



ORIGINAL ARTICLE

Morphometric and Seasonal Studies of Mouth Parts of *bombyx mori*

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ABSTRACT

Silk worms belong to the class Insecta, Phylum Arthropoda, which comprise by far 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. The order Lepidoptera included all the insects known as moths and butterflies, including the silkworm moth. The aim of the present work is to provide detailed account of morphology, Morphometric and Seasonal morphometric variations of mouth parts of mulberry silkworm under the conditions of Agra district. 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 two 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. 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 countries 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.

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INTRODUCTION

The mulberry silkworm may be further classified and identified as of Japanese, Chinese, European or Indian origin based on geographical distribution or as univoltine, bivoltine and multivoltine depending upon the number of generation produced in a year under natural conditions or as trimolters, tetramolters and pentamolters according to the number of moult during larval growth of finally even as a pure strain and as hybrid which may be either monohybrid when two strain are involved or polyhybrid when more than two strains are involved in the hybrid. In the present study, morphometric and seasonal variations have been studied in mouthparts.

MATERIALS AND METHODS

The mulberry silkworms for the morphological investigation are 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 foliage 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. Dissections of the larvae are made under high power binocular microscope, with the help of microscalpel and microneedles. Few specimens are fixed in different fixatives. The fixative 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 glycerin. For the study of mouthparts 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 are taken by microscopic scale.

RESULTS AND DISCUSSION

MORPHOMETRIC AND SEASONAL MORPHOMETRIC STUDIES OF MOUTH PARTS:

Labrum:

The unpair and flat labrum (LB) present over the mandible which remain movably articulated with the anticlypevs (AC) by a pair of sclerotized tormae (TR) and towards distal it depressed into a prominent medium notch called Labral notch (LN) through Labrum notch the food is guided into the mouth. The margin of the labrum is sclerotized and inflectea into the epipharyngeal wall (EW), which towards labral notch proximally also remain chitinized into an epidharynged shield (ES). On each lateral side of the epipharyngeal shield are two specialized sensory cones (SC). The labrum is of 2.00mm broad and 1.2mm broad after secondary moulting but initially it is 1.5mm broad and 1.00mm long and each side of labrum notch bears six setae and a puncture. The three setae (LL₁, LL₂ and LL₃) of lateral group get located on the margin of lateral side. Remaining three setae (LM₁, LM₂ and LM₃) belonging to the median group in which latter two of both sides lie across the top of the notch, while the former near the tip of labral lobe. LM₃ is posterodorsal to LM₂ and at the lable of epipharygeal shield a single puncture LBA on either side present, situated between the setae LM₁ and LM₂.

There is no change of morphometric in any season, size up to IInd moulting 1.5mm X 1.00mm after IInd moulting 2.00mm X 1.5mm.

Setae	-	6x2=12
Puncture	-	1x2=2

Mandible:

The mandibles are the heavy jaws for biting and chewing with the epicranium on either side by two articular facets in between labrum. The mandible articulates dorsally by an anterior epicondyle (EC) and ventrally through the hypocondyle (HC). The two points of the articulation receive the apodemes of the abductor and adductor muscles respectively. The mandible gland open by an opening (OG). The two unequal sized setae MB₁ and MB₂ are present after IInd moulting MB₁ is larger thn MB₂.

Size - Mandibles are in 2mm X 1.5mm size.

There is no seasonal variation in size but up to IInd moulting the abductor and adductor muscles remain weak.

Maxillae:

These are much more complicated than the mandible are 0.5mm long throughout larval stage. Maxillary palps are well developed after IInd moulting which are sensory organs for test of food. There is no seasonal phenotype variation in these organs.

Labium:

It is attached to the cephalic border of the gula. It appears to be a single organ though composed of a pair of appendages grown together on the middle line of the body. Labium consists of a pair of labial palps.

As the present investigation and the work of the other workers like Atwal and Verma (1961); Crampton (1921), Denis (1979), Singh and Mavi (1987), Jermy (1966) 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 neighbourhood, wild insect will crawl about in search of food for long distance as long as it lives. There is no general agreement of the insect head. Du Porte (1946) has 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 of 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, Kin, *et al.* (1982) rightly pointed out that until the development relation of various structures has 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 incised Y shaped epicranial suture.

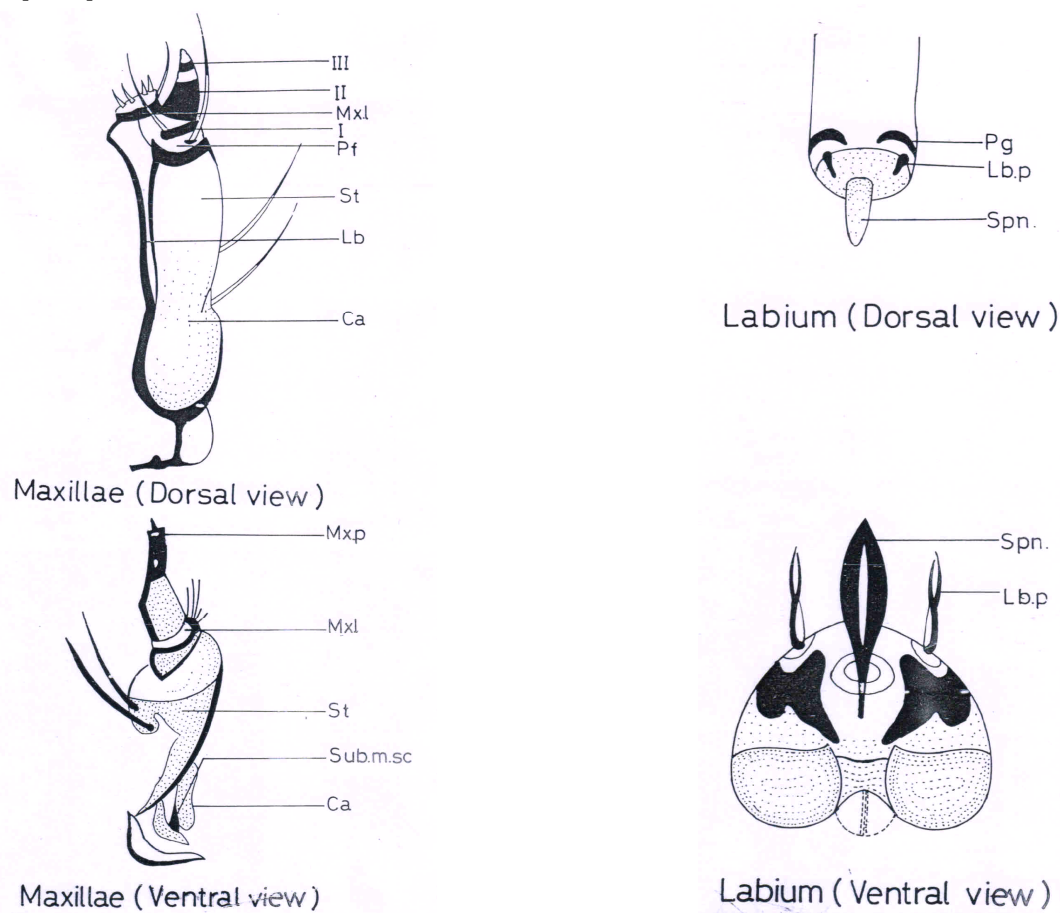


Plate 1: Variation in mouth parts (Maxillae and Labium)

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