

FIELD EVALUATION OF *BACILLUS THURINGIENSIS* VAR. *ISRAELENIS* FOR CONTROL OF *AEDES TAENIORHYNCHUS* IN SALT MARSH POOLS<sup>1</sup>

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INTRODUCTION

*Bacillus thuringiensis* var. *israelensis* (*Bti*) was originally isolated from soil samples taken from mosquito-producing sites in Israel by Goldberg and Margalit (1977). Laboratory tests have shown the delta-endotoxin of *Bti* to be extremely toxic to mosquito larvae (de Barjac 1978, Garcia et al. 1980). Field data are limited, however, regarding the efficacy of

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Table 1. Efficacy of Vectobac®, a wettable powder formulation of *Bacillus thuringiensis* var. *israelensis* (*Bti*), applied at 2 rates for control of *Aedes taeniorhynchus* larvae in salt marsh pools, Pamlico Co., NC, October 21–23, 1981.

Replicate <sup>a</sup> (pool)	Rate of application		Salinity (ppt)	Ave. no. larvae/dip (% control) <sup>b</sup>		
	(kg/ha)	(IU/ml)		Pre-treatment	1 day Post-treatment	2 days Post-treatment
1	1.0	4.4	17.0	131	0 (100)	0 (100)
2	1.0	2.2	16.0	74	2 (96.7)	0 (100)
3	1.0	5.9	16.0	105	0 (100)	0 (100)
4	0.1	0.3	13.5	206	171 (0)	211 (32.9)
5	0.1	0.6	11.5	279	425 (0)	Dry
6	0.1	0.6	12.5	71	96 (0)	114 (0)
7	Untreated		13.0	122	109	220
8	Untreated		13.7	153	114	200

<sup>a</sup> Each replicate was an isolated pool. Pools ranged in size from 0.4 to 2.3 m<sup>2</sup>, and 2.5 to 10.2 cm deep on the day of *Bti* application.

<sup>b</sup> Average no. larvae per dip based on 10 dips with a 0.47 liter enameled dipper in each pool. Percent control was corrected using Abbott's formula.

various commercial formulations of *Bti* for control of mosquitoes in brackish waters. Garcia and Desrochers (1980) conducted preliminary field trials of a Sandoz formulation (WDC-I) of *Bti* for control of *Aedes dorsalis* (Meigen) and *Culex tarsalis* (Coq.) in brackish water habitats in California. Purcell (1981) studied the effects of a Biochem Products wettable powder formulation of *Bti* on *Aedes taeniorhynchus* Wied. and some non-target organisms in a Florida salt marsh. The objective of this investigation was to evaluate Vectobac®, a wettable powder formulation of *Bti* produced by Abbott Laboratories, for control of *Ae. taeniorhynchus* larvae in salt marsh pools in North Carolina.

#### MATERIALS AND METHODS

The *Bti* tested was a wettable powder formulation designated ABG-6108-II (lot no. 8278-55) provided by Abbott Laboratories, North Chicago, IL. The material had a potency of 2,000 International *Aedes aegypti* toxic units/mg ( $9.1 \times 10^8$  IU/lb).

A field test was conducted in salt marsh pools in Hobucken, Pamlico Co., NC on October 21–23, 1981. The pools had formed in small depressions after flooding by high tides and rain ca. 2 days before treatment. The pools were isolated from one another, had surface areas ranging from 0.4 to 2.3m<sup>2</sup>, and were 2.5 to 10.2 cm deep on the day of *Bti* application. Second instar *Ae. taeniorhynchus* larvae were present in each pool. Applications of the *Bti* formulation were made to the surface of each pool using a hand-pumped, compressed air sprayer at rates of 1.1 kg/ha (2.2 to 5.9 IU/ml of water in the pools) to 3 pools and 0.1 kg/ha (0.3 to 0.6 IU/ml) to 3 other pools. The amount of the formulation required for each treatment rate was determined by calculating the total surface area of the water in each pool. The volume of spray was standardized at 380 ml/m<sup>2</sup> surface area for all treatments. Two untreated pools served as controls. The mean numbers of mosquito larvae present in the pools were based on 10 dips with a 0.47 liter

white enameled dipper taken at ca. equal intervals around each pool before treatment, and at 1 and 2 days posttreatment. Percent control in the treated pools was corrected for any changes in the mosquito populations in untreated pools by Abbott's formula. Water temperatures (measured by a continuous recording thermograph) ranged from 11.1 to 27.8°C, and salinities (measured daily in each pool with a YSI Model 33 SCT Meter) ranged from 11.5 to 17.0 parts per thousand (ppt) during the course of study.

#### RESULTS AND DISCUSSION

Application of a wettable powder formulation of *Bti* at 1.1 kg/ha (2.2 to 5.9 IU/ml) to salt marsh pools produced 100% control of *Ae. taeniorhynchus* larvae (Table 1) at 1 and 2 days posttreatment. Garcia and Desrochers (1980) found that *Bti*, when applied at 1 kg/ha, gave 90% control of *Ae. dorsalis* in a Marin Co., California salt marsh with 32 ppt salinity. Our results are also similar to those of Purcell (1981), who reported that *Bti*, when applied at a concentration of 4.5 IU/ml, killed 99% of the *Ae. taeniorhynchus* larvae in a Florida salt marsh. Purcell (1981) also reported an LD<sub>90</sub> of ca. 3.5 IU/ml for *Ae. taeniorhynchus* larvae, and that mean survival of *Ae. taeniorhynchus* larvae in treated containers was equal to that of larvae in untreated containers at *Bti* concentrations of 0.6 IU/ml or lower. In our investigation, those pools in which *Bti* failed to control mosquito larvae were treated at 0.1 kg/ha, and contained *Bti* concentrations of 0.6 IU/ml and 0.3 IU/ml. Although a precise threshold amount of *Bti* required for effective *Aedes* mosquito control in salt marshes can not be calculated, it appears that 2–5 IU/ml would be effective in the saline water.

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