DEVELOPMENT OF RESISTANCE TO CERTAIN INSECTICIDES IN THE PINK BOLLWORM *PECTINOPHORA GOSSYPIELLA* (Saund.)

BY

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ABSTRACT

Hemat Zakaria Mohamed Moustafa. Study of the development of resistance to certain insecticides *Pectinophora gossypiella* (Saund.). Unpublished M.Sc. thesis, Ain shams University, Faculty of Agriculture, Department of Plant Protection, 2005.

Two field strains of pink bollworm *Pectinophora gossypiella* (Saund) collected from Sharkia governorate were exposed to the selection pressure of pyrethroid deltamethrin and to *Bacillus thuringiensis* subsp. *Kurstaki* (Dipel 2x) in artificial diet by using adequate method to each compound under laboratory condition. After 14 generations of selection pressure resistance of deltamethrin increased to 215.11-fold compared to susceptible strain. In Dipel 2x resistant strain was obtained after 7 generations. Resistance ratio attained 16-fold based on the susceptible strain after14 generations of selection. Study the response of deltamethrin and Dipel 2x resistant strains to some insecticides indicated that there is cross resistance to esfenvalerate was 23.75-fold in deltamethrin strain compared to the susceptible strain and no cross resistance occurred to thiodicarb, chlorpyrifos and the bioinsecticides Ecotech and Agerin. In Dipel 2x resistant strain there is no cross resistance to the conventional insecticides, esfenvalerate, chlorpyrifos, thiodicarb or the bioinsecticides Ecotech and Agerin. These data may be emphasize the possibility of rotation Dipel 2x with these insecticides in pest control program of pink bollworm to manage resistance to *B.t.* products. Detoxication enzymes assay revealed that activity of glutathion S- transferase were higher in all selected generations than susceptible strain. In phosphatases activity, acid phosphatase increased than susceptible in all generations in Dipel 2x strain, alkaline phosphatase decreased in all generations than the susceptible strain. Study of protein electrophoresis in gut of resistant and susceptible larvae revealed that there are new bands appear in the

resistant strains and disappear in susceptible strain. Cross sections of larvae midgut of deltamethrin and Dipel 2x resistant strains showed histological changes in epithelium cells than susceptible, development of resistance resulted in thickness of epithelium cells.

***Key words*:** pink bollworm, resistance, selection, pyrethroid, *Bacillus thuringiensis*, cross resistance.

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CONTENTS

INTRODUCTION

Pink bollworm *Pectinophora gossypiella* (Saund.) is primarily a mid and late season pest and one of the most serious insect pest attacking cotton crop in Egypt as well as the most cotton producing countries which cause a great damage in the quality and quantity of cotton yield.

In the early 1980`s, pyrethroid insecticides were rapidly substituted for organophosphorus and organochlorine insecticides for control of the pink bollworm due to their wide spectrum, low dosage, high killing efficiency, low residue and low toxicity to humans and animals. Unfortunately, resistance by the bollworm to such insecticides became more and serious because of indiscriminate applications. **(Wang 1992).**

Bacillus thuringeinsis as a biopesticide is a valuable source of insecticidal proteins for use in conventional sprayable formulations, and in transgenic crops and it is the most promising alternative to synthetic insecticides **(Ferre and Van Rie 2002).** The benefits of using *B. thuringiesis* include reduced environmental and worker exposure to conventional insecticides, reduced selection for resistance to conventional insecticides and improved conservation of natural enemies. However Lepidopteran resistance to *B.t***.** has been known since 1985 but only in a few taxonomic families. Nonetheless these insects were susceptible to other *Bt* toxins. Resistance to *B. thuringeinsis* has documented for several insect species **(Tabashnik 1994)**. Pink bollworm and more than a dozen other pests have been selected in the laboratory for resistance to *B. thuringeinsis* toxin **(Frutos *et al*. 1999)**.

Since the resistance of such pests are expected, the aim of the present work is to investigate:

1-The development of resistance of *P. gossypiella* to the pyrethroid deltamethrin as well as a formulation of *B. thuringeinsis* (Dipel 2x).

2-Cross-resistance to other insecticides in resistant strains.

3-Biochemical mechanism of resistance.

4- Histopathological changes of gut of resistant strains larvae.

LIST OF FIGURES