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PJBS

ISSN 1028-8880

Pakistan Journal of Biological Sciences

ANSInet
Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Pakistan Journal of Biological Sciences 6 (13): 1156-1158, 2003
ISSN 1028-8880

Screening of the Best Insecticide in Reducing the Chickpea Pod Damage Inflicted by Gram Pod Borer, *Helicoverpa armigera* (Lepidoptera: Noctuidae) in Faisalabad

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Abstract: The present study was conducted to compare the effectiveness of different insecticides with reference to chickpea pod damage by the larvae of *Helicoverpa armigera* (Hubner) during Rabi season 2001-02. Four insecticides *viz.* cypermethrin (10 EC) @ 350 ml acre^{-1}, endosulfan (35 EC) @ 1000 ml acre^{-} ,^{1} lambdacyhalothrin (2.5 EC) @ 250 ml acre^{-1} and chlorpyrifos (40 EC) @ 800 ml acre^{-1} were tested twice. The screening of best insecticide was determined by comparing treated plots with untreated plots. Chlorpyrifos proved to be the best insecticide in reducing the pod damage and hence increased biomass and yield followed by endosulfan, lambdacyhalothrin, cypermethrin. However, all the insecticide treatments proved to be better in comparison with control in all the above mentioned aspects.

Key words: Chemical control, pesticide, insect pest, pod damage, yield, insecticide resistance

Introduction

Chickpea, *Cicer arietinum* L. is the world's third most important pulse crop grown on about 10 million hectares annually (Rheenen and Van Rheenen, 1991). The crop is damaged extensively by gram pod borer, *Helicoverpa armigera* (Reed *et al*., 1980; Lal *et al*., 1985; Naresh and Malik, 1986; Deka *et al*., 1987) as it feeds on tender shoots and young pods (Lal, 1996). They make holes in pods and insert their half body inside the pods to eat the developing seeds (Kadam and Patel, 1960).

The damage may reach 10-30% in grain yield (Qadeer and Singh, 1989) or even up to 60 % (Vaishampayan and Veda, 1980). According to Joginder *et al.* (1990), damage to pods and seeds by pod borer varies from 13.58-84.28 and 3.15-84.28 % respectively. These losses to the crop can be reduced by the application of insecticides (Gohokar *et al*., 1987 and Biradar *et al*., 1999). The present study was executed to determine the most effective insecticide in reducing the pod damage.

Materials and Methods

The present study was conducted to test the efficacy of different insecticides in relation to chickpea pod damage. The experiment was laid in Randomized Complete Block Design comprising five treatments including a control and four replications at Ayub Agricultural Research Institute, Faisalabad during Rabi season 2001-02. The plot size was 7.00 m X 3.60 m. Four insecticides *viz.* cypermethrin (10 EC) @ 350 ml acre^{-1}, endosulfan (35 EC) @ 1000 ml acre^{-1}, lambdacyhalothrin (2.5 EC) @ 250 ml acre^{-1} and chlorpyrifos (40 EC) @ 800 ml acre^{-1} were applied twice, eight and nineteen days after the commencement of pod formation. The aforesaid insecticides were applied with the help of "Solo Knapsack Hand Sprayer".

The pod damage was noted one day before and one, three, five, seven and nine days after the application of each spray. Healthy and damaged pods were counted on randomly selected five plants per plot and then percent pod damage was evaluated. The biomass and yield of one row from each plot of ripe crop was determined and then extrapolated for one acre. The data about percent pod damage was finally subjected to statistical analysis using analysis of variance and Duncan's multiple range test.

Results

Pod damage: The percent pod damage inflicted by gram pod borer, *Helicoverpa armigera* recorded one day before the application of first spray revealed that the means of different treatments were statistically insignificant but after the application of spray significant differences were found among treatment means (Table 1). The least percent pod damage was observed in plots treated with chlorpyrifos and this situation remained as such in all the observed days after the application of sprays. The percent pod damage in the plots treated with cypermethrin, endosulfan and lambdacyhalothrin was also lower compared with control. The least effective insecticide was cypermethrin.

Biomass: Table 2 indicated that the plots treated with chlorpyrifos offered maximum biomass of 2261.93 kg acre^{-1} compared to control with biomass of 1192.74 kg acre^{-1}. The biomass in plots treated with cypermethrin, endosulfan and lambdacyhalothrin were 1435.69, 1944.76 and 1868.88 kg acre^{-1}, respectively.

Yield: The extrapolated grain yield/acre (Table 2) showed that the chlorpyrifos was the most effective treatment

Table 1: Percent pod damage inflicted by gram pod borer (*Helicoverpa armigera*) observed at different time intervals after the application of insecticides on chickpea during Rabi season 2001-02

		First spray						Second spray					
			Pod damage observed after						Pod damage observed after				
Treatments	Dose/acre	Pretreatment pod damage	1 day	3 days	5 days	7 days	9 days	Pretreatment pod damage	1 day	3 days	5 days	7 days	9 days
Cypermethrin	350ml	3.98NS	6.15ab	8.57ab	8.31b	8.94b	9.58b	9.71b	8.88b	9.24b	10.49b	10.44b	12.06b
Endosulfan	1000ml	2.71NS	6.72a	5.93bc	6.10b	5.84bc	8.00b	4.38b	6.28b	7.44b	7.43b	8.48b	7.70c
Lambdacyhalothrin	250ml	3.68NS	1.74bc	1.82c	2.13c	3.19b	6.63b	3.99b	6.46b	7.13b	8.28b	8.37b	9.11c
Chlorpyrifos	800ml	2.49NS	0.35c	0.87c	0.84c	2.85c	4.76b	4.53b	3.25c	3.45c	3.54c	4.09c	4.23d
Control		2.03NS	8.14a	13.01a	15.96a	17.86a	17.31a	14.78a	14.06a	17.48a	23.28a	25.28a	26.24a

A. NS = Non Significant B. Treatment means marked by the same letter/letters are non-significant at $\alpha = 0.05$ and vice versa.

Table 2: The biomass and grain yield per acre (kg) of chickpea after the application of different insecticides during Rabi season 2001-02.

Treatments	Biomass/acre (Kg)	Grain Yield/acre (Kg)
Cypermethrin	1435.69	423.16
Endosulfan	1944.76	505.86
Lambdacyhalothrin	1868.88	487.39
Chlorpyrifos	2261.93	570.10
Control	1192.74	294.68

(with grain yield of 570.10 kg acre^{-1}) while cypermethrin was the least effective (having grain yield of 423.16 kg acre^{-1}). However, all the insecticide treatments were proved to be better than control (294.68 kg acre^{-1}).

Discussion

Chickpea crop is damaged extensively by *Helicoverpa armigera* which is a widely distributed pest (Reed *et al*., 1980). The population of *H. armigera* increased greatly during the pod formation stage (Deka *et al*., 1987; Lal, 1996; Patel and Koshiya, 1999) and caused serious damage to pods. In the present study different insecticides were tested to reduce the pod damage. A comparison of the present study with those of other entomologists was not possible in absolute terms because of the differences in combinations of insecticides employed by them.

The results of the present study i.e., chlorpyrifos be the best insecticide in reducing the pod damage and hence increased biomass and yield was in agreement with that observed by Balasubramanian *et al*. (2001). The results also revealed that all the insecticides reduce the pod damage to a considerable extent compared with control. These investigations are in accordance with those of Sinha *et al*. (1983), Gohokar *et al*. (1987), Rakesh *et al*. (1996), Khurana (1997), Subbarayudu (1997) and Biradar *et al*. (1999). These authors applied different insecticides against *H. armigera* on chickpea and concluded that the application of insecticides reduced the pod damage to a considerable extent and hence increased the yield in comparison with control.

Although, in the past, the best insecticide was considered to be the cypermethrin (Gohokar *et al*., 1987; Singh *et al*., 1987; Khan *et al*., 1993; Jadhav and Suryawanshi, 1998) and endosulfan (Chaudhary *et al*., 1980; Rizvi *et al*., 1986) but in the present study chlorpyrifos proved to be the best insecticide. This was due to the reason that *H. armigera* in certain localities have acquired resistance to these insecticides. High resistance to the cypermethrin (King and Sawicki, 1990) and to a lesser extent to the endosulfan and lambdacyhalothrin (Ahmed *et al*., 1997) was observed in *H. armigera* larvae. Phokela *et al*. (1990) also observed a tendency of increased resistance to cypermethrin in the population of *H. armigera*. The older larvae were more resistant to the insecticides than the younger ones (Khurana, 1997). Although the pest has developed resistance to the insecticides but still insecticide treatments were useful in reducing the pod damage and increasing the biomass and yield.

References

Ahmad, M., M.I. Arif and M.R. Attique, 1997. Pyrethroid resistance of *Helicoverpa armigera* (Lepidoptera: Noctuidae) in Pakistan. Bull. Entomol. Res., 87: 343-347.

Balasubramanian, G., P.C.S. Babu and T.R. Manjula, 2001. Efficacy of Spicturin against *Helicoverpa armigera* Hubner on chickpea (*Cicer arietinum* L.). Madras Agric. J., 88: 336-338.

Biradar, A.P., S.B. Jagginavar, R.G. Teggalli and N.D. Sunitha, 1999. Efficacy of thiodicarb 75 WP (Larvin) against Bengal gram pod borer. Insect Environ., 4: 144-145.

Chaudhary, J.P., L.S. Yadav and K.B. Rustogi, 1980. Chemical control of gram pod borer, *Heliothis armigera* Hubner and semi-loopers, *Plusia* spp. on gram, *Cicer arietinum* L. Haryana Agri. Univ. J. Res., 10: 324-328.

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: 421-428.

Gohokar, R.T., S.M. Thakre and M.N. Borle, 1987. Chemical control of gram pod borer (*Heliothis armigera* Hubner) by different synthetic pyrethroids and insecticides. Pesticides, 21: 55-56.

Jadhav, R.S. and D.S. Suryawanshi, 1998. Chemical control of *Helicoverpa armigera* (Hubner) on chickpea. J. Maharashtra Agri. Univ., 23: 83-84.

Joginder, S., S.S. Sandhu and M.L. Singla, 1990. Ecology of *H. armigera* on chickpea in Punjab. J. Insect Sci., 3: 47-52.

Kadam, M.V and G.A. Patel, 1960. The gram pod borer. Direc. Pub. Govt. Maharashtra Bombay. Crop pests and how to fight them, pp: 73.

Khan, M.M., M.A. Rustamani, M.A. Talpur, H.B. Balouch and A.B. Chhutto, 1993. Efficacy of different insecticides against *Heliothis armigera* (Hub.) on gram. Pak. J. Zool., 25: 117-119.

Khurana, A.D., 1997. Seasonal activity and chemical control of *Helicoverpa armigera* (Hubner) on chickpea. J. Insect Sci., 10: 48-51.

King, A.B.S. and R.M. Sawicki, 1990. Insecticide resistance of *Helicoverpa* and its management. Proceedings of the Second International Workshop on Chickpea Improvement, pp: 195-201.

Lal, O.P. 1996. An outbreak of pod borer, *H. armigera* (Hubner) on chickpea in Eastern Uttar Pradesh, India. J. Entomol. Res., 20: 179-181.

Lal, S.S., C.P. Yadava and C.A.R. Dias, 1985. Assessment of crop losses in chickpea caused by *H. armigera*. FAO Plant Prot. Bull., 33: 27-35.

Naresh, J.S. and V.S. Malik, 1986. Observations on the insect pests of chickpea (*Cicer arietinum* L.) in Haryana. Bull. Entomol., 27: 75-77.

Patel, C.C. and D.J. Koshiya, 1999. Population dynamics of gram pod borer, *Helicoverpa armigera* (Hubner) Hardwick on cotton, pigeon pea and chickpea. Gujarat Agri. Univ. Res. J., 24: 62-67.

Phokela, A., S. Dhingra, S.N. Sinha and K.N. Mehrotra, 1990. Pyrethroid resistance in *Heliothis armigera* Hubner Development of resistance in field. Pestic. Res. J. 2: 28-30.

Qadeer, G.A. and Y.P. Singh, 1989. Some observations on outbreak of gram pod-borer on gram during Rabi 1987-88 in Haryana. Plant Prot. Bull., 41: 1-2.

Rakesh, R., N. Paras, R. Rai, and P. Nath, 1996. Evaluation of some insecticides for the management of the pod-borer, *Helicoverpa armigera* infesting gram, *Cicer arietinum*. Annals of Plant Prot. Sci., 4: 154-159.

Reed, W., S.S. Lateef and S. Sithanantham, 1980. Insect pest management on chickpea. Proceedings of the International Workshop on Chickpea Improvement. pp. 179-183.

Rheenen, H.A.V. and H.A. Van Rheenen, 1991. Chickpea breeding, progress and prospects. Plant breeding abs., 61: 997-1009.

Rizvi, S.M.A., M.B. Chandhary, V. Pandey and V.K. Upadhyay, 1986. Efficacy and economics of some insecticides in the management of *Heliothis armigera* Hubner. Ind. J. Plant Prot., 14, 47-50.

Singh, H.M., R. Singh and S.M.A. Rizvi, 1987. Screening of synthetic pyrethroids against *Heliothis armigera* attacking chickpea. Narendra Deva J. Agri. Res., 2: 140-143.

Sinha, M.M., S.S. Yazdani, A. Kumar and K. Lal, 1983. Relative efficacy of different spray formulations against gram pod borer. Pesticides, 17: 33-34.

Subbarayudu, B., 1997. Field evaluation of certain synthetic pyrethroids against *Helicoverpa armigera* (Hubner) on chickpea. Ind. J. Plant Prot., 25: 42-44.

Vaishampayan, S.M. and O.P. Veda, 1980. Population dynamics of gram podborer, *Helicoverpa armigera* (Hubner) and its outbreak situation on gram, *Cicer arietinum* L. at Jabalpur. Ind. J. Entomol., 42: 453-459.