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Research Article

Evaluation of spore crystal toxin complex of *Bacillus thuringiensis* isolates against *Helicoverpa armigera* larvae

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ABSTRACT

In vitro toxicity testing was performed with six Bt. isolates *viz.,* 4D4, 4A3, 4J3, MTCC868, Bt1 and Bt9 procured from different sources and their spore crystal toxin (SCT) complex was produced which was evaluated by feeding to second instar larvae of *Helicoverpa armigera* at different concentrations (500µg/ml, 250 µg/ml and 125 µg/ml). Out of six Bt isolates tested, three isolates Bt1, MTCC868 and 4D4 proved very effective. Cent per cent mortality was obtained in Bt1 and MTCC868 which was at par with 4D4 (93.33%) at 500 µg/ml after 240 hours. The other isolates were less effective even at higher concentration but all the Bt isolates showed more than 50 per cent mortality at 500 µg/ml after 240 hours. The mortality at higher concentration (500µg/ml) was significantly better than middle concentration (250µg/ml) which in turn was significantly better than lower concentration (125 µg/ml) under laboratory condition.

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INTRODUCTION

Helicoverpa armigera is a serious pest of legumes, cotton and vegetables in South East Asia with an ability to develop a quick resistance to all kind of chemical insecticides. Keeping in view the side effects of insecticides, there is strong need for development and evaluation of eco-friendly strategies for the management of this pest. Among the several alternative methods for pest management, biological control by entomopathogens is promising one. Entomopathogens are the disease causing agents in the insect population, which may help in keeping the insect population below economic threshold level. It is a class of insecticides which is called as biopesticide. Biopesticides provide desired degree of plant protection which is totally eco-friendly (Cannon, 1990). Of all the biological agents that have been evaluated as insect control products, the most successful so far is *Bacillus thuringiensis* Berliner (Bt) which is being widely used as a biopesticidal formulation to control pest population among Lepidoptera, Diptera and Coleoptera (Beegle and Yamamoto, 1992, Schnepf *et al.,* 1998) because these are generally specific, economically viable, environmentally safe and compatible with the other methods of pest control (Jayaraj and Raghupathy, 1993).

Bt is extraordinary because of its unique capacity to synthesize crystal protein during sporulation. These crystal proteins have high insecticidal activity and quite selective in their toxicity to specific insect pests (Schnepf *et al.,* 1998, Whitlock *et al.,* 1991). Ingestion of delta endotoxin protein is a must for susceptible larvae; the crystal protein is solubilised in the alkaline midgut and then activated by digestive enzyme to yield a proteolyticaly stable toxin. The activated toxin passes through peritrophic membrane and binds to specific receptors in the brush border membrane vesicles. It opens up the K^+ channel in the membrane and eventually cell lysis causes death of the insects (Karim and Riazuddin, 1997). These naturally occurring insecticidal proteins have been commercially produced and used as insecticides for decades. Entomopathogens have shown varying degrees of virulence under different environmental conditions so, in present study different *Bacillus thuringiensis* isolates at different concentrations of spore crystal toxin were evaluated for their virulence against second instar larvae of *H.armigera*.

MATERIALS AND METHODS

In vitro toxicity test was performed with four Bt isolates