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Short communication

Comparative toxicity of two isolates of *Bacillus thuringiensis* Berliner from *Plutella xylostella* L. and *Papilio demoleus* L. to some important lepidopteran pests of horticultural crops

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ABSTRACT

Toxicity of two isolates of *Bacillus thuringiensis* viz. KPx-1 and IPd-1 isolated from diamondback moth, *Plutella xylostella* (Lepidoptera: Yponomeutidae), and citrus butterfly, *Papilio demoleus* (Lepidoptera: Papilionidae), were tested against cabbage leaf webber, *Crocidolomia binotalis*, hairy caterpillar, *Diacrisia obliqua* and tomato fruit borer, *Helicoverpa armigera*. Among these, *C. binotalis* was highly susceptible (28.4 and 26.0 ng/cm^2, for KPx-1 and IPd-1, respectively), while, *H. armigera* was the least susceptible (9.5 and 10.0 µg/ml, for KPx-1 and IPd-1, respectively).

Key words: *Bacillus thuringiensis*, isolates, toxicity

Bacillus thuringiensis (Bt) has been successfully employed in the management of insect pests in agriculture and in public health. During the survey, two isolates of Bt subsp *kurstaki* (Btk), namely, KPx-1 and IPd-1 were isolated from diamondback moth, *Plutella xylostella* (Lepidoptera: Yponomeutidae), and the citrus butterfly, *Papilio demoleus* (Lepidoptera:Papilionidae), respectively. In this communication we report the toxicity spectrum of these Bt isolates to some important lepidopteran pests of horticultural crops viz., cabbage leaf webber, *Crocidolomia binotalis* (Lepidoptera: Pyralidae), hairy caterpillar, *Diacrisia obliqua* (Lepidoptera:Arctiidae) and tomato fruit borer, *Helicoverpa armigera* (Lepidoptera:Notuidae).

Stock culture of *H. armigera* was maintained on semisynthetic diet (Nagarkatti and Prakash, 1974), while, that of *C. binotalis* and *D. obliqua* maintained on cabbage. The Bt isolates were grown on nutrient agar at 30°C for 72 h and were homogenized in distilled water which formed the spore, crystal preparation (SCP). An aliquot of the SCP was used for protein estimation using Lowry's method (Lowry *et al*, 1971). Bioassay was conducted using serial dilutions of the SCP. Two hundred µl of different dilutions were applied on both sides of fresh cabbage leaf discs (62cm^2) @ 100µl/side. Single treated leaf disc was placed in individual, sterile plastic Petri plate (10 x10cm) and 20 five-day old larvae of each *C. binotalis* and *D. obliqua* were released separately per replication. Similarly, 100 µl of different dilutions were surface - coated on 3 ml of semi synthetic diet and a single, five-day old larva of *H. armigera* was released per replication. There were five replications per treatment and an untreated control. Mortality of the treated larvae was recorded every 24 h interval for one week and data were subjected to Probit analysis (Abbott, 1925).

Bioassay results showed that there was little variation in toxicity of KPx-1 and IPd-1 to all the test insects. Differences in toxicity were 0.1 & 4.0 ng/cm^2 and 0.1 µg/ml for *C. binotalis* & *D. obliqua* and *H. armigera*, respectively. Among the test insects, *C. binotalis* was found to be the most susceptible while *H. armigera* was least susceptible to both the isolates (Table 1). Minor differences in toxicity of the above isolates could be attributed to various factors such as protoxin composition, rate of dissolution and activation of protoxins, presence of receptors, etc. in different test insects (Crickmore *et al*, 1998). Other factors governing toxicity are complex and poorly understood (Jarret, 1985). In the present investigation, as we found no appreciable variation in toxicity of the two isolates, it is likely that composition, rate of dissolution and activation of the protoxin may have been similar in the three test insects used.

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Table 1. Comparative toxicity of *B. thuringiensis* isolates, KPx-1 and IPd-1 to some important lepidopterous pests of horticultural crops

Insect species	KPx –1			IPd – 1		
	LC_{50}	Fiducial limit		LC_{50}	Fiducial limit	
		Lower	Upper		Lower	Upper
Crocidolomia binotalis (Lepidoptera: Pyralidae)	28.40 ng/cm^2	28.30	28.50	26.00 ng/cm^2	25.93	26.07
Diacrisia obliqua(Lepidoptera: Arctiidae)	249.00 ng/cm^2	248.89	249.12	245.00 ng/cm^2	244.90	245.10
Helicoverpa armigera (Lepidoptera: Noctuidae)	3.30 µg/ml	3.29	3.31	3.40 µg/ml	3.28	3.52
Control	0.00	0.00	0.00	0.00	0.00	0.00

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