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Relative Performance of Certain Newer Insecticides against Pod Bug [*Clavigralla gibbosa* (Spinola)] on Long Duration Pigeonpea

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Field experiments were conducted to observe, the relative performance of some new insecticides with novel mode of action (Acetamiprid 20 SP @20 g a.i./ha, Spinosad 45 % SC @73 g a.i./ha, Rynaxypyr 18.5 SC 30g a.i/ha, Dimethoate 30 EC @ 600 g a.i./ha, Profenophos+DDVP 20ml+0.5ml/lit, Acephate 75 SP @ 750 g a.i./ha) for the management of Pod bug [*Clavigralla gibbosa* (Spinola)] on Pigeon pea in field condition, during the *kharif* season of 2012-13 and 2013-14 at Agricultural Research Farm, Banaras Hindu University, Varanasi. Among the insecticide tested, the lowest pod damage & grain damage by Pod bug was recorded in the plot treated with Rynaxypyr 18.5 SC @ 30g a.i./ha (10.33 &9.00% and 3.65 &2.05% respectively) which is at par with Spinosad 45% SC @73 g a.i./ ha (12.66% & 10.00 % and 3.84% & 2.51 % respectively).

Key words: Rynaxypyr, Pod bug, Insecticides, Spinosad.

Pigeon pea (*Cajanus cajan* L. Mills.) is known by more than 350 dialect names, the crop ranks fourth in importance as edible legume in the world. It is the second most important pulse crop after chickpea in India (Das *et. al* 2015). It is estimated that India imported about 4 million tonnes of pulses during 2012-13, and the production of Pigeon pea faced a decrease from 3.07 to 3.04 million tonnes during 2012-13 to 2013-14 with an import pressure of 0.33 million tonnes to meet the demand of 3.30 million tonnes (Anonymous, 2015). Pigeon pea is mainly grown as marginal or a component of mixed cropping system in cotton, sorghum and soybean, receiving less attention off farmers (Sharma *et al*., 2011). Yield of this crop remained stagnant for the past 3 to 4 decades, largely due to damage inflicted by insect pests Basand Rai *et al*. (2011). Mandal *et al*. (2009) observed that Pigeon pea infested with as many as 21 insect pests and 2 species of mites at different stages of crop growth in an overlapping manner. Pigeon pea is attacked by insect/pests right from sowing to harvesting and also during the storage. Climate change may lead to shift in production areas of the pigeon pea as well as changes in geographical distribution, incidence and intensity of pests and diseases. Among insect pests, Tur pod bug *Clavigralla gibbosa* (Spinola), is potential pests and occasionally cause significant grain yield losses in long duration pigeon pea (Singh & Nath 2011).Feeding by nymphs and adults of this bug causes premature shedding of flower-buds, flowers and pods, deformation of pods, and shriveling of grains, resulting in substantial losses to pigeon pea crops. Both adult and nymph of *C. gibbosa* feed on pigeon pea by piercing the pod wall and extracting the nutrient from the developing seeds. Bio intensive integrated pest management allows selective use of eco friendly pesticides after maximizing effectiveness of natural control. Hence,

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the present study was carried out on the role of bio rational approaches in reducing pod and grain damage by *C. gibbosa* to pigeon pea.

MATERIALS AND METHODS

The field experiments were conducted at Agricultural Research Farm, Banaras Hindu University, Varanasi during the *kharif* season 2012-13 and 2013-14. The long duration pigeonpea variety BAHAR, which is commonly cultivated in this area, was grown in plots of 5 rows, 4 meters following row to row and plant to plant spacing of 75 cm and 10 cm respectively. The crop was grown following the normal agronomic practices in "Randomized Block Design" with three replications and seven treatments of insecticides i.e. Acephate 75 SP 750g a.i/ha, Acetamiprid 20 SP @20 g a.i./ha, Spinosad 45 % SC @73 g a.i./ha, Rynaxypyr 18.5 SC 30g a.i/ha, Dimethoate 30 EC @ 600 g a.i./ha, Profenophos+DDVP 20ml+0.5ml/lit and control. . Three sprays were taken, first spray of insecticidal treatments was given after 50% flowering and subsequent sprays were applied at 15 days interval. Five plants in each plot from the three rows were selected randomly and all the pods from five plants were pooled together and finally 200 pods were picked up for pod and grain damage assessment and yield was recorded for each plot.

Statistical analysis

The values were duly transformed and subjected to statistical analysis. The significance of data was analysed by analysis of variance (ANNOVA) and the means were compared. The analysis was done by SPSS vs.16.0.

RESULTS AND DISCUSSION

Pod damage by pod bug

The treatment applied showed significant differences in the percent pod damage by pod bug and data are given in table (1,2) .The percent pod damage ranged from 10.33 &9.00% Rynaxypyr 18.5 SC @ 30g a.i./ha to 17.00 &15.00 in Acetamiprid 20SP @ 20g a.i./ha during 2012-2013 & 2013-14 respectively. While in control plot the damage was 18.33 & 15.33% during both the year. All treatment were found to be superior over control with respect to percent pod damage. The relative performance of various insecticide was found in order of Rynaxypyr 18.5 SC @ 30g a.i./ha > Spinosad 45 % SC @73 g a.i./ha > Dimethoate 30 EC @ 600g a.i./

Table 1. Relative performance of newer insecticides against pod bug (*Clavigralla gibbosa)* infesting long duration Pigeon pea at Varanasi during, 2012-13

Treatments	Doses (a.i./ha)	Percent Damage bypod bug		Yield (kg/ha)
		Pod	Grain	
Acephate 75 SP	750g	15.66 (23.29)	5.05 (12.96)	1702
Spinosad 45% SC	20g	12.66 (20.82)	3.84 (11.17)	1851
Rynaxypyr 18.5 SC	73g	10.33 (18.68)	3.65 (11.09)	1900
Acetamiprid 20 SP	30g	17.00 (24.15)	5.16 (13.09)	1730
Profenophos+DDVP	2ml+0.5ml/lit	13.66 (21.62)	4.96 (12.77)	1645
Dimethoate 30EC	600g	13.33 (21.39)	4.24 (11.87)	1660
Control	-	18.33 (25.31)	6.68 (14.95)	810
SEm±	-	1.28	0.70	-
C.D at p= 0.05%	-	3.99	2.20	-

Figures in parentheses are Angular transformed values

ha Profenophos + DDVP @ 2ml +0.5 ml/lit >Acephate 75SP @ 750 g a.i./ha> Acetamiprid 20SP @ 20g a.i./ha. The lowest pod damage by pod bug was recorded in the plot treated with Rynaxypyr 18.5 SC @ 30g a.i./ha (10.33 &9.00%) which is at par with Spinosad 45 % SC @73 g a.i./ha (12.66% & 10.00 %). Same trend of result was also showed by Pandey and Das (2014) Rynaxypyr 20% SC @ 30g *a.i.* /ha was found to be most effective as it recorded lowest bug population after each spray intervals. Niraj *et al*. (2008) found that the E_2Y_{45} 20% SC (Rynaxypyr) @ 40 g a.i. /ha is the best treatment against pod damage by pod bug with 15.7% compare to other treatments. Narasimhamurthy and Ram Keval (2013) and the study revealed that the treatments applied showed significant difference in the per cent pod damage by pod bug. The plot treated with Spinosad 45% SC showed minimum (8.30%) pod damage by pod bug during 2009-2010, which is at par with Indoxacarb 14.5% SC, Dimethoate 35% EC and Endosulfon 30% EC.

Grain damage by pod bug

The treatment applied showed significant differences in the percent grain damage by pod bug and data are given in table .The percent grain damage ranged from 3.64 &2.05 percent in Rynaxypyr 18.5SC @ 30g a.i./ha to 5.16 &5.00 in Acetamiprid 20SP @ 20g a.i./ha during 2012-2013 & 2013-14 respectively. While in control plot the damage was 6.68 & 5.33 percent during both the year. All treatment were found to be superior over control with respect to percent grain damage.The relative performance of various insecticide was found in order of Rynaxypyr 18.5SC @ 30g a.i./ha > Spinosad 45% SC @73 g a.i./ha >Dimethoate 30 EC @ 600g a.i./ha>Profenophos + DDVP @ 2ml +0.5 ml/lit>Acephate 75SP @ 750 g a.i./ha> Acetamiprid 20SP @ 20g a.i./ha. The lowest grain damage by pod bug was recorded in the plot treated with Rynaxypyr 18.5SC @ 30g a.i./ha (3.65 &2.05%) which is at par with Spinosad 45% SC @73 g a.i./ ha (3.84% & 2.51 %) (Table). Similar type of findings was reported by Rachappa *et al*. (2014) who observed that the Cyantraniliprole (Rynaxypyr) 10.26%w/w OD @ 60 g a.i. /ha was highly effective in controlling pigeon pea pest by registering lowest seed damage by pod bug (1.55 %). Singh *et al*. (2008) found that the E_2Y_{45} 20% SC (Rynaxypyr) @ 40 g a.i. /ha is most effective in controlling pigeon pea pod bug with 8.47% and 6.46% over control. Narasimhamurthy and Ram Keval (2013) recorded that the plot treated with Spinosad 45% SC showed minimum 2.36% grain damage by pod bug during

Table 2. Relative performance of newer insecticides against pod bug (*Clavigralla gibbosa)* infesting long duration Pigeon pea at Varanasi during 2013-14

Treatments	Doses (a.i./ha)	% Damage by pod bug		Yield (kg/ha)
		Pod	Grain	
Acephate 75 SP	750g	15.66 (23.29)	5.05 (12.96)	1702
Spinosad 45% SC	20g	12.66 (20.82)	3.84 (11.17)	1851
Rynaxypyr 18.5 SC	73g	10.33 (18.68)	3.65 (11.09)	1900
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Control	-	18.33 (25.31)	6.68 (14.95)	810
SEm±	-	1.28	0.70	-
C.D at p= 0.05%	-	3.99	2.20	-

Figures in parentheses are Angular transformed values

2009-2010, which is at par with Indoxacarb 14.5% SC, Dimethoate 35% EC and Endoslfon 30% EC.

Grain yield

The grain yield under different insecticide treatment differed significantly during both the year. The relative performance of various insecticides in terms of grain yield was found in order of Spinosad 45% SC @ 73ga.i./ha >Acetamiprid 20 SP>Rynaxypyr 18.5 SC>.profenophos +DDVP>Acephate 75 SP>Dimethoate 30EC. The highest grain yield was observed in the treatment treated with Spinosad 45% SC (1900 kg/ha & 1810 kg/ha) followed by treatment treated with Acetamiprid (1851 kg/ha &1690 kg/ha) respectively during both the year, while the lowest yield was observed under control plot. The findings of present study are in accordance with Sreekanth *et al*. (2014) found that the maximum grain yield was observed in spinosad 45.1 SC @ 0.33 ml/litre treated plot 16.2 and 18.4 q/ ha, respectively which was significantly superior over all the treatments. Manjunath *et al*. (2014) indicated that pesticide based IPM module comprising of thiodicarb 75 WP, rynaxypyr 18.5 SC, spinosad 45 SC, DDVP 76 EC and flubendiamide 480 SC proved to be cost effective by recording highest grain yield (2819 kg/ha) and benefit cost ratio (4.09**).**

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