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Original Research Article

Field Evaluation of Chlorfenpyr 240 SC against Pod Borer Complex of Redgram and Its Impact on Natural Enemies

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A B S T R A C T

A field study was conducted to evaluate the efficacy of chlorfenpyr 240 SC against pod borer complex of pigeonpea during *kharif*-2016 in a cropping season at KVK Raichur. The experiment was conducted in a randomized block design with seven treatments and three replication. Four doses of chlorfenpyr (144, 192, 240 and 288 *g.a.i./ha*) were tested along with deltamethrin 2.8% EC and monochrotophos 36% SL. Two sprays of were taken based on ETL of pod borers. During cropping period pod borer population *viz.*, gram pod borer and spotted pod borer were reached ETL before the imposition of treatments, after application of insecticides the population was reduced in all the plots except controlled one. Among the treatments chlorfenpyr 240 SC @ 240 and 288 *g.a.i./ha* treated plots were recorded lower pod damage (7.03 & 7.11 %) and higher yield (1136.1 @ 1124.8 kg/ha respectively) and also chlorfenpyr 240 SC @192 *g.a.i./ha* and deltamethrin 2.8% EC @ 12.5 *g.a.i./ha* was found to be next best treatment in reducing pod borer population and both recorded 8.19 and 8.60 per cent pod damage and 1103.7 and 1089.0 kg/ha yield respectively. The highest pod damage (32.06%) and lowest yield (746.7 kg/ha) were reported in the untreated plot.

Keywords

Chlorfenpyr, Deltamethrin, ETL, Gram Pod borer, Monochrotophos, Pigeonpea, Spotted pod borer

Introduction

Pigeon pea or Tur or Red gram (*Cajanus cajan* (L) Millspaugh) is one of the most important grain legume crops of tropical and subtropical countries. India is the world's largest producer and consumer of pulses including pigeonpea. However, pulses production has been stagnant over the last two decades due to several reasons. Amongst them, insect pests are one of the major constraints for poor productivity of pigeonpea. The major insect pests during different growth stages are thrips, whitefly, leafhopper and stemfly cause appreciable damage. But, worldwide, over 30 species of lepidoptera feed on pods and seeds of pigeonpea (Shanower *et al*., 1999). Among the insect species infesting pigeon pea, the pod borer complex is reported to reduce the yield up to 27.77 per cent (Sahoo and Senapati, 2000), where gram pod borer, *Helicoverpa armigera* Hub. is considered to be the most destructive one. The losses in annual pigeonpea due to *H. armigera* have been estimated by more than 300 million dollars worldwide (Anonymous 1992). The pod damage is about 39 to 45 per cent caused by this pest (Thakur and Nema, 1986). Regardless of several control strategies that were found effective in managing these pests the chemical control plays a vital role because of quick action, readily available and very easy to use unlike alternative methods, such as biological control and other similar methods which can take a long while to plan and often don't have an immediate effect on pests (Ahmad and Rai, 2005). Several insecticides have been reported to be effective for controlling pod borers on pigeonpea. In recent years, newer compounds with novel modes of action are being evolved to check infestation by these insect pests (Sreekanth, 2013). Therefore, keeping these views in mind, the present study was conducted to evaluate the bio-efficacy of newer insecticides against pod borer complex in pigeon pea.

Materials and Methods

The field experiment was conducted at KVK, Raichur during *kharif*-2016 to determine the efficacy of certain chlorfenpyr 240 SC against pod borer complex of pigeonpea. The experiment was laid out in randomized block design (RBD) with seven treatments and three replication with a net plot size of 5*5.4 m^2. Pegeionpea variety TS3-R was taken for the experiment and sown in a field with a spacing of 90 cm X 30 cm between plants and rows was maintained respectively. The crop was raised under rainfed conditions and only one protective irrigation was provided during the flowering stage of the crop. All the recommended agronomic practices *i.e*., fertilizer application, thinning, inter cultivation and weeding operations were practiced at a regular time. The application of insecticides was taken two times based on the population of pod borers on pigeonpea. Four doses of chlorfenpyr 240 SC @ 144, 192, 240 and 280 *g.a.i./ha* was taken along with deltamethrin 2.8% EC @ 12.5 *g.a.i./ha* and monocrotophos 36% SL @ 500 *g.a.i./ha*. The first spray was taken 45 days after sowing and the second spray was taken 10 days after the first spray. The control plot was sprayed only with water.

Observation:

For gram pod borer (*H. armigera*) the data on the number of larvae/plant and percent pod damage concerning the imposition of various insecticides were recorded from five randomly selected plants from each plot was made at 1 day before spray, 1, 3, 7 and 10 days after each spray. For spotted pod borer (*Maruca*) live webs per plant were counted on ten randomly selected plants from each plot was made at 1 day before and 1, 3, 5, 7 and 10 days after each spray.

Statistical analysis

The recorded data was transformed and analyzed using the SPSS package. The percent reduction of larval population, pod damage and yield advantage over control were calculated.

Results and Discussions

Efficacy against gram pod borer (*H. armigera*)

Gram pod borer is the one of important pests of pigeonpea, during the time of the experiment the population of this pest was reached ETL before application of the pesticides. The population of gram pod borer was uniform over all the treatments (6.35 – 7.36 larvae/5 plants) (Table 1). The larval population was reduced after the application of insecticides in all the treated plots. Three days after the application of insecticides the population of the gram pod borer was reduced to a considerable number. Lowest number of larvae was observed in the plot treated with chlorfenpyr 240 SC @ 288 *g.a.i/*ha (0.71 larvae/ 5 plant) (Table 1) it was on par with its second lower dose @ 240 *g.a.i/*ha (0.73 larvae/ 5 plant) this was followed by chlorfenpyr 240 SC @ 192 *g.a.i/*ha and deltamethrin 2.8 EC @ 12.5 *g.a.i/*ha both noticed 1.13 and 1.18 larvae/ 5 plants and both on par with each other. The highest number of the larva was noticed in the untreated plot (4.87 larvae/ 5 plant). The population of gram pod borer was under check up to 7 days after application but after 10 days of spray the population was increased gradually and reached ETL, so for this, another spray was taken to control the increasing population. After 10 days of the second spray the population of gram pod borer was nil in the plots treated with chlorfenpyr 240 SC @ 288 and 240 *g.a.i/*ha. The plots treated with chlorfenpyr 240 SC @ 192 *g.a.i/*ha and deltamethrin 2.8 EC @ 12.5 *g.a.i/*ha have noticed minimum larval population (0.02 & 0.09 larvae /5 plants respectively) and both are on par with each other. The plots treated with chlorfenpyr 240 SC @ 288 and 240 *g.a.i/*ha have recorded 100 per cent reduction over control. From this, we can conclude that chlorfenpyr 240 SC @ 288 and 240 *g.a.i/*ha are both the best treatments in controlling the pod borer population.

Efficacy against spotted pod borer (*M. vitrata*)

Spotted pod borer was one of the important pests during the early stage of the cropping period, it feeds on leaves by making webs during an early stage if not controlled it will start feeding pod also. Before the application of insecticides, the pest population reached ETL. The pest incidence was taken in the form of live webs per 10 plants, before the application of insecticides, the number of live webs ranged from 6.52 to 6.94 per 10 plants (Table 2). After the application of insecticides, the population spotted pod borer was decreased and after 10 days of the insecticide application population of this pest was below ETL in all the treatments except the untreated plot. However, the lowest population was noticed in the plot treated with chlorfenpyr 240 SC @ 288 and 240 *g.a.i/*ha both noticed 0.29 live webs per 10 plants (Table 2). This was followed by chlorfenpyr 240 SC @ 192 *g.a.i/*ha and deltamethrin 2.8 EC @ 12.5 *g.a.i/*ha both are on with each other with 0.60 live webs per 10 plants (Table 2). The highest larval population was noticed in untreated plot 2.58 live webs per plant. After the second spray observation was not made regarding the spotted pod borer as it was completely minimized with only one spray. Here also chlorfenpyr 240 SC @ 288 and 240 *g.a.i/*ha are the best treatments in reducing the spotted pod borer incidence.

Pod damage and yield

The data on pod damage was present in Table 3 which revealed that the per cent of pod damage was varied significantly among all the treatments and was found to be superior over untreated control. The lowest pod damage (7.03 % damaged pods/plant) has been recorded in chlorfenpyr 240 SC @ 288 *g.a.i/*ha and highest pod damage (32.06 % damaged pods/plant) has been recorded in untreated plot. Similarly the highest yield (1136.1 kg/ha) was noticed in the plot treated with chlorfenpyr 240 SC @ 288 *g.a.i/*ha (Table 3) it was followed by chlorfenpyr 240 SC @ 240 *g.a.i/*ha (1124.8 kg/ha) and lowest grain yield (746.7 kg/ha) was noticed in untreated plot. From this, we can say that chlorfenpyr 240 SC @ 288 and 240 *g.a.i/*ha are both the best treatment in reducing pod damage and increasing grain yield.

In the present investigation, all the treatments are effective and superior over control in controlling pod borer complex namely, *H. armigera* and *M. vitrata* on pigeonpea.

Table.1 Comparative efficacy of chlorfenapyr 240 SC against *H. armigera* infesting red gram during *kharif* 2016

Sl. No.	Treatments	Dose (*g.a.i*/ha)	Larvae per 5 plants after first application					Larvae per 5 plants after second application					% ROC
			1 DBS	1DAS	3 DAS	7 DAS	10 DAS	1 DBS	1 DAS	3 DAS	7 DAS	10 DAS	
T_1	Chlorfenapyr 240 SC	144	6.35 (2.54)*	1.42 (1.43)	1.25 (1.37)	0.75 (1.20)	2.20 (1.66)	4.01 (2.09)	1.25 (1.38)	0.91 (1.26)	0.52 (1.11)	0.19 (0.94)	92.36
T_2	Chlorfenapyr 240 SC	192	6.41 (2.55)	1.25 (1.38)	1.13 (1.34)	0.65 (1.16)	1.72 (1.52)	3.85 (2.06)	0.60 (1.13)	0.21 (0.95)	0.10 (0.92)	0.02 (0.90)	99.19
T_3	Chlorfenapyr 240 SC	240	6.59 (2.58)	1.07 (1.32)	0.73 (1.20)	0.42 (1.05)	1.33 (1.40)	3.75 (2.01)	0.18 (0.94)	0.05 (0.92)	0.00 (0.89)	0.00 (0.89)	100
T_4	Chlorfenapyr 240 SC	288	7.06 (2.66)	0.89 (1.25)	0.71 (1.19)	0.29 (1.01)	1.25 (1.38)	3.68 (2.01)	0.11 (0.92)	0.00 (0.89)	0.00 (0.89)	0.00 (0.89)	100
T_5	Deltamethrin 2.8% EC	12.5	7.36 (2.71)	1.36 (1.42)	1.18 (1.36)	0.65 (1.16)	1.90 (1.60)	3.91 (1.93)	0.95 (1.19)	0.59 (1.12)	0.21 (0.95)	0.09 (0.91)	96.38
T_6	Monocrotophos 36% SL	500	7.00 (2.65)	4.33 (2.15)	2.43 (1.72)	2.79 (1.81)	3.71 (2.02)	4.16 (2.13)	2.67 (1.78)	1.43 (1.44)	0.89 (1.25)	0.48 (1.07)	80.72
T_7	Untreated control	-	6.83 (2.62)	5.28 (2.34)	4.87 (2.26)	3.68 (2.01)	4.33 (2.15)	4.48 (2.19)	3.85 (2.06)	4.16 (2.12)	3.49 (1.96)	2.49 (1.73)	-
SEm+			0.09	0.10	0.07	0.09	0.09	0.08	0.10	0.10	0.08	0.06	
CD at 5%			NS	0.31	0.20	0.27	0.28	NS	0.31	0.30	0.24	0.60	
CV (%)			7.96	10.29	9.84	10.24	8.65	7.68	7.96	8.96	10.22	9.25	

*Figures in the parentheses are $\sqrt{x + 0.1}$ transformation; DBS – Day before spray; DAS – Days After Spray. NS: Non - significant

Table.2 Comparative efficacy of chlorfenapyr 240 SC against *M. vitrata* on redgram during *kharif* 2016

Tr. No	Treatments	Dose (*g.a.i/*ha)	PTC	Average no. of larval population (live webs) / 10 Plants				
				First Spray				
				1 DAS	3 DAS	5 DAS	7 DAS	10 DAS
T_1	Chlorfenapyr 240 SC	144	6.52 (2.57)	6.05 (2.48)	1.87 (1.57)	1.69 (1.51)	1.49 (1.45)	0.77 (1.22)
T_2	Chlorfenapyr 240 SC	192	7.40 (2.71)	6.32 (2.54)	1.48 (1.45)	1.16 (1.35)	0.98 (1.29)	0.60 (1.15)
T_3	Chlorfenapyr 240 SC	240	7.12 (2.67)	6.94 (2.64)	1.48 (1.45)	1.20 (1.36)	1.18 (1.36)	0.29 (1.02)
T_4	Chlorfenapyr 240 SC	288	6.91 (2.63)	6.27 (2.53)	1.18 (1.36)	0.89 (1.25)	1.02 (1.31)	0.29 (1.02)
T_5	Deltamethrin 2.8% EC	12.5	7.71 (2.77)	6.76 (2.61)	1.78 (1.54)	1.48 (1.45)	1.18 (1.36)	0.60 (1.15)
T_6	Monocrotophos 36% SL	500	6.85 (2.63)	6.69 (2.60)	4.36 (2.16)	2.96 (1.85)	2.58 (1.75)	1.60 (1.49)
T_7	Untreated control	-	7.03 (2.65)	6.72 (2.60)	5.61 (2.40)	4.36 (2.16)	3.12 (3.12)	2.58 (1.75)
S.Em±			0.12	0.12	0.08	0.07	0.10	0.09
CD at 5%			NS	NS	0.23	0.22	0.29	0.27

Figures in the parentheses are √x + 1 transformation; PTC – Pre Treatment Count; DAS – Days After Spraying. NS: Non - significant

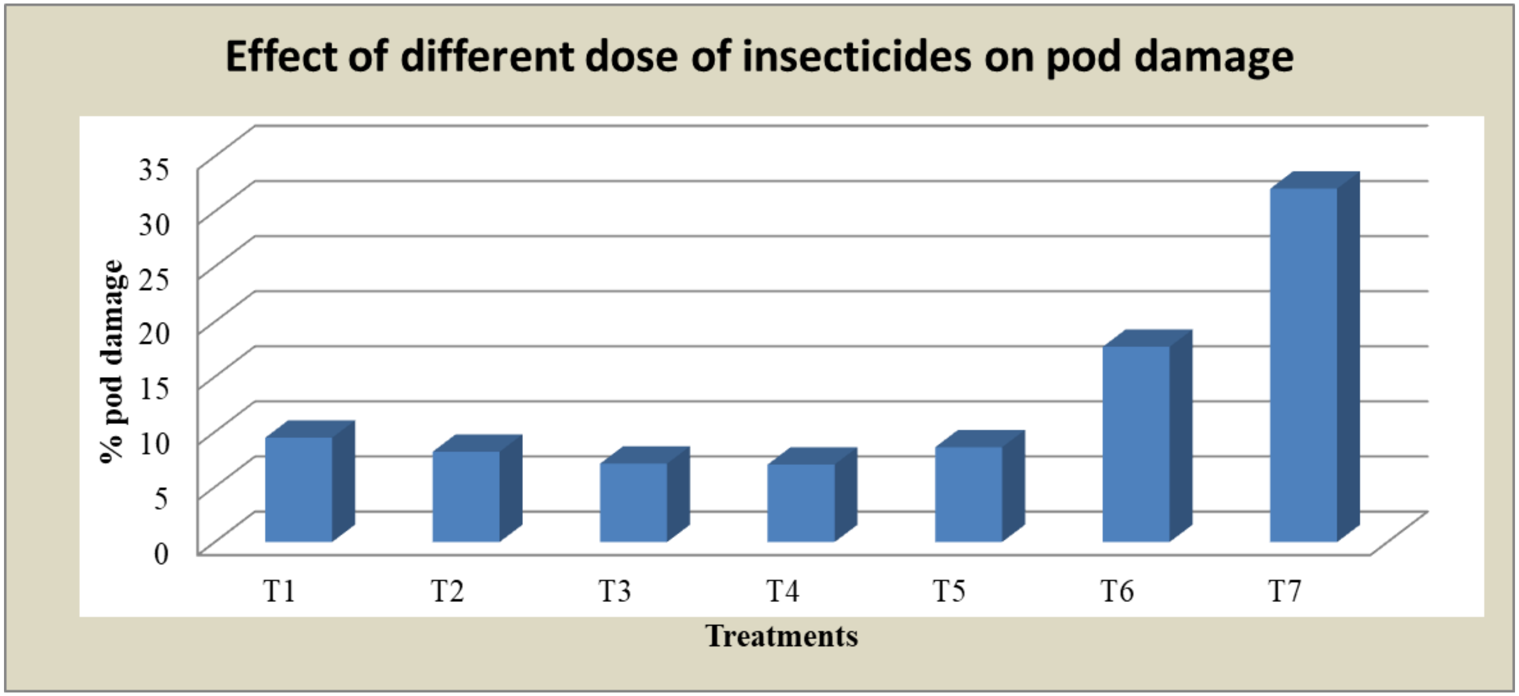
Note: The maruca incidence after second spray was negligible in all the treatments hence not made observations after second spray.

Table.3 Effect of different doses of chlorfenapyr 240 SC on per cent pod damage and yield of red gram during *kharif* 2016
Comparison of effect different insecticides on pod damage by pod borer complex

Tr.No.	Treatments	Dose (*g.a.i*/ha)	**Pod borers damage (%)	Yield (kg/ha)
T_1	Chlorfenapyr 240 SC	144	9.46 (16.94)	1056.3
T_2	Chlorfenapyr 240 SC	192	8.19 (15.72)	1103.7
T_3	Chlorfenapyr 240 SC	240	7.11 (14.61)	1124.8
T_4	Chlorfenapyr 240 SC	288	7.03 (14.52)	1136.1
T_5	Deltamethrin 2.8% EC	12.5	8.60 (16.12)	1089.0
T_6	Monocrotophos 36% SL	500	17.71 (23.58)	946.4
T_7	Untreated control	-	32.06 (32.82)	746.7
SEM(±)			0.72	25.41
CD at 5%			2.14	76.16
CV %			9.18	6.95

Values in parenthesis are arcs in transformed

Fig.1 Comparison of effect different insecticides on pod damage by pod borer complex



The formulation chlorfenpyr 240 SC @ 288 and 240 *g.a.i/ha* are both best treatment in controlling pod borer complex in pigeonpea. The present formulation of chlorfenpyr is a newer molecule on pigeonpea hence information about the efficacy of chlorfenpyr against pod borer complex was not available but the same chemical or other chemicals with the same mode of action was studied against other lepidopteran pests by many authors. Patra *et. al.* (2016) reported that chlorfenpyr 10 SC @ 200 *g.a.i/ha* was superior treatment in reducing DBM on cabbage and recorded higher yield. Bhushan *et al*. (2010) reported the effectiveness of chlorfenapyr against *S. litura* Fab. On potato. Taggar *et al*. (2011) and Gaur and Chaudhary (2012) also reported its effectiveness against *S. litura*. Karmakar and Patra (2015) reported that Pyridalyl 15% + Fenpropathrin 20% EC was the best chemical in controlling pod borer complex in pigeonpea. Nair *et al*. (2008) reported that pyridalyl 10 EC (at 50 and 75 g a.i./ha) was highly effective in controlling the pest of red gram up to 15th days of treatment.

From the present experiment, it can be concluded that chlorfenpyr was the best chemical in controlling pod borer complex on pigeonpea compared to deltamethrin and monochrotophos as they both are old chemical. From this we suggest formers to take newer molecules to control pigeonpea pod borers rather than using older chemicals.

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