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Incidence of Brinjal Mosaic Virus and Brinjal Little Leaf Diseases in Dipel-Organic Insecticide Combination Treatments

P. NARAYANASAMY[1], V. RAGUNATHAN[2] and P. BASKARAN[3]

A field experiment was carried out to evaluate different Dipel (a bacterial formulation - *Bacillus thuringiensis* var *alesti* Berliner) mosaic virus and brinjal little leaf diseases as they are prevalent in this part of the country. It was found that Sevin + Dipel was superior for Brinjal mosaic virus and Thiodan and Ekalux + Dipel (alternate day sprays) for little leaf. The chemicals brought about a decline in the respective vector populations effectively.

Brinjal (*Solanum melongena* L.) is normally subjected to heavy infestation by many insect pests and diseases (Singh, 1970). In recent years, brinjal mosaic virus and little leaf disease have also become alarmingly serious (Siva subramaniam, 1974 and Mohammed Usman, 1975). These two diseases are known to be transmitted by brinjal leaf hoppers *Amrasca devastans* Dist and *Hishimonus phycitis* (Mohammed Usman, 1975 and Chelliah, 1975) respectively and the the control of these vectors is still a problem in brinjal. It is well known that combinations of sub-lethal doses of insecticidal chemicals and Dipel (*Bacillus thuringiensis* var *alesti* Berliner) (N/s. Abbott's Lab, U.S.) are additive or synergistic in biological activity against a number of insect pests (Creighton *et al.*, 1974; Creighton and Mc Fadden, 1974 and Sekar, 1976). The present study was undertaken to find out the efficacy of some of the insecticide Dipel WP combinations against the vectors and on the incidence of brinjal mosaic virus and brinjal little leaf diseases.

MATERIAL AND METHODS

A field trial was laid out at the Annamalai University Orchard area during 1975-75 with 14 treatments (Table I) with four replications. The experiment was of randomized block design and a plot size of 3 x 3 m^2 was adopted. Plantings were done with a spacing of 0.75 m and 0.6 m between rows and plants respectively. Thirty days old seedlings of Annamalai brinjal were transplanted at the rate of 20 plants per plot and a manurial schedule of 188 N: 63 P : 150 K kg/ha was adopted.

The insecticides were used in their recommended dosages as pure spray and

1 & 3 Division of Entomology, Faculty of Agriculture, Annamalai University Annamalainagar.

2 Senior Plant Pathologist, Central Plant Protection Training Institute, Hyderabad.

TABLE I. Details of the Dipel — Organic insecticide treatments

Treatments	Concentration of insecticide (%)	Type of spray
DDT	0.01	Pure
DDT + Dipel	0.08	Combination spray
DDT + Dipel	0.1	Alternate day spray
Thiodan	0.03	Pure
Thiodan + Dipel	0.02	Combination spray
Thiodan + Dipel	0.13	Alternateday spray
Sevin	0.1	Pure
Sevin + Dipel	0.08	Combination spray
Sevin + Dipel	0.1	Alternate day spray
Ekalux	0.05	Pure
Ekalux + Dipel	0.04	Combination spray
Ekalux + Dipel	0.05	Alternate day spray
Dipel	1.14 kg/ha.	Pure
Untreated control	—	No spray

similarly Dipel was used at 1.14 kg/ha as pure spray. In the second set, insecticides were mixed with Dipel and sprayed together as combination sprays. In the third set the crop was first sprayed with lethal doses of insecticides and with Dipel on the next day. Totally six sprayings were given with knapsack sprayer commencing from 15 days after transplantation at ten days interval.

Population of the adults of the leaf hoppers (*Amrasca devastans* and *Hishimonus phycitics)* was estimated early in the morning on five randomly selected plants in each plot. The initial count was recorded a day prior to the spraying and observations were continued at weekly intervals for five periods.

The incidence of brinjal mosaic virus and little leaf diseases was assessed by counting total number of infected plants in such treatment and the percentage of the incidence was calculated.

RESULTS AND DISCUSSION

i. Brinjal mosaic virus

The Table II shows the incidence of the diseases and the respective jassid population. The Sevin + Dipel plots recorded very low incidence of the disease (9.94 per cent) followed by DDT, Thiodon + Dipel (alternate), Sevin with 11.06 per cent, 11.81 per cent; 11.83 per cent respectively. Maximum incidence was noticed in Ekalux treated plots which showed an increase of 67.35 per cent over control. As regards the jassid population, the same Sevin + Dipel had relatively low population as expected, while maximum number of hoppers was noted in Thiodan + treated as expected, plot. There had been maximum number of virus diseased plants. It is also clear that almost all the treatments mixed with Dipel had significantly reduced disease incidence when compared to pure insecticide sprays.

TABLE II. Effect of Dipel — Organic insecticide combinations on the incidence of brinjal mosaic virus and brinjal little leaf disease and their respective vectors

Treatments	*Amarasca devastans* No./plants (mean for 5 weeks)	Brinjal Mosaic virus		*Hishimonus phycitis* No / plant* (mean for 4 weeks)	Brinjal little leaf disease	
		% mean for 5 weeks	% increase (+) (or) decrease (—) over control		% mean for 4 weeks	% increase (+), or decrease (—) over control
DDT	6.32 d	11.06 ab	—22.7	9.54 d	5.04 c	+32.63
DDT + Dipel	7.18 g	14.41 ab	+14.07	5.75 bc	1.02 a	—73.14
DDT + Dipel (alternate)	6.16 c	13.37 ab	—76.30	5.82 bc	1.02 a	—73.14
Thiodan	7.83 h	22.01 cd	+54.89	2.00 a	—	—100.00
Thiodan + Dipel	7.71 h	20.51 cd	+44.33	4.90	1.47 a	—61.32
Thiodan + Dipel (alternate)	5.64 b	11.81 ab	—16.89	9.59 d	8.25 d	+11.71
Sevin	5.52 a	11.83 ab	—16.75	6.01 bc	3.80 b	—
Sevin + Dipel	5.49 a	9.94 a	—30.04	5.94 bc	1.74 a	—54.21
Sevin + Dipel (alternate)	5.46 a	16.32 abc	+14.85	5.84 bc	1.44 a	—62.10
Ekalux	6.56 ef	23.78 cd	+67.35	4.28 b	1.74 a	—54.21
Eklaux + Dipel	6.64 f	22.30 cd	+56.92	6.47 bc	4.63 bc	+21.84
Ekalux + Dipel (alternate)	5.56 a	18.80 cd	+32.29	1.00 a	—	—100.00
Dipel	6.51 e	15.73 ad	10.89	7.87 cd	1.02 a	—73.14
Control (untreated)	8.90 c	14.21 ab	—	5.91 bc	3.80 b	—

Figures represent angles corresponding to percentages

* Population of hoppers was estimated by counting number of adults from three selected (top, middle bottom) leaves each in five plants and averaged.

Significance	**	**	**	**
C.D (=0.01%)	0.12	6.00	2.22	1.01

Any two means followed by the same letter are not significantly different.

ii. Brinjal little leaf :

Table II illustrates that treatments such as Thiodan and Ekalux + Dipel (alternate) did not show the little leaf disease. Also, DDT+Dipel (alternate) DDT+Dipel and pure Dipel were equally effective against the disease as equivalent to the untreated control. The treatments like, Thiodan and Ekalux+Dipel (alternate) harboured the lowest population of the hopper and it was found to be higher in treatments like Thiodan + Dipel (alternate) DDT, Sevin + Dipel (alternate), Sevin + Dipel, and DDT + Dipel. The earlier findings that insecticides mixed with Dipel have been promising well against little leaf disease have been proved here.

In general, efficacy of pure insecticide sprays was found comparatively lower than when used along with the bacterial formulation namely Dipel ((Sekar, 1976), Enhanced effect between sub-lethal dose of chemicals and Dipel has already been indicated from this laboratory. It is also indicated that the spraying of Dipel after spraying with lethal dose of Sevin or Ekalux did increase respectively. However, on the other hand, the use of sub-lethal dose of Sevin + Dipel would cause consider-

able reduction in the amount of poisonous chemicels into the eco-system as suggested by Pristavko (1967) and Baskaran and Sekar (1967). But the same type of enhanced action was not evident in Ekalux and Thiodan when combined with Dipel. Dipel as pure spray could not also be a substitute for other pure chemical sprays as evidenced from the Table II. However, it is interesting to note that it has reduced little leaf disease to a level of 73.14 per cent over untreated control. Sekar (1976) reported effective significant reduction in the population of leaf hopper (*A.devastans* due to insecticides - Dipel sprays.

Thus, it can be concluded as seen from the Table II that alternate spraying of lethal doses of chemical insecticides followed by Dipel on the brinjal crop would render it non-preferable by the leaf hoppers and thus, reduce the incidence of the brinjal mosaic virus and brinjal little leaf disease as the leaf hoppers act as vectors.

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