EFFECT OF THE JUVENILE HORMONE AND ITS ANALOGUES ON THE EMBRYONIC DEVELOPMENT OF THE HOUSE FLY, MUSCA DOMESTICA (L.)

A THESIS

Submitted in Partial Fulfilment of the

Requirements for the Award

of the Degree of M.Sc.

BY

HAYAM EL HAMOULY ABD EL RAHMAN HASSANEEN

Nawal Shanbaky

Department of Entomology

Faculty of Science

Ain Shams University

Cairo

1991

B I O G R A P H Y

Date and place of Birth	:	29.6.1961, Cairo.
Date of Graduation	:	May, 1983.
Degree Awarded	:	B.Sc. (Entomology).
Grade	:	Excellent.
Date of Appointment	:	October, 1983.
Date of Registration	:	23.3.1987.

بسم الله الرحمن الرحيم

THESIS EXAMINATION COMMITTEE

Name	TITLE	SIGNATURE
....	....	....
....	....	....
....	....	....
....	....	....

COURSES STUDIES BY THE CANDIDATE IN THE PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE M.Sc.DEGREE

Language:

English, M.Sc. Courses, Examination passed on: October, 1985.

Entomology courses:

1. New approaches to insect control.
2. Chemistry of insecticides.
3. Insect phermones.
4. Insect hormones.
5. Thesis preparation.
6. Principles of insect taxonomy.
7. Microbial control of insects.
8. Environmental pollution.
9. Radiation biology.
10. Special course.

Statistical course: Biostatistics.

Examination passed on: September, 1985.

SUPERVISORS

Prof. Dr. N. M. Shanbaky
Prof. Dr. W. A. Radwan
Ass.Prof. Dr. R. A. Enan

HEAD OF DEPARTMENT

Prof. Dr. ADEL I.MARDAN

ACKNOWLEDGEMENT

My deepest appreciation and gratitutde are to professor Dr. N.M. SHANBAKY, Department of Entomology, Faculty of Science, Ain Shams University, for suggesting this work, her valuable construction criticism and encouragement during the course of the present work.

My deepest thanks and gratitutde to professor Dr. W. A. RADWAN, Professor of Entomology, in the same Department, for her valuable comments and guidance and her diligent effort in programming the work and for her direct and serious supervision.

My thanks to Dr. R.A.Enan , in the same Department, for her encouragements and guidance.

Finally my depest thanks are expressed to all members of Department of Entomology, Faculty of Science, Ain Shams University, for their generous cooperation and facilities that they offered to me during this study.

C O N T E N T S

Page

I. INTRODUCTION

I. INTRODUCTION

The house fly, *Musca domestica* L. has forced itself upon the attention of man as it has been a nuisance to him and a menace to his health.

Today, the problems in the house fly control are complicated by the development of resistance to insecticides, the non selective effects, environmental pollution and health hazards caused by insecticides, chemosterilants, and some other chemicals. Therefore, it seems urgent to attempt another mode for controlling this insect.

A controlling substance that is effective, safe and species specific could be found among hormones and hormone like substances.

Exogenous juvenile hormone (JH) and juvenile hormone analogues (JHA) have been reported to block embryonic development of insects in many orders including Diptera. During periods of metamorphosis, excess JH or JHA can upset development causing profound morphological changes, mainly due to juvenilizing effect and drangement of adult morphogenesis.

A comparison of the effect of hormones during embryonic and post embryonic periods promotes a better understanding of the mechanism of hormone action and the principle of morphogenesis.

The embryogenesis of Dipteran insects has been investigated in only a few species and is usually focussed on the early embryonic development. Therefore the present study was aimed for the following:

1. To study cleavage, blastoderm formation, and gastrulation.

2. To study the effect of JH I and JHA (Sumilarv) on embryogenesis by using two methods.

   a) Indirect application, by treating females at different periods of the reproduction cycle.

   b) Direct application on newly laid eggs either topically or by dipping the eggs in a solution of the hormonal material.

II. LITERATURE REVIEW

II. LITERATURE REVIEW

1. General embryological studies:

As early as, 1843, Kolliker made sketches of whole embryos of *Simiulium* and he recognized its similarity to *chironomus*. Subsequently Metchnikoff (1866) identified the embryonic membranes and observed the rotation within the egg of three species of *Simiulium*.

Gambrell (1933) studied the embryonic development of the black fly, *Simiulium pictipes*. The similarity of the embryonic development of this fly to other dipterous forms has been observed. The period of embryonic development in *Simiulium* is completed in five days. The amnion closes on the ventral side at the end of the first twenty four hours. On the dorsal side, the embryo closes toward the end of the 3rd day. The embryo makes a 180° rotation upon its longitudinal axis soon after the completion of the germ band.

Butt (1934) discussed the embryonic development of *Sciara* (Diptera). The author found that the egg stage varied from about seventy six hours to two weeks. The blastoderm stage was completed at the 10th hour. The anterior amniotic fold appeared on the ventral side at the 13th hour, followed by the posterior amniotic fold. Between the

25th and 50th hour, the neural groove invaginated, the neuroblasts developed, and the stomodaeum and the proctodaeum invaginated. There were no coelomic sacs. By the 90th hour the mid intestine was complete, gastric coeca and Malpighian tubules had developed.

Butt (1936) studied the early embryonic development of the parthenogenetic alfalfa snout beetle, Brachyrhinus ligustici L. It was found that the primary dorsal organ appeared at this time as a mass of cells that invaginate into the yolk along one side of the blastoderm leaving a groove on the outside surface. The blastoderm was completed at the 30th hour. The formation of the embryonic envelopes and differentiation of the ventral plate were described.

The embryonic development of the southern corn bill bug, Calendra callosa, has been followed by Wray (1937). The blastoderm stage was formed by 10 hours. A gastrula tube was formed but the lumen was not extremely large. The neuroblasts were differentiated at an early hour and the brain was formed shortly before the ventral cord. The author considered that the suboesophageal body is endodermal in origin. The dorsal body is formed at 24 hours from the vitellophages, supra-oesophageal body at 94 hours. The ventral wall of the heart was formed from a dorsal mesodermal layer whereas the cardioblasts formed the lateral wall. Hatching occurred at 96 hours.

Miller (1939) studied the early embryonic development of the stone fly, Pteronarcys proteus, Newman. The development of the embryo was completed in about 5.5 months. The first six divisions were essentially synchronous and the cleavage cells reached the periphery of the yolk independently and at random. The primary epithelium (blastoderm) did not form a continuous layer.

Fish, (1947) described the embryonic development of the calliphorid, Phaenicia sericata Meigen from the process of fertilization to the formation of the blastoderm. The cleavage nuclei migrate peripherally,where the majority fuse with the periplasm. The remaining cells turn back into the yolk. A nucleated coat of protoplasm, the blastema, was formed; which completely envelopes the yolk. The time required for egg development up to the formation of the germ cells was about 7 hours.

Fish (1949) studied the phases of development involved in the formation of gastrular or mesodermal tube in the embryo of Phaenicia sericata. The germ band was formed by an elongation of a strip of ventral blastodermal