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BIO-EFFICACY OF FOUR STRAINS OF *BACILLUS THURINGIENSIS* BERLINER AGAINST HAIRY CATERPILLAR *DIACRISIA OBLIQUA* WIK

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Three commercial preparations of bactospeine (bactospeine WP 16000 IU Ak/mg serotype H-3a3b, bactospeine FC 8500(IU Ak/mg) serotype H-3a3b and bactospeine FC 7500 IU Ak/mg serotype H-7) and a USDA standard strain HD-1-S-1980 (16000 IU/mg) were evaluated in different concentrations against field collected 3rd instar larvae of hairy caterpillar (*Diacrisia obliqua* Wlk.). The HD-1-S-1980 was found to be significantly more effective than to bactospeine preparations against the test insect after three and four days of exposure.

Key words: Bacillus thuringiensis; Bactospeine; *Diacrisia obliqua.*

INTRODUCTION

Indiscriminate use of chemical insecticides has cicated a number of biological hazards, 'viz', air and soil pollution, phytotoxicity, development of resistant strains of insect pests, danger to beneficial insects, fishes and birds, and toxic residual effects. In developed countries, restrictions have been imposed on the use of many strong chemical insecticides, specially chlorinated hydrocarbons. However, in developing countries use of such insecticides remains indispensable in the absence of alternate non-hazardous means of pest control.

Recent efforts for the control of insect pests with their natural pathogens all over the world have resulted in the discovery of many potent strains of bacteria (e.g. *Bacillus thruingiensis*), and viruses (e.g. Nuclear polyhedrosis virus). Isolation and purification of these insect pathogens and their subsequent testing (bioassay) proved their immense importance specially in control of lepidopterous insect pests. Thus, many viral and bacterial insecticides, e.g., thuricide, elcar, biotrol, dipel and bactospeine have come into existence and are available in markets.

Many investigators have conducted studies on the susceptibility of different insects to various strains of *Bacillus thuringiensis* [1-4,6,8-10,12,13,15-18]. The present paper describes the bio-efficacy of different strains of Bacillus thuringiensis incorporated in bactospeine commercial preparations and their comparison with USDA's standard *Bacillus thuringiensis* strain (HD-1-S-1980) against hairy caterpillar, *Diacrisia obliqua* Wlk., a serious pest of mungbean (*Vigna radiata* L. wilczek), mashbean (*Vigna mungo* L.), sunflower (*Helianthus annus* L.), soybean (*Glycine max* L., *mess)* and groundnut (*Arachis hypogaea* L.).

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MATERIALS AND METHODS

Test insect. Field collected second instar larvae of D.obliqua were subjected to adaptability test for about 72 hrs. During the test, the larvae were fed on the green mungbean leaves. Third instar larvae obtained as a result of this test were used in the experimentation.

Bacterial toxins. Three commercial preparations of *B.thuringiensis* (procured from the Biochem Products, Brussels-Belgium) namely, bactospeine (R) WP 16000 IU Ak/mg (serotype H-3a3B bactospeine (R) FC 8500 IU Ak/mg (serotype H-3a3b), bactospeine (R) FC 75000 IU Ak/mg (serotype H-7) and USDA's standard HD-1-1980 WP 16000 IU/mg were used in the study.

Preparation of toxin concentrations. Nine serial concentrations of the bacterial toxins were prepared in fresh phosphate buffer (7.0 pH) without tween 80. The initial concentrations of wettable powders (WP) of bactospeine (16000 IU Ak/mg) and HD-1-S-1980 (16000 IU/mg Ak/mg) contained 4.8 x 104 IU/ml while that of flowable concentrates (FC) of bactospeine (8500 IU Ak/mg) and bactospeine (7500 IU Ak/mg) included 2.5 x 10^4 IU/m and 2.2 x 10^4 IU/ml respectively. Subsequent concentrations were obtained from the initial concentration of respective toxin (using seven and nine serial dilution method [8] (Table 1).

Toxin administration. For each concentration, a batch of 15 third instar larvae (6-8 hrs starved) was used. Each larval batch was placed in a UV sterilized plastic jar (9.5

cm x 11.00 cm) and allowed to feed on 12 fresh mungbean leaves treated with 6 ml of the toxin concentration. The jars were covered with sterilized muslin cloth. Four replications of each concentration were maintained with their respective control. Observations on larval mortality were recorded at 72 and 96 hrs after exposure to bacterial toxin. The Lc(50)s of the toxins were computed through probit analysis method [20]. All experiments were maintained at 25-30 C and 65-80 % RH.

RESULTS AND DISCUSSION

Lc(50) values clearly indicated that the standard *B.thuringiensis* preparation, HD-1-S-1980, was more effective against 3rd instar larvae of *D.oblique* than bactospeine commercial preparations, 3 and 4 days after treatment (Table-2). However, the three commercial preparations also showed significantly different Lc (5) values after same exposure period. The Lc (50) values after 4 days exposure, following all the treatments, were almost half of the values obtained after 3 days of exposure. Bactospeine (8500 IU Ak/mg) was least effective as it resulted in significantly high Lc (50) value as compared with all other preparations after 3 days of exposure.

Very few workers have studied effects of *B.thruingiensis* preparations on field collected larvae of lepidoptera [5,12,14]. Most of the workers have studied mortality of laboratory reared pests against commercial preparations [3,6,7,15,17,19]. However, Lc (50) values of microbial preparations have usually been based on laboratory reared larvae. Although field tests obtained by Kaya [12] confirmed the results obtained by him in the laboratory, earlier workers reported high susceptibility of 3rd-instar Anisota senatoria (Smith) to *B.thruingiensis* [11].

The present study was based on field collected larvae in order to obtain the Lc (50) results which not only gave a comparative efficacy of different *B.thuringiensis.* preparations but also provided informations on the use of the preparations against *D.obliqua* in the field.

Table 1. Bacterial toxin concentrations expressed in IU per ml

Concentration	HD-1-S-1980 (16000 IU/mg)	Bactospeine (16000 IU Ak/mg)	Bactospeine (8500 IU/mg)	Bactospeine (7500 IU Ak/mg)
1.	48000 IU/ml	48000 IU/ml	25500 IU/ml	22500 IU/ml
2.	36000 IU/ml	36000 IU/ml	19125 IU/ml	16875 IU/ml
3.	24000 IU/ml	24000 IU/ml	12750 IU/ml	11250 IU/ml
4.	18000 IU/ml	18000 IU/ml	9563 IU/ml	8438 IU/ml
5.	12000 IU/ml	12000 IU/ml	6375 IU/ml	5625 IU/ml
6.	9000 IU/ml	9000 IU/ml	4781 IU/ml	4219 IU/ml
7.	6000 IU/ml	6000 IU/ml	3188 IU/ml	2813 IU/ml
8.	4500 IU/ml	4500 IU/ml	2390 IU/ml	2109 IU/ml
9.	3000 IU/ml	3000 IU/ml	1594 IU/ml	1409 IU/ml

*International units (IU) values are based on manufacturer's informations.

Table 2. Comparison of adjusted Lc(50) values of HD-1-S-1980 and 3 bactospeine commercial preparations of *Bacillus thuringiensis* berl iner against hairy caterpillar *D.obliqua.*

B.thuringiensis strains	3 days exposure			4 days exposure		
	mean Lc50	95% confidence limits		mean Lc50	95% confidence limits	
	(IU/ml)	lower	upper	(IU/ml)	lower	upper
HD-1-S-80 16000 IU/mg	3513	3481	3545	2062	2029	2094
Bactospeine 16000 IU Ak/mg	13697	13665	13729	7851	7819	7883
Bactospeine 8500 IU AK/mg	17347	17329	17364	5605	5588	5622
Bactospeine 7500 IU AK/mg	3569	3554	3584	1668	1653	1683

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