

EXTERNAL MORPHOLOGY OF AK GRASSHOPPER (POEKILOCERUS PICTUS)

INTEGUMENT

The outer covering or body wall of an insect is called integument. The body wall having muscles on its inner side is called exoskeleton. It bends or grows into the body cavity at different points to form rigid processes, the apodemes. They collectively make an endoskeleton. There are many outgrowths of the body wall (such as antennae, legs, wings, etc.) which are called appendages. The body wall consists of a number of hardened areas or plates, the sclerites. These are separated by the grooves called sulci (sing. suleus). The grooves representing the line of fusion of two sclerites are still known as sutures (e.g. epicranial suture).

The integument (Fig. 13A) consists of three main layers, viz., cuticle, epidermis and basement membrane.

1. Cuticle: It is the outer non-cellular layer, which is secreted by the epidermal cells below it. When newly formed it is flexible and elastic, but later on it becomes generally hard through the process of sclerotization. It protects the insects from water loss, penetration of insecticides and provides ground for the attachment of muscles. It is further divided into the following three layers.

(a) Epicuticle: It is the outermost non-chitinous and very thin layer, which is 1-4 μm in thickness. In some insects this further comprises the cement, wax, polyphenol and cuticulin layers.

(b) Exocuticle: It is the middle much thicker layer, which is hard, pigmented and darker and consists mostly of chitin and protein.

(c) Endocuticle: It is the innermost thickest layer, which is soft and flexible and also contains chitin and protein. This layer is made up of fine horizontal lamellae or stratified layers deposited by the epidermal cells.

The exocuticle and endocuticle together make up the procuticle (up to 200 μm thick), which is traversed by the vertical lines called pore canals.

2. Epidermis: ^{situated} Below the cuticle, there is a single layer of cells which is known as epidermis or hypodermis. Among the normal cells of epidermis are some modified or specialized cells for performing different functions. Of these, the trichogen and tormogen cells participate in the formation of setae or hair, while the glandular cells throw their secretions through their ducts on the surface of cuticle. For forming a seta, a single trichogen cell becomes greatly enlarged. Another adjoining cell or tormogen is also enlarged to form a cup-like socket or pit and an articular membrane of the hair at its base.

An ingrowth of exoskeleton that bends/grows

(28)

Spines } may be uni-
8 spurs } multicellular
cuticular processes

(Spurs - articulated
movable spurs) 27

Cuticle

or Trichod
Sensilla

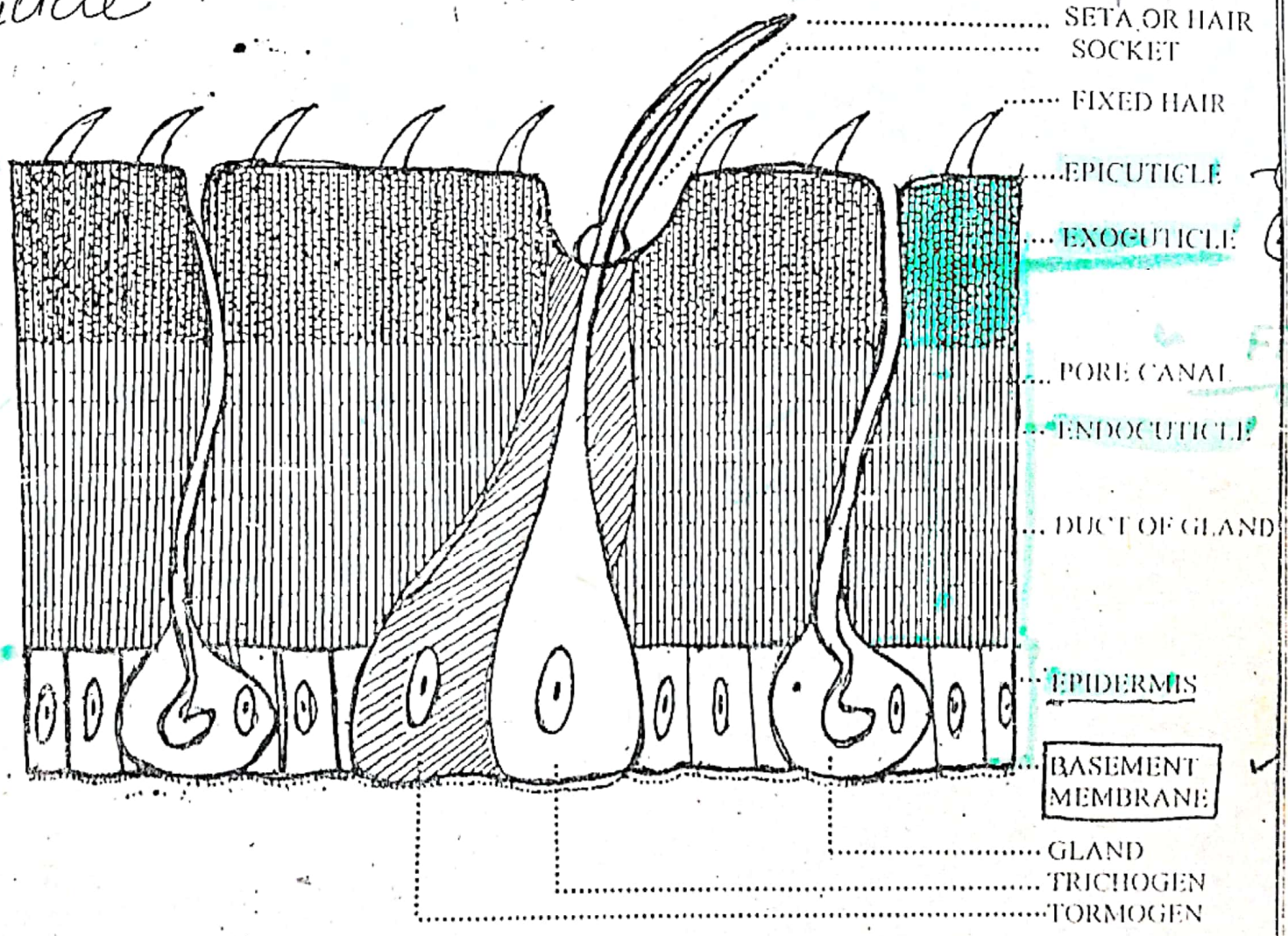


FIG. 13A. TYPICAL INSECT INTEGUMENT

Basement membrane

Handwritten signature or initials.

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3. Basement membrane: It is a very thin (up to 0.5 μm thick) non-cellular layer lying beneath the epidermis. The epidermal cells stand on it. It appears to be amorphous granular under the electron microscope.

The external surface of cuticle bears a number of fixed processes, such as spines, horns, minute fixed hair, tubercles, etc., and movable appendages, in addition to the segmental appendages, like setae and spurs.

*includes pointed
processes out growth of cuticle*

DIVISION OF BODY

The body consists of a series of joints or segments which are grouped into three regions or tagmata (sing. tagma), viz., head, thorax and abdomen.

HEAD

This is the first region of the body. If you press the head from top, it clearly becomes demarcated from the thorax. The hard outer covering of the head is the head capsule. This type of head having the mouthparts (see their types under INSECT APPENDAGES) on its lower side and projecting downward is called hypognathous. Compare this type of head with that of a beetle and a bug. In a beetle the head is of prognathous type in which the mouthparts are on the front side and project forward. In a bug it is of opisthognathous or opisthorhynchous type with the mouthparts on its lower side in the form of a proboscis projecting backward. The head is made up of 6 segments, fused together to form a box-like structure, the cranium.

First of all examine the front side of head (Fig. 14A). Its upper half is the frons. It has a median longitudinal furrow, the frontal furrow which bears a tiny median ocellus (simple eye) in it. Note an ocellus has a single lens. On upper one-third of the frons, there is a grooved high ridge, the frontal costa. The groove of the frontal costa merges below into that of the frontal furrow. On the sides of the frontal costa are depressions, the antennal sockets. From each socket arises a thread-like antenna (see its parts and types under INSECT APPENDAGES). On the margin of an antennal socket, just inner to the anterior end of a compound eye, lies a lateral ocellus (pl. ocelli). Below the frons is an other somewhat raised sclerite, the clypeus. It is separated from the frons by a transverse frontoclypeal or epistomal sulcus. The clypeus is partially divided by a trans sulcus (only clear from sides) into two parts. The anterior narrow part is the anteclypeus while the posterior broader part is the postclypeus. Below the clypeus is an other sclerite, the labrum. It is separated from the clypeus by a transverse clypeolabral sulcus. On each side of clypeus and labrum the grooved outer surface of the mandible is visible. See the mandible by lifting up the labrum with your dissecting needle. Also note the segmented maxillary and labial palpi (sing. palpus) on the sides of the mouth.