MUTANTS OF BACILLUS THURINGIENSIS SUBSPECIES ISRAELENSIS AND THEIR TOXICITIES TO AEDES AEGYPTI LARVAE

A Thesis

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Master of Science in Biology

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by

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APPROVAL SHEET

This thesis entitled MUTANTS OF BACILLUS THURINGIENSIS SUBSP. ISRAELENSIS AND THEIR TOXICITIES TO AEDES AEGYPTI LARVAE, prepared and submitted by ANTONIO E. BATOMALAQUE in partial fulfillment of the requirements for the degree of MASTER OF SCIENCE Major in BIOLOGY has been examined and is recommended for acceptance and approval for ORAL EXAMINATION.

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ABSTRACT

Four mutant strains were isolated from Bacillus thuringiensis subsp. israelensis after treatment with N-methyl-N'-nitro-N-nitrosoguanidine (NTG). Of these mutants, three strains were oligosporogenous (Osp) and crystalliferous (Cry). One of these Osp.Cry strains produced dark brown pigment into the culture media. Another mutant was sporogenous and crystalliferous but produced dark brown pigment. Parasporal inclusions produced by these mutants were spherical in shape and morphologically similar to those produced by the parent strain. These mutants were found to be very stable regarding reversion.

Toxicity tests showed that all of these mutant strains were highly toxic to the larvae of the mosquito, Aedes aegypti, although none of their toxicities were higher than those of the parent strain. Toxicity is also associated with the formation of the parasporal inclusions or crystals.

Biochemical characteristics of the parent strain and the mutant strains were similar except that one mutant strain did not hydrolyze starch.

Serological studies showed that there was no difference between the flagellar antigenic structures of the parent strain and the mutants. Heat-stable somatic antigens of these strains were very similar to those of the parent strain, however, a slight difference was also suggested.

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INTRODUCTION

For many years, chemical insecticides have been used for the control of insect pests. Though effective, they also posed a threat to our environment. They harm non-target organisms such as plants, beneficial insects, domestic animals and man. Their residues remain not only on crops but in the air, water and soil. Besides, more and more insects acquired resistance against chemical pesticides. To counteract these problems, the use of microbial agents for insect pest control gained much attention. Under ordinary conditions, insect pathogens are usually harmless and non-toxic to non-target organisms owing to their relatively high degree of specificity in infections (Aizawa, 1981).

Bacillus thuringiensis is one of the several biological control agents being commercialized for control of agricultural insect pests. It proves to be a promising control agent since it is lethal to the target insects but harmless to the non-target organisms including human. Numerous investigations have revealed that the toxicity of B. thuringiensis to certain insects is mainly due to the parasporal inclusion produced by this bacterium (Angus, 1954; Burgeys and Bailey, 1968). However, the toxicity of paras-