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COMPARATIVE PERFORMANCE OF BIOPESTICIDES AND INSECTICIDES AGAINST POD BORER COMPLEX OF PIGEONPEA.

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Field experiments were conducted at Experimental Field of Entomology, Department of Life Sciences, Manipur University for two consecutive crop seasons (2001 & 2002) to study the comparative performance of three biopesticides *viz.* Achook (2 ml/lit.), Neemall (5 ml/lit.) and *B.t.* (2 gm/lit.) with two insecticides *viz.* Cypermethrin (0.02%) and Dimethoate (0.05%) against pod borer complex of pigeonpea. The treatment with Achook showed better impact in terms of lower population density (4.29 & 16.81, respectively) in both the years. It also revealed the highest reduction percentage of 89.86 and 68.87 which was at par with Dimethoate in the first year and with Cypermethrin in the second year respectively but differed significantly from the rest of the treatments.

Keywords: Biopesticides, comparative, insecticides, pigeonpea, pod borers.

INTRODUCTION

Pigeonpea, commonly known as redgram or arhar is one of the most important pulse crop in India. It is cultivated over an area of 3.5 million hectares with an average production and productivity of 2.72 million tonnes and 583 kg/ ha, respectively (Asthana, 2000). Amongst 250 insect pests infesting the crop right from sowing till its harvesting stage (Upadhyay *et.al.*,1998), severe damage have been solely attributed due to the pod borer pests. These insect pest attacks the reproductive parts *viz.* flower buds, flowers, pods and seeds causing substantial losses in the overall yield. Awasthi & Bhatnagar (1983) reported pod and grain damage due to pod borer complex to an extent of 77.04 and 68.70%, respectively. About 27 species of pod borers are recorded on pigeonpea in India (Chaudhury & Bhattacharya.,1974; Lal *et.al.*, 1985). In Manipur, the pod borer complex includes the blue butterfly, *Lampides boeticus*; the plume moth, *Exelastis atomosa*; the spotted pod borer, *Maruca testulalis* and the pod fly, *Melanagromyza obtusa*. In order to minimize this tremendous loss, considerable work has already been carried out using insecticides (Patil *et al.*, 1988, Rao, 1992). However, to curtail the adverse effects of insecticidal applications (Morgan *et al.*, 1970) and in the search for effective, eco-friendly and economically viable options, certain biopesticides were evaluated in the present investigation against the pod borer complex of pigeonpea.

MATERIALS AND METHODS

Studies were conducted during 2001-2002 and 2002-2003 at the experimental field, Department of life Sciences, Manipur University. The experiment was laid out in a randomized block design with five treatments including one untreated control, each replicated three times. The pigeonpea var. T-21 was sown in an area of 14.5 x 5.05 m consisting 6 plots in each replication. The inter and intra row spacing of 75 x 45 cm was maintained. A gap of 1m was adopted between two plots. The insecticides, Cypermethrin

Table 1 : Population density and per cent reduction of pod borer complex on pigeonpea during 2001-2002.

Treatments	First treatment						Second treatment						Overall Efficiency	
	3 DAT		7 DAT		14 DAT		3 DAT		7 DAT		14 DAT			
	Popula-tion density	Reduc-tion (%)	Popula-tion density	Reduc-tion (%)	Popula-tion density	Reduc-tion (%)	Popula-tion density	Reduc-tion (%)	Popula-tion density	Reduc-tion (%)	Popula-tion density	Reduc-tion (%)	Popula-tion density	Reduc-tion (%)
Achook (2 ml/ Lit)	4.16	86.88 (69.16)a	4.56	88.76 (70.45)a	5.11	88.28 (69.69)a	3.63	92.29 (73.93)a	3.75	90.19 (71.96)a	4.22	92.73 (74.18)a	4.29	89.86 (71.37)a
Neemall 5 ml/ Lit)	5.71	82.38 (65..20)a	6.55	83.85 (66.36)a	7.27	84.34 (65.97)a	8.43	84.59 (64.51)b	9.91	79.70 (63.38)b	10.38	81.56 (64.67)c	8.04	82.74 (65.02)c
B.t. 2 gm/ Lit)	13.27	59.08 (50.23)b	17.31	57.68 (49.54)b	23.31	46.49 (42.93)b	14.99	66.70 (54.91)c	19.29	61.52 (51.69)c	19.64	66.73 (54.80)d	17.97	57.70 (50.69)
Cypermethrin (0.02%)	5.76	82.25 (60.05)a	6.09	85.18 (67.34)a	7.20	83.45 (66.51)a	5.25	88.12 (70.20)ab	5.20	89.61 (71.23)a	5.47	90.80 (72.37)ab	5.83	86.57 (67.95)b
Dimethoate (0.05%)	3.18	90.53 (76.65)a	4.97	88.07 (70.05)a	5.83	86.75 (68.03)a	5.10	89.12 (70.18)ab	6.52	87.03 (68.92)ab	7.68	86.32 (68.41)bc	5.55	87.97 (69.71)ab
Control	32.50		40.97		43.91		46.33		50.15		58.09		45.43	
S.E. ±		3.52		4.61		2.95		3.12		2.77		2.26		1.41
C.D.		8.12		10.63		6.80		7.20		6.39		5.20		3.25

* : Figure in parenthesis are angular transform values, DAT : Days after treatment.

(0.02%), Dimethoate (0.05%), Achook (2ml/lit of water), Neemall (5ml/lit of water and *B.t.* (2gm/lit of water) and untreated control were sprayed at 15 days interval. Observations were recorded on 3rd, 7th and 14th days after treatment. Both the infested and non infested flower buds, flowers and pods were counted from 3 (three) randomly selected plants of each plot. Data collected were statistically analysed after angular transformation. For judging the overall efficacy of insecticides the percentage decline in the pest population obtained at different intervals after treatments were summed up and the average percentage of decline were worked out.

RESULTS AND DISCUSSION

The observation on the average population density and reduction percentage recorded on 3rd, 7th and 14th DAT are presented in Tables I & II.

Analysis of variance showed that there was overall significant reduction over control for all the different treatments. The percentage reduction of pod borer population recorded on 3rd day after 1st treatment ranged from 59.08 to 90.53%. The plant product, Achook and Neemall observed equal effectiveness being at par with Dimethoate (0.05%), which recorded the highest reduction percent amongst the tested treatments. The lowest reduction of 59.08% was obtained in the treatment with *B.t.* The data at 7 and 14 day after 1st treatment indicated that the maximum reduction was obtained in the treatment with Achook, while the minimum was recorded in the treatment with *B.t.*

The data after 2nd treatment also indicated that Achook gave the highest reduction of 92.29, 90.19 and 92.73% at 3, 7 and 14 DAT, respectively over control. However, it did not differ significantly from Cypermethrin at 7 DAT. The data further revealed that though the treatment with Neemall may not proved to be as effective as that of Cypermethrin and Dimethoate but observed at par with these treatments. Similarly, effectiveness of NSKE at different concentrations against pod borer, *Helicoverpa armigera* on pigeonpea was reported by Sarode (1995).

When efficacies of all the treatments based on mean per cent reduction of the 1st year were compared, Achook still proved to be the most effective registering the highest reduction of 89.86%, which was at par with Dimethoate (87.97 reduction per cent). The next best treatment was recorded with Cypermethrin (0.02%) affording 86.57 reduction per cent. This was followed by Neemall giving 82.74% reduction. Moreover, the lowest reduction per cent of 59.70 was observed in the treatment with *B.t.*

Almost similar trends in the efficacy of different treatments were observed in both the years of investigation. In the 2nd year also, these was an overall significant reduction of pod borer population due to different treatments. Though, Cypermethrin afforded the highest reduction per cent at 3, 7 and 14 DAT after 1st treatment but observed at par with Achook and Neemall. The data a 7th and 14th days after 2nd treatment also revealed that Achook, afforded maximum reduction of 77.28 and 73.86% and differed significantly from the rest of the treatments. Several workers reported the antifeedant activity of neem products against several insect order including Lepidoptera (Warthen *et al.*, 1978) and Diptera (Kareem *et al.*, 1974).

Table II : Population density and per cent reduction of pod borer complex on pigeonpea during 2002-2003.

Treatments	First treatment						Second treatment						Overall	
	3 DAT		7 DAT		14 DAT		3 DAT		7 DAT		14 DAT		Efficiency	
	Popula -tion density	Reduc -tion (%)	Popula -tion density	Reduc -tion (%)	Popula -tion density	Reduc -tion (%)	Popula -tion density	Reduc -tion (%)	Popula -tion density	Reduc -tion (%)	Popula -tion density	Reduc -tion (%)	Popula -tion density	Reduc -tion (%)
Achook (2 ml/ Lit)	11.42	72.80 (59.75)ab	17.80	62.76 (52.49)a	24.20	54.83 (47.77)a	16.40	71.79 (58.01)	13.83	77.28 (61.61)a	17.23	73.86 (58.63)a	16.81	68.87 (56.38)a
Neemall 5 ml/ Lit)	23.00	48.05 (43.20)b	27.60	41.87 (41.57)a	29.00	45.38 (42.30)a	23.80	58.13 (49.69)	26.23	56.92 (49.15)c	32.84	50.12 (44.83)c	27.08	50.08 (45.13)c
B.t. 2 gm/ Lit)	37.30	16.17 (21.53)c	38.82	18.83 (24.78)b	41.64	21.66 (26.80)b	27.98	50.95 (45.54)	32.62	46.49 (42.97)d	37.60	36.92 (37.39)d	35.99	31.84 (33.17)d
Cypermethrin (0.02%)	6.12	84.45 (67.18)a	16.40	66.14 (54.63)a	21.00	60.89 (51.37)a	17.60	69.11 (56.31)	20.81	65.84 54.30)bc	23.42	64.45 (53.46)ab	17.56	68.48 (56.21)a
Dimethoate (0.05%)	14.00	69.20 (56.97)ab	20.40	57.10 (49.26)a	23.86	55.79 (48.39)a	20.74	64.08 (53.29)	33.35	64.10 (55.43)b	25.84	60.67 (51.25)bc	23.03	61.82 (52.43)b
Control	45.40		48.22		53.60		57.20		61.07		65.92		55.24	
S.E. ±		7.20		6.44		6.38				2.39		2.83		1.42
C.D.		16.60		14.85		14.71		NS		5.51		6.52		3.27

* : Figure in parenthesis are angular transform values. DAT : Days after treatment.

Overall mean observations of 2nd year showed the superiority of Achook (68.87 per cent reduction) over all the other treatments. In all the observations, the treatment with *B.t.* was found to be the least effective in reducing the pod borer population. Similarly, ineffectiveness of *B.t.* was also reported in controlling the borers on field bean (Krishnaiah *et al.*, 1978) lablab and pigeonpea (Chelliah, *et al.*, 1978), under field conditions. Schmutterer (1990) stated that neem based pesticides were safe to natural enemies due to weak contact effects in insects. Several workers have also explored the utility of neem as one of the potential source for managing pod borer complex of pigeonpea (Sachan & Lal, 1990; Rao & Rao, 1993) in search for effective, eco-friendly and economically viable options. Similarly, from the above results, the neem based product, Achook was found to be effective against the pigeonpea pod borer complex. Hence, the neem based product, Achook, which is eco-friendly biopesticide can be recommended for the control of the pigeonpea pod borer complex against the highly toxic chemical insecticides.

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