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Evaluation of Some New Insecticides Against Major Paddy Pests

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ABSTRACT

Results of the field experiments carried-out during *kharif* 1993-94 to 1996-97 at Main Rice Research Station, Nawagam, Gujarat revealed that among the treatments evaluated least (2.72 to 3.73 hoppers/hill) number of white backed plant hopper *Sogatella furcifera* (Horv.) were observed in the treatment of buprofezin 25 WP (0.5 kg a.i./ha) followed by acephate 75 sp. (0.75 kg a.i./ha). Relatively low (3.91%) incidence of leaf folder, *Cnaphalocrocis medinalis* Guen, was found in the plot treated with monocrotophos 36 = WSC (0.75 kg a.i./ha), acephate 75 sp (4.38%) and trizophos 40 EC (5.03 %) as against 9.30% in untreated check. Minimum incidence (120.67 white earheads/plot of 27.6 m^2) of stem borer *Scirpophaga incertulas* (Walker) was registered in trizophos 40 EC (0.50 kg a.i./ha) treatment. Highest (2625 kg/ha) grain yield was obtained from the plots treated with buprofezin followed by acephate (2618 kg/ha) carbofuran 3G (2572 kg/ha) and monocrotophos (2499 kg/ha). Highest Cost Benefit Ratio was found in acephate (1 : 7.73) followed by trizophos (1 : 4.99) and buprofezin (1 : 4.71).

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INTRODUCTION

Paddy, the important cereal crop of Gujarat is cultivated in about 6.5 to 7.5 lakh hectares of land occupying about 5% of the gross cropped area of the state. The crop is attacked by number of insect pests causing yield reduction to the extent of about 30 to 40%. With the introduction of high yielding and fertilizer responsive improved cultivars of paddy in the intensive multicropping system, the problem of insect pests is becoming alarming day by day. The loss caused by insect pests attacking paddy crop in Gujarat is estimated about Rs. 15.6 crores (Patel and Patel, 1983). Large number of new chemicals are being evaluated against paddy pests elsewhere in the country. Information about their efficacy against paddy pests is completely lacking in this region. It was therefore felt necessary to evaluate some of the newer products alongwith presently recommended insecticides against major paddy pests in the state. With this in view, the present study was carried out during *kharif* seasons from 1993 to 1996. The results obtained are presented here under.

MATERIALS AND METHODS

Field experiments were conducted during 1993-94 to 1996-97 at the Main Rice Research Station, Gujarat Agricultural

University, Nawagam, Gujarat. During 1994-95 pest pressure was below desired level and hence the data were not considered. The experiment was laid-out in Randomized Block Design with 3 replications. Gross and net plot size was 6.9 x 4.0 m and 5.7 x 2.8 m., respectively. The seedlings of the susceptible paddy cultivar (GR-11) were transplanted with a spacing of 20 x 15 cm. There were seven treatments including check to avoid intermixing of treatments, about 20 to 30 cm thick mud boundaries were prepared all around the plots having the treatment of granular insecticides. Two recommended granular insecticides (carbofuran 3 G and phorate 10 g) and monocrotophos 36 WSC were kept as standard checks for comparision. The carbofuran and phorate were used 20.75 and 1.00 kg a.i./ha, respectively. The granules were mixed with little quantity of dry sand and broadcasted in respective plots having 3 to 4 cm. standing water. Three newer insecticides i.e. acephate 75 SP, buprofezin 25 WP and trizophos 40 EC @ 0.50 kg a.i./ha and monocrotophos 36 WSC at @ 0.75 kg a.i./ha, were tested as foliar sprays. Spray applications were made by using knapsack sprayer with hollow cone nozzle @ 500-600 litres spray fluid per hectare depending on crop growth stages. Drifting from one plot to other was avoided by using plastic sheet at the time of spraying.

The insecticide applications were made whenever the pest population crossed the threshold level (Anon. 1993). All the recommended agronomic practices were followed for raising the crop. Incidence of white backed plant hopper (WHPH), *Sogatella furcifera* (Horv.) was found during *kharif* 1993-94 and 1996-97. Similarly, leaf folder (LF), *Cnaphalocrocis medinalis* Guen. damage was noticed during 1995-96 and 1996-97, whereas the incidence of stem borer (SB), *Scirpophaga incertulas* (Walker) appeared very late (at heading stage) during *kharif*, 1995 season. The WBPH populations present on 10 randomly selected hills in a net plot area were recorded at 3 and 7 days after treatment (DAT). Similarly, the LF incidence was assessed by counting total and LF damaged leaves on 10 hills from net plot. Incidence of SB was assessed by counting total number of white earheads per plot (27.6 sq.m.).

Grain and fodder yields were recorded separately from net plot area of each treatment. Economics of insecticide applications was computed on the basis of economic returns from grain and fodder yields and cost of insecticidal treatments. The Cost Benefit Ratios (CBR) thus calculated were used for judging the economics of treatments.

RESULTS AND DISCUSSION

All the six inseticides tested were found to be significantly superior to untreated control in reducing WBPH population. The number of hoppers per hill ranged from 3.72 to 5.33 in treated plots as against 41.39 in untreated plots at 3 DAT. The corresponding values on 7 DAT were 2.72 to 8.63 and 33.08 hoppers/ hill, respectively (Table 1). Statistically, all the insecticidal treatments were on par in suppressing the hopper incidence. However, least number of hoppers were found in the plots sprayed with buprofezin followed by acephate. Our results confirm with the reports of Satapathy and Anjaneyulu (1989) who also reported the effectiveness of acephate in reducing tungro disease infection in rice crop transmitted by the hopper vector.

Leaf folder incidence recorded during 1995-96 season indicated non significant impact of the treatments, however the data of 1996-97 season revealed significant variation among different treatments. During second year of experimentation, monocrotophos exhibited significantly less (3.11%) incidence of the pest followed by acephate (3.42%) and trizophos (3.76%). Pooled results did not show statistical difference among the treatments.

TABLE 1

The bioefficiacy of insecticides against major pests of paddy.

Sr. No.	Treatments	Dose (kg-a.i./ha)	Av. No. of WBPH/Hill on different days						LFDL (%)			
			3 DAT			7 DAT						No. of
			1993-94	1996-97	Pooled	1993-94	1996-97	Pooled	1995-96	1996-97	Pooled	WE/Plot
1.	Carbofuran 3 G	0.75	1.97	5.73	3.85	1.05	8.87	4.96	6.47	4.66	5.57	131.00
2.	Phorate 10 G	1.00	2.48	7.40	4.94	1.78	15.47	8.63	5.32	6.89	6.11	138.33
3.	Acephate 75 SP	0.50	2.02	5.67	3.84	1.03	4.73	2.88	5.25	3.42	4.33	155.67
4.	Buprofezin 25 WP	0.50	2.53	4.93	3.73	1.07	4.37	2.72	5.41	5.37	5.93	169.00
5.	Trizophos 40 EC	0.50	3.40	7.27	5.33	1.57	7.07	4.32	6.29	3.76	5.03	120.67
6.	Monocrotophos 36 WSC	0.75	2.12	6.03	4.07	0.88	5.13	3.01	4.71	3.11	3.91	190.00
7.	Control	—	45.05	37.73	41.39	22.32	43.83	33.08	6.86	11.75	9.30	191.67
	S. Em. = Treat.		0.35	0.80	2.12	0.40	0.82	3.38	0.48	0.61	1.32	10.50
	Year		—	—	0.23	—	—	0.25	—	—	0.21	—
	T x Y		—	—	0.62	—	—	0.65	—	—	0.55	—
C. D. at 5%	Treat.		1.08	2.46	7.35	1.22	2.54	11.69	NS	1.89	NS	32.36
	Year		—	—	—	—	—	—	—	—	—	—
	T x Y		—	—	1.80	—	—	1.89	—	—	1.60	—
	C. D. (%)		7.13	12.92	11.11	16.22	11.18	13.17	14.31	19.13	16.81	11.61

LF = Leaf folder WE = White earheads

TABLE 2

Effect of various insecticides on yield of paddy and its economics.

Sr. No.	Treatments	Mean yield (kg/ha)* Grain	Mean yield (kg/ha)* Fodder	Gross income Rs/ha	Cost of treatment Rs/ha	Net gain Rs/ha	Net profit over control Rs/ha	CBR
1.	Carbofuran 3 G @ 0.75 kg a.i./ha	2572	4567	17716	2228	15488	5794	1 : 2.60
2.	Phorate 10 G @ 1.0 kg a.i./ha	1782	4313	12849	845	12004	2310	1 : 2.73
3.	Acephate 75 Sp @ 0.5 kg a.i./ha	2618	4504	17960	947	17013	7319	1 : 7.73
4.	Buprofezin 25 WP @ 0.5 kg a.i./ha	2625	4407	17954	1447	16507	6813	1 : 4.71
5.	Trizophos 40 EC @ 0.5 kg a.i./ha	2405	4358	16609	1154	15455	5761	1 : 4.99
6.	Monocrotophos 36 WSC @ 0.75 kg a.i./ha	2499	4560	17274	1502	15772	6078	1 : 4.05
7.	Control	1316	3596	9694	—	9694	—	—
S. Em. ±		229.18	255.91					
C. D. at 5%		706.21	NS					
C. V. %		12.22	6.18					

Price

Paddy grain	Rs. 120/20 kg
Paddy straw	Rs. 10/20 kg
Labour Charge	Rs. 34/day

Market price

Carbofuran 3 G	Rs. 52.80/ka.
Phorate 10 G	Rs. 49.00/kg.
Acephate 75 SP	Rs. 750/kg.
Buprofezin 25 WP	Rs. 400/kg.
Trizophos 40 EC	Rs. 500/lit.
Monocrotophose 36 WSC	Rs. 400/lit.

*Pooled data of 3 seasons.

However, relatively low damage of the pest was registered in the plots treated with monocrotophos, acephate and trizophos. Effectiveness of acephate and trizophos @ 0.75 kg a.i./ha against *C. medinalis* has been reported by Rao *et al.* (1983) and Rao *et al.* (1984), respectively. According to Anon. (1995 and 1996), spray application of trizophos and acephate proved to be more effective in controlling leaf folder in paddy. As observed in the present study, Anon. (1981, 1982, 1983, 1984 and 1985) also concluded that trizophos (Hostathion) and monocrotophos were the most effective insecticides both for controlling insect pests of paddy and in increasing yields.

Stem borer incidence observed during 1995-96 season only, was minimum (120.67 WE/plot). In plots treated with trizophos (Table 1) and differed significantly from other foliar sprays. Low incidence of stem borer at heading stage in plots treated with trizophos @ 0.5 kg a.i./ha has been recorded by Anon. (1983, 1984 and 1985). According to Murugesan and Chelliah (1984) one application of trizophos @ 0.75 kg a.i./ha significantly reduced the incidence of *S. incertulas*. Similarly, Heinrichs *et al.* (1986) also reported that trizophos as a foliar spray effectively controlled the stem borer. All these reports support the present findings.

The highest (2625 kg/ha) grain yield was obtained from the plots treated with buprofezin followed by acephate (2618 kg/ha), carbofuran (2572 kg/ha) and monocrotophos (2499 kg/ha) (Table 2). These treatments were significantly superior over the untreated control and phorate. Impact of insecticides on fodder yield was found to be significant in individual years, whereas the pooled data failed to show its significant effect. However, comparatively higher (4407 to 4567 kg/ha) fodder yield was harvested from the same treatments which produce significantly higher grain yield.

Highest (1 : 7.73) Cost Benefit Ratio (C.B.R.) was found in the case of acephate followed by trizophos (1 : 4.99) and buprofezin (1 : 4.71) (Table 2). Inspite of high yields obtained in the case of carbofuran, it showed the lowest (1 : 2.60) CBR value due to its high cost. In contrast to this, low cost of application of acephate gave the highest C.B.R. value.

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