EFFECT OF SOME NEW COMPOUNDS USED FOR PEST CONTROL ON THE BIOLOGY AND PHYSIOLOGY OF CERTAIN NATURAL ENEMIES OF COTTON PESTS.

B y

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THESIS

SUBMITTED IN PARTIAL FULFILMENT

OF THE REQUIREMENTS

FOR THE DEGREE OF

Master In Agriculture

(Entomology)

Department of Plant Protection

FACULTY OF AGRICULTURE

AIN SHAMS UNIVERSITY

1986

APPROVAL SHEET

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Title of thesis : EFFECT OF SOME NEW COMPOUNDS USED FOR PEST CONTROL ON THE BIOLOGY AND PHYSIOLOGY OF CERTAIN NATURAL ENEMIES OF COTTON PESTS.

Degree : M.Sc. (Entomology)

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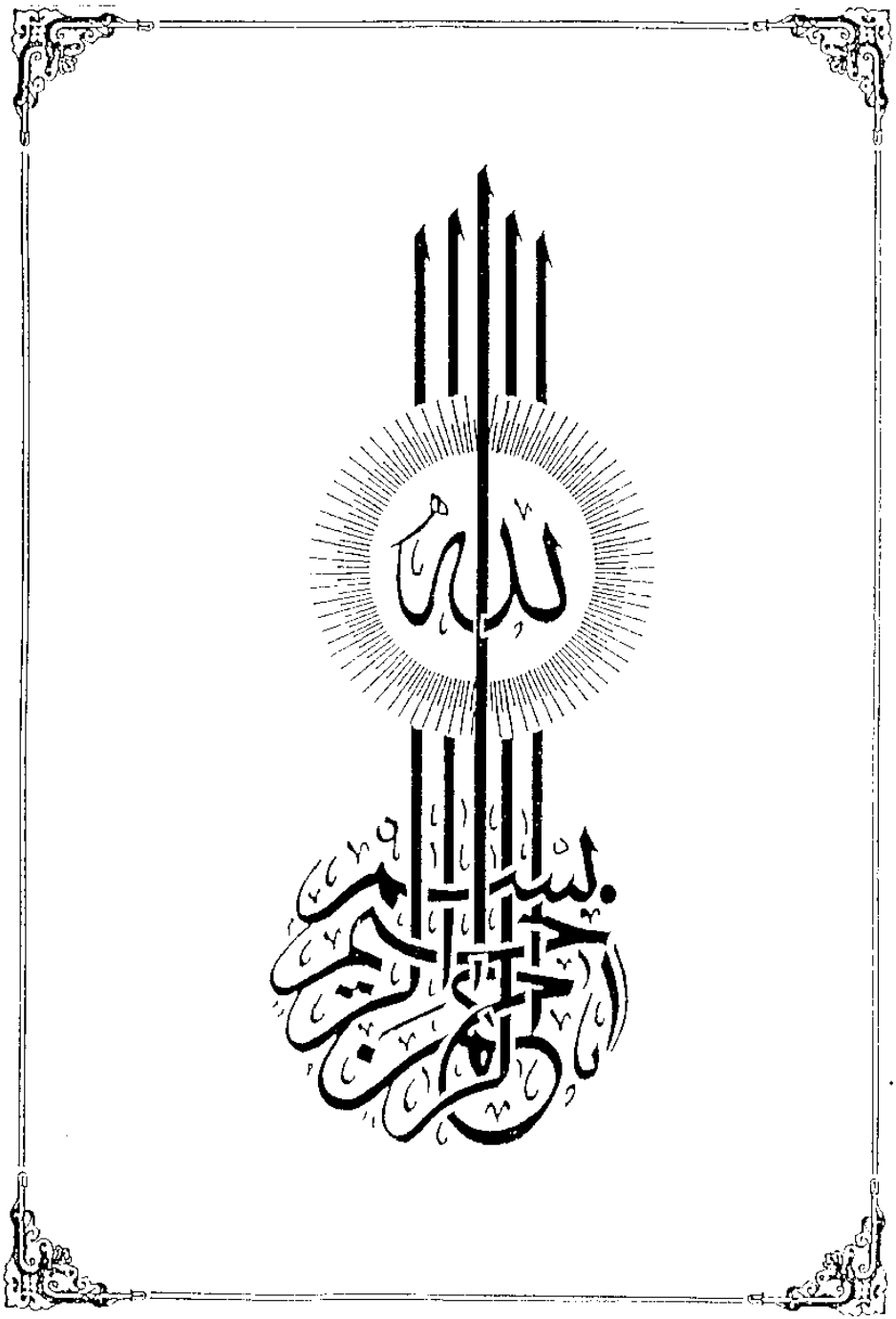
Date : 6 / 11 /1986.



ACKNOWLEDGEMENT

Firstly, ultimate thanks to God.

The writer wishes to express his deep appreciation and gratitude to Prof. Dr. M.F. El-Shaarawy, Professor of economic entomology and Dean Faculty of Agriculture, Ain Shams University for suggesting the problem, help, advice and encouragement he kindly offered throughout the course of this work.

Deep thanks are due to Dr. F.M.A. Marie, Associate Prof. of Entomology, Department of Plant Protection, Faculty of Agriculture, Ain Shams University and Dr. F.N. Zaki Associate Prof. of Biological Control, Laboratory of Pests and Plant Protection, N.R.C. for their supervision, guidance and helps and for the interest they expressed in this study.

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INTRODUCTION

I. INTRODUCTION

Insect predators and parasites play an important role in the natural control of insect pests.

Ever since the serious damage inflicted by insecticides on natural enemies was realized, the preservation of these enemies has been an important aim. Integrated control programs are planned to achieve the best possible results by combining biological and chemical methods of pest control.

A soundly devised pest control program should take maximal advantage of natural control by employing insecticides which are highly effective against the target insect pests and yet minimally harmful to beneficial species present.

The present study is an attempt to evaluate the effect of Dimilin and Dowco 439, as new chemical compounds, on two beneficial insects, i.e., the predator Coccinella undecimpunctata R. and the parasite Bracon brevicornis Wesm.

Dimilin (diflubenzeron) is a new group of insecticidal compounds, the substituted 1-benzoyl 1-3 phenylurea, discovered by Duphar B.V., the Netherlands. Dimilin acts by

interfering with the deposition of chitin, one of the main components of the insect cuticle. After treatment with Dimilin, larvae find difficulty in moulting. The malformed cuticle of the new larval instar cannot withstand the internal pressure during ecdysis and/or cannot give sufficient support to the muscles involved. The results in an inability to cast the exuviae and finally leads to the larval death.

The mode of action of Dimilin can also give rise to ovicidal effects by interfering with chitin deposition of the developing embryo. Adult insects are not lethally affected.

Dimilin is mainly a stomach poison, but in some cases the contact activity is also of importance.

Histological examination revealed that in various larvae the endocuticular deposition during an instar was disturbed after ingestion of Dimilin (diflubenzuron). After moulting, only epicuticular tissue could be found. The synthesis of chitin, one of the main components of the cuticle, which is responsible for its rigidity, is blocked by diflubenzuron. As a result the newly formed

cuticle is very delicate and cannot withstand muscular contraction during moulting. This explains why affected larvae succeed only partly in casting their exuviae (Mulder and Gijswijts, 1973).

Beside the ovicidal effect by contact activity, diflubenzuron can also prevent egg eclosion after oral uptake by the female. This phenomenon has been reported for several insect species (Grosscurt, 1976).

Dowco 439 acts as a stomach and contact insecticide, it inhibits chitin synthesis and so interfers with the formation of the cuticle. Post-embryonic stages of insects that form new cuticles should be susceptible to Dowco 439 exposure.

The aim of present work is to study the effects of Dimilin and Dowco 439 on the predator, Coccinella undecimpunctata and the parasite, Bracon brevicornis.

REVIEW OF LITERATURE

II. REVIEW OF LITERATURE

1. Effect of Dimilin (diflubenzuron) on certain economic pests :-

Mulder and Gijswijt (1973) found that all stages of Pieris brassicae treated with Dimilin remained obviously unaffected until they had entered the apolytic stage preceeding the actual shedding of the exuviae. The moulting process is stagnated somewhere on the way. On close examination the apolysed larvae could be seen moving within their intact exuviae, but they were unable to split the latter and wriggle out. After some time the larvae usually lost some fluid, gradually blackened, and finally died. At marginal lethal concentrations some larvae actually succeeded in splitting the exuviae and in getting out partly, but they were unable to complete ecdysis and died with loss of moisture and blackening. Last instar larvae diet with similar symptoms as other instars except that they remained attached laterally instead of posteriorly to the substrate. At marginal concentrations the abdomen of the pupae shed the exuviae, while the anterior part remained in the larval skin.

P. brassicae larvae usually liberated themselves partly from their old skins at all the effective dosages applied.

The same authors found that apolysed larvae of Aedes aegyptii were either moving inside their intact exuviae, or that had succeeded in liberating their anterior parts. In this state they were capable of moving in the water for a considerable length of time. Therefore the final mortality counts were postponed until emergence of the adult mosquitoes in the controls.

They added that the abdomens of most third instar larvae of Leptinotarsa decomlineata showed ballon-like distortions. After some time the ballon shaped larvae stopped feeding and died at pupation, loosing moisture and turning black.

Endocuticular thickness remained constant in the fourth instar larvae of P. brassicae treated with diflubenzuron, whereas in untreated larvae it increased until shortly before moulting.

Ascher and Nemny (1976) found that diflubenzuron was active as a residue on glass against 100 and 200 mg larvae of the Egyptian cotton leaf worm, Spodoptera littoralis, the toxicity of residues was identical

whether a dispersable formulation or a wettable powder or the technical substance were used. By topical application, diflubenzuron had an ED_{50} for cumulative percentage mortality up to the adult stage of 0.040 and 0.066 ug/larva for 100 and 200 mg larvae respectively. Neither the site of the topical application nor if the larvae were kept singly or in groups of ten after treatment had an influence on toxicity. Further diflubenzuron had contact toxicity to at least one insect species as well as the known stomach poison action.

Grosscurt (1976) treated Musca domestica eggs by topical application with Dimilin or by oral uptake by gravid female (this compound had no contact activity on eggs of this insect species). In all cases embryonic development occurred normally. Injection of 1 ug diflubenzuron per female totally prevented eclosion of eggs laid two or more hours later.

Oral uptake of 1000 p.p.m. of the compound by both sexes of M. domestica did not influence either the number of eggs produced per female or the percentage of unfertilized eggs. Also injection of males with 5 ug diflubenzuron, one day before copulation with untreated females, had no