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Evaluation of Economic Insecticidal Control Schedules for the Pod Borer Complex in Pigeonpea*

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ABSTRACT

Investigations were carried out at Junagadh (Gujarat) for the estimation of avoidable losses due to pod borer complex in pigeonpea and for the evaluation of the insecticidal spray schedules for the control of pod borer pests. All the spray schedules were proved significantly superior over control. The over all percentage of pods damaged due to pod borer complex at harvest of the crop was minimum (2.25 per cent) in treatment which sprayed for four times i.e. first spray of fenvalerate 0.01% at bud initiation, second with monocrotophos 0.04% at 50 per cent flowering, third spray with fenvalerate 0.01% at 50 per cent pod setting and followed by monocrotophos 0.04% at 10 day after pod setting. It also gave 50.30 per cent highest yield (1245.83 kg/ha) over isolated control plot (829.17 kg/ha). The percentage of pods damaged was 5.15 per cent in the plot sprayed with endosulfan 0.07% at 50 per cent flowering and followed by monocrotophos 0.04% at 50 per cent pod setting. But, it was the next best in yield (1122 kg/ha) which gave 35.54 per cent higher yield over control. The percentage of avoidable loss in yield was lowest in the plot sprayed with fenvalerate 0.01% at bud initiation, monocrotophos 0.04% at 50 per cent flowering, fenvalerate 0.01% at 50 per cent pod setting and followed by monocrotophos 0.04% at 10 days after pod setting. This treatment was followed by plot sprayed with monocrotophos 0.04% at bud initiation, endosulfan 0.07% at 50 per cent flowering and 50 per cent pod setting and monocrotophos 0.04% at 10 days after pod setting (4.25 per cent) and treatment sprayed for two times i.e. spray with endosulfan 0.07% at 50 per cent flowering and monocrotophos 0.04% at 50 per cent pod setting (9.95 per cent). Whereas in isolated control loss was 33.47 per cent. The highest NICBR (1:4.30) was observed in treatment sprayed at 50 per cent flowering with endosulfan 0.07 per cent and second spray at 50 per cent pod setting with monocrotophos 0.04 per cent. The next highest NICBR (1:3.67) was obtained in treatment sprayed with monocrotophos 0.04 per cent at 50 per cent flowering.

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INTRODUCTION

The efforts for increasing production of pigeonpea are greatly hampered by number of pod borer pests, which severely damaged to flowers and pods of the crop. Amongst the various pod borer pests, gram pod borer, *Heliothis armigera* (HUB), plume moth, *Exelastis atomosa* (Wlam), blue butterfly, *Euchrysops cnejus* (Fab.), and the podfly, *Melanagremyza obtusa* (Malloch) cause extensive damage to the crop year-after-year. Considering the behaviour of pod borer pests in the field, a strategy for effective and

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economical control of pod borer complex was formulated to restrict the insecticidal application in pigeonpea to realise its maximum yield with losses insecticidal input.

MATERIALS AND METHODS

Field experiments were conducted at Junagadh (Gujarat) for two years (1984-85 and 1985-86) on pigeonpea BDN-2. The crop was sown at a distance of 75 x 10 cm in first week of July in both the years. All the recommended agronomical practices were followed for crop maintenance. The experiments were conducted in randomized block design with four replications. The gross and net size of each plot was kept 4.5 x 5.0 m (6 lines/plot) and 3.0 x 4.0 m (4 lines/plot), respectively. The most commonly recommended insecticides monocrotophos 0.04 per cent (500 ml/ha/spray) endosulphan 0.07 per cent (1 lit/ha/spray) and fenvalerate 0.01 per cent (250 ml/ha/spray) were tested. The respective spraying of insecticides for 1st, 2nd, 3rd and 4th was done at bud initiation, 50 per cent flowering, 50 per cent pod setting and 10 days after pod setting stage of the crop, respectively. Observations in pigeonpea pods damaged by the pod borers were recorded from five randomly selected plants from each plot at the time of harvest. Percentage pod damage was worked out and subjected to angular transformation, for statistical pooled analysis. The treatment-wise yield was also recorded separately for two years and pooled analysis was carried out. The losses due to pest in various treatment were calculated by using a formula of Pradhan (1969) and Poul (1976).

$$\% \text{ loss due to pest.} = \frac{\text{Yield in treatment which gave the highest yield} - \text{Yield in any other treatment of no treatment}}{\text{Yield in treatment, which give the highest yield}} \times 100$$

The economics and net incremental cost benefit ratio (NICBR) of insecticidal treatments were also worked-out and conclusion was drawn.

RESULTS AND DISCUSSION

Pod borer incidence

From the results (Table 1) of two years on overall mean per cent pods damaged by pod borer complex, it is evident that all the insecticidal treatments were found significantly superior over control and isolated control. Treatment sprayed at bud initiation with fenvalerate 0.01 per cent, second spray at 50 per cent flowering with monocrotophos 0.04 per cent, third spray at 50 per cent pod setting with fenvalerate 0.01 per cent and fourth spray at 10 days after pod setting with monocrotophos 0.04 per cent and treatment sprayed at bud initiation with monocrotophos 0.04 per cent, second and third sprayed at 50 per cent flowering and 50 per cent pod setting with endosulfan 0.07 per cent and fourth sprayed at 10 days after pod setting with monocrotophos 0.04 per cent were found the best in all insecticidal treatments and they followed by treatment sprayed at 50 per cent flowering with monocrotophos 0.04 per cent and second sprayed at 50 per cent pod

TABLE 1

Effect of insecticidal sprayed schedules on per cent pods damaged, grain yield and avoidable losses due to pod borer complex at harvest.

Treatment No.	Insecticides	Spray at growth stages	Per cent pod damaged due to pod borer (pooled mean)	Grain yield in kg/ha (pooled mean)	Percentage increased in yield over isolated control)	Percentage avoidable loss in grain yield
T1	Monocrotophos	50% flowering	18.91 (10.08)	960.00	15.80	22.85
T2	Endosulphan	50% flowering	13.12	1121.67	35.34	9.95
	Monocrotophos	50% pod setting	(05.15)			
T3	Monocrotophos	bud initiation	19.52	1009.17	21.71	19.02
	Endosulphan	50% flowering	(10.10)			
	Monocrotophos	50% pod initiation				
T4	Monocrotophos	bud initiation	11.33	1192.50	43.90	4.25
	Endosulphan	50% flowering	(03.86)			
	Endosulphan	50% pod setting				
	Monocrotophos	10 day after pod setting				
T5	Fenvalerate	50% flowering	18.54 (10.11)	942.50	13.75	24.31
T6	Fenvalerate	50% flowering	14.45	1054.17	27.14	15.41
	Monocrotophos	50% pod setting	(06.21)			
T7	Monocrotophos	bud initiation	16.75	1067.50	28.82	14.29
	Fenvalerate	50% flowering	(08.29)			
	Monocrotophos	50% pod setting				
T8	Fenvalerate	bud initiation	8.65	1245.83	50.30	00.00
	Monocrotophos	50% flowering	(02.25)			
	Fenvalerate	50% pod setting				
	Monocrotophos	10 days after pod setting				
T9	Control		25.16 (18.06)	836.67	00.70	32.83
T10	Isolated	(pesticide free area)	25.52 (18.55)	829.17	00.00	33.47
	S.Em.		1.05	41.67		
	C.D. at 5%		2.96	116.67		
	C. V. %		17.35	11.33		

Figures in paranthesis are retransformed values.

setting with endosulfan 0.07 per cent, and treatment sprayed with fenvalerate 0.01 per cent at 50 per cent flowering and second sprayed with monocrotophos 0.04 per cent at 50 per cent pod setting. However, treatment sprayed at 50 per cent flowering with monocrotophos 0.04 per cent and second sprayed at 50 per cent pod settihg with endosulfan 0.07 per cent was significantly equally effective with the treatment sprayed for four times i.e., first spray with monocrotophos 0.04%, second with endosulfan 0.07%, third with endosulfan and fourth with monocrotophos 0.04%. The over all per cent damage was 5.12, 3.86 and 2.25 per cent in insecticidal treatments T2 (first sprayed at 50 per cent flowering with endosulfan and second sprayed at 50 per cent pod setting with monocrotophos), T4 (first sprayed with monocrotophos at bud initiation, second and third sprayed with endosulfan at 50 per cent flowering and 50 per cent pod setting, respectively and fourth sprayed with monocrotophos at 10 days after pod setting), and T8 (first spray with fenvalerate, second monocrotophos, third fenvalerate and fourth sprayed with monocrotophos), respectively. While in control and isolated control plots per cent pod damaged were recorded 18.06 and 18.55 per cent, respectively. Results also clearly indicated that one spray of endosulfan or fenvalerate was superior to control plot but it was not equally effective to protect with two spray or more present studies confirm the finding of Srivastava (1980), Deware and Dhanarkar (1981), Talati *et al.* (1983) and Babu *et al.* (1984).

Grain yield

Results also revealed that all the insecticidal treatment were gave significantly better yield than the control. The highest grain yield (1245.830 kg/ha) was obtained in the treatment sprayed for four times i.e., 1. Fenvalerate, 2. Monocrotophos, 3. Fenvalerate, 4. Monocrotophos which was significantly better over all the treatments except treatment sprayed for two times i.e., endosulfan and monocrotophos and treatment sprayed for four times i.e., 1. monocrotophos, 2. endosulfan. 3. endosulfan, and 4. monocrotophos. Treatments T2 and T4 gave 1121.670 and 1192.500 kg/ha yield, respectively. Whereas, the plot gave low yield which have sprayed only T5 one time at 50 per cent flowering.

Avoidable losses

It is clear from the results that in all the treatments, yield was increased from 13.75 to 50.30 per cent over isolated control plots. Treatment T2 (first sprayed with endosulfan and second monocrotophos) was the next best with 35.54 per cent higher yield over isolated control polt. Whereas, in treatment sprayed with monocrotophos and treatment sprayed with fenvalerate, the per cent increased in yield over control was only 15.80 and 13.75 per cent, respectively. Thus it is cleared from the results that in all the treatments a loss due to pod borer complex in yield was 4.25 to 33.47 per cent over maximum yield. The percentage of avoidable loss in yield was lowest in treatment T8 (sprayed for four times i.e., fenvalerate, 2. monocrotophos, 3. fenvalerate and monocrotophos 4.25 per cent) followed by T4 (sprayed for four times i.e., first monocrotophos, second and third edosulfan and fourth monocrotophos), 9.95 per cent. Whereas, in control and isolated control plots. the avoidable losses was 32.83 and 33.47 per cent, respectively.

TABLE 2

Economics of insecticidal spray schedules tried for control of pod borer complex in pigeonpea.

Treatment No.	Insecticides	Spray at growth stages	No. of spray	Total cost of treatment application	Gross realisation (Rs/ha)	Net realisation over isolated control (Rs/ha)	Net profit (Rs/ha)	NICBR
T1	Monocrotophos 50%	flowering	1	112.00	3840	524	412.0	1:3.67
T2	Endosulphan 50% Monocrotophos 50%	flowering pod setting	2	221.00	4488	1172	951.0	1:4.30
T3	Monocrotophos Endosulphan 50% Monocrotophos 50%	bud initiation flowering pod initiation	3	333.00	4836	728	387.0	1:1.16
T4	Monocrotophos Endosulphan 50% Endosulphan 50% Monocrotophos 10 day after pod setting	bud initiation flowering pod setting	4	442.00	4772	1456	1014.7	1:2.29
T5	Fenvalerate	50% flowering	1	189.50	3772	456	346.5	1:3.16
T6	Fenvalerate 50% Monocrotophos 50%	flowering pod setting	2	221.50	4216	900	678.5	1:3.06
T7	Monocrotophos Fenvalerate 50% Monocrotophos 50%	bud initiation flowering pod setting	3	333.50	4272	956	622.5	1:1.86
T8	Fenvalerate Monocrotophos 50% Fenvalerate 50% Monocrotophos 10 day after setting	bud initiation flowering pod setting	4	443.00	4984	1668	1225.0	1:2.76
T9	Control	—	—	—	3348	32	—	—
T10	Isolated	(Pesticide free area)	—	—	3316	—	—	—

1) PRICE of seeds = 4 Rs/kg

2) LABOUR charges = 22 Rs/ha/spray

3) PRICE of insecticides = Endosulphan 35 EC = 87 Rs/litre
= Monocrotophos 36 EC = 180 Rs/litre
= Fenvalerate 20 EC = 350 Rs/litre

Economics

Economics of the insecticidal sprayed schedules applied during 1984 and 1985 are presented in Table-2. The data revealed that the net realization was maximum in case of treatment sprayed for four times i.e., 1. fenvalerate, 2. monocrotophos, 3. fevalerate and 4. monocrotophos (1668 Rs/ha). Similarly, treatment sprayed four times with the insecticides namely monocrotophos, endosulfan, endosulfan and monocrotophos was get 1456 Rs/ha net realization 1172 Rs/ha was obtained by treatment sprayed two times namely endosulfan and monocrotophos which was protected only two times. Thus looking to the Net Incremental Benefit Ratio (NICBR) the highest NICBR was recorded in treatment sprayed two times with insecticides namely endosulfan and monocrotophos (1:4.30) followed by treatment sprayed with monocrotophos (1:3.67) and treatment sprayed with fenvalerate (1:3.16). The insecticidal treatment sprayed three times with insecticides namely monocrotophos, endosulfan and monocrotophos gave the lowest NICBR. Therefore, insecticidal spray schedules as per the treatment sprayed three times with monocrotophos, endosulfan and monocrotophos and treatment sprayed three times with fenvalerate, monocrotophos and fenvalerate were not found more economical as they gave minimum economical returns. Thus it can be inferred from these results that the protection of pigeonpea variety BDN-2 at 50 per flowering with endosulfan 0.07 per cent and at 50 per cent pod setting stage with monocrotophos 0.04 per cent are essential to get maximum return with minimum cost.

These results are similar with the findings of Talati *et al.* (1983). They have also revealed that one spraying of endosulfan 0.07 per cent and second with monocrotophos 0.04 per cent gave economical return of the pigeonpea variety T-15-15.

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