERA* (HUB.) IN CHICKPEA

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ABSTRACT
A field experiment was conducted in randomized block design with three replications of seven treatments during Rabi season 2010-11 at entomological research block of crop research centre, Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut (U.P.) to evaluate the effect of some novel insecticides against the *H. armigera* in chickpea. Efficacy of six insecticides *viz.,* Indoxacarb 14.5 SC @ 500 ml/ha, Cypermethrin 25 EC @1000 ml/ha, Lambda cyhalothrin 5 EC @ 500 ml/ha, Thiodicarb 75 WP @ 625 gm/ha, Spinosad 45 SC @ 200 ml/ha and Carbosulfan 25 EC @ 1000 ml/ha tested against *H. armigera* larvae. The treatment with Indoxacarb 14.5 SC @ 500 ml/ha was found best with minimum population of *H. armigera* at first spray 1.33 (3 DAS) and 2.00 larvae/five plants (9 DAS), and the minimum larval population at second spray 1.67 (3 DAS) and 3.33 larvae/ five plants (9 DAS). The Cypermethrin 25 EC @1000 ml/ha was recorded less effective among all the treatments, though it was statistically superior to the untreated control. The result revealed that Indoxacarb 14.5 SC @ 500 ml/ha was found best to minimizing the larval population after the both insecticidal spray.

INTRODUCTION

Chickpea (*Cicer arietinum* L.) is the premier pulse crop of Indian subcontinent. India is the largest chickpea producer as well as consumer in the world. Chickpea is the most important pulse crop of India, and occupies 7.1 million hectares with a production of 5.75 million tons, accounting for 30.9 per cent and 39.9 per cent of total pulse area and production respectively. It contains 21.1 per cent proteins, which is the maximum provided by any pulse and 61.1 per cent carbohydrates**.** The world's total production of chickpeas around 8.5 million metric tons annually and is grown over 10 million hectares of land approximately. In India the productivity of chickpea is highest in Andhra Pradesh (1280 kg/ha), West Bengal (1050 kg/ha), Bihar (1005 kg/ha), Punjab (1000 kg/ ha), Madhya Pradesh (972 kg/ha) but in Uttar Pradesh the productivity of chickpea is low *i.e.* 942 kg/ha than other states. There are many abiotic and biotic factors responsible for low productivity in this state. Insect pest are the major constraints for low productivity of chickpea under biotic factors. The high yield in chickpea could not be achieved due to large number of insect pest attacking chickpea. The crop is known to suffer from a number of insect pests among which the *H. armigera*is most serious insect pest of chickpea. *H. armigera* appear in great number during vegetative growth and at pod formation stage of chickpea (Lal, 1996). In Western Uttar Pradesh, in addition to other insect pests, the *H. armigera* seriously damages the crop during fruiting stage and is considered to be a major limiting factor for the production of chickpea. Single larvae may destroy several pods before reaching to maturity and this pest is reported to damage 5 to 40 per cent pods of chickpea crop during different year (Chaudhary *et al.,* 1982, Chauhan, 1992 and Chauhan and Dahiya, 1994). The moth begins ovipositing on chickpea at the seedling stage but this behavior is checked by the adverse climatic and geographical conditions (Tahhan *et al.,* 1982). The caterpillars feed on flowers if suitable vegetation is not available (Deka *et al.,* 1987 and Patel and Koshiya, 1999). It attacks more than 180 cultivated species from cereals, legumes, vegetables, fruits, forage and wild species (Jat and Ameta, 2013). Similar type of work with a number of insecticides have been reported to be effective for controlling *H. armigera* in different crops (Ujagir, 2000, Ahmed *et al.,* 2004, Ghosh *et al.,* 2010, Meena and Raju, 2014 and Dhaka *et al.,* 2015). Keeping in view of the seriousness of the pest and economic importance of this crop, the present investigation was planned to evaluate the effect of different novel insecticides against *H. armigera* under field conditions.

MATERIALS AND METHODS

The experiment was laid out in Randomized Block Design (RBD). The healthy seeds of chickpea variety 'Avrodhi' sown manually 10 cm deep on November 22, 2010. There were total seven treatments along with untreated (control), each with three replications. Each plot was having 7 rows of 4 meter long. Row to row and plant to plant spacing was 40 cm and 10 cm, respectively. Normal fertilizers doses and recommended agronomical practices were adopted. The sex pheromone traps were used to monitoring the first appearance

of adults of *H. armigera* in the experimental field. The six insecticides *viz.*, Indoxacarb 14.5 SC @ 500 ml/ha, Cypermethrin 25 EC @1000 ml/ha, Lambda cyhalothrin 5 EC @ 500 ml/ha, Thiodicarb 75 WP @ 625 gm/ha, Spinosad 45 SC @ 200 ml/ha and Carbosulfan 25 EC @ 1000 ml/ha tested against *H. armigera* larvae. All the insecticides under study were applied as foliar spray using Knapsack sprayer. To determine the efficacy of chemicals, total two sprays of insecticides on chickpea crop were done. First spray was done at pod initiation stage and second spray was done after ten days of first spray. The population of *H. armigera* larvae was recorded on five randomly selected plants from five inner rows in each plot, one day before spraying and 3 and 9 days after first and second spray and ninth day count becoming pre-treatment count for the second spray the following methodology of Dhaka *et al*. (2010). The data recorded during the course of investigation were subjected to statistical analysis by using analysis of variance technique (ANOVA) for Randomized Block Design to compare means of different treatments as suggested by Panse and Sukhatme (1985).

RESULTS AND DISCUSSION

Number of larvae at one day before spray

The statistically analyzed data revealed that one day before spray the larval population of *H. armigera* larvae ranged from 9.33 to 10.67 larvae/five plants and non-significant difference was found among all the different treatments (Table 1).

Number of larvae at three days after first spray

The population of *H. armigera* larvae at three days after first spray ranged 1.33 to 6.67 larvae/five plants (Table 1 & Fig. 1). Among all the treatments the indoxacarb 14.5 SC @ 500 ml/ha was found best with minimum population of 1.33 larvae/five plants. The next best treatments in order were Thiodicarb 75 WP @ 625 g/ha, Spinosad 45 SC @ 200 ml/ha and Carbosulfan 25 EC @ 1000 ml/ha which recorded with larval population of 2.33, 2.67 and 3.00 larvae/five plants, respectively and were statistically at par with the best treatment. The other treatments to follow were Lambda cyhalothrin 5 EC @ 500 ml/ha 5 EC and Cypermethrin 25 EC @ 1000 ml/ha which recorded with 4.33 and 6.67 larvae/five plants, respectively.

Number of larvae at nine days after first spray

The statistically analyzed data revealed that at nine days after first spray mean number of *H. armigera* larvae ranged from 2.00 to 7.33 larvae/five plants (Table 1 & Fig. 1). The best treatment was observed in Indoxacarb 14.5 SC @ 500 ml/ha among all the treatments with minimum population of 2.00 larvae/plant. The next best treatments in order were Thiodicarb 75 WP @ 625 g/ha, Spinosad 45 SC @ 200 ml/ha, Carbosulfan 25 EC @ 1000 ml/ha and Lambda cyhalothrin 5 EC @ 500 ml/ha which recorded with minimum larvae/five plants 3.67, 4.33, 4.67 and 5.67 respectively and were statistically at par with the best treatment. Among all the treatments maximum number of 7.33 larvae/five plants was recorded in Cypermethrin 25 EC @ 1000 ml/ha, though it was statistically superior to the untreated control.

Number of larvae at three days after second spray

Three days after second spraying, mean number of *H. armigera* larvae ranged from 1.67 to 7.00 larvae/five plants (Table 1 & Fig. 1). The minimum population of 1.67 larvae//five plants was observed in Indoxacarb 14.5 SC @ 500 ml/ha and it was found best among all the treatments. The next best treatments in order were Thiodicarb 75 WP @ 625 g/ha and Spinosad 45 SC @ 200 ml/ha which recorded with 3.00 and 3.67 larvae/five plants, respectively and were statistically at par with the best treatment. The other treatments to follow were Carbosulfan 25 EC @ 1000 ml/ha, Lambda cyhalothrin 5 EC @ 500 ml/ha, and Cypermethrin 25 EC @ 1000 ml/ha which recorded with number of 4.33, 5.33 and 7.00 larvae/five plants, respectively and was found to be inferior then the best treatment and statistically superior to the untreated control.

Number of larvae at nine days after second spray

The statistically analyzed data revealed that at nine days after second spray mean the minimum population of 3.33 larvae/five plants was recorded in Indoxacarb 14.5 SC @ 500 ml/ha and it was found best among all the treatments (Table 1 & Fig. 1). The next best treatments in order were Thiodicarb 75 WP @ 625 g/ha and Spinosad 45 SC @ 200 ml/ha which recorded of 4.33 and 4.67 larvae/five plants, respectively and were statistically at par with the best treatment *i.e.,* Indoxacarb 14.5 SC @ 500 ml/ha. The other treatments to follow were Carbosulfan 25 EC @ 1000 ml/ha, Lambda cyhalothrin 5 EC @ 500 ml/ha, and Cypermethrin 25 EC @ 1000 ml/ha which recorded with 6.00, 7.33 and 9.67 larvae/five plants, respectively and was found to be significantly different with the best treatment. The maximum number of 21.33 larvae/five plants recorded with untreated control. The present

Table 1: Effect of different treatments on the number of larval population against *H. armigera*

Treatments	Dose	Larvae/five plants				
		One day before spray	First spray		Second spray	
			3 DAS	9 DAS	3 DAS	9 DAS
Indoxacarb 14.5 SC	500 ml/ha	9.3** (3.19)	1.3 (1.51)*	2.0 (2.05)	1.7 (1.60)	3.3 (2.07)
Cypermethrin 25 EC	1000 ml/ha	9.7 (3.24)	6.7 (2.74)	7.3 (2.88)	7.0 (2.81)	9.7 (3.24)
Lambda Cyhalothrin 5 EC	500 ml/ha	10.3 (3.35)	4.3 (2.29)	5.7 (2.56)	5.3 (2.50)	7.3 (2.86)
Thiodicarb 75 WP	625 gm/ha	10.0 (3.30)	2.3 (1.80)	3.7 (2.15)	3.0 (1.99)	4.3 (2.29)
Spinosad 45 SC	200 ml/ha	10.7 (3.40)	2.7 (1.89)	4.3 (2.29)	3.7 (2.14)	4.7 (2.37)
Carbosulfan 25 EC	1000 ml/ha	9.7 (3.25)	3.0 (1.98)	4.7 (2.36)	4.3 (2.29)	6.0 (2.63)
Control		10.3 (3.35)	14.3 (3.90)	16.7 (4.20)	19.7 (4.54)	21.3 (4.71)
SE.m ±			0.19	0.24	0.18	0.17
CD at 5%		NS	0.61	0.76	0.57	0.53

*Figures in parentheses are angular transformed values; DAS = Days after spraying; ** Average of three replications

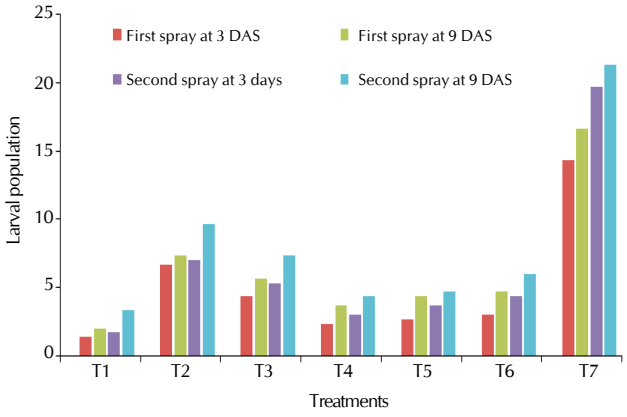

Figure 1: Effect of different treatments on the number of larval population against *H. armigera*

experimental findings are supported by Anis-ur-Rahman *et al*. (2006) who reported that Indoxacarb was the most effective in reducing the larval population in chickpea crop. Singh and Yadav (2007), Dhaka *et al*. (2010), Dhaka *et al*. (2015) and Deshmukha *et al*. (2010) reported that Indoxacarb caused minimum larval population in chickpea.

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