ISSN: 0974 - 0376

The Ecoscan : Special issue, Vol. VII: 315-318: 2015
AN INTERNATIONAL QUARTERLY JOURNAL OF ENVIRONMENTAL SCIENCES
www.theecoscan.in

BIO-EFFICACY OF CERTAIN NEW INSECTICIDES AGAINST LARVAL POPULATION OF GRAM POD BORER, *HELICOVERPA ARMIGERA* (HUBNER) IN CHICKPEA

Prajan Singh *et al.,*

KEYWORDS

Helicoverpa Armigera
Chickpea
New Insecticides
Larval Population

Proceedings of National Conference on Harmony with Nature in Context of Bioresources and Environmental Health
(HORMONY - 2015)
November 23 - 25, 2015, Aurangabad,
organized by
Department of Zoology,
Dr. Babasaheb Ambedkar Marathwada University
Aurangabad (Maharashtra) 431 004
in association with
National Environmentalists Association, India
www.neaindia.org

The Ecoscan
AN INTERNATIONAL QUARTERLY JOURNAL OF ENVIRONMENTAL SCIENCES

PRAJAN SINGH[1], RAJENDRA SINGH[1], SUDHIR KUMAR*[1], VIPIN KUMAR[2] AND SUSHIL KUMAR[1]
[1]Department of Entomology, S. V. P. University of Agriculture and Technology, Meerut - 250 110, INDIA
[2]Department of Plant Pathology, S. V. P. University of Agriculture and Technology, Meerut - 250 110, INDIA
e-mail: sudhirkhanna1285@gmail.com

ABSTRACT

A field experiment was conducted at Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut, India, to determine the efficacy of different treatments during *Rabi* season of 2013-2014 in chickpea. Efficacy of different insecticides *viz*., indoxacarb 14.5 SC @ 500 ml/ha, spinosad 45 SC @ 200 mL/ha, flubendiamide 480 SC @ 75 ml/ha, emamectin benzoate @ 200 g/ha, methomyl 40 SP @ 1000 g/ha and neem excel EC @ 3000 ml/ha was tested against *Helicoverpa armigera* larvae. The treatment with flubendiamide 480 SC @ 75 ml/ha was found best with minimum population of *H. armigera* at first spray 1.67 (3 DAS) and 2.33 larvae/five plants (7 DAS) and the minimum larval population at second spray 2.00 (3 DAS) and 2.67 larvae/five plants (7 DAS). The least effective treatment was neem excel EC @ 3000 ml/ha with maximum population at first spray 5.67 (3 DAS) and 7.33 larvae/five plants (7 DAS) and the maximum larval population at second spray 6.00 (3 DAS) and 9.00 larvae/five plants (7 DAS). The result revealed that flubendiamide 480 SC @ 75 ml/ha was found best treatment in respect of minimum larval population after the both insecticidal spray.

***Corresponding author**

INTRODUCTION

Chickpea (*Cicer arietinum* L.) is an annual legume and the only cultivated species within genus Cicer. Its considerable nutritive value makes it a valuable source for both food and feed it also play an important role in maintaining soil fertility. In India where most of the population is primarily vegetarian chickpea has a special place in the daily diet of people and major source of high protein for human as well as animal consumption. Chickpea are contains an excellent source of the essential nutrients *viz*., 21 per cent protein, 2.2 per cent fat and 62 per cent carbohydrates. It also contains calcium of about 190 mg/100g, Iron 90.5 mg/100g and Phosphorus 280 mg/100g (Katerji *et al.,* 2001). Chickpea has medicinal importance as the germinated gram seeds are recommended to cure scurvy and malic and oxalic acids in green leaves prescribed for the intestinal disorders and blood purification (Singh, 1996). Chickpea is a very important component of cropping systems of the dry and rainfed areas because it can fix 80 to 120 kg nitrogen per hectare through symbiotic nitrogen fixation (Papastylanou, 1987). The main chickpea producing states are Andhra Pradesh (1235 kg/ha), Punjab (1226 kg/ha), Bihar (1182 kg/ha), Gujarat (1172 kg/ha) and West Bengal (1106 kg/ha) but in Uttar Pradesh the productivity of chickpea is low *i.e.* 930 kg/ha than other states. The major insect pests of chickpea *i.e.* termites (*Odontotermes obesus*), cutworms (*Agrotis ipsilon*, *A. segetum, A. spinifera and Mythimna separata)* appear during seedling stage in certain areas, while *H. armigera* appear in great number during vegetative growth and at pod formation stage of chickpea (Lal, 1996). The insect is multivoltine and polyphagous in nature and has become a pest of national importance by causing economic losses to chickpea. It attacks more than 180 cultivated species from cereals, legumes, vegetables, fruits, forage and wild species (Jat and Ameta, 2013). A single larva can destroy several pods before reaching to maturity and this pest was reported to damage 5-40 per cent pods of chickpea (Chauhan and Dahiya, 1994). In India, the extent of losses due to *H. armigera* in chickpea is up to 27.9 per cent in North West Plain Zone, 13.2 per cent in North East Plain Zone, 24.3 per cent in Central Zone and 36.4 per cent in South Zone (Lateef and Reed, 1983). The crops have been noticed to suffer an avoidable loss of 9 to 60 per cent by this insect. In Uttar Pradesh alone 15.3 per cent of the chickpea crop worth Rs. 462.5 million is lost annually due to *H. armigera* attack, 17.2 per cent in Karnataka and 28.5 per cent in Delhi. Lal (1996) reported that the yield losses of chickpea grain due to *H. armigera* were 75-90 per cent and in some places the losses were up to 100 per cent. A number of insecticides have been found 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). Exploring new insecticides with lesser residues and lower environmental threat has become imperative. In recent years, newer compounds with novel modes of action are being evolved to check infestation by this insect pest. The present study is aimed at evaluating the efficacy of certain new insecticides against the pod borer in chickpea ecosystem.

MATERIALS AND METHODS

An experimental field trial was conducted at entomological research block of Crop Research Centre (CRC), Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut during *Rabi* season of 2013-2014. The experiment was laid in randomized block design (RBD), having seven treatment *viz*. indoxacarb 14.5 SC @ 500 ml/ha, spinosad 45 SC @ 200 ml/ha, flubendiamide 480 SC @ 75 ml/ha, emamectin benzoate @ 200 g/ha, methomyl 40 SP @ 1000 g/ha, neem excel EC @ 3000 ml/ha and untreated (control) which were replicated thrice. The chickpea seed of variety 'WCG3' was sown in plots size 4 x 5 mt^2 with row spacing 40 cm and plant to plant distance consisting 10 cm. Normal fertilizers doses and recommended agronomical practices were adopted. All these insecticides were applied using Knapsack sprayer twice for assessing effective control strategies against pod borer. Total two insecticidal sprays were given during the crop period. The population of *H. armigera* larvae was recorded on five randomly selected plants from inner rows in each plot. One day before spraying, 3 and 7 days after first and second spray, the following methodology of Dhaka *et al*. (2011). The data were statistically analyzed as suggested by Panse and Sukhatme (1985).

RESULTS AND DISCUSSION

Number of larvae at one day before spray

The table data revealed that one day before spray the larval population of *H. armigera* larvae ranged from 9 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 result presented in table indicated that population of *H. armigera* was significantly reduced in treated plots as compared to untreated (Table 1 and Fig. 1). Flubendiamide 480 SC @ 75ml/ha was found best treatments with minimum population of larvae 1.67 /five plants followed by indoxacarb 14.5 SC @ 500 ml/ha. The least effective treatments was neem excel EC @ 3000 ml/ha (5.67 larvae /five plants). The maximum number of larvae 12.33 /five plants was recorded with untreated control.

Number of larvae at seventh days after first spray

The statistically analyzed data showed (Table 1 & Fig. 1) revealed that mean number of *H. armigera* larvae ranged from 2.33 to 14.67 larvae/five plants. The best treatment was observed in flubendiamide 480 SC @ 75 mL/ha among all the treatments with minimum population of 2.33 larvae/five plants. The next best treatments in order were indoxacarb 14.5 SC @ 500 mL/ha, spinosad 45 SC @ 200 mL/ha, emamectin benzoate 5 SG @ 200 g/ha mL/ha and methomyl 40 SP @ 1000 g/ha which recorded with minimum larvae/five plants 3.00, 3.67, 4.33 and 6.33, respectively. The treatments maximum number of 7.33 larvae/five plants was recorded in neem excel EC @ 3000 mL/ha, though it was statistically superior to the untreated control.

Number of larvae at three days after second spray

The data revealed that after three days of second spray all the treatments were found statistically superior to the untreated control (Table 1 and Fig. 1). The minimum population of 2.00 larvae/five plants was observed in flubendiamide 480 SC @ 75 ml/ha and it was found best among all the treatments. The maximum larval population of *H. armigera* in neem excel EC @ 3000 ml/ha which recorded with number of 6 larvae/five plants followed by methomyl 40 SP @1000 g/ha and emamectin benzoate 5 SG @200 g/ha which recorded with 3.67 and 4.67 larvae/five plants, respectively and it was found statistically superior to the untreated control.

Number of larvae at seventh days after second spray

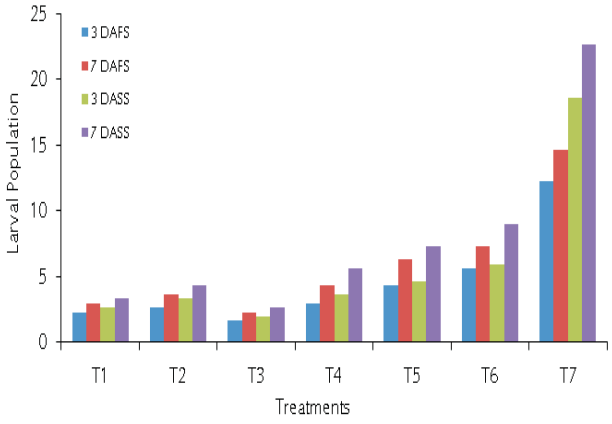
Seven days spray, the lowest larval population of *H. armigera* (2.67 and 3.33 larvae/five plants) was recorded in those plots whose crop were treated with flubendiamide 480 SC @ 75 mL/ha and indoxacarb 14.5 SC @ 500 ml/ha, respectively (Table 1 and Fig. 1). Higher larval population (9.00 and 7.33 larvae/five plants) was recorded treatments neem excel EC @ 3000 mL/ha and methomyl 40 SP @ 200 g/ha. In order the next least treatments were spinosad 45 SC @ 200 mL/h and emamectin benzoate 5 SG @ 200 g/ha which recorded with 4.33 and 5.67 larvae/five plants. In untreated control the maximum number of 22.67 larvae/five plants was recorded.

All the treatments were effective in controlling *H. armigera* larval population. Among all treatments the flubendiamide 480 SC @ 75 ml/ha was found best to control the larvae of *H. aramigera*. The present findings are supported by Kumar and Shivaraju (2009) and Ghosal *et al*. (2012). Similarly, Anandhi *et al*. (2011) reported the indoxacarb was the most effective treatment followed by novaluron, spinosad and emamectine benzoate. The present findings are supported by Deshmukh

Table 1: Effect of different treatments on larval population

Treatments	Dose	Number of Larvae/five plants				
		One day before spray	First spray 3 DAS	7 DAS	Second spray 3 DAS	7 DAS
Indoxacarb14.5 SC	500 mL/ha	10** (18.41)*	2.33 (8.76)	3 (9.96)	2.67 (9.37)	3.33 (10.48)
Spinosad 45 SC	200 mL/ha	9 (17.45)	2.67 (9.39)	3.67 (11.01)	3.33 (10.50)	4.33 (11.98)
Flubendiamide 480 SC	75 mL/ha	10 (18.42)	1.67 (7.41)	2.33 (8.77)	2 (8.12)	2.67 (9.38)
Emamectin Benzoate 5 SG	200 gm/ha	10.67 19.05)	3 (9.96)	4.33 (11.99)	3.67 (11.02)	5.67 (13.75)
Methomyl 40 SP	1000 mL/ha	10.33 (18.74)	4.33 (11.98)	6.33 (14.56)	4.67 (12.47)	7.33 (15.69)
Neem excel EC	3000 mL/ha	10 (18.38)	5.67 (13.75)	7.33 (15.69)	6 ((14.17)	9 (17.42)
Control		9 (17.45)	12.33 (20.54)	14.67 (22.50)	18.67 (25.57)	22.67 (28.40)
SE.m ±		0.401	0.375	0.340	0.450	0.571
CD at 5%		N.S.	1.167	1.059	1.401	1.780

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



*DAFS (days after first spray), ** DASS (days after second spray)

Figure 1: Effect of different treatments on larval population

et al. (2010) obtained the similar results, spinosad and emamectin benzoate were found the most effective in reducing the *H. armigera* population. Ghosh *et al.* (2011) who found emamectine benzoate most effective against *H. armigera* larvae.

REFERENCES

Ahmed, S., Zia, K. and Shah, N. R. 2004. Validation of chemical control of gram pod borer, *Helicoverpa armigera* (hub.) with new insecticides. *Int. J. Agri. Biol.* **6(6):** 278-280.

Anandhi, D. M. P., Elamathi, S. and Simon, S. 2011. Evaluation of bio-rational insecticides for management of *Helicoverpa armigera* in chick pea. *Ann. Pl. Protec. Sci.* **19:** 207-209.

Chauhan, R. and Dahiya, B. 1994. Response of different chickpea genotypes to *Helicoverpa armigera* at Hisar. *Indian J. Plant Prot.* **22:** 170-72.

Deshmukh, S. G., Sureja, B. V., Jethva, D. M. and Chatar, V. P. 2010. Field efficacy of different insecticides against *Helicoverpa armigera* infesting chickpea. *Legume Research*. **33(4):** 269-273.

Dhaka, S. S., Singh, G., Ali, N., Mittal, V. and Singh, D. V. 2011. Efficacy of novel insecticides against pod borer, *Etiella zinckenella* (Treitschke) in vegetable pea. *Crop Res.* **42(1,2 &3):** 331-335.

Dhaka, S. S., Singh, G., Yadav, A., Rai, M. and Kumar, A. 2015. Efficacy of novel insecticides against pod borer, *Helicoverpa armigera* (Hubner) in vegetable pea. *Progressive Horticulture*. **47(1):**146-150.

Ghosal, A.,Chatterjee, M. L. and Manna, D. 2012. Studies on some insecticides with novel mode of action for the management of tomato fruit borer *Helicoverpa armigera* (Hub). *J. Crop and Weed.* **8(2):** 126-129.

Ghosh, A., Chatterjee, M. and Roy, A. 2011. Bio-efficacy of spinosad 45 SC against *Helicoverpa armigera* (Hubner) and its effect on natural enemies in okra. *J. Insect Sci. (Ludhiana).* **24(1):** 24-27.

Ghosh, A., Chatterjee, M. and Roy, R. 2010. Bio-efficacy of spinosad against tomato fruit borer (*Helicoverpa armigera* Hub.) (Lepidoptera: Noctuidae) and its natural enemies. *J. Horticulture and Forestry*. **2(5):** 108-111.

Jat, S. K. and Ameta, O. P. 2013. Relative efficacy of biopesticides and newer insecticides against *Helicoverpa armigera* (Hub.) in tomato. *The Bioscan*. **8(2):** 579-582.

Katerji, N., Van Hoorn, J. W., Hamdy, A., Mastrorilli, M., Owies, T. and Malhotra, R. S. 2001. Response to soil salinity of chickpea varieties differing in drought tolerance. *Agr. Water Manage*. **50:** 83-96.

Kumar, C. T. A. and Shivaraju, C. 2009. Evaluation of newer insecticide molecules against pod borers of Black gram. *Karnataka J. Agricultural Sciences*. **22(3):** 521-523.

Lal, O. P. 1996. An outbreak of pod borer, *H. armigera* (Hubner) on chickpea in Eastern Uttar Pradesh, India. *J. Entomol. Res.* **20(2):** 179-81.

Lateef, S. S. and Reed, W. 1983. Review of crop losses by insect pests in pigeonpea internationally and in India. In: *Proceedings of the International Seminar on Crop losses due to insect pests* (Ed. Rao. B.H.K. and Murthy, K.S.R.K.), Entomological Society of India, Hyderabad, A.P. India. pp. 284-291.

Meena, L. K. and Raju, S. V. S. 2014. Bioefficacy of newer insecticides against tomato fruit borer, *Helicoverpa armigera* (Hubner) on tomato, *Lycopersicon esculentum* mill under field conditions. *The Bioscan*. **9(1):** 347-350.

Panse, V. G. and Sukhatne, P. V. 1985. Statistical methods for agricultural workers. *ICAR,* New Delhi. p. 381.

Papastylanou, I. 1987. Effect of preceding legume on cereal grain and nitrogen yield. *J. Agric. Sci.* **108:** 623-626.

Singh, S. S. 1996. Handbook of Agricultural Sciences. *Kalyani Publishers,* New Delhi p. 824.

Ujagir, R. 2000. Field efficacy of insecticides against pod borer complex in early pigeonpea (*Cajanus cajan* (L.) Millsp. at Pantnagar, North India. *Ann. Pl. Protec. Sci.* **71:** 19-25.