

STUDY OF THE BLOOD AND CIRCULATION
IN THE SPINY BOLLWORM, Earias insulana Boisd.
(LEPIDOPTERA: ARCTIIDAE).

A THESIS

*Submitted in Partial Fulfillment of the Requirements
for the Award of the Degree of
M. Sc.*

By

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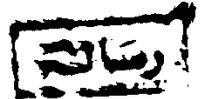
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I. I N T R O D U C T I O N

The spiny bollworm, Farías insulana Boisd., is widely distributed all over the world, causing high damage to many crops and vegetables. It is considered as one of the major and most important economic pests in A.R.E.

Although various functions have been attributed to insect haemocytes, very little is known of the functions of particular types of haemocytes in different species. This lack results, in part, from the fact that the haemocytes of comparatively few species of insects have been described quantitatively. In addition, comparative studies attempting to correlate haemocyte morphology and physiology are made difficult because of the absence of standard techniques for preparing insect blood for analysis and because there is, until now, no general agreement on a common terminology.

The blood of insects is known to act as an internal medium for the transportation of nutrients and other biochemical components.

The study of the haemolymph of the spiny bollworm, Earias insulana, has received very little attention. In this work it has been tried to investigate the actual components of the haemolymph, especially the protein content and the protein fractions and their changes as regard to the different host plants.

Haemolymph volume, total and differential haemocyte counts of Earias insulana were combined in order to gain a better understanding of the complicated quantitative and qualitative haemolymph changes occurring during the moulting cycle, and development of the insect. This may help in solving some longstanding problems such as the development of new methods of pest control and taxonomic studies, and may shed light on the resistance and other immunological problems involving the use of chemicals.

Aim of the present study:

This study aimed to investigate the following:

- 1- Circulatory system and circulation of the blood in the fourth instar larva.
- 2- Effect of the normal physiological processes and type of host plant on blood volume, total and differential haemocyte counts, and absolute number of circulating haemocytes.

- 3- The total content of the haemolymph protein and protein fractions, and their changes as regard to different host plants.

II. LITERATURE REVIEW

(1) The circulatory system:

Peterson (1912), studied the anatomical structure of the circulatory system in the tomatoworm larvae, Protoparce carolina. He stated that the circulatory system was divided into two portions: the heart and the aorta. The heart was a very delicate, flattened tube closed at the caudal end, and presumably open in each segment by a system of valves. He described four pairs of laterally fan-like rays of tendons extending from the area of the first to the fifth abdominal segments. He also found that the cephalic portion of the heart, the aorta, starting within the mesothoracic region and passing into the head, was a smaller and smoother muscular tube.

Hessel (1966), studied the preliminary comparative anatomy of the mesothoracic aorta in Lepidoptera. He found two distinct types of mesothoracic aortal chambers:

- (1) a vertical type with dorsal incurrent ostia and an associated accessory diaphragm and
- (2) a horizontal type with lateral incurrent ostia.

(2) Types of the blood cells (Haemocytes):

Kollman (1908), stated that insects have at least three fairly well-defined morphologically distinct types of haemocytes: the prohaemocytes, plasmacytes, and granular haemocytes.

Yeager (1945), identified 10 classes of blood cells in his study on the southern armyworm, Prodenia eridania: proleucocytes, smooth-contour chromophilic cells, oenocyte-like cells, plasmacytes, podocytes, vermiform cells, cystocytes, spheroidocytes, eruptive cells, and degenerating cells.

Jones (1954 a), described and figured the principal types of haemocytes of the common mealworm, Tenebrio molitor. These were the oenocytoids, plasmacytes, and cystocytes.

Whitten (1964), described the changes occurring in the haemocytes during metamorphosis of Sarcophaga bullata, Drosophila melanogaster, and other Diptera cyclorrhapha. He suggested that, in general, the haemocyte picture in D. melanogaster paralleled that of other cyclorrhapha, with spherules, and spindle-shaped plasmacytes present in the pupal stage.