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Efficacy and Economics of Certain Insecticides Used for the Control of Pest Complex on Brinjal

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The trial conducted during *Kharif*, 1983 and *Kharif*, 1984 at farm area of Seed Technology Department, Gujarat Agricultural University, Sardar Krushinagar for testing the bio-efficacy of various insecticides including synthetic pyrethroid, deltamethrin against pest complex of brinjal Doli-5 showed significant superiority of quinalphos 0.05% and endosulfan 0.07% to rest of the insecticides. Deltamethrin 0.005% proved more effective against shoot and fruit borer, *Leucinodes orbonalis* G. than fenitrothion 0.05%, DDVP 0.05% and phosalone 0.07%. The maximum percentage increase in brinjal fruit yield over control due to plant protection measures was obtained from quinalphos treated plot (73.92) followed by endosulfan (70.39). The mean cost benefit ratio (C.B.R.) for the two trials ranged from 1:3.45 (fenitrothion 0.05%) to 1:11.42 (endosulfan 0.07%).

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INTRODUCTION

Brinjal, *Solanum melongena* L. is one of the important vegetable crops of Gujarat. It suffers heavily due to the attack of aphid, jassid, thrip, whitefly and shoot and fruit borer. It has been seen that without effective control of these pests the damage is generally high resulting in substantial loss of fruit yield. A number of research papers have been published on the efficacy of different insecticides against pest complex of brinjal (Bhandarkar and Borde, 1980, Krishnaih *et al.*, 1976, Shah, 1979). The present investigations were undertaken to assess the efficacy of different insecticides for checking the damage by above pests, determine possible benefit in the form of increase in yield and calculate the cost benefit ratio for each insecticides. Deltamethrin, one of the recently developed and potent synthetic pyrethroids was also included in the trials.

MATERIALS AND METHODS

The experiments were conducted in the farm area of the Seed Technology Department, Gujarat Agricultural University, Sardar Krushinagar in *kharif* 1983 and *kharif* 1984, using brinjal Doli-5. The experiments were laid out in Randomised Block Design with eight treatments including control, each treatment was replicated four times. Commercial formulations of quinalphos (25 E.C.), carbaryl (50 W.P.), deltamethrin (2.8 E.C.), dichlorvos (100 E.C.), endosulfan (35 E.C.), phosalone (35 E.C.) and fenitrothion (50 E.C.) were sprayed with knapsack hand sprayer

when 30 per cent and 5 per cent plants were infested by sucking pests and shoot and fruit borer respectively. Five and four sprayings were required during 1983 and 1984 respectively.

In the net plot of 24 plants, 5 plants were selected at random observing statistical procedures and tagged with red ribbon for counting sucking pests *viz.*, aphid, jassid, thrip and whitefly. In each three leaves one each from top, middle and bottom portions of the plant were taken. The pest population of sucking pests was recorded prior and 24 hours, one week and two weeks after spraying. Observations for the damage by shoot and fruit borer were recorded on the basis of number and weight of healthy and infested fruits at each picking. Plot wise yield of fruit was recorded during each picking, from which yield in quintals per hectare and increase in yield over control as well as cost benefit ratio (C.B.R.) were calculated. The data were subjected to analysis of variance and are presented in Tables 1 and 2.

RESULTS AND DISCUSSION

Pooled analysis of two years results presented in Table-1 show that aphid population was significantly reduced by spray application of quinalphos 0.05% and endosulfan 0.07% until 15 days after their applications as compared to remaining insecticides including synthetic pyrethroid, deltamethrin 0.005%. Tewari and Moorthy (1983) have also reported the superiority of endosulfan to deltamethrin against aphid and jassid. Jassid and whitefly population was also found significantly lower in endosulfan and quinalphos treatments as compared to carbaryl 0.25%, phosalone 0.07% and fenitrothion 0.05% after 7 days and 15 days and 7 days of their applications respectively. Yein (1981) findings on effectiveness of quinalphos against whitefly and endosulfan against jassid and whitefly are also in conformity with present findings. The infestation of thrip occurred only in *Kharif*, 1983. However, quinalphos and endosulfan were found to be more effective than other tested insecticides.

The study on bio-efficacy of various insecticides against brinjal shoot and fruit borer (Table 2) revealed that quinalphos and endosulfan significantly reduced the damage of brinjal shoot and fruit borer to brinjal fruits during both years. Same trend was observed in pooled results also. They were followed by deltamethrin. Deltamethrin proved more effective than some of the conventional insecticides *viz.*, fenitrothion, DDVP and phosalone. Gangwar and Sachan (1981), Shah (1979), Purohit and Khatri (1975) and Krishnaih *et al.*, (1976) have also reported the effectiveness of deltamethrin, endosulfan and quinalphos against brinjal shoot and fruit borer. Thus, their observations are in conformity with present findings.

The ultimate objective of the control operations against any insect pest is to reduce the damage and consequently bring about substantial increase in yield. The yield data and percentage increase in yield over control due to plant protection measures (Table 2) indicated that maximum increase in brinjal yield over control was found in quinalphos treatment (73.92 per cent). It was followed by endosulfan (70.39 per cent), carbaryl (42.33 per cent), DDVP (34.26 per cent), deltamethrin (28.54 per cent), phosalone (26.95 per cent) and fenitrothion (14.60 per cent). Vecraval and Baskram (1977) and Night and Taley (1979) have also reported the highest yield from quinalphos and endosul-

TABLE 1

Efficacy of various insecticides against aphid, jassid, whitefly (Pooled *Kharif* 1983 and *Kharif* 1984) and thrip (*Kharif* 1983) on brinjal Doli-5.

Sr. No.	Treatments	Before spraying	Average number of aphids(A), jassids(J), whiteflies(W) and thrips(T) per leaf After																		
			24 hours				48 hours				1 week				2 week						
		A	J	T	W :	A	J	T	W :	A	J	T	W :	A	J	T	W :	A	J	T	W
1.	Quinalphos 0.05%	1.89*	1.73	1.23	1.54	1.45	1.29	1.19	1.33	1.21	1.20	1.03	1.21	1.10	1.22	1.01	1.13	1.05	1.09	1.00	1.06
		2.57	1.99	0.51	1.37	1.10	0.66	0.42	0.77	1.46	0.44	0.06	0.46	0.21	0.49	0.02	0.28	0.10	0.19	0.00	0.12
2.	Carbryl 0.2%	1.79	1.71	1.38	1.58	1.55	1.54	1.11	1.51	1.48	1.49	1.10	1.43	1.41	1.55	1.08	1.40	1.40	1.47	1.06	1.33
		2.20	1.92	0.90	1.50	1.40	1.37	0.23	1.28	1.19	1.22	0.21	1.04	0.99	1.40	0.17	0.96	0.96	1.16	0.12	0.77
3.	Deltamethrin 0.005%	1.77	1.68	1.22	1.53	1.61	1.43	1.14	1.48	1.51	1.35	1.10	1.31	1.47	1.30	1.19	1.27	1.38	1.29	1.16	1.22
		2.13	1.82	0.49	1.34	1.59	1.04	0.30	1.19	1.28	0.82	0.21	0.72	1.16	0.69	0.42	0.61	0.90	0.66	0.34	0.49
4.	DDVP 0.05%	1.77	1.68	1.20	1.59	1.54	1.45	1.11	1.41	1.43	1.29	1.06	1.28	1.34	1.30	1.05	1.02	1.26	1.23	1.03	1.17
		2.13	1.82	0.44	1.53	1.59	1.10	0.23	1.99	1.28	0.66	0.12	0.63	1.16	0.69	0.10	0.44	0.90	0.51	0.06	0.37
5.	Endosulfan 0.07%	1.85	1.75	1.38	1.63	1.41	1.37	1.07	1.29	1.26	1.20	1.03	1.16	1.14	1.10	1.04	1.07	1.03	1.03	1.01	1.11
		2.42	2.06	0.90	1.66	1.99	0.88	0.14	0.66	0.59	0.44	0.06	0.35	0.30	0.21	0.08	0.24	0.03	0.44	0.02	0.20
6.	Phosalone 0.07%	1.77	1.67	1.19	1.58	1.58	1.56	1.15	1.51	1.56	1.48	1.14	1.41	1.50	1.51	1.08	1.34	1.43	1.44	1.04	1.30
		2.13	1.79	0.42	1.50	1.50	1.43	0.32	1.28	1.43	1.19	0.30	0.99	1.25	1.28	0.17	0.80	1.04	1.07	1.19	0.69
7.	Fenitrothion 0.05%	1.78	1.75	1.38	1.55	1.57	1.57	1.14	1.48	1.48	1.42	1.09	1.36	1.45	1.47	1.07	1.35	1.46	1.40	1.07	1.27
		2.17	2.06	0.90	1.40	1.46	1.46	0.30	1.19	1.19	1.02	0.19	0.85	1.10	1.16	0.14	0.82	1.13	0.96	0.14	0.61
8.	Control (water spray)	1.80	1.81	1.22	1.54	1.82	1.91	1.32	1.78	1.84	1.96	1.28	1.96	1.83	1.93	1.31	1.68	1.70	1.92	1.32	1.63
		2.24	2.28	0.49	1.37	1.31	2.65	0.74	2.16	2.39	2.84	0.64	1.86	2.35	2.72	0.72	1.82	1.89	2.69	0.74	1.66
	'F' test	N.S.	Sig.	N.S.	N.S.	N.S.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig
	S. Em +	0.05	0.03	0.09	0.03	0.09	0.04	0.05	0.06	0.08	0.05	0.01	0.05	0.05	0.05	0.02	0.06	0.05	0.07	1.01	0.07
	CD at 5%	-	0.07	-	-	-	0.11	0.13	0.19	0.27	0.18	0.03	0.16	0.14	0.18	0.05	0.19	0.18	0.22	0.03	0.24
	CV %	8.28	4.18	13.31	5.82	6.87	7.05	7.76	6.05	6.05	2.02	1.64	3.74	10.01	5.31	3.12	4.50	6.21	3.26	1.92	10.39

* $\sqrt{x+1}$ Transformation.

Figures in parentheses are retransformed values.

TABLE 2

Effect of various insecticides on brinjal shoot and fruit borer and fruit yield (pooled, Kharif, 1983 and Kharif 1984).

Sr. No.	Treatments	Per cent infested fruits		Fruit yield q/ha	% age increase in fruit yield over control	Mean C.B.R.
		Number basis	Weight basis			
1.	Quinalphos 0.05%	9.32* (2.66)	9.44 (2.67)	289.54	73.92	1 : 7.59
2.	Carbaryl 0.2%	14.39 (6.12)	13.81 (5.70)	236.96	42.33	1 : 4.67
3.	Deltamethrin 0.005%	13.35 (5.34)	13.56 (5.50)	213.99	28.54	1 : 8.52
4.	DDVP 0.05%	14.93 (6.67)	15.35 (7.00)	223.52	34.26	1 : 9.01
5.	Endosulfan 0.07%	9.43 (2.67)	9.15 (2.55)	283.66	70.39	1 : 11.42
6.	Phosalone 0.07%	14.60 (6.34)	14.89 (6.60)	211.34	26.95	1 : 3.46
7.	Fenitrothion 0.05%	15.54 (7.12)	15.88 (7.45)	190.79	14.60	1 : 3.45
8.	Control (water spray)	20.51 (12.23)	20.62 (12.45)	166.48	—	—
	'F' test	Sig.	Sig.	Sig.		
	S Em ±	0.41	0.56	9.00		
	C D at 5%	1.16	1.60	25.61		
	C V%	8.54	10.75	11.59		

* Arcsin $\sqrt{\text{percentage}}$ transformation.

Figures in parentheses are retransformed values.

fan treated brinjal plots. Manjunath *et al.*, (1983) have reported the superiority of quinalphos in yielding the higher yield to carbaryl.

The Cost Benefit Ratio (C.B.R.) is a very important criterion which indicate the efficacy and suitability of any recommendation of insect pest control. The comparision of C.B.R. in various treatments (Table 2) ranged from 1:3.45 (Fenitrothion) to 1:11.42 (endosulfan). Endosulfan was followed by DDVP, deltamethrin and quinalphos with C.B.R. 1:9.01, 1:8.52 and 1:7.59 respectively. Looking to the damage yield relationship of these three insecticides quinalphos is preferable for having minimum pest damage and maximum fruit yield specially for the area where shoot and fruit borer is a serious problem. Deltamethrin was found significantly superior to DDVP in checking the shoot and fruit borer damage but yield difference in these two treatments was non-significant, so any one of these two can be sprayed for the control of shoot and fruit borer.

On the basis of these results it can be claimed that under moderate to heavy levels of sucking pests and shoot and fruit borer infestation it will be highly profitable to use endosulfan 0.07 per cent.

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