Available online at www.ijpab.com

ISSN: 2320 – 7051
Int. J. Pure App. Biosci. **3 (3):** 280-283 (2015)

INTERNATIONAL JOURNAL OF PURE & APPLIED BIOSCIENCE

Research Article

OPEN ACCESS

Evaluation of Certain Insecticides against Gram Pod Borer, *Helicoverpa armigera* (Hubner) Infesting Pigeonpea (*Cajanus cajan* L.)

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ABSTRACT

Two field experiments were conducted during Kharif, 2010 and 2011 to evaluate the bio-efficacy and economics of certain insecticides against gram pod borer, Helicoverpa armigera (Hubner) on pigeonpea. Experimental results showed that the pod damage due to pod borer, H. armigera was lowest (5.9%) in plots treated with acetamiprid and dimethoate, followed by fipronil (6.6%) and thiamethoxam (7.2%) with 42.2, 42.2, 35.3 and 29.4 per cent reduction over control respectively. The untreated plot has recorded maximum pod damage of 10.2%. Highest grain yield was recorded in fipronil treated plots (4.5 q/ha), followed by thiacloprid (4.2 q/ha) and dimethoate (4.0 q/ha) with 50.0, 40.0 and 33.3 per cent increase in yield over control respectively as against the minimum yield of 3.0 q/ha in the untreated check. However, the ICBR was highest in thiamethoxam (1: 7.8) and dimethoate (1: 6.2), followed by acetamiprid (1: 4.1) and thiacloprid (1:3.4).

Key words: *Helicoverpa armigera, insecticides, pigeonpea.*

INTRODUCTION

Pigeonpea (*Cajanus cajan* L.) is a tropical grain legume mainly grown in India and ranks second in area and production and contributes about 90% in the world's pulse production. In India, pigeonpea is grown in 4.42 million ha with an annual production of 2.89 million tonnes and 655 kg ha-1 of productivity. In Andhra Pradesh, it is cultivated in an area of 6.38 lakh ha with production and productivity of 2.65 lakh tonnes and 415 kg ha-1, respectively[2]. Though the area under redgram is increasing both in Kharif and Rabi seasons, the yields have remained stagnant (500- 700 kg/ha) for the past 3-4 decades, largely due to insect pest damage[6]. More than 300 species of insect species have been reported infesting the crop[4] of which pod borer, *Helicoverpa armigera* Hubner is the most dreaded and polyphagous pest of pigeonpea worldwide[5]. Its preference for flowering and fruiting parts results in heavy loss up to 60% or more under subsistence agriculture in the tropics. The annual loss due to this was estimated to be US $ 400 million in pigeonpea[1]. Management of *Helicoverpa armigera* relies heavily on insecticides, often to the exclusion of other methods of management. A number of insecticides have been found reported to be effective for controlling *H. armigera* on pigeonpea[7]. 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 pigeonpea ecosystem.

MATERIALS AND METHODS

Two field experiments were conducted against gram pod borer, *H. armigera* at Regional Agricultural Research Station, Lam, Guntur during Kharif, 2010 and 2011 in a randomized block design (RBD) using pigeonpea cv. ICPL 85063 (Lakshmi) with 7 treatments viz., imidacloprid 17.8 SL @ 0.25 ml/L, acetamiprid 20 SP@ 0.20 g/L, thiamethoxam 25 WG @ 0.2 g/L, fipronil 20 SC @ 2.0 ml/L, thiacloprid 21.7 SC @1.25 ml/L, dimethoate 30 EC @ 2.0 ml/L and untreated control (Table 1) with three replications (4 rows of 5 m long in each replication) . The seeds were sown at a depth of 5 cm below the soil surface in black cotton soils with the help of "gorru" behind the cattle pair with 180 cm spacing between rows. Immediately after sowing, "guntaka" was run over the seeds to cover the seeds with soil. Thinning was done 20 days after seedling emergence by retaining one seedling per hill at a spacing of 20 cm between the plants. Normal agronomic practices were followed for raising the crop (Basal fertilizer N: P: K: 20:50: 0 kg/ha). Intercultural and weeding operations were carried out as needed. Three sprays were given, commencing at 50 per cent flowering, followed by two sprays at 15 days interval with hand operated knapsack sprayer with a spray volume of 500 L per ha. Number of pods showing Helicoverpa damage was recorded and expressed as a percentage of the total number of pods at maturity. The pods were then threshed and grain yield was recorded after discarding the *Helicoverpa armiger* damaged grains. This method was uniformly followed for both the seasons. The monetary returns and incremental cost–benefit ratios of treatments were worked out for selecting economical treatments against the pest. The data were subjected to RBD analysis using AGRES package (Gomez and Gomez, 1984).

RESULTS AND DISCUSSION

The results (Table 1) showed that all the treatments significantly reduced the pod damage due to *H. armigera*. During 2010, there was no significant difference between the treatments with regard to pod damage due to *H. armigera.* Whereas, during 2011 the pod damage was significantly reduced in plots treated with acetamiprid (8.9%), followed by dimethoate (10.0%), fipronil (11.7%) and thiamethoxam (12.0%). The untreated control plot has recorded pod damage of 18.3 per cent. The over all mean showed that pod damage was significantly low in plots treated with acetamiprid and dimethoate (5.9%), followed by fipronil (6.6%) and thiamethoxam (7.2%) with 42.2, 42.2, 35.3 and 29.4 per cent reduction over control (10.2%), respectively.

Continuous heavy rains during October and December, 2010 have resulted in heavy flower drop (both first and second flesh) which ultimately caused drastic reduction in the yield. However, maximum yield of 5.3 q/ha was obtained in plots treated with fipronil, followed by thiacloprid 4.9 q/ha as against the lowest yield of 3.2 q/ha in untreated check during 2010 (Table 1). The erratic rainfall pattern during the crop growth period has resulted in poor yields during 2011-12. However, maximum yield of 3.8 q/ha was obtained in treatments dimethoate and thiamethoxam as against 2.8 q/ha in control. But, pooled data revealed that highest grain yield of 4.5 q/ha and 4.2 q/ha was obtained in plots treated with fipronil 20 SC and thiacloprid 21.7 SC, respectively with 47.5 and 38.3 per cent increase in yield over control as against the lowest yield of 3.0 q/ha in untreated check. The cost effectiveness of thiamethoxam and dimethoate was also high and very favorable with incremental cost-benefit ratios of 1:7.8 and 1: 6.2, respectively followed by acetamiprid (1:4.1) and thiacloprid (1: 3.4).

Since the insecticides were new, the literature on these chemical was scanty. Hence, from the present findings, it could be evidenced that insecticides like fipronil, dimethoate and thiamethoxam were found effective against legume pod borer, *M. vitrata* along with an increased level of yield. Further, the cost effectiveness of thiamethoxam and dimethoate was also high and very favorable with incremental cost-benefit ratios of 1:7.8 and 1: 6.2, respectively followed by acetamiprid (1:4.1) and thiacloprid (1: 3.4). Hence, it is suggested that the effective insecticides may be alternated in order to avoid the development of resistance.

Table 1. Efficacy and economics of insecticides in the control of pod borer, *Helicoverpa armigera* on pigeonpea

Treatment	Dose	Pod damage (%) *				Yield (kg/h)			Increase in yield over control (%)	Increase in yield over control (q)	Cost of increased yield (Rs.) [A]	**Plant protection cost(Rs.) [B]	Net Profit (Rs.) [A-B]	ICBR
		2010	2011	Mean	Reduction ove control (%)	2010	2011	Mean						
Imidacloprid 17.8 SL	0.25 ml/L	2.2 (8.5)	17.8 (24.8)	10.0 (16.6)	2.0	3.7	3.0	3.4	13.3	0.3	1320	388	932	1: 2.4
Acetamipride 20 SP	0.20 g/L	2.9 (9.8)	8.9 (17.2)	5.9 (13.5)	42.2	3.6	3.3	3.5	16.7	0.5	1864	365	1499	1 : 4.1
Thiamethoxam 25 WG	0.20g/L	2.4 (8.7)	12.0 (20.2)	7.2 (14.4)	29.4	4.0	3.8	3.9	30.0	0.9	3516	400	3116	1:7.8
Fipronil 20 SC	2.0 ml/L	1.4 (6.8)	11.7 (19.9)	6.6 (13.4)	35.3	5.3	3.6	4.5	50.0	1.4	5732	2196	3536	1:1.6
Thiocloprid 21.7 SC	1.25 ml/L	2.0 (8.2)	14.4 (22.0)	8.2 (15.1)	19.6	4.9	3.4	4.2	40.0	1.2	4616	1047	3569	1:3.4
Dimethoate 30 EC	2.0 ml/L	1.8 (7.7)	10.0 (18.4)	5.9 (13.1)	42.2	4.1	3.8	4.0	33.3	0.9	3760	525	3235	1 :6.2
Control		2.1 (6.4)	18.3 (25.4)	10.2 (15.9)	--	3.2	2.8	3.0	--	--	--	--	--	--
C.D		NS	7.2	--	--	0.9	0.7	0.8	--	--	--	--	--	--
C.V (%)		22.3	28.4	25.35	--	14.5	23.9	19.2	--	--	--	--	--	--

* Values in parentheses are arc sine transformed values. **Labour charges included; NS: Non Significant;

Market Price of Redgram: Rs. 40/- per kg; Standard spray volume: 500 l/ha

REFERENCES

1. Anonymous, The medium term plan. ICRISAT, Patancheru 502324, Andhra Pradesh, India. **3:** 1-10 (2007)
2. Anonymous, All India Co-ordinated Research Project on Pigeonpea. Project Coordinator's Report.Annual group meet at UAS, Bangalore, 13th-15th May, 2012, 9-10.
3. Gomez, K.A. and Gomez, A.A., Statistical procedures for agricultural research. Joh Wiley and sons, New York, 207-215 (1984)
4. Lal, S.S. and Singh, N.B. In Proceedings of National Symposium on Management of Biotic and Abiotic Stresses in Pulse Crops. Indian Institute for Pulse Research, Kanpur, India, 65-80 (1998)
5. Shanower, T.G. Romeis, J. and Minja, E.M., Insect pests of pigeonpea and their management. *Annual Review of Entomology*, **44:** 77-96 (1999)
6. Sharma, H.C. and Pampapathy, G., Effect of natural plant products, Brassinolide and host plant resistance in combination with insecticides on *Helicoverpa armigera* (Hubner) damages in pigeonpea. *Indian Journal of Plant Protection* **32(2):** 40-44 (2004)
7. Ujagir, R., Field efficacy of insecticides against pod borer complex in early pigeonpea (*Cajanus cajan* (L.) Millsp. at Pantnagar, North India. *Annals of Plant Protection Sciences*, **71:** 19-25 (2000)