e-ISSN: 2455-667X

Annals of Natural Sciences
Vol. 2(4), December 2016: 6-10
Journal's URL: http://www.crsdindia.com/ans.html
Email: crsdindia@gmail.com

Annals of Natural Sciences

ORIGINAL ARTICLE

Study of External Morphological Characteristics of Head Region of *Bombyx Mori*

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ABSTRACT

Silk moth is a useful insect of order lepidoptera to man as it is a source of true silk. There are several other insects and moths, which spin silk cocoon but the silk produced from their cocoons is not of good quality for making the thread. In India, silk is produced by the moths of tur families known as Bombycidae and Sacturnidae. Sacturnidae includes Eri-silk moth (Attacus ricini) and Tassar silk moth (Antheroea paphia). But the excellent silk moth found on mulberry is known as Bombyxmori, which belongs to the family Bombycidae.

Key words: *Bombyx mori, Head Region, Silk Cocoon*

Received: 5th June, 2016, Revised: 30th August. 2016, Accepted: 3rs September 2016

How to cite this article:
Saxena G., Verma R.K. and Sharma H.N. (2016): Study of External Morphological Characteristics of Head Region of *Bombyx Mori*. Annals of Natural Sciences, Vol. 2[4]: December, 2016: 6-10.

INTRODUCTION

Mouth appendages of *Bombyxmori* silkworm are biting and chewing types adopted for feeding mulberry leaves, which are labrum, mandible, maxillae, labium and hypopharynx. Adult *Bombyxmori* does not take food during this period. More than 20 counties in the world produce raw silk, of which Japan topped accounting for 52.4% followed by China 24.8%, the Soviet Union 7.3%, South Korea 6.2% and India occupies 5th place in mulberry silk production and 4.3% raw silk is produced. Silk worms belong to the class Insecta, Phylum Arthropoda, which comprise by for the largest number of animals in the world. The insects are characterized by the division of body into three distinct divisions namely head, thorax and abdomen. They are segmented in their body structure, a typical insect having six segments in the head, three in the thorax and eleven in the abdomen. They may or may not carry jointed appendages and also one or tow pairs of membranous wings. The class insect is divided into two sub classes namely Apterygota and Pterygota. This improved technique has been since popularized on a large scale during the lost years in South India. As a result, it has been possible for the sericulturists adopting the new technique to step up the average yield from the earlier level of 20-25Kgs to 30-40kgs. The order Lepidoptera included all the insects known as moths and butterflies, including the silkworm moth. The different kinds of silkworms fall under the super family Drapenoidea according Essig. Thus the domesticated insect of the order Lepidoptera have attracted attention of the workers from very early time. The aim of the present work is to provide detailed account of morphology, Morphometirc and Seasonal morphometric variations of mouth parts of mulberry silkworm under the conditions of Agra district.

MATERIALS AND METHODS

The mulberry silkworm for the morphological investigation is collected during the month of July, August and September from Sericulture Station at Artoni, Agra district. After careful collection the silkworm are reared in ordinary breeding cages in laboratory

conditions. Fresh foliages of mulberry are provided from the mulberry plantation collected from near the side of Bichpuri Canal, Agra. The mulberry silkworm are killed by chloroform vapours or benzene fumes and then preserved in formalin in different stages.
For the study of morphology both preserved and fresh specimens are used. Dissection of the larvae is made under high power binocular microscope, with the help of microscalpel and microneedles. Few specimens are fixed in different fixatives. The fixatives used are:

1. Bovin's fluid
2. Alcoholic Bovin;s fluid
3. Zenkar's fluid

After keeping in fixative for twenty four hours, they are washed the roughly through several changes of 70% alcohol with a few drops of glycerine.
For the study of mouthparts, antennal, legs and genetalia, dissection are stained in two drops of Mann's methyl blue, Endrine for differentiation of these appendages, their muscles and delicate chitinous structure which could not be ordinarily be detected in KOH preparation. Morphometric of different parts taken by microscopic scale.

RESULTS AND DISCUSSION

MOUTH APPENDAGES:

The mouth appendages of the larvae are biting and chewing types adapted for feeding mulberry leaves.

Labrum (Plate 1):

The labrum is a broad lobe suspended from the clypius in front of the mouth and forms the upper lip. On its inner side it is membranous and may be produced into a median lobe, the epipharynx bearing some sensilla. It is often free movable.

Mandibles (Plate 2):

The madibles are the upper pair of jaws. The mandibles are armed with string serrated edged surface and the molar area has flattened ridges for grinding. Mandibles glae mulberry leaves with their serrated teeth.

Maxillae (Plate 3):

The maxillae are second pair of jaws of insects. Maxilla feel the taste of the leaves while feeding and also play an important role at the time of cocoon making. Maxillae are much more complicated than the mandibles. Each maxillae consists of the following parts:

1. The cardo is the first proximal part of the maxilla. It is usually more or less triangular in outline and has a single articulation with the head.
2. The stipes is the next part, usually triangular and articulates with the cardo by its base with the palpifer by its lateral margin and with the subgalae by its mesal side.
3. The palpifer is situated upon the lateral (outer) side of the stripes. It is often much more developed on the dorsal side of the maxilla than the ventral.
4. The maxillary palps or feeler it the most conspieous of the appendages of maxilla. It is an organ composed of one to three freely movable segments and is articulated to the palpifer on the latero distal angle of the body of maxilla. The palps are sensory organs used to test the quality of the food.

Labium (Plate 4):

The labium or under lip is attached to the cephalic border of the gula, and is the most ventral of the mouth parts. It appears to be a single organ though composed of a pair of appendages grown together on the middle line of the body. Labium has a pair of labial palps as its top. Between labial palps the spinnerat is observed. Near the base there is part which bears the labial palps and appears as the basal segment of the palps this part is known as palpifer and is homologous to the palpifer of the maxillae.

SENSORY ORGANS OF HEAD AND MOUTH:

Gustatory Organs:
It is said that the sense of taste of silkworm larvae is ruled by the maxillary palps and maxillary lobes. In case the maxillary palps and lobes are extirpated silkworm larvae eat leaves of cherry tress or any other trees without hesitation.
Larvae by comparison have many fewer sensilla and neurons concerned with host plant selection. Apart from the antennae the main sensilla are on the maxilla and in *Bombyx mori* larvae the total number is 110 (Schoonhoven, 1973).

Tactile Organs:
The tactile organs specially occur on antennae as sensory projections in mouth parts as maxillary palps, maxillary lobes, labial palps or three pairs of projections grown on the internal surface of labrum.

Olfactory Organs:
Olfaction is one of the most important senses of silkworm larvae, because silkworms can mainly choose mulberry leaves by olfaction. There are following olfactory pores in head capsule and mouth appendages-

Head capsule :

Frons: external surface- 12
Internal surface – 12
Clypeus: external surface- 8
Internal surface- 8
Mouth appendages
Labrum: external surface- 4
Internal surface- 6
Mandible right and left- 4
Antennae (right and left)- 2
Maxillary palps (right and left) – 18
Lateral surface (right and left)- 4

As the present investigation and the work of the other workers like Askari, Sami and Sharan in 1982; Atwal, Verma in 1961; Fraenkal in 1943; Bhaskar et al., 1983 and Shasikanta et al. (2008) clearly indicate that the silk worm lost its grasping power so it can hardly climbs up the twigs of the mulberry trees and eat tender leaves at the top therefore they are domesticated by man and the cut pieces of tender leaves of mulberry are generally provided, secondly the silkworm has lost crawling power and when there is no food in its neighbourhead, wild insect will crawl about in search of food for long distance as long as it lives. But the silkworm can move only few decimetres around himself and can not go long distance as has been observed in the present study. Moreover silkworm larvae eats nothing but mulberry. Its sense of smell is very poor. It can not smell the mulberry but at a long distance unless mulberry lies very close to it, and generally it dies for want of food.The morphological features of the silkworm larvae as worked out in the present investigation are fundamentally similar than that of the other Lepidopterous larvae.
There is no general agreement of the insect head. De Porte (1946) and Snodgrass (1947) have suggested new term for the structures which are formerly regarded as sutures. Most of the so called sutures of the past have now been determined to be sulci which indicate the presence eof an external groove formed by an infolding of a cuticle to form endoskeletal strengthening ridge of apodeme and the term sutures being restricted to the line of union between separate areas of dermal hardening. The line weak unigmented cuticle which split at ecdysis has been termed as the ecdysial cleavage line. However, Hensen rightly pointed out that until the development relation of various structures have been worked out there seems no reason why the term suture should not be used for any line. In the light of this agreement all lines have been described as sutures in the present work. Controversy exists round one of the most important features of the insect head viz. the incested Y shaped epicranial suture.

Plate 1: Labrum

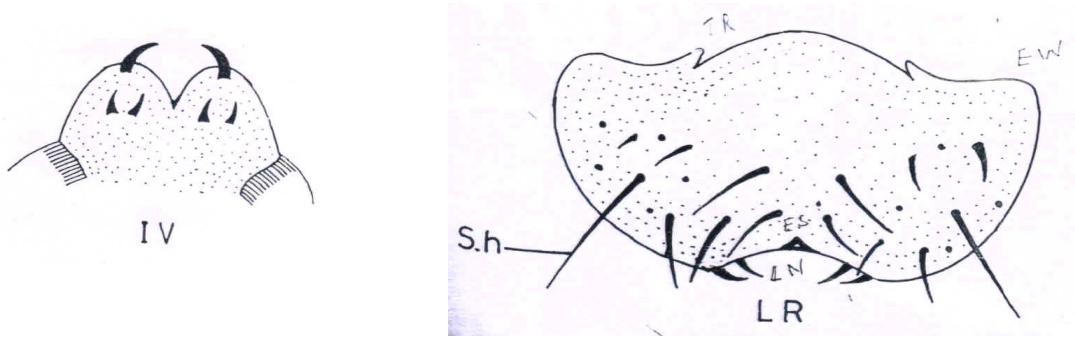


Plate 2: Mandibles

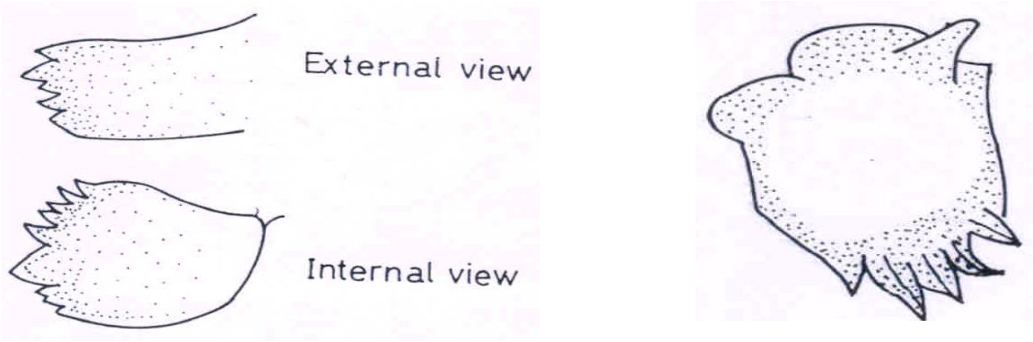


Plate 3: Maxilla

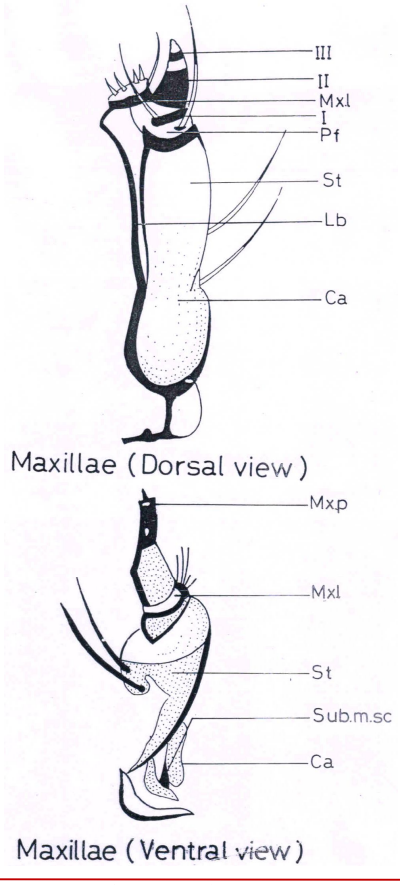
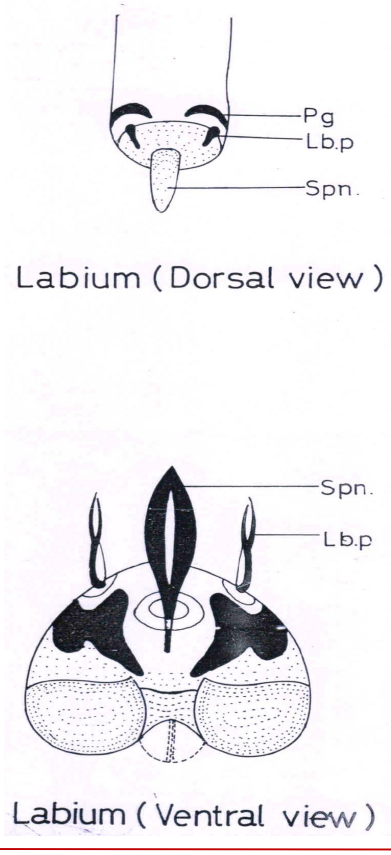


Plate 4: Labium



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