Mycopath (2014) 12(2): 119-122 **Research Article**

Relative efficacy of selective insecticides against gram pod borer (*Helicoverpa armigera* H.) of chickpea

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Abstract

A field study was conducted to evaluate the efficacy of five insecticides *viz.*, Emamectin 1.9 EC® (emamectin benzoate), Lannate 40SP® (methomyl), Coragen 20SP® (rynaxypyr), Match 50 EC® (lufenuron), Profenofos 50 EC® (profenofos) against gram pod borer (*Helicoverpa armigera* H.) on chickpea (*Cicer arietinum* L.) variety BRC-390. The experiment was conducted in randomized complete block design with three replications at Regional Agricultural Research Institute, Bahawalpur. The highest mortality of gram pod borer was recorded in plots treated with Profenofos (85%, 90% & 94%) and Coragen (85%, 90% & 92%) at 3, 5 and 7 days after treatment (DAT), respectively. No plant mortality was recorded in untreated plots from 3 to 7 DAT. Thus, these insecticides proved highly effective for the management of gram pod borer on chickpea under field conditions.

Key words: Chickpea, gram pod borer, *Helicoverpa armigera*, insecticides.

Introduction

Chickpea (*Cicer arietinum* L.) is an important legume crop that belongs to family Fabaceae. Asia contributes 90% of chickpea production in the world and Pakistan ranked third for its production (Ahmed and Awan, 2013). Chickpea seed is also important for its high nutritive value and enriched with vegetable protein, carbohydrate, cholesterol lowering fiber, oil, ash, calcium and phosphorus (Pittaway *et al.*, 2006; Muehlbauer and Rajesh, 2008). Chickpea plant is under threat of many insect pests that attack on its roots, foliage and pods (Rao and Shanower, 1999).

Gram Pod borer (*Helicoverpa armigera* H.) is one of the major insect pests of chickpea and has great economic importance (Ahmed and Awan, 2013). It is highly polyphagous insect feeding on many other crops such as cotton, tobacco, safflower, tomato, maize, cabbage, peanuts and pulses (Patankar *et al.*, 2001; Javed *et al.*, 2013). Leguminous crops such as chickpea are its major host resulted in substantial yield loss (37-50%) and in severe cases up to 90% pod damage (Lal, 1996; Yadava and Lal, 1997; Sarwar *et al*., 2009). Single larva can damage 40 pods and selectively feeds upon growing points and reproductive parts of the host plant. It feeds on floral buds, flowers and young pods of the growing crop (Khan *et al.*, 2009).

The wider host range, multiple generation, migratory behaviour and high fecundity of gram pod borer made it difficult to manage. The chemical control is still considered as the last resort for its management due to their quick known effect (Sreekanth, 2014). However, wise use of insecticide is the need of the time to avoid their drastic side effects on environment and natural biocontrol agents (Suhail *et al.*, 2013). Thus, exploring new insecticides with high efficacy and unique mode of action has become imperative. In recent years, newer compounds with novel modes of action are being concentrated to check the infestation of gram pod borer. Keeping in view the severe attack of gram pod borer, the present study aimed to evaluate the efficacy of selected insecticides against the pod borer in chickpea crop under field conditions.

Materials and Methods

The experiment was laid out in Randomized Complete Block Design (RCBD) with three replications at Regional Agricultural Research Institute, Bahawalpur. Five selective insecticides (Emamectin 1.9 EC, Lannate 40 SP, Coragen 20SC, Match 50 EC, Profenofos 50EC) along with a control were tested in the experiment for their relative toxicity against gram pod borer on a chickpea variety BRC-390 (Table 1). These insecticides are abundantly available in the market and used against variety of insect pests of different crops. The chickpea seeds were sown at 0.3 m spacing between the rows and 10 cm distance between the plants. The plot size was 4 m × 1.8 m with a distance of 100 cm between the plots and 150 cm between the replications. Whole agronomic practices were applied uniformly in the field throughout the cropping season. The insecticides were sprayed at their recommended doses with knapsack sprayer (20 mL capacity) at economic threshold level (ETL) of gram pod borer (one larva per meter per row). Five randomly plants were selected from each plot and the population of gram pod borer was recorded from the damaged pods. The data was recorded at 1 day before treatment (pre-treatment) and 3, 5 & 7 days after treatment (post-treatment). The percentage mortality of gram pod borer was calculated with the following formula (Razaq *et al.*, 2005).

Mortality (%) = A –B/C × 100

where

A = Mean population in control

B = Mean population in treatment

C = Mean population in control

Statistical Analysis

The data was analyzed statistically by using analysis of variance (ANOVA) and means were separated by least significance difference (LSD) test at 5% probability level using computer software STATISTICS 8.1**.**

Results and Discussion

Results showed that all the insecticides significantly reduced the pod borer larval population. At 3 DAT, maximum mortality was recorded in plots treated with Coragen (85%) and Profenofos (85%) that a statistically at par followed by Lannate (80%), Emamectin (75%) and Match (65%). Like wise, both Coragen and Profenofos also gave significant highest mortality (90%) as compared to other tested insecticides such as Lannate (87%), Emamectin (80%) and Match (65%). Maximum mortality of gram pod borer was recorded in plots treated with Profenofos (94%) followed by Coragen (92%), Lannate (90%), Emamectin (85%) and Match (80%) at 7 DAT. No mortality was observed in the untreated plots at 3, 5 and 7 DAT. Thus, it is revealed that Profenofos and Coragen were the most effective insecticides to give high mortality of gram pod borer on chickpea under field conditions. It was also observed that the efficacy of all insecticides was gradually increased with the passage of time (Table 2).

These results are in conformity with those of Chandrakar and Shrivastava (2002) and Sonune *et al. (*2010), who also reported the highest mortality of pod borer (94%) in pigeonpea with profenofos. In contrast, Sreekanth *et al.* (2014) reported that population of gram pod borer was lowest in plot treated with flubendiamide, chlorantraniliprole, spinosad and indoxacarb followed by profenofos and emamectin bonzoate. Our results are partially in agreement with Babariya *et al.* (2010), where profenofos exhibited good results after spinosad for the control of gram pod borer. The possible reason for profenofos best control is its unique mode of action. It is an anticholinesterase inhibitor that inhibits the normal functioning of cholinergic pathways. Hamadain and Chambers (2001) argue that the inhibition of acetylcholinesterase in that cholinergic synapse of the nervous system is the primary mechanism of acute toxicity of organophosphate insecticides that might gave the highest mortality of gram pod borer in the present study. A new chemistry insecticide Coragen (rynaxypyr) with different mode of action, high larvicidal potency and long-lasting activity might be the reason for prominent control of gram pod borer in this study. Khan *et al.* (2009) reported that methomyl can reduce the percentage reduction in pod borer infestation which is partially in confirmatory with our results where methomyl also revealed promising results against pod borer. The findings that Emamectin is also effective against pod borer is in agreement with Sharma *et al.* (2011), who concluded that emamectin, a green chemistry insecticide helped in achieving the less yield loss through reduction of pod borer population.

Conclusion

The present findings clearly indicated that all insecticides were effective against gram pod borer, up to seven days after treatment. However, Coragen and Profenofos gave maximum mortality of targeted insect pest at 3, 5 and 7 DAT. Hence, it is suggested that these effective insecticides may be suggested to the growers for management of the borer population below economic threshold level under field conditions. However, thorough investigation are necessary to test their specificity, environmental compatibility and insect pest resistance.

Acknowledgement

The author acknowledged the research support of Muhammad Younis (Entomologist) at Regional Agricultural Research Institute Bahawalpur, Pakistan.

Table 1: Insecticides and their doses used in the experiment**.**

Treatments	**Trade Name**	**Formulations**	**Common Name**	**Group/mode of action**	**Dose (Acre^{-1})**
T_1	Emamectin	1.9 EC	emamectin benzoate	Avermectin (Nerve poison)	200 mL
T_2	Lannate	40 SP	methomyl	Carbamates (Nerve poison: Acetyl-cholinesterase inhibitor	350 g
T_3	Coragen	20 SP	rynaxypyr	Diamide (Nerve and muscle poison	80 mL
T_4	Match	50 EC	lufenuron	Benzoylureas (Insect growth regulators)	200 mL
T_5	Profenofos	50 EC	profenofos	Organophosphates (Nerve poison: Acetyl-cholinesterase inhibitor	800 mL
T_6	Control	-	-	-	-

Table 2: Mean comparison of mortality of gram pod borer on chickpea at 3, 5 and 7 days after treatment (DAT).

Treatments		**Mortality (%)**		
		3 DAT	**5 DAT**	**7 DAT**
T_1	Emamectin 1.9 EC	75 ±3.6 b	80±5.77 ab	85±5.50 ab
T_2	Lannate 40 SP	80±2.8 ab	87±1.52 a	90±5.03 a
T_3	Coragen 20 SP	85±1.15 a	90 ±2.88 a	92±3.21 a
T_4	Match 50 EC	65±1.52 c	75 ±5.50 b	80 ±2.64 b
T_5	Profenofos 50 EC	85±0.57 a	90 ±3.60 a	94±1.15 a
T_6	Control	0 d	0 c	0 c
	LSD at $P \leq 0.05$	2.120	2.120	2.120

The means under each insect population column sharing the same letter are not significantly different at $P \leq 0.05$.

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