Research Paper :

Effect of synthetic insecticides and biopesticides on the extent of pod borers damage and grain yield in pigeonpea

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SUMMARY

A field experimental results of pod and grain damage due to pod borer of pigeonpea revealed that the treatment with monocrotophos was superior in reducing collective pod and grain damage to the lowest extent than other treatments. The next promising treatment was endosulfan. The maximum grain yield was also obtained from the plots treated with monocrotophos which was at par with endosulfan treatment.

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In India, pigeonpea is one of the major pulse crops grown on nearly 4.6 million hectares with an annual production of 2.5 million tonnes (Anonymous, 2000). More than 150 insect species have been reported feeding on pigeanpea at various stages of its growth in India (Davies and Lateef, 1975).

The pigeonpea pod borers are of great significance as they attack developing grains in the pods. The pod and grain damage has been reported separately to the extent of 60% due to infestation of pod borers (Reed *et al.,* 1980, Lateef and Reed, 1985 and Singh, 1986).

Keeping this in view and considering economic importance of pigeonpea, the present investigation was undertaken to know the effect of synthetic insecticides and biopesticides on the extent of pod damage, grain damage and grain yield by different borers on pigeonpea.

MATERIALS AND METHODS

At the instructional farm during *Kharif* season, a field experiment was conducted in Randomized Block Design taking three replications and thirteen treatments along with control, by sowing 'ICPL-87'as pigeonpea variety at a spacing of 30cm x 15 cm and plot size of 3.9 m x 2.7 m The details of insecticides and biopesticides used for treatment are given in the tables. Three sprayings were done by hand operated Knapsack sprayer using the spray fluid @ 500 l/ha, for each spray. The first spray was given at 50% flowering and subsequent sprays were given at 15 days interval. Neem seed kernel extract (NSKE) was prepared just before the application. At the time of harvesting, randomly selected five plants of each plots were critically examined for recording the number of damaged pods as suggested by Bindra and Jokhmola (1967). On the basis of symptom caused the attack of different borers on pigeonpea was counted *H.armigera* larvae bored large holes inside pod shells which were devoid of excreta, while *E.atosoma* larvae showed holes opposite to seed and partially eaten grains with blackish excreta. In case of *M.obtusa,* maggot prepared mines below the grain testa by initially feeding internally and later becoming an external grain feeder. Also, the pods were opened and examined for grain damage. The yield of pigeonpea per plot was recorded at harvest separately. The yield per plot was later converted into yield per hectare. Statistical analysis of the data on per cent damage

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obtained from field experiment was done as per the procedure given by Panse and Sukhatme (1967). The data on percentage of damaged pods and grains were transformed into their arcsin values to reduce the variation in differents treatment and then subjected to statistical analysis. The significance of treatment was assessed by determining critical difference (C.D.) at 5% level of significance.

RESULTS AND DISCUSSION

It could be seen from the Table 1 that pod damage caused due to *H. armigera* was to the extent 21.43% in the untreated plots. Insecticide treatment of endosulfan against *H. armigera* proved to the significantly superior recording a least pod damage (7.05%) followed by monocrotophos (7.46%). Similar results were obtained by Biradar *et al.* (2001) during their study.

The pod damage caused due to *E. atomosa* revealed that endosulfan recorded lowest pod damage of 2.91%. It was, however at different from monocrotophos (3.30%), cyhalothrin (3.55%) and MVD_1(3.91%).The present finding in respect to endosulfan and monocrotophos are in agreement with those of Sinha *et al.* (1977), Bharadwaj *et al.* (1978) and Chelliah *et al.* (1978). Whereas the untreated plot showed pod damage to the extent of 8.62%.

Infestation of pods due to *M. obtusa* exhibited the damage in the untreated plots to the extent of 12.25%. Monocrotophos established its superiority over all other treatments by recording pod damage of 3.10% followed by dichorvos (4.93%) and endosulfan (5.33%), being at par with each other. Reddy *et al.* (2001) found that spraying of monocrotophos gave excellent protection to the pods.

Considering the performance of all treatments on the collective pods damage, it proved that monocrotophos and endosulfan were highly effective in reducing the pods damage due to attack of different borers.

The data obtained from Table 2 indicated the all the treatments were significantly superior over untreated control (35.50%) ranging from 9.75% to 27.10% in reducing the grain damage by pod borers. Monocrotophos recorded the lowest grain damage (9.75%) and proved to be significantly superior to all other treatments except endosulfan (11.07%) which was at par with it. Sundara Babu and Rajsekaram (1984) reported excellent performance of endosulfan in controlling the pod borers from damaging the grains.

In the present investigation, MVD_1 was found promising among biopesticides, but cannot be compared due to lack of literature. *Bacillus thuringiensis* and NSKE were inferior against pod borers as compared to synthetic insecticides. The result in respect to NSKE is in conformity with Sahoo and Senapati (2000) whereas controversial in case *of Bacillus thuringiensis* as per the findings of Mathur *et al.* (1995) and Pawar and Gunjal (1995). The low dose *i.e.* 500 g/ha used could be the reason for poor performance of *Bacillus thuringiensis*

Table 1: Effect of synthetic insecticide and biopesticide on the extent of pod damage due to pod borers

Sr. No.	Treatments	Dose	Pod damage (%)			Collective pod damage (%)
			H. armigera	*E. atomosa*	*M. obtusa*	
1.	Endosulfan	350 g a.i./ha	7.05 (15.39)	2.91 (9.80)	5.33 (13.31)	15.29 (23.02)
2.	Monocrotophos	250 g a.i./ha	7.46 (15.84)	3.30 (10.47)	3.10 (10.14)	13.86 (21.85)
3.	Dichorvos	500 g a.i./ha	8.68 (17.15)	4.54 (12.25)	4.93 (12.79)	18.15 (25.20)
4.	Profenophos	500 g a.i./ha	10.03 (18.43)	5.20 (13.18)	7.10 (15.45)	22.33 (28.20)
5.	Acephate	300 g a.i./ha	13.31 (21.39)	6.02 (14.18)	7.62 (16.00)	26.95 (31.59)
6.	Cyhalothrin	15 g a.i./ha	11.58 (19.91)	3.55 (10.86)	8.06 (16.48)	23.19 (28.78)
7.	Cartap	500 g a.i./ha	13.90 (21.89)	6.60 (14.89)	6.65 (14.95)	27.15 (31.38)
8.	Spinosin	12.5 g a.i./ha	15.23 (22.95)	6.98 (15.23)	7.28 (15.68)	29.40 (32.83)
9.	NSKE	25 kg /ha	11.54 (19.82)	5.10 (13.05)	10.44 (18.81)	27.08 (31.35)
10.	MVD_1	5×10^{12} spores/ha	8.34 (16.74)	3.91 (11.39)	6.77 (15.06)	19.02 (22.85)
11.	MVD_2	5×10^{12} spores/ha	12.87 (21.05)	4.32 (11.97)	7.70 (16.11)	24.89 (29.93)
12.	*Bacillus thuringiensis*	500 g/ha (formulated)	13.66 (21.68)	4.75 (12.58)	8.18 (16.64)	26.59 (31.03)
13.	Untreated control	-	21.43 (27.56)	8.62 (17.05)	12.25 (20.48)	42.30 (40.56)
	S.E. $\pm$	-	0.07.	0.55	0.72	0.51
	C.D. (P=0.05)	-	0.22	1.40	2.10	1.49
	C.V (%)	-	0.64	8.29	8.77	3.02

Figures in parenthesis are sin transformed values

Table 2: Effect of synthetic insecticide and biopesticide on the extent of grain damage and yield of pigeonpea due to attack of pod borers

Sr. No.	Treatments	Dose	Collective (%) grain damage	Grain yield		Per cent increase over control
				kg/plot	kg/ha	
1.	Endosulfan	350 g a.i./ha	11.07 (19.42)	2.04	1937	51.98
2.	Monocrotophos	250 g a.i./ha	9.75 (18.19)	2.06	1956	52.45
3.	Dichorvos	500 g a.i./ha	13.92 (21.83)	1.80	1709	45.58
4.	Profenophos	500 g a.i./ha	18.30 (25.32)	1.66	1576	40.98
5.	Acephate	300 g a.i./ha	21.58 (27.68)	1.53	1452	35.95
6.	Cyhalothrin	15 g a.i./ha	19.27 (26.03)	1.66	1576	40.98
7.	Cartap	500 g a.i./ha	25.36 (30.24)	1.49	1415	34.27
8.	Spinosin	12.5 g a.i./ha	27.10 (31.35)	1.40	1329	30.02
9.	NSKE	25 kg /ha	24.42 (29.60)	1.50	1424	34.69
10.	MVD_1	5×10^{12} spores/ha	15.73 (23.35)	1.76	1671	44.34
11.	MVD_2	5×10^{12} spores/ha	22.66 (28.16)	1.56	1481	37.20
12.	*Bacillus thuringiensis*	500 g/ha (formulated)	21.80 (27.81)	1.53	1452	35.95
13.	Untreated control	-	35.50 (36.57)	0.98	930	-
	S.E.$\pm$	-	0.61	0.02	-	-
	C.D (P=0.05)	-	1.78	0.07	-	-
	C.V (%)	-	3.98	2.09	-	-

Figures in parenthesis are sin transformed values

in the present study.

From the Table 2, it could be seen that the maximum increase in the yield over control was obtained by monocrotophos (52.45%), followed by endosulfan (51.98%) and dichlorvos (45.58%). The above result obtained is in conformity with the findings of Samalo and Patnaik (1986). The minimum increase in yield over control was registered by spinosin (30.02%).

Hence, the experimental evidence clearly implies that monocrotophos was significantly superior in reducing collective pod and grain damage as well as obtaining the maximum grain yield from the treated plots.

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