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COMPARATIVE STUDIES ON THE BASIS OF CIBARIAL ARMATURE OF *ANOPHELES (CELLIA) PULCHERRIMUS* THEOBALD AND *ANOPHELES (CELLIA) ANNULARIS* VAN DER WULP

Shipali Rani

Department of Zoology and Environment Sciences, Punjabi University, Patiala- 147002.

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ABSTRACT

The purpose of this paper is to describe characters of the cibarial armature of *Anopheles* species collected from Punjab state. The cibarial armature of these species studied by many workers but with the aid of Scanning Electron Microscopic (SEM) it was done for first time from this state.

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1. INTRODUCTION

Cibarium is dorsoventrally flattened structure situated under the clypeus at proximal end of proboscis. It is located at the base of pharyngeal pump. Length of cibarium is twice its width and anterior dorsal hard palate is about one-third the length of cibarium [1]. Cibarium includes cibarial armature and cibarial sense organs. Cibarium is the highly important structures of taxonomic significance. Cibarial armature of two species i.e. *Anopheles (Cellia) pulcherrimus* Theobald and *Anopheles (Cellia) annularis* Van der Wulp have been studied and illustrated for the first time from India. Species identification on the basis of cibarial armature or genitalia has reached as state of perfection in mosquitoes hardly equally by any other group of insects of comparable size. Very few papers have been published on SEM studies of cibarial armature of mosquitoes as compared with a vast amount of literature dealing with this structure. The morphological characteristics of the cibarial armature also differentiate the mosquitoes at species and subgenera level.

The taxonomic significance of cibarium has been highlighted by various authors like [2-14] Whereas, Cibarium of *Anopheles (Cellia) stephesi* Liston has been studied by [15], [1] and [16], but it has been conducted for first time with the help of SEM. [1] made a detailed study of the cibarial sense organs: palatal papillae (pp), campaniform sensilla (cs), dorsal papillae (dp), trichoid sensilla (trs) and ventral papillae (vp). Structure of Cibarial armature is quite elaborate and it varies from species to species. The study was initiated because of unsatisfactory and somewhat contradictory statements in literature in regard to cibarium.

During recent collection-cum-survey tours two species i.e. *Anopheles pulcherrimus* and *Anopheles annularis* were procured from different parts of Punjab state. Additional taxonomic attributes which might be added to taxonomy of this minute structure to identify the species authentically.

2. MATERIAL AND METHODS

Female mosquitoes were collected from throughout Punjab state. For SEM studies of cibarial armature, the method given by has been adopted [1]. The head of adult female mosquitoes were snipped off from body

*Corresponding author: Shipali Rani, Email: shifali267@gmail.com
Department of Zoology and Environment Sciences, Punjabi University, Patiala- 147002.

and boiled in 10% KOH solution till their clearance. Dissected material was washed several times with water. The head was placed on a slide with a drop of water and dissection was completed with needles under the binocular microscope. Compound eyes were slowly pulled apart in order to expose cibarium that is located immediately behind the clypeus. Dissected material was washed several times with water and dehydrated by passing through ascending grades of alcohol. The specimens were placed on stubs in dorsal position after air drying on filter paper and then coated with gold. After that images were observed under JSM-6610LV Scanning Electron Microscope at Indian Institute of Technologies (IIT) Ropar. Terminology given by [1] and [7] has been followed.

3. RESULTS

Size of Cibarium: Length of cibarium twice its width and Anterior Hard Palate (AHP) about one-third length of cibarium in both species. Cibarium having two parts: cibarial armature and cibarial sense organs which further consists of different structures.

Cibarial armature: It consists of Rods and Cones which are present in the form of two alternative rows of teeth. Number and shape of both rods and cones vary from species to species. 5-10 specimens of both species were studied and two rows with varying number of rods and cones were studied. Detailed observations of these as following:

Rods: In case of *Anopheles pulcherrimus* the number of rods from 12-13, long and bifid at tip position and in *Anopheles annularis* 9-10, longer than cones and with bifid tip like former species.

Cones: In *Anopheles pulcherrimus*, these are 9-10 in number, broad, flat, joined to each other with row of spine like structures at tip, tapering at base and tapering at tip and in *Anopheles annularis* same number as in *pulcherrimus*, broad, fabricated ends, tapers at both base and tip somewhat broad in middle with lateral spines on either side.

Cibarial sense organs: Four types of sense organs are observed, its number and position as following in both species:

Palatal papillae: In both species these 4 in number, socketed, arranged in group.

Campaniform papillae: In *Anopheles pulcherrimus*, total 2 papillae i.e. two on either side of AHP, socketed but in some specimens these are 3 in number, two on one side and single on another side. This is variation in number of papillae with in species. In case of *Anopheles annularis*, 2 in number, one on either side of AHP.

Dorsal papillae: In both species two in number, socketed and present on either side of AHP near to campaniform papilla.

Ventral papillae: In *Anopheles pulcherrimus*, 4 in number, arranged in semicircle, not socketed and in another species same number as in former species but these are socketed in this species.

Trichoid papillae: In both species two in number, socketed and present in middle of cibarium.

4. DISCUSSION

Both the species studied in present work i.e. *Anopheles pulcherrimus* and *Anopheles annularis* are closely allied species. The cibarial armature of both the species was studied by ^[15] and ^[16] in detail with the help of ordinary microscope. SEM studies have been conducted on cibarium of both the species in detail and many additional taxonomic attributes like number of cones and rods, number and shape of sense organs have been discussed and have lot of significance. These new taxonomic attributes will helpful to differentiate and update the diagnosis of both the species.

Cibarial armature of *Anopheles (Cellia) pulcherrimus* Theobald

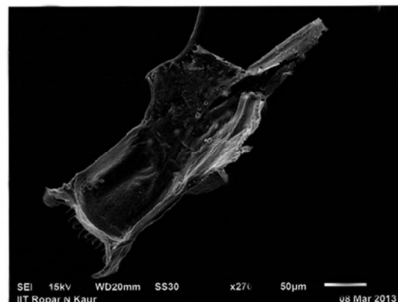


Fig. 1 Cibarial armature

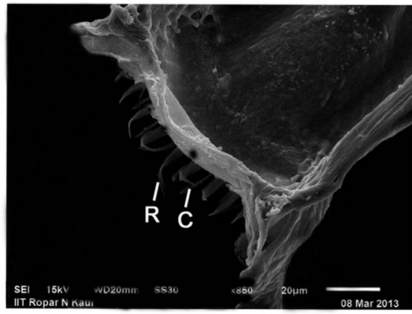


Fig. 2 Cibarial teeth

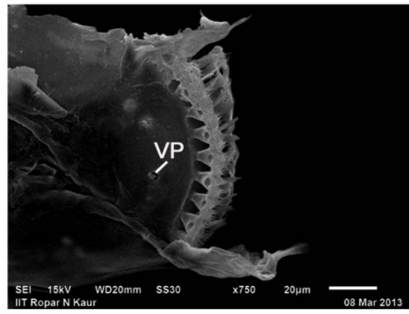


Fig. 3 Ventral papillae

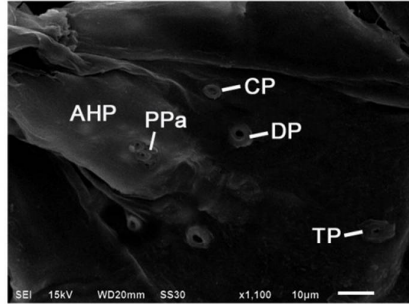
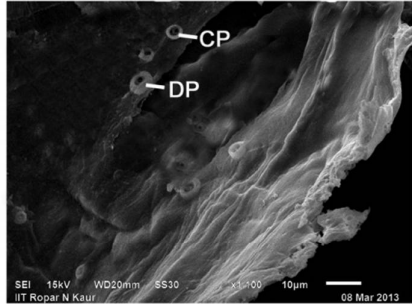


Fig. 4 & 5 Various types of papillae

Cibarial armature of *Anopheles (Cellia) annularis* Van der Wulp

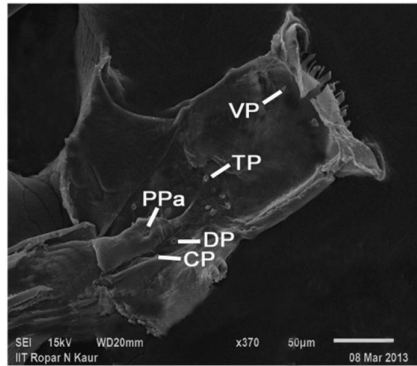


Fig. 6 Cibarial armature with different papillae

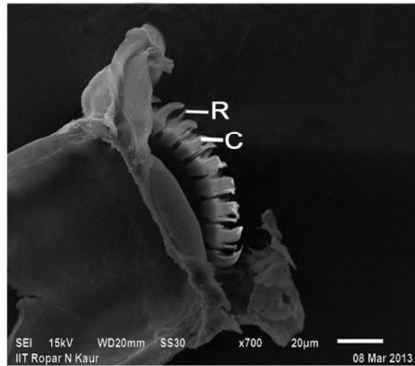


Fig. 7 Cibarial teeth (Magnified)

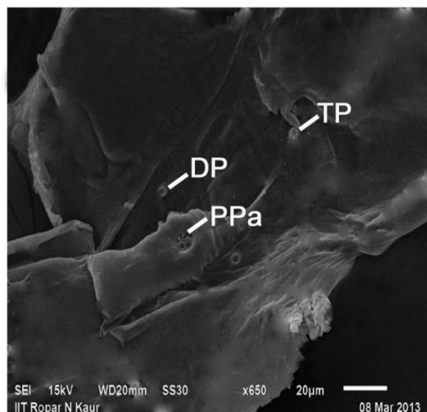


Fig. 8 Various types of papillae

5. ABBREVIATIONS

AHP (Anterior Hard Palate), C (Cones), CP (Campaniform papillae), DP (Dorsal papillae), PPa (Palatal papillae) R (Rods), TP (Trichoid papillae), VP (Ventral papillae).

6. REFERENCES

- [1] Lee, R.M.K.W., & Craig, D.A. 1983 . Cibarial sensilla and armature in mosquito adults (Diptera: Culicidae). *Canadian Journal of Zoology*. 61(3): 633-646.
- [2] Barraud, P.J., & Covell, G. 1928. The morphology of buccal cavity in anopheline and culicine mosquitoes. *Indian Journal of Medical Research*. 15: 671-680.
- [3] Christophers, S.R., & Puri, I.M. 1931. Notes on some anopheline mosquitoes collected in Sierra Leone including differentiation of *Anopheles dthali* Patton (Mediterranean) as a district species from *Anopheles rhodesiensis* Theobald (Ethiopian). *Indian Journal of Medical Research*. 18: 1133-1166.
- [4] Michener, C.D. 1944. Differentiation of females of certain species of *Culex* by the cibarial armature. *Journal of New York Entomological Society*. 52: 263-266.
- [5] Chen, C.Y. 1972. Studies on morphology of culicine mosquitoes I. Eight species of culicine common in the Taipei area, Taiwan. *Journal of Formosan Medical Association*. 71: 282-291.
- [6] Chen, C.Y. 1974. Studies on morphology of culicine mosquitoes I. Some *Culex* mosquitoes of Taiwan belonging to subgenera *Lophoceraomyia*, *Eumelanomyia* and *Culiciomyia*. *Journal of Formosan Medical Association*. 73: 511-525.
- [7] Sirivanakarn, S. 1978. The female armature of New World *Culex*, subgenus *Melanoconion* and related subgenera with notes on this character in subgenera *Culex*, *Lutzia* and *Neoculex* and genera *Galindomyia* and *Deinocerites* (Diptera: Culicidae). *Mosquito Systematics*. 14: 265-333.
- [8] Chadee, D.D., Beier, J.C., & Martinez, R. 1996. The effect of the cibarial armature on blood meal haemolysis of four anopheline mosquitoes. *Bulletin of Entomological Research*. 86: 351-354.
- [9] Dapples, C.C., & Lea, A.O. 1974. Inner surface morphology of the alimentary canal of *Aedes aegypti* Linnaeus (Diptera: Culicidae). *International Journal of Insect Morphology and Embryology*. 3: 433-442.
- [10] Uchida, K. 1979. Cibarial sensilla and pharyngeal valves in *Aedes albopictus* (Skuse) and *Culex pipiens pallens* Coquillett (Diptera: Culicidae). *International Journal of Insect Morphology and Embryology*. 8: 159-167.
- [11] Forattini, O.P., & Sallum, M.A.M. 1992. Cibarial armature as taxonomic characters for the spissies section of *Culex* (*Melanoconion*) (Diptera: Culicidae). *Mosquito Systematics*. 24(1): 70-84.
- [12] Boza, S., & Vargas, M. 2006. The morphology of cibarial armature and sensilla of *Mansonia titillans*, *Psorophora cingulata*, *Coquillettia arribalzagae*, *Culex coronator* and *Limatus durhamii* (Diptera: Culicidae). *International Journal of Tropical Biology*. 54(3): 815-820.
- [13] Williams, M.R., & Savage, H.M. 2009. Identification of *Culex* (*Melanoconion*) species of United states using female cibarial armature (Diptera: Culicidae). *Journal of Medical Entomology*. 46(4): 745-752.
- [14] Samboon, P., Yamniam, K., & Walton, C. 2009. Scanning electron microscopy of the cibarial armature of species in the *Anopheles dirus* complex (Diptera: Culicidae). *Southeast Asian Journal of Tropical Medicine and Public Health*. 40(5): 937-941.
- [15] Christophers, S.R. 1933. The fauna of British India, Diptera, Vol. IV, Family Culicidae, Tribe Anophelini, illus. p. 371.
- [16] Sinton, J.A., & Covell, G. 1927. The relationship of morphology of buccal cavity to the classification of anopheline mosquitoes. *Indian Journal of Medical Research*. 15: 301-308.