

INTERNATIONAL JOURNAL OF PURE & APPLIED BIOSCIENCE

Studies on Genitalia of *Culex univittatus* Theobald and *Culex bitaeniorhynchus* Giles with the Aid of Scanning Electron Microscope

Jagbir Singh Kirti, Jasneet Kaur and Shipali*

Department of Zoology and Environmental Sciences, Punjabi University, Patiala- 147002

*Corresponding Author E-mail: shifali267@gmail.com

ABSTRACT

External genitalic structures are more important for species diagnosis in insects than any other character. These structures are highly species specific in mosquito species. Scanning Electron Microscopic studies have been conducted on external genitalia of two species of genus Culex Linnaeus i.e. Culex (Culex) univittatus Giles and Culex (Culex) bitaeniorhynchus Theobald for the first time to study various ultra structures present on external genitalia.

Key words: Scanning Electron Microscope, genitalia, *Culex univittatus* and *Culex bitaeniorhynchus*.

INTRODUCTION

During recent collection-cum-survey tours conducted in various localities of Punjab state. Two species of genus *Culex* Linnaeus i.e. *Culex univittatus* Giles and *Culex bitaeniorhynchus* Theobald were found to be most common. The main breeding sites of *Cx. univittatus* are generally restricted to cultivated areas, especially in fresh water found in drains, irrigation channels, seepage water and flooded rice fields. This species is exophagic and endophagic. It bites human beings as well as animals⁴. Major work has been done on *Culex univittatus* by Jupp^{7,8,9}, Jupp and Brown¹⁰ and Jupp and Harbach¹¹ and Jupp and McIntosh¹². *Culex univittatus* is a common mosquito in Ethiopian region, Mediterranean region, Iran, Pakistan, India and Turknan¹⁹. This species is distinguished from its other nearby species with the help of few small post spiracular scales and pale longitudinal stripes on legs¹⁶. *Cx. bitaeniorhynchus* is a rural species and its larval habitat restricted to accumulation of water containing *Spirogyra*, a filamentous green algae¹⁷. Morphologically the members of this genus show variation and sometimes it becomes difficult to identify and characterize its population. A lot of work has been done by many workers on these species. However, nobody has studied its ultra structures on genitalia with the help of Scanning electron Microscope (SEM). SEM studies have been conducted on the external genitalic attributes of these species which have yielded fruitful results.

MATERIALS AND METHODS

The mosquito species under study area were collected from various localities i.e. gardens, cattle sheds, hay stacks, nurseries, forests and human dwellings with the help of oral aspirators, test tubes, torch and insect collecting nets during dusk and dawn.

Generally all the locations of district Punjab were visited during pre- monsoon, monsoon and post-monsoon. For the identification of species, keys given by Darsie and Pradhan², Sirivanakarn¹⁸, Huang⁶, Reinert *et al.*¹⁴ and Reuda¹⁵ and for SEM studies protocol given by Chaudhry and Gupta¹ and Lee and Craig¹³ have been followed. The terminology given by Harbach and Knight⁵ for naming constituent parts of genitalia has been followed. For genitalic studies, the last two abdominal segments of adult male and female mosquitoes were snipped off with fine forceps from their body. These abdominal tips were boiled in 10% KOH solution until their clearance. Dissected material then washed several times with water and dehydrated by passing through ascending grades of alcohol.

The specimens were placed on stubs in dorsal positions after air drying on filter paper and coated with gold. After that images were observed under JSM-6610LV SEM.

RESULTS AND DISCUSSION

Different types of structures in genitalia of two species of mosquitoes belonging to genus *Culex* are described below:

Male genitalia

Culex univittatus: Basistyle with compliment of large and small setae respectively on lateral and dorsal surface, lateral surface having one or two rows of moderately long and slender setae (Fig.1); dististyle elongated, slightly curved with a claw at tip (Fig.1); subapical lobe having proximal and distal division bearing setae (**a-h**) of variable length and shape (Fig.2). Out of eight setae four long and others small, seta **a** very prominent rod like, **b** more stouter, **c**, **d** and **e** fine hair like inconspicuous, **f** blunt rod like, **g** foliform with apex not sharply produced, **h** bend from the centre and hooked at apex; inner division of phallosome simple and broad leaf like; ventral arm originates from base of basistyle from ventral view (Fig.4); ventral arm appearing V shaped; paraproct comprising of apical crown with spine-like spicules, inconspicuous lateral blades present (Fig.3); cercal setae 4-5 in number at proximal and distal end of paraproct.

Culex bitaeniorhynchus: Basistyle conical, slender with large setae on lateral surface and small setae on dorsal surface (Fig.9); dististyle typical sickle- shaped having long, apparently bilobed claw at tip and two small setae on dorsal surface (Fig.11); subapical lobe (Fig.11) prominent, (**a-h**) setae present (Fig.12) four setae long and other short, setae **a** and **b** elongated and strongly produced, **d**, **e**, **f** and **h** smaller in size, all with hooked apices, **g** lanceolate in shape; paraproct (Fig.10) long, narrow and with median sized apical crown consists of short spine like spicules and a few lateral blades; cercal setae four in number (Fig.10) on posterolateral margin of paraproct; lateral plate of phallosome strongly divided into outer and inner division; ventral arm with laterally fuzzy covering of minute spicules³; basal sternal process small or not well developed.

Female genitalia

Culex univittatus: Cerci short rounded bearing both large and small setae (Fig.5); postgenital lobe with two elongated setae (Fig.7 & 8); tergum IX slightly curved and having five pair of setae on inner part; VIII tergum V-shaped with numerous setae.

Culex bitaeniorhynchus: Cerci small and moderately rounded (Fig.13); postgenital lobe broadly oval with 5-7 setae (Fig.14 & 15); tergum IX is slightly concave.

Culex (Culex) univittatus Theobald

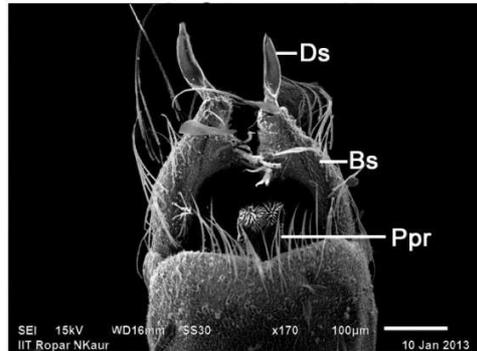


Fig. 1 Male Genitalia

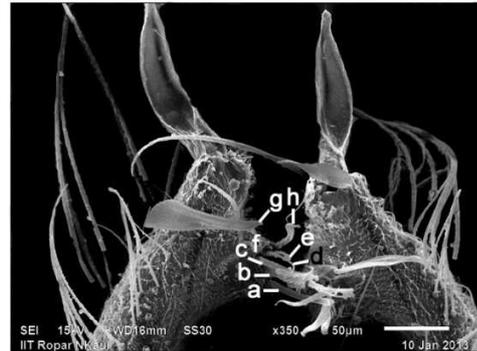


Fig. 2 Subapical Setae

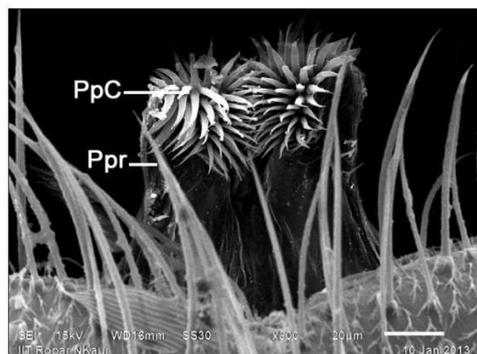


Fig. 3 Paraproct

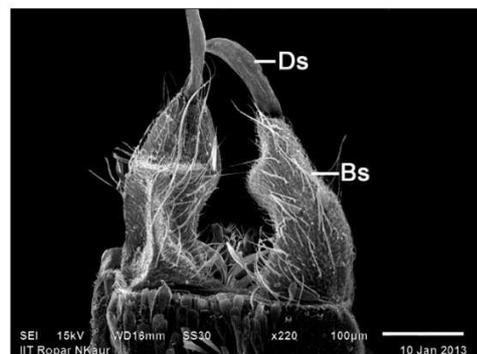


Fig. 4 Male Genitalia (Ventral view)

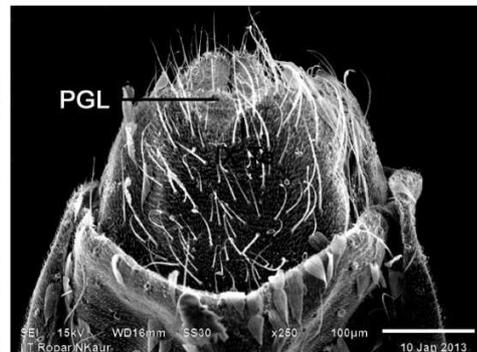
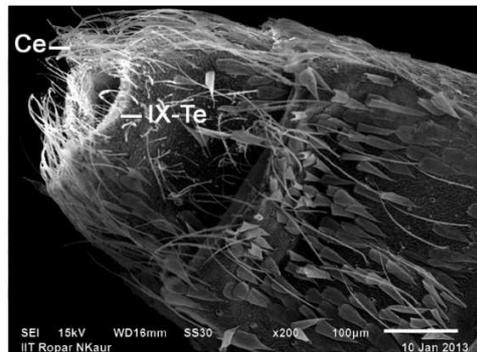


Fig. 5 & 6 Female Genitalia

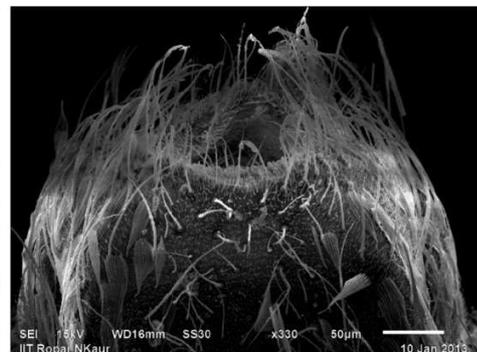
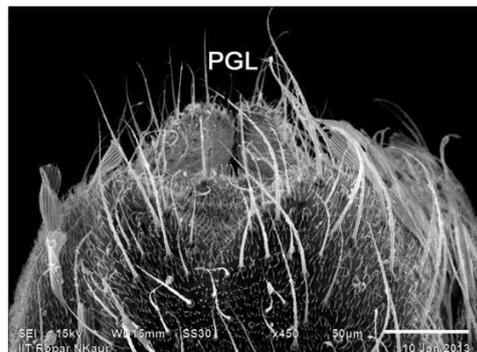


Fig. 7 & 8 Postgenital Lobe

Culex (Culex) bitaeniorhynchus Giles

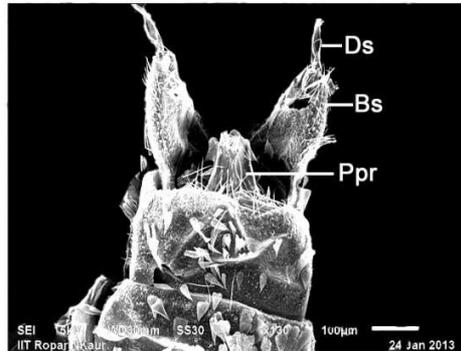


Fig. 9 Male Genitalia

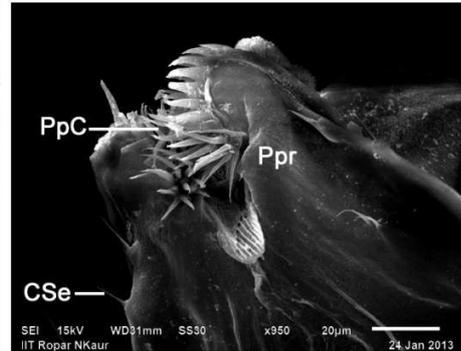


Fig. 10 Paraproct

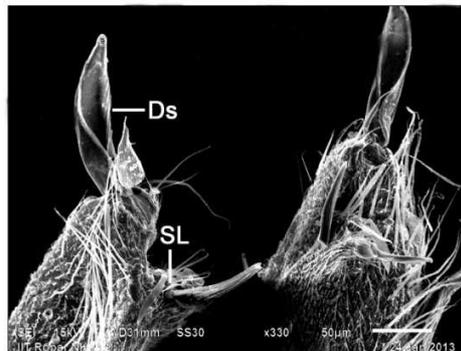


Fig. 11 Dististyle & Subapical Lobe

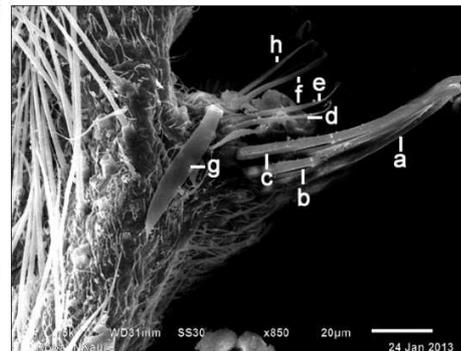


Fig. 12 Subapical Setae

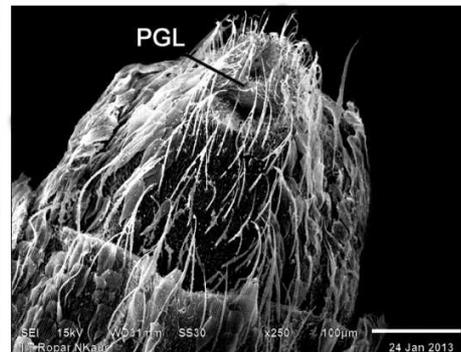
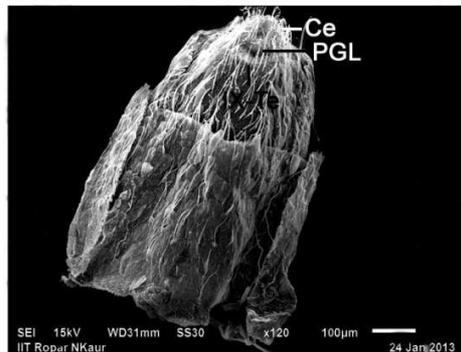


Fig. 13 & 14 Female Genitalia

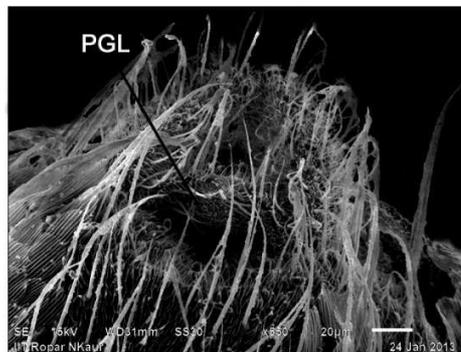


Fig. 15 Postgenital Lobe

CONCLUSION

Both the species perhaps the most remarkable member of *Culex* (*Culex*), exhibiting striking and discontinuous variation in color of adults. In this research studies, genitalia of both the species has been studied and its various structures like basistyle, dististyle, shapes of setae on subapical lobe and phallosome has been compared for the first time in Punjab with the help of SEM studies. The varying additional taxonomic attributes helpful in construction of keys and species identification.

Abbreviations

Basistyle (Bs), Ce (Cerci), CSe (Cercal Seta), Ds (Dististyle), PGL (Post Genital Lobe), PpC (Paraproct Crown), Ppr (Paraproct), SL (Subapical Lobe) and IX-Te (IX- Tergum).

REFERENCES

1. Chaudhry, S. and Gupta, S. Scanning electron microscopic studies on the egg architecture of *Anopheles* (*Cellia*) *stephensi* Liston (Diptera: Culicidae). *Proc. Zool. I. Soc. Calcutta*, **57**(1): 1-4 (2004)
2. Darsie, R.E. and Pradhan, S.P. The mosquitoes of Nepal: their identification, distribution and biology. *Mosq. Syst.*, **22**: 69-130 (1990)
3. Delfinado, M.D. The culicine mosquitoes of the Philippines. Tribe Culicini (Diptera: Culicidae). *Mem. Am. Ent. Inst.*, **7**: 252 (1966.)
4. Gad, A.M. Said, S.El. Soliman, B. Hasan, A.N. and Shoukry, A. Distribution and bionomics of Egyptian *Culex univittatus* (Theobald). *J. Egypt. Soc. Parasitol.*, **17**(1): 1-30 (1987)
5. Harbach, R.E. and Knight, K.L. Taxonomist's glossary of mosquito anatomy. Plexus Publishing, Marlton, NJ.1-414 (1980)
6. Huang, Y.M. Medical Entomology studies- XI. The subgenus *Stegomyia* of *Aedes* in the Oriental region with keys to the species (Diptera: Culicidae). *Contrib. Am. Entomol. Inst.*, **15**(6): 1-79 (1980)
7. Jupp, P.G. The taxonomic status of *Culex* (*Culex*) *univittatus* Theobald (Diptera: Culicidae) in South Africa. *Mosq. Syst.*, **2**: 9-16 (1970)
8. Jupp, P.G. The taxonomic status of *Culex* (*Culex*) *univittatus* Theobald (Diptera: Culicidae) in South Africa. *J. Entomol. Soc. South Af.*, **34**: 339-357 (1971)
9. Jupp, P.G. A morphological study of *Culex* (*Culex*) *univittatus* Theobald and *Culex* (*Culex*) *neavei* Theobald from various African countries. *Mosq. Syst.*, **4**: 103-113 (1972)
10. Jupp, P.G. and Brown, R.G. The laboratory colonization of *Culex* (*Culex*) *univittatus* Theobald (Diptera: Culicidae) from material collected in the Highveld region of South Africa. *J. Ent. Soc. South. Afr.*, **30**: 34-39 (1967)
11. Jupp, P.G. and Harbach. R.E.. Crossmating and morphological studies of *Culex neavei* and *Culex perexiguus* (Diptera: Culicidae) to elucidate their taxonomic status. *Mosq. Syst.* **22**: 1-10 (1990)
12. Jupp, P.G. and McIntosh, B.M. Ecological studies on Sindbis and West Nile viruses in South Africa. II. Mosquito bionomics. *S. Afr. med. Sci.*, **32**: 15-33 (1967)
13. Lee, R.M.K.W. and Craig, D.A. Cibarial sensilla and armature in mosquito adults (Diptera: Culicidae). *Can. J. Zool.*, **61**(3): 633-646 (1983)

14. Reinert, J.F. Harbach, R.E. and Kitching, I. Phylogeny and classification of Aedini (Diptera: Culicidae) based on morphological characters of all life stages. *Zool. J. Linn. Soc.*, **142**: 289-368 (2004)
15. Reuda, L.M. Pictorial keys for the identification of mosquitoes (Diptera: Culicidae) associated with Dengue Virus Transmission. *Zootaxa*, **589**: 1-60 (2004)
16. Riberio, H. and Mexica, J.T. Research on the mosquitoes of Angola (Diptera: Culicidae) III-A, Culicine survey in the habito-Catumbela region. *Anias. Inst. Med. Trop.*, **23(1-2)**: 167-182 (1966)
17. Senior- White, R. Physical factor in mosquito ecology. *Bull. Ent. Res.*, **16**: 187-248 (1962)
18. Sirivanakarn, S. A revision of the subgenus *Culex* in the Oriental region (Diptera: Culicidae). *Contrib. Am. Entomol. Inst.*, **12**: 1-186 (1976)
19. Stone, A. Knight, K.L. and Starcke, H. A synoptic catalogue of mosquitoes of the world (Diptera: Culicidae). The Thomas Say Foundation. **VI**: 358 (1959)