

STUDIES ON BIO-EFFICACY OF SOME INSECTICIDES AGAINST THE PEST COMPLEX OF TOMATO, *Lycopersicon esculentum* MILL., VAR. PUSARUBY

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A field experiment was carried out during the summer season 1982-83 to evaluate the efficacy of 9 insecticides against the pest complex of tomato, Var. Puṣa ruby. The Treatment of decamethrin proved most effective (1.23 % damage) against the fruit borer followed by fenvalerate (2.20 % damage) and permethrin (2.76 % damage). Three treatments viz., decamethrin, fenvalerate and permethrin offered the best protection against white flies. These three insecticides, also were effective in reducing the incidence of leaf curl virus. The jassid population was significantly low in the three treatments. Considering the economics of insecticidal application in relation to extra yield obtained, the decamethrin gave highest fruit yield (20,000 kg/ha) and highest net profit of Rs. 6,120 per ha followed by permethrin. It is contemplated that the synthetic pyrethroids due to their quick knock down effect, low mammalian toxicity and longer persistence on the treated surface have a bright future in controlling the insect pests of tomato.

Tomato, *Lycopersicon esculentum* Mill, is one of the most important and commonly grown vegetable crop throughout the country. Some of the insect pests which are considered important are: (1) tomato fruit borer, *Heliothis armigera* (Hubner); (2) white fly, *Bemisia tabaci* Gen.; and (3) Jassid, *Amrasca biguttula* Ishida. white fly is a insect vector and can transmit tomato leaf curl virus from diseased plants to healthy plants to the extent of 36.5 per cent (Shastri and Singh, 1971). Prakash *et al.* (1979) reported that fruit borer, can cause damage to the extent of 21.50 per cent in mature tomato fruits.

Although various workers have obtained the effective control of white fly and tomato fruit borer with the help of conventional insecticides viz., monocrotophos 0.04 per cent and Malathion 0.05 per cent, respectively (Mote, 1976; Singh and Chahal, 1978); it was thought necessary to screen newer insecticides viz., decamethrin, fenvalerate, cypermethrin and permethrin (synthetic pyrethroids) vis-a-vis conventional insecticides such as carbaryl, malathion, sumithion, quinalphos and endosulfan against the pest complex of tomato.

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MATERIALS AND METHODS

A field trial was conducted with tomato variety 'Pusa ruby' during Feb. to June, 1983 in a randomized block design with three replications in a plot size of 20 m². The first spray was given just after 12 days of transplanting of the seedlings and subsequent five sprays were given later at 12 days interval. For the first and second sprays, quantity of water was 600 lit/ha while for other four sprays the quantity of water was kept 800 lit/ha to get complete coverage of the crop.

The counts of the white flies and jassid nymphs were taken on 10 plants per plot selected at random one day before each insecticidal application. Observation was recorded early in morning when the temperature is low and weather is also cool and flies are not very active. The borer affected and free fruits of individual plots were sorted out after each harvest done at 10-days interval and the number and weight of marketable fruits recorded. The percentage of borer infestation was computed on the basis of cumulative data of all the six pickings. The mean number of jassids and white flies per plant was worked out and data subjected to statistical analysis. The data on percentage infestation of fruits by fruit borer were angular transformed and subjected to statistical analysis as recommended by Snedecor (1950).

The per cent increase in fruit yield over untreated control was also calculated and presented in Table. The economics of the various treatments was also worked out on the basis of the fruit yield recorded from both the treated and control plots and presented in Table.

RESULTS AND DISCUSSION

Fruit borer :

All the insecticidal treatments were found significantly superior over the untreated control. The per cent fruit damage in the treatments varied from 1.23 - 9.60 as compared with 25.33 per cent in control. Decamethrin 0.02 kg ai/ha gave excellent control of tomato fruit borer (1.23 per cent) followed by fenvalerate 0.05 kg ai/ha and permethrin 0.1 kg ai/ha. Two treatments viz, Cypermethrin 0.05 kg ai/ha and endosulfan 0.70 kg ai/ha were at par. Folithion applied @ 0.50 kg ai/ha proved least effective treatment in controlling the fruit borer. The results obtained in the present investigations are in close conformity with the findings obtained at Ludhiana (Anonymous, 1981) where decamethrin 0.01 kg ai/ha gave excellent control of fruit borer followed by fenvalerate and permethrin.

WHITE FLY :

The number of white flies per plant in treatments varied from 1.53 to 7.43 as compared with 9.85 per plant in untreated control (Table)

and all the treatments were significantly superior over the control in reducing the white flies population. Three treatments *viz.*, decamethrin, fenvalerate and permethrin were found most effective where the population of white flies varied from 1.50 to 1.8 per plant followed by malathion, cypermethrin and endosulfan where the population ranged

between 3.46 to 3.76 per plant. Two treatments *viz.*, folithion and quinalphos were least effective in controlling the white flies.

The mean percentage of leaf curl virus affected plants in treatments varied from 3.86 to 28.00 as compared with 36.00 per cent in control (Table).

Table Bio-efficacy of insecticidal treatments against insect pests of tomato.

Treatment	Dose Kg ai/ha	Mean infested fruits by fruit borer %	Mean No. of white fly per plant	Mean leaf curl virus affected plants in %	Mean No. of jassid per plant	Marketable fruit yield [kg/ha]	Increased yield over control %	*Value of additional yield [Rs./ha]	**Total cost of insecticides application [Rs./ha]	Net profit over control [Rs./ha]
Decamethrin [Decis 2.8 EC]	0.02	1.23 (6.37)	1.53 (11.33)	3.86 (11.33)	0.47	20,000	95.12	7,800	1680.00	6120.0
Fenvalerate [Sumicidin 20 EC]	0.05	2.20 (8.44)	1.86 (11.64)	4.10 (11.64)	0.80	17,200	67.80	5,560	746.40	4813.60
Cypermethrin [Ripcord 10 EC]	0.05	5.23 (13.22)	3.76 (13.22)	15.00 (22.79)	1.26	16,375	59.76	4,900	1295.40	3604.60
Permethrin [Ambush 50 EC]	0.10	2.76 (9.56)	1.50 (9.56)	4.00 (11.54)	0.50	18,700	82.44	6,760	1091.80	5668.20
Carbaryl [Sevin 50 Wp]	1.00	9.60 (18.04)	4.93 (18.04)	28.00 (31.94)	1.90	12,260	19.61	1,608	143.00	1465.00
Malathion [Cythion 50 EC]	0.50	7.43 (16.18)	3.46 (16.18)	13.16 (21.27)	1.66	12,365	20.63	1,692	251.60	1440.40
Endosulfan [Thiodan 35 EC]	0.70	4.46 (12.14)	3.53 (12.14)	15.30 (23.02)	2.66	15,135	47.66	3,908	173.00	3735.00
Sumithion [Folithion 50 EC]	0.50	14.10 (22.05)	7.00 (22.05)	25.26 (30.17)	2.80	11,290	10.15	832	221.00	611.00
Quinalphos [Ekalux 25 EC]	0.50	10.33 (18.74)	7.43 (18.74)	20.73 (27.08)	1.71	13,180	20.59	2,344	230.40	2113.60
Control [Untreated]	—	25.33 (30.21)	9.85 (30.21)	36.00 (36.87)	3.60	10,250	—	—	—	—
SE [m]		0.458	0.248	0.274	0.176					
CD at 5%		0.964	0.521	0.575	0.369					

* Rs. 80/Qt.

** Cost of insecticides is approximate, based on the local market.

Figures in parentheses are angular transformed values

The treatments of decamethrin fenvalerate and permethrin were found significantly superior in reducing the incidence of leaf curl virus followed by malathion. Cypermethrin and endosulfan were ranked third in reducing the incidence of disease. Most of the workers have recommended conventional insecticides e. g., dimethoate 0.03 per cent and monocrotophos 0.04 per cent for controlling the white flies and leaf curl virus in tomato (Shastri and Singh, 1971; Mote 1976) and the review of the published literature brings an important fact that no data are available regarding the bio-efficacy of synthetic pyrethroids against white flies and on the incidence of leaf curl virus in tomato. The synthetic pyrethroids viz., decamethrin, fenvalerate and permethrin are characteristic in their quick knock down effect and longer persistence on treated surface may prove effective against the white flies and leaf curl virus.

JASSIDS :

In the present investigations, the population of jassids per plant was very low. All the treatments were found significantly superior to the control in controlling the jassids. Population of jassid nymphs/plant in treatments varied from 0.47 to 2.80 as compared to 3.60 per plant in control. The treatments of decamethrin, permethrin and fenvalerate proved most effective in reducing the jassids population followed by cypermethrin. Folithion and endosulfan were found least effective in controlling the jassids. The results obtained are in close conformity with the findings of Mohan *et al.* (1983) where fenvalerate and permethrin each applied @ 0.1 kg ai/ha kept the jassids population very low in okra,

When compared with the fruit yield obtained, it was observed that highest per cent increase (95.12) was recorded from the treatment of decamethrin followed by permethrin (82.44) (Table). The treatment of decamethrin gave highest fruit yield (20,000 kg/ha) and net profit Rs. 6,120. ha) followed by permethrin with 18,700 kg ha fruit yield and net profit of Rs. 5,668.20 per ha (Table). Folithion treatment could show the lowest net profit of Rs. 611.00 per ha.

ACKNOWLEDGEMENT

The author is thankful to Head, Department of Entomology and Joint Director, Horticultural Research Centre, Patharchatta for providing the necessary facilities.

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