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"THE HISTOLOGY OF CATERPILLAR OF PAPILIO DEMOLEUS LINN. (LEPIDOPTERA PAPILIONIDAE)"

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ABSTRACT

The study of histology of Lepidoptera has been a fact of great Charm for the insect lovers. The interest in insects started from behavioral (um-ecological approach, but the need to try understanding that the insects were doing and how they were doing it extended to histology.

Key Words : *Histology, Caterpillar, Lepidoptera Papilionidae.*

INTRODUCTION

Nerw comer (1914) cleared up the various confusing view of the digestion and cell structure of the digestive epithelium in insects. Snodgrass (1925) represented his finding on the anatomy and physiology of the honey bee. Butt (1934) investigated the origin of peritrophic membrane in seiara and the honey bee . Mukerji (1962) studied the anatom of the mature larva of Acherantia styx dererves mention. Mall (1969) gave a theory on the morphology histology and physiology and past embryonic development of the digestive system in certain insects. Mathur (1975) worked on the histology of the larvel Amsaeta moopei is unique.

Constantino and correndor (2004) studied the biology and merphology of the carry stages of Morpho Macrophthalmus and Mopho peleides felaman. Blandin &Purser (2013) presented evaluation and diversitication of Neotropical butterflies. Wagner et al (2018) gave parisitism of Lepidopteran defoliators of urban plants by Palmistichus elacisis. Xioaling et al (2021) discussed the evalution and genetics of Lepidopteran egg and caterpillar coloration. Luis et al (2022) studied effec t of experimental host plant swifehing on the life cycle of a ferm spore freeding micromorth of the genus stathmopoda Entomolgia.

MATERIAL AND METHODL

The caterpillars of different instars of Papilio demoleus linn were collected from J.S. University, Shikohabad orchasrd and were reared in glass jars be Maintain the stock.

2.1 HISTOLOGY

In order to study the morpho-hislogy of the digestive tract the mature caterpillars were dissected quickly in double distilled water stained mounts of various structures and associated glands were also prepared. For histological studies of different structures and associated glands of the digestive tract, Bouin's fluid was used to prevent the post mortem changes at a minimum. The matorial was kept in the fixative for about twenty four hours. Parafin was used for microtonic preparations. A small quantity of bee wax (1:100) was added to paraffin wax to avoid the crystallization in the microtomic sections. The addition also helped in getting the continuous ribbons during sectioning.

Before embedding the material under study was behydrated in the usual way and cleared up twice in xylol. Then it was placed ina mixture of xylol and wax for over night of room temperature. After it, the material was replaced to the even at a temperature of 520Cfor two to three hours. Two to three changes of pure wax were given for complete removal of xylol. Blocks were also prepared in the usual way to study the different structures. Sections of 6u thickness were cut with the help of rotating microtome and stained in Haematoxylin and Eosin. Microphotographs were also taken.

3. OBSERVATIONS

3.1 HISTOLOGY

Histologically the stomsdarum is divided intothe pharynx, the cesophegus and the crop. The stomodaeum leads into the mesenteron. The stomsdaeum anterior to the pyloric value widens to form a pear shaped crop which gradually tapers anteriorly and forms a narrow tube. The posterior broader portiun of the taperiong narrow tube forms the oesophagus while the enterior half is represented by the pharynx. The pharynx opens into the buccal cavity.

The wall of the stomodoaeum is comprised of the following layers. The two layered thick chitinous intime and a single layer of the epithelial cells which rests on a basement membrane

a double layered muscular sheath comprised of an outer layer of circular muscles and an inner layer of longitudinal muscles. The stomadeverum is ectodermal in origin.

3.2 PHARYNX

The pharynx is the first part of the stomodoeum and is continued to the head region, following on from the buecal ecavity. It has series of dilator muscles and plays a part in passing the food from the mouth to the oesophagus. The epithelium resets on a basement membranes. The epithelium results into a series of infolding. The margins of the individual cells are indistinguishable from each either. The pharynx is devoid of spines or bristles. The circular muscles are highly developed and form the outer periphery of the region. The longitudinal muscles are feebly developed and lie between the epithelium and the circular muscles. The epithelium contains small sized nuclei.

3.2.2 OESOPHAGUS

The pharynx is followed by the oesophagus, which is a tubilar structure. The epithelium of the oesophagus results into several infoldings. The epithelium rests on a basement membrane the in time bears spines, which are out worldly pointed. Both the circular muscles and the longitudinal muscles are well developed but the latter are discontinuous.

3.2.3 CROP

The crop is the largest part of the stomodaeum and is in the form of pear shaped structure when empty the crop is filled with air. Its thin epithelial wall is formed of poorly defined cell boundaries. The intima is thick and has delicate laminated appearance. The lumen is broad. The epithelium is produced into folds which are clearly distinct. The circular muscles are thick while lengitudinal muscles are thin.

3.2.4 ANTERIOR INTERSTITIAL RING

At the junction of the oesophageal value and midgut epithelium there is a small part of the gut well showing a layer of small nuclei. This forms the interstitial ring. Theis regionforms a part of the stomodaeum.

3.2.5 HESENTEROXI

The mesenteron is the largest part of the digestive tract and occupies the most space inside the body. Unlike the stomodoeum the mesenteron is an undifferentiated tube of uniform diameter throughout its length. The epithelial cells are distinct from the ocsophageal epithelium. The epithelium contains a layer of the columnar epithelium interposed with goblet cells, regenerative, cells. Exteriorly the epithelium resets on a basement membranes. A delicate layer of the connective tissue envolope the entire outer surface of the mesent cron.

The single layer of the midgut epithelium which rests on a basement membrane consists of three types of cells.

(a) Columnar or cylindrical cells.

(b) Goblet or calciform cells

(c) Interstitial or Regenerative cells.

(a) Columnar or Cylindrical cells.

The columnar cells out number other types of cells in the midgut epithelium. These cells possess striated border of variable, height which is highest in the anterior part of the mesenteron. The starated border may be vegarded to increase. The cell surface for various activities. The cytoplasma is clear and grancular. The nueleus which occupies a central position is prominent. The dimension of the colummer epithelial cells depends of the amount of the food in the midgut and their activity during digestion. In the distal ends of the many full sized colamnar. Cells are observed some globuer or vesicular protrusions which appear to arising from the lymen ends of the cells. Such protrusions are not observed in the smaller or newly formed columnar cells. Globuler are considered to be secretary in functions.

(b) Goblet or Calceiform cells.

These are flask shaped cells. They are more or less the same form as the columnar cells. These cells are interposed between the columnar cells. Each cell contains a large internal cavity with deep stained lining which is thickness and denser at the base of the cavity than at the sides. In the anteiror part of the mesenteron these cavities extended deep into the

cytoplasm causing the nuclei to lie close to the basement membrane while at the posterior part they do not extend deep so, the nuclei occupy the centre place in the cell.

(c) Interstitial or Regenerative cells.

These cells either occur in groups or are scattered singly all over the base of the midgut epithelium. They are generally very small but variable in size, roughly tri-angular in shape with prominent nuclei and often with indistinct cell. Walls they are covered over by tell columnar and goblet cells.

3.2.6 PERTROPHICMEMBRANE

The pertrophic membrane in the larva of F. demoleu is in the form of a thin, transparent membrane surrounding the food contents in the lumen of the mesenteron. The whole of the membrane can be taken outalong with the food contents which it envelops bringing with it a position of the midgut cells of the anterior region. A close examination of the transverse section of the midgut reveals the total absence of any reinforcement of the membrante from the general surface of the midgut epithelium Moreover, except for the enterior where it is closely attached to the cells producing it, there is a space between the epitheliumand partrophic membrane. Hence it appeare to be formed by the cells of the anterior and of the midgut.

3.2.7 PROCTODAEUM

The protodaeum is comprised of the following regions.

(a) Pylones

(b) Tleum

(c) Colen

(d) Rectal value

(e) Rectum

(a) Pylones :

Pylones is a small tube like region and firat part of the protodaeum which recives the ambulia of the Melpighian tubules. The Malpighian tubules sries from the pylerus. The pyleurus centains pyleric value.

(b) Tleum :

The ideum epithelium is highly convoluted with numerous foids of small size, there by leaving a large lumen within. Anteriorly the epithelium is lined by means of thin in time while externally it rests on a thick basement membrane. The lengitudinal muscles form a continuous covering around the epithelium. The circular muscles are found in patches.

(c) Colen :

The colon has five large folds in its wall besides numerous smaller folds in between. The intime of smaller folds posse's short and pointed bristles. The nuclei are pointy visible. The intime covering the epithelium is thick walked. The lumen is reduced due to the number of folds. The dilator muscles are also visible.

(d) Rectal value of Posterior sphincter Region :

The rectal value lies in between the colon and the rectum. In this region the epithelium wall is thrown into longitudinal folds. The lumen is very much reduced. The epithelial cells have prominent and deeply stained nuclei. The intimae and the circular muscles are well developed. Few longitudinal muscles are also seen around the circular muscles in patches.

(e) Rectum:

The rectum has convoluted epithelium which possess small and deeply stained nuclei of irregular shape and size. The thin intime in much similar to colon. The epithelium lacks the bristiles. The circular muscles are very much developed and are present in the form of thick bands all around the rectum. The longituidinal muscles are poorly developed and are in the form of patches. The rectal wall shows a cryptonephric type Malpighian system.

3.2.8 HALPIGHIAM TUBULES

The malpighian tubules ampulla is kept in position by sterno-ampullary muscles and is divisible into duet, bladder and neck, the former opens, into the pylorus of the hindgut, Only the ampulla bears a muscularis and an intima. The Malpighian tubules leacking both of them

comprising only of the epithelium and basement membrane. The terminal region of the Malpighian tubules Penetrates into the rectal wall and thus forms cryptonephridial system. The nuclei are clearly visible.

3.2.9 MANDIBULAR GLANDS

These glands have thick synegtial epithelial layer. The secretary cells bear large nuclei. The epithelial cells rest on a basement membrans. The central cavity is lined by intima. The intima is much reduced. The vacucles are also seen in the cytoplasm.

3.2.10. LABIAL OR SILK GLANDS

The labial glances are composed of single layer of secretary cells around the central cavity. The central cavity is filled with the silkmass. The cell wall contains nuclei of different size.

The epithelial cells rest on a thin basement membrane. Internally the basement membrane is lined by thick intima.

4. DISCUSSION

HISTOLOGY

In the larva of P. demoleus the pharynx results into series of infoldings projecting into the lumen. Contrary to it, Durr (1960) in Sesania calamistis has observed four, longitudinal ridges, projecting into the lumen with few small folds in between them.

In the larva of P. demoleus the intima of oesopheque bears out worldly pointed spines. The results are further strengthened by the recordings like Henson (1931).

The presence of the three kidns of the cells in the mesenteron viz., the columner of cylmderical cells, the goblet or calciform cells and the interstitial or regenerative cells is a common feature in the lepidopterous larvae. In the present investigation the midgut epithelial wall possess regenerative erypts which are formed by the regenerative cells. The vegenerative function is in confirinity with the findings of Henson (1929).

There are different views regarding the partirophic membrane. Much confusion previls because of a commonly held view that the cells of midgut cannot secrete chitineous membrane.

Two modes of the formation of the peritrophic membrane have been cited. In some insects it is a tough tube consisting of one or more layers and is produced mainly by the anterior and of the midgut. In others, it consists of a large numberot thin layers which arise from the entire surface of the midgut epithelium snodgreas (1925) recorded in honey bee the multilayered membrane was formed of layers produced by the both the method.

The main sub divisions of the hind gut of the larva of P. demoleus are pylonus, iteum, colon retal value and rectum. They are similar to those of other lepidopterous larve.

In the larve of P. demoleus the cryptonephric candition of the Malpighian tubules is confirmed. The ampulla bears a muscularls and an intima. The Malpighian tubules lacking both of them and are compoised only the epithelium and basement membrane.

Also the larva of P. demsleus Malpighiar tubeless are recorded to open into the pylorus region of the hindgut This is in conformity with the finding of Kumar F. Srivastava (1983) in the larva of the lemon butterfly.

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