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Research Notes

Effect of drift of *Bacillus thuringiensis* var Berliner on mulberry silkworm, *Bombyx mori* L.

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With the onset of problems due to continued insecticide usage such as resistance, resurgence and residue, the interest in the use of *Bacillus thuringiensis* was developed as it proved to be effective against a wide range of insect pests. The fear of the use of these agents towards *Bombyx mori* have been felt early as 1960s in Japan and it was suggested to use *B. thuringiensis* strains having low toxicity to the silkworm, but high toxicity to injurious insects (Aizawa and Fujiyoshi, 1968; Aizawa, 1982). The authors reported that *B. thuringiensis* preparations are known to be practically harmless to human, domestic animals, wild life, plants, honey bee and beneficial insects except silkworms. The toxicity of *B, thuringiensis* to silkworm has been demonstrated by several workers over years (Ishiguru and Miyasono, 1979; Deshmukh and Despande, 1989; Pramanik and Somchoudhury, 2001). Govindan *et al.* (1998) suggested that *B. thuringiensis* preparations should not be used anywhere close to the rearing environment and if need be, a strain not pathogenic to silkworm

Table 1. Influence of *B.t* spray swath on *B.mori*

	Distance from spray swath (m)	Mortality (%)			
		Without maize as barrier crop		With maize as barrier crop.	
		II Instar	III Instar	II Instar	III Instar
Hand operated sprayer	10	5.50^{c}	4.67^{c}	3.33^{b}	1.85^{b}
	25	2.67^{b}	2.50^{b}	0.00^{a}	0.00^{a}
	50	0.00^{a}	0.00^{a}	0.00^{a}	0.00^{a}
	75	0.00^{a}	0.00^{a}	0.00^{a}	0.00^{a}
	Control	0.00^{a}	0.00^{a}	0.00^{a}	0.00^{a}
Power sprayer	30	14.67^{d}		8.33^{c}	
	50	11.33^{c}		2.50^{b}	
	70	4.50^{b}		0.00^{a}	
	90	0.00^{a}		0.00^{a}	
	Control	0.00^{a}		0.00^{a}	

In a column, means followed by common letter are not significantly different by DMRT (P=0.05)

should be employed and the minimum distance for safe use will have to be worked out.

The experiment was conducted by spraying *B. thuringiensis* at a distance of 10 m, 25 m, 50 m and 75 m from mulberry garden with variety, Kanva 2 along the direction of wind during the month of June. 2004. The commercial *B.thuringiensis* product, Delfin *(B. thuringiensis* var. *kurstaki)* was sprayed during evening hours using hand operated sprayer with dose of 1 kg ha^{-1}. The wind speed recorded at the time of spraying was 30 km/hr. On zero days after spraying , Kanva-2 leaves were collected from the field from each treatment and fed once each to second instar and third instar cross breed, PM X NB4D2. Six replications were maintained for each treatment in the laboratory @ 100 larvae per replication. An untreated control was also maintained. Observations for mortality was made 48 h after treatment. The economic parameters were also recorded for each treatment. Another experiment was carried out with the same treatments in the presence of barrier crop of 20 rows of maize (CO 1) all around the field with crop height of 2.0 m.

The drift effect was also assessed against second and third instar using power sprayer in the presence and absence of a barrier crop at a distance of 30, 50, 70 and 90 m along with control.

Statistical analysis of data from factorial completely randomized design was done using methods suggested by Panse and Sukhatme (1957) and means were compared with Duncun's multiple range test.

Drift experiments conducted in the present study revealed that a distance of 50 and 25 m were safe for *B. thuringiensis* spraying with hand operated sprayer in the absence and presence of barrier crop, respectively. Mortality due to drift ranged from 0 to 5.50 per cent against the second instar and 0 to 4.67 per cent against the third instar in the absence of a barrier crop (Table 1). In the presence of barrier crop, the mortality ranged from 0 to 3.33 per cent against the second instar and 0 to 1.85 per cent against the third instar. No significant difference was observed with respect to economic characters.

When sprayed with power sprayer, it ranged from 0.00 to 14.67 per cent and 0 to 8.33 per cent in absence and presence of barrier crop respectively (Table 1). No significant difference was observed with respect to economic characters.(Table 3).

The result of our studies go with the result of Nishiisutsuji uwo and Wakjisak (1975) who felt that there is a danger of *B. thuringiensis* being scattered by wind resulting in greater damage to sericultural areas. From the present study, it was inferred that the distance of 50 m was safe to second instar larvae of *B. mori.* The drift had no influence on surviving population. There was no significant difference in all the economic parameters. Similar result was obtained with third instar larvae. The distance of 25 m was found to be safe in the presence of barrier crop both for the second and third instar larvae (Table 1).

The distance of 70 m was found to be safe in presence of a barrier crop and 90 m in absence of a barrier crop (Table 1). The per cent mortality ranged from 0 to 14.67.

From the drift studies conducted recently by Sreenivasa *et al.* (2002), it was clear

that Dipel 8L drift was carried to a distance of 5 and 20 m, respectively with knapsack and power sprayer. The result obtained is in conformity with Paddidam (1991) who reported that in Japan, safe distance of 70 m was essential for spraying on adjacent crop.

Present result did not agree with Sreenivasa *et al.* (2002) who reported that a distance of 10 and 50 m were safe by spraying Dipel with knapsack and power sprayer, respectively. In the present investigation, the drift studies were conducted during high (maximum) windy season (June, July) to catalogue the drift effect and that might be the reason for the variation in result.

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