

Research Article

**DESCRIPTION OF MALE AND FEMALE GENITALIA OF
ANOPHELES (CELLIA) CULICIFACIES GILES WITH THE AID OF
SCANNING ELECTRON MICROSCOPE**

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ABSTRACT

External male and female genitalic features of the species *Anopheles (cellia) culicifacies* Giles have already been described. However, Scanning electron microscopic (SEM) studies have been conducted on external male and female genitalic structures of this species for the first time to explore additional taxonomic attributes.

Keywords: SEM, *Anopheles culicifacies*, Male genitalia, Female genitalia.

INTRODUCTION

Malaria is one of the serious scourges inflicted over humanity. It causes human mortality and morbidity along with great financial loss (Mary *et al.* 2013). *Anopheles (cellia) culicifacies* Giles is a very common species inflicting human beings. Though the external male and female structures of this species are well known and studied by pioneer workers like Puri (1931), Christophers (1933), Ross and Robert (1943), Nagpal and Sharma (1995), Chaudhary and Gupta (2004) and Barik *et al.* (2009). However nobody has tried to explore some additional taxonomic features with the help of Scanning electron microscope (SEM). The SEM has been done in the present work. Male and female genitalia have been scanned to explore additional taxonomic attributes for first time. Large numbers of attributes have been discovered. These features will not only strengthen the diagnosis of species *An. culicifacies* but will also help to resolve various sibling species of the present species.

The identification of mosquitoes has been based mainly on the external characters and/or on the characters of the sexual appendages of the adult male. The external characters are removable and so many often it becomes impossible to classify a number of closely related

species. In those cases, definite differences in these structures of genitalia will prove to be the only available characters for the identification (Hara, 1959). The use of SEM to the study the male and female genitalia are more complicated than the examination of these organs under an optical microscope. The main advantage of SEM included the high magnification and to see the structures of genitalia without any distortions (Khalin, 2009).

MATERIAL AND METHODS

Male and female specimens of present species were collected from Punjab state. Specimens were collected by using test torch method and oral aspirators. For SEM studies, method given by Lee and Craig (1983) and Kirti and Kaur (2011) were followed. For genitalic attributes, last three segments of both male and female specimens were dissected with the help of forceps. These were first boiled in 10% KOH for 10-15 minutes, washed with water several times, air-dried and mounted. After mounting, these were sputter-coated with gold and scanned with JSM-6610LV scanning electron microscope. 5-7 specimens were used for each investigation.

The terminology for various morphological characters and abbreviations given by Harbach and Knight (1980 and 1981) has been adopted.

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RESULTS AND DISCUSSIONS

Concerning female genitalia genitalia important to point out that spermatheca is located inside the abdomen and its morphological architecture as well as its number is used as taxonomic character. Furthermore, in males, genitalia is built up by several structures (aedeagus, parameres, coxite, style, tergites, lamella and basal membrane among others) which are also very important in species identification (Alexandre-Pires *et al.*, 2010).

Male genitalia: Male genitalia (Fig. 1-4) bears two basistyle (Fig. 3) covered with several type of long and short setae having pair of dististyle. Dististyles (Fig. 4) are sickle shaped sickle-shaped having claw at its tip and also having small spine near its tip. Basistyle with three kinds of spines: three accessory spines, one internal spine which

is longer and thinner than accessory spine and one parabasal spine. Shape and size of both accessory spines, and parabasal spine is almost same. Pair of club-shaped claspettes arising from phallosome (Fig. 2) region is very clearly visible. Aedeagus looks like a pyramid being the vertex at top of it (Alexandre-Pires *et al.*, 2010) and v-shape at basal region.

Female genitalia (Dorsal view): Female genitalia (Fig. 6) having cerci, Postgenital lobe (Fig. 6) (PGL) and IX-tergum. A pair of cerci covered with several types of long and short setae. Post genital clearly visible bearing pair of seta arising from its tip. Shape of IX-tergum very species specific and in the present species it is almost in straight line covered with setae of different kind except at middle region.

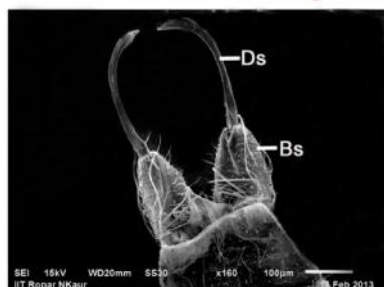


Fig. 1 Male genitalia

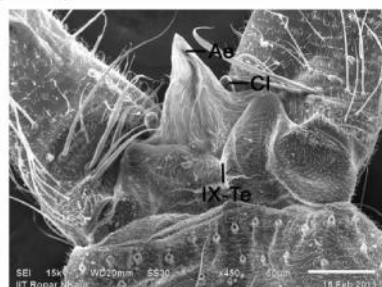


Fig. 2 Phallosome

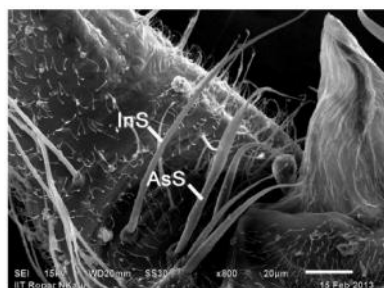


Fig. 3 Different types of spines on basistyle



Fig. 4 Dististyle

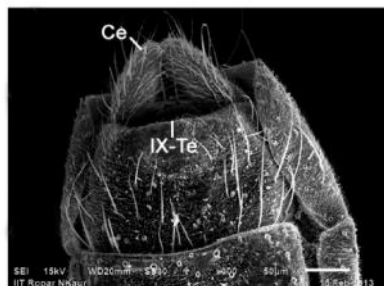


Fig. 5 Female genitalia

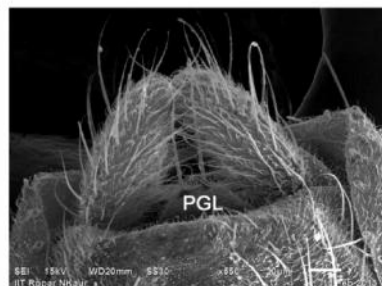


Fig. 6 Postgenital lobe

Figure 1-6. Genitalia of *Anopheles culicifacies*. [Abbreviations: Ae (Aedeagus), AsS (Accessory spine), Basistyle (Bs), Ce (Cerci), Cl (Claspettes), DsC (Dististyle claw), Ds (Dististyle), InS (Internal spine), PGL (Post Genital Lobe), IX-Te (IX-Tergum)].

CONCLUSIONS

External genitalic attributes are highly species specific in genus *Anopheles* Meeigen. These three dimensional structures have proved to be of great taxonomic significance, in order to study various ultra structures on these species specific character. SEM studies have revealed shape of aedeagus, spine at tip of gonostylus, shape and size of both accessory spines and parbasal spine in male genitalia and shape of IX-tergum and post genital lobe in female genitalia. These features will strengthen the diagnosis of this economically significant species.

CONFLICT OF INTERESTS

We declared that there is no conflict of interests associated with this article.

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