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Control of the Cabbage Webworm *Crocidolomia binotalis* Zell. on Mustard with *Bacillus thuringiensis* Berliner and Other Insecticides

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Mustard, an important oilseed crop, is very highly susceptible to the attack by the cabbage webworm *Crocidolomia binotalis* Zell. (Singh and Rawat, 1980). During February, 1988 there was a very severe outbreak of *C. binotalis* on mustard in the Tamil Nadu Agricultural University farm. There were nearly 30 - 40 larvae per plant which caused near total defoliation. After devouring the foliage, the larvae were found feeding on the bark of the stem.

A field trial was conducted to identify a suitable insecticide for the management of the pest. Seven insecticides, including *Bacillus thuringiensis B.t.*Berliner(Bactospeine) (Table 1) were evaluated in a randomised block design with three replications. Each plot consisted of six rows (5 m) of mustard plants. Neem seed kernels were pounded and soaked in water for 24 h, filtered through a muslin and emulsified with 0.5% Teepol before spraying. Fish oil rosin soap was also emulsified thoroughly before application The treatments were applied with a backpack hydraulic sprayer using a spray fluid of ca. 1000 l per ha.

A cloth screen (1.75 m high) was held all around the plot while spraying to prevent spray drift to adjacent plots. Counts on larval population of *C. binotalis* were made 24 and 48 h after application on five randomly selected plants. The data were transformed to $\sqrt{x+0.5}$ and after analysis of variance,the means were separated by Duncan's multiple range test.

The data on *C. notalis* 24 and 48 h aftert reatment showed that even though *B.t.* significantly reduced the larval numbers when compared to untreated check, it was not as effective as the chemical insecticides monocrotophos or endosulfan which recorded significantly the least larval populations when compared to all the other treatments (Table 1). The efficacy of endosulfan against *C. binotalis* on mustard has been reported earlier (Singh and Rawat, 1978)., By addition of monocrotophos at the rate of 225 g a.i./ha to *B.t* ,the efficacy could be significantly increased, but it was not as effective as monocrotophos at 450 g a.i./ha. Fish oil rosin soap did not give satisfactory control. Neem oil could cause appreciable reduction in larval numbers 48 h after treatment when it was found to be significantly better than *B.t.* That *B.t.* is not very effective against *C. binotalis* was also observed in the laboratory. When 50 final instar larvae were exposed to *B.t.*-treated mustard leaves, only 22 larvae died recording a mortality rate of 44 per cent.

One reason for the ineffectiveness of *B.t.* may be that the larval population in the field consisted mostly of the later instars. If the application of *B.t.* is made when the larvae are in the early instars, better control may be achieved. Ooi (1980) could obtain 100 per cent mortality of 1-3 day old *C. binotalis* larvae with Bactospeine when the larvae were fed with blocks of semisynthetic diet dipped in *B.t.* suspension containing 5.6 × 10 IU/ml. Application of *B.t.* at higher doses or with adjuvants like milk at 0.5% and whole egg homogenate at 0.1% (Justin, 1987) when the pest is in early stages might prove to be successful since, Krishnaiah *et al.* (1981) could successfully control *C. binotalis* on cabbage by weekly spyras of Dipel (*B.t.*) at 0.5 kg/ha.

Diflubenzuron was not as effective as either monocrotophos or endosulfan but, 48h data showed that it was better than *B.t.* At the time of treatment, the crop had lost

TABLE 1. Efficacy of *Bacillus thuringiensis* and some insecticides against *Crocidolomia binotalis* on mustard

Treatments	No. of larvae*/plant h after spraying		
	0**	24	48
Bactospeine 300 g/ha	39.9	11.4c (71.4)	10.3d (74.2)
Diflubenzuron 300 g a.i./ha	41.0	13.4d (67.3)	6.8c (84.3)
Bactospeine 300 g + monocrotophos 225 g a.i./ha	30.1	6.1b (79.7)	4.7b (84.4)
Neem oil emulsion 1% (10 lit/ha)	38.7	18.9d (51.2)	5.6bc (85.5)
Fish oil rosin soap 2.5% (25 kg/ha)	39.1	27.4e (29.9)	11.2d (71.4)
Monocrotophos 450 g a.i./ha	33.7	1.3a (96.1)	0.9a (97.3)
Endosulfan 680 g a.i./ha	29.4	1.3a (94.6)	0.7a (97.6)
Control	38.5	33.7e (12.5)	15.7e (59.2)

*In vertical column, means followed by similar letters are not different statistically (P = 0.05) by D.M.R.T.
**Differences between the means not significant
Figures in parenthesis represent percentage reduction over initial population

nearly 60 per cent of the foliage and nearly 50 per cent of the larvae were found distributed on the stems and pods. These larvae feeding on the bark and seeds inside pods might not have consumed adequate quantity of the moult inhibitor to produce the desired kill.

KEY WORDS: *Crocidolomia binotalis*, mustard, *Bacillus thuringiensis*, insecticides, control

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