SHORT COMMUNICATION

COMPARATIVE EFFICACY OF NOVEL INSECTICIDES AND BIO- PESTICIDES ON LARVAL POPULATION DENSITY OF GRAM POD BORER (*HELICOVERPA ARMIGERA* HUBNER) ON CHICKPEA

Pankaj Kumar, Sandeep Kumar, Rohit Rana, and S.K. Sachan

Department of Entomology, Sardar Vallabhbhai Patel University of Agriculture and Technology Meerut-250110 (U.P.), India

Abstract: Field study was conducted to determine the comparative efficacy of lambdacyhalothrin 5 EC, fenvalerate 10 EC, indoxacarb 14.5 SC, quinalphos 25 EC, spinosad 45 SC, neemarin 1500 ppm and *Ha* NPV against the larval population of gram pod borer, *Helicoverpa armigera* on chickpea in the experimental research area of Crop Research Centre of Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut-250110 (U.P.) during Rabi 2011-12. The efficacy of the insecticides was ascertained by comparing treated plots with the control plots. All the insecticides resulted in significant reduction in the larval population density of the pest in comparison with control. However, indoxacarb 14.5 SC proved to be the best insecticide followed by spinosad 45 SC, lambda-cyhalothrin 5 EC, quinalphos 25 EC, fenvalerate 10 EC, neemarin 1500 ppm and *Ha* NPV respectively**.**

Keywords: Chickpea, Gram pod borer, Larval populattion

INTRODUCTION

Chickpea, *Cicer arietinum* (Lineus) is an important pulse crop and commonly known as chana, or Bengal gram. Chickpea is a very important component of cropping systems of the dry, rainfed areas, because it can fix 80 to 120 kg nitrogen per hectare through symbiotic nitrogen fixation (Papastylanou, 1987). Various Factors responsible for low production and productivity the crop are poor genetic base, weeds, diseases and insect pests. Major insect pests of chickpea are cutworm, *Agrotis sp.* (Hufnagel), gram pod borer, *Helicoverpa armigera* (Hubner), gram semilooper, *Autographa nigrisigna* (Walker), aphid, *Aphis craccivora* (Koch) and tur pod bug, *Clavigralla gibbosa* (Spinola).

The moths begin ovipositing on chickpea at the seedling stage but this behavior is checked by the adverse climatic and geographical conditions (Tahhan *et al*., 1982; Lal, 1996). *H. armigera* starts devouring the young shoots, leaves and pods whatever available soon after hatching. A large number of entomologists studied the population fluctuations of *H. armigera* on chickpea (Dakwale and Singh, 1980; Deka *et al*., 1989; Prasad *et al*., 1989; Patel and Koshiya, 1997) and observed population peaks in different months of the year. The population peaks generally corresponds to the full bloom and pod formation stage of chickpea (Deka *et al*., 1987; Lal, 1996 and Patel and Koshiya, 1999). Many other factors including temperature and humidity (Yadava *et al*., 1991; Yadava and Lal, 1988), rainfall (Tripathi and Sharma, 1985), predators (Thakur *et al*., 1995; Gunathilagaraj, 1996) and parasitoids (Bhatnagar, 1980; Srinivas and Jayaraj, 1989; Thakur *et al*., 1995) can also affect *H. armigera* population. The extent of damage inflicted by *H. armigera* to chickpea depends not only on the number of larvae but also on its developmental stages (Tripathi and Sharma, 1984). No study has so far reported population fluctuations with reference to eggs and larval instar densities under field conditions. Therefore, the aim of this study was to describe the population dynamics of *H. armigera* in terms of eggs and larval instars. The role of environmental factors affecting these variations has also been described.

Choudhary and Sachan (1995), Lal (1996) tested various insecticides and biopesticides against gram pod borer on chick pea at various stage of growth like 50% flowering, pod formation and dough stage. They reported that the application of insecticides at proper stage resulted in less pod borer population and increased yield as compared to check.

MATERIAL AND METHOD

The present study was carried out at the experimental field Crop Research Centre of Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut-250110 (U.P.) during Rabi 2011-12. The experiment was laid in randomized block design with 3 replications. Chickpea variety WCG-3 was sown on 14th November at a distance of 30 X 8 cm apart. Similar agronomic practices were applied to all 8 treatments from sowing to harvesting. First spray was applied at pod formation stage and second spray after 10 days of the first spray. Observations regarding pest population were recorded from 5 randomly selected plants from each plot 24 hours before spray and 3, 7 and 10 days of first and second spray.

RESULT AND DISCUSSION

Pre-treatment larval population of *Helicoverpa armigera* was insignificant but larval population differed significantly among the treatments after the application of insecticides (Table I and II). A sharp decline in the larval population density of *H.*

armigera was noted third day after the application of each spray as compared to control. All the treatments were effective in managing the larvae of *H. armigera* than control. The most effective treatment was indoxacarb 14.5 SC @ 500 ml/ha after first spray of 1.00 (3 DAS), 1.67 (7 DAS) and 2.33 larvae/five plants (10 DAS) and the minimum larval population after second spray of 1.33 (3 DAS), 2.00 (7 DAS) and 3.67 larvae/five plants (10 DAS), respectively. The treatments spinosad 45 SC @ 200 ml/ha and lambda cyhalothrin 25 EC @ 500 ml/ha were found at par. Next effective treatment after first spray i.e. spinosad 45 SC @ 200 ml/ha 1.33 (3 DAS), 2.33 (7 DAS), 3.00 (10 DAS), lambda-cyhalothrin 5EC @ 500 ml/ha 2.00 (3 DAS), 2.67 (7 DAS), 3.67 (10 DAS), quinalphos 25 EC @ 1000 ml/ha, 2.67 (3 DAS), 3.33 (7 DAS), 4.33 (10 DAS), fenvalerate 10 EC @ 1000 ml/ha 3.00 (3 DAS), 3.67 (7 DAS), 4.67 (10 DAS), neemarin 1500 ppm @ 3000 ml/ha 3.67 (3 DAS), 4.33 (7 DAS), 5.00 larvae/five plants (10 DAS), and after second spray i.e. spinosad 45 SC @ 200 ml/ha 1.67 (3 DAS), 2.67 (7 DAS), 4.33 (10 DAS), lambda-cyhalothrin 5EC @ 500 ml/ha 3.00 (3 DAS), 3.67 (7 DAS), 4.67 (10 DAS), quinalphos 25 EC @ 1000 ml/ha, 3.67 (3 DAS), 4.33 (7 DAS), 6.00 (10 DAS), fenvalerate 10 EC @ 1000 ml/ha 4.00 (3 DAS), 4.67 (7 DAS), 7.67 (10 DAS), neemarin 1500 ppm @3000 ml/ha 3.67 (3 DAS), 4.33 (7 DAS), 5.00 larvae/five plants larvae/five plants (10 DAS), respectively. The lowest effective treatment was found *Ha* NPV 500 LE/ha after first spray of 4.00 (3 DAS), 4.67 (7 DAS) and 5.67 larvae/five plants (10 DAS) and the minimum larval population after second spray of 5.00 (3 DAS), 5.67 (7 DAS) and 10.67 larvae/five plants (10 DAS) respectively. The present findings are supported by Singh and Yadav (2007) who reported that efficacy of four insecticides *i.e.*, indoxacarb, thiamethoxam, spinosad and endosulfan; three bio pesticides (two *Bacillus thuringiensis*-based bio insecticides) namely Halt, Biolep and *H. armigera* nuclear polyhedrosis virus (*Ha* NPV) and two neem formulations *viz.*, nimbicidine and neemarine revealed that indoxacarb was effective in reducing larval population at the minimum. Anandhi *et al*. (2011) reported that indoxacarb was the most effective in comparison to spinosad, quinalphos, NSKE etc in chickpea crop. Dhaka *et al.* (2011), Biradar *et al.* (2001) reported that indoxacarb caused minimum larval population in chickpea. The present findingare contrary to finding of Randhawa *et al.* (2009) reported that spinosad 48 SC was found to be the most effective insecticide for the control of *H. armigera*.

Table 1: Larval population of *Helicoverpa armigera* on chick pea after first spray of various insecticides and bio-pesticides.

Treatment	**Mean no. of Larvae/five plants**				
	1 DBS	**3 DAS**	**7 DAS**	**10 DAS**	**Mean**
Lambda-cyhalothrin 5 EC	10.67 (3.41)	2.00 (1.71)	2.67 (1.91)	3.67 (2.15)	2.78
Fenvalerate 10 EC	9.67 (3.26)	3.00 (1.98)	3.67 (2.15)	4.67 (2.37)	3.78
Indoxacarb14.5 SC	10.33 (3.35)	1.00 (1.38)	1.67 (1.62)	2.33 (1.82)	1.66
Quinalphos 25 EC	11.00 (3.44)	2.67 (1.91)	3.33 (2.07)	4.33 (2.30)	3.44
Spinosad 45 SC	9.67 (3.26)	1.33 (1.52)	2.33 (1.82)	3.00 (1.98)	2.22
Neemarin 1500 ppm	11.33 (3.50)	3.67 (2.15)	4.33 (2.30)	5.00 (2.44)	4.33
Ha NPV	10.67 (3.41)	4.00 (2.22)	4.67 (2.36)	5.67 (2.58)	4.78
Control	9.67 (3.26)	15.00 (3.99)	16.33 (4.16)	18.67 (4.35)	16.66
SE(m)± **CD at 5%**	0.154 NS	0.147 0.450	0.113 0.347	0.098 0.300	

DBS = Day before spray, DAS = Days after spray

* Figures in parentheses square root values

Table 2: Larval population of *Helicoverpa armigera* on chick pea after second spray of various insecticides and bio-pesticides.

Treatment	Mean no. of Larvae/five plants				
	1 DBS	3 DAS	7 DAS	10 DAS	Mean
Lambda-cyhalothrin 5 EC	3.67 (2.15)	3.00 (1.98)	3.67 (2.15)	4.67 (2.37)	3.78
Fenvalerate 10 EC	4.67 (2.37)	4.00 (2.22)	4.67 (2.37)	7.67 (2.93)	5.44
Indoxacarb14.5 SC	2.33 (1.82)	1.33 (1.52)	2.00 (1.71)	3.67 (2.15)	2.33
Quinalphos 25 EC	4.33 (2.30)	3.67 (2.15)	4.33 (2.30)	6.00 (2.70)	4.66
Spinosad 45 SC	3.00 (1.98)	1.67 (1.62)	2.67 (1.91)	4.33 (2.30)	2.89
Neemarin 1500 ppm	5.00 (2.44)	4.33 (2.30)	5.00 (2.44)	9.33 (3.20)	6.22
Ha NPV	5.67 (2.58)	5.00 (2.44)	5.67 (2.57)	10.67 (3.41)	7.11
Control	18.67 (4.35)	21.00 (2.69)	23.67 (4.96)	22.33 (4.79)	22.34
SE(m)± **CD at 5%**	0.098 0.300	0.118 0.361	0.138 0.424	0.117 0.358	

DBS = Day before spray, DAS = Days after spray
* Figures in parentheses square root values

REFERENCES

Anandhi, D. M. P., Elamathi, S. and Sobita Simon (2011). Evaluation of bio-rational insecticides for management of *Helicoverpa armigera* (Hubner) in chick pea. *Annals of Plant Protection Sciences*, 22 (1):207-209.

Bhatnagar, V.S., (1980). A report on research on *Heliothis* complex at ICRISAT (India), 1974–79. *Int. Crops Res. Instt. for the Semi–Arid Tropics*, pp. 23.

Biradar, A. P., Jagginavar, S. B. and Sunitha, N. D. (2001). Bio-efficacy of Methomyl 40 SP against chickpea pod borer, *Helicoverpa armigera* (Hubner). *Karnataka Journal of Agricultural Sciences*,14 (2):366-368.

Choudhary, R.R.P. and Sachan R.B., (1995). Influence of sowing dates and use of insecticide on the infestation of Uttar Pradesh. *Bhartia Krishi Anusandhan Patrika*, 10: 143-150.

Dakwale, R.N. and R. Singh (1980). Logistic growth curve in *Heliothis armigera* population. *Geobios*, 7: 57–60.

Deka, N.K., D. Prasad and P. Chand (1989). Plant growth, *Heliothis* incidence and grain yield of chickpea as affected by date of sowing. *J. Res. Birsa Agric. Univ.*, 1: 161–8.

Deka, N.K., D. Prasad, and P. Chand (1987). Succession and incidence of insect pests in chickpea, *Cicer arietinum* L. *Giornale Italiano di Entomol.*, 3: 421–8.

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 Research (Hisar)*.42 (1/2/3): 331-335.

Gunathilagaraj, K. (1996). Management of *Helicoverpa armigera* in chickpea with *Acridotheres tristis*. *Madras Agric. J*., 83: 72–3.

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

Papastylanou, I. (1987). Effect of preceding legume on cereal grain and nitrogen yield. *Journal of Agricultural Sciences*, 108:623-626.

Patel, C.C. and Koshiya D.J., (1997). Seasonal abundance of American bollworm, *Helicoverpa armigera* on different crop hosts at Junagadh (Gujarat). *Indian J. Ento.*, 59: 396–401.

Patel, C.C. and Koshiya D.J., (1999). Population dynamics of gram pod borer, *Helicoverpa armigera* (Hubner) Hardwick on cotton, pigeon pea and chickpea. *Gujarat Agric. Univ. Res. J.,* 24: 62–7.

Prasad, D., P. Chand, N.K. and R. Prasad, (1989). Population dynamics of *Heliothis armigera* (Hub.) on chickpea. *Giornale Italiano di Entomol.,* 4: 223–8.

Singh, S. S. and Yadav, S. K. (2007). Comparative efficacy of insecticides, biopesticides and neem formulations against *Helicoverpa armigera* (Hubner) on chick pea. *Annals of Plant Protection Sciences.*15 (2):299-302.

Srinivas, P.R. and S. Jayaraj (1989). Record of natural enemies of *Heliothis armigera* from Coimbatore district, Tamil Nadu. *J. Biol. Control.*, 3: 71–2.

Tahhan, O., S. Sithanantham, G. Hariri and W. Reed (1982). *Heliothis* species infesting chickpeas in northern Syria. *Int. Chickpea Newsl.,* 6: 21.

Thakur, J.N, Singh J.P., Verma O.P. and Diwakar M.C. (1995). Bioecological studies on gram pod borers *Heliothis* species under Jammu conditions. *J. Adv. Zool.,* 16: 118–22.

Tripathi, S.R. and Sharma S.K., (1985). Population dynamics of *Heliothis armigera* (Hubner) (Lepidoptera Noctuidae) on gram in the Terai belt of N. E. Uttar Pradesh. *Giornale Italiano di Entomol.*, 2: 347–53.

Yadava, C.P. and Lal S.S., (1988). Relationship between certain abiotic and biotic factors and the occurrence of gram pod borer, *Heliothis armigera* (Hbn.) on chickpea. *Entomon*, 13: 3–4.

Yadava, C.P., Lal S.S., R. Ahmad and Sachan J.N., (1991). Influence of abiotic factors on relative abundance of podborers of chickpea (*Cicer arietinum*). *Indian J. Agric. Sci.,* 61: 512–5.