Australian Journal of Basic and Applied Sciences, 3(1): 89-95, 2009
ISSN 1991-8178

# Male Genitalial Morphology of the Carob Moth, *Ectomyelois Ceratoniae* (Zeller) (Lepidoptera: Pyralidae) with Reference to Their Chemoreceptor

[1]Sawsan S. Moawad and [2]Amal M.F. Al-Barty

[1]Plant Protection Department National Research Centre, Cairo, Egypt.
[2]Biology Department, Science Faculty for Girls, El -Taif University, K.S.A

**Abstract:** External genitalial morphology of male carob moth, *Ectomyelois ceratoniae* (Zeller) (Lepidoptera: Pyralidae) was studied and illustrated for the first time. In addition to study morphological structure of different types of sensillae on external genitalia, these sensillae are identified as (trichoid in three types, one type of coeloconic and basiconic sensillae).

**Key words:** Carob moth, male genitalial morphology, chemoreceptor.

## INTRODUCTION

*Ectomyelois* (*Myelois*) *ceratoniae* is one of the most destructive pests on the pomegranate and other fruits tree in different part of the world. Successful control of any pests is based on correct identification and inability to recognize distinct populations can have drastic and costly consequences for pest management (Menken & Ulenberg 1987). The taxonomists interested by studying the morphology and ultra-structure of chemoreceptor of male genitalia to scrutinize variation between species and subspecies. Male genitalial morphology of carob moth has not been studied before. Hence, the descriptions of the male copulatory organs with their illustrations are given here for the first time. In addition to study identification, description and definition the distribution of chemoreceptor on male copulatory organs, by using light and electron -microscopy.

## MATERIAL AND METHODS

***Light Microscopy Study:***

Mounts of male copulatory organs of the carob moth were prepared following a procedure similar to that described by Radovic and hurd (1980). Specimens of the male genitalia were treated with clean solution (10ml lactic acid + 2ml glycerin + 4ml formaldehyde 40% conc.) for 72 hr. and then washed in 70 % alchol. After that, placed the target specimen on concave slide with one glycerin drop for investigation under sterio and/or light microscope and drown by using lusida camera. Also, the chemo- receptors distribution was examined.

***Scanning Electron Microscopy Study:***

Newly emerged moths were isolated their external genitalia, were placed as previous mentioned in clean solution and then placed in 70 % ethanol for 72 hrs., then transferred to 90% alcohol for 15 min. then the two specimens were gently removed. They were air dried mounted on specimen stubs and transferred to vacuum evaporation unit, where they were coated with 20nm. of carbon, followed by 20 nm of 40% palladium-gold while being rotated at about 15 rad, 5-10 ensure a uniform coating as possible Boult, and Brabazon (1968). The ultra-structure of chemo-receptor of the specimens was then examined in JXA-840 scanning electron microscope at a beam voltage of 15 kv.

## RESULTS AND DISCUSSION

The structure of the male copulatory organ of the carob moth is investigated by light microscope as described in Fig. 1 (a, b, c, d & e). The male genitalia isolated from 8$^{th}$ last abdominal segments. Prominent from the last abdominal segment a pair of harps which were long, large ,broader and slight curved at apex Fig. 1(a & b). A long the inner margin of two harps distributed three cluster groups of large setae while nearly the harps apex noticed a large number of different size setae. They hinged to the vinculum as major

**Corresponding Author:** Sawsan Moawad, Plant Protection Department National Research Centre, Cairo, Egypt.
E.mail: abzs9999@yahoo.com

lepidopterous insects El Sherif (1966). The aedeagous stout, tubular, apex slightly narrow and curved, ejaculatorius entering well above the base and ending in stout well chitinised penis Fig. 1(c & e). Anellus membranous sheath enclosing aedeagous present. Juxta was small and tiangular-shaped. Gnathos with arms ring-like and less prominent. Uncus broad and rounded apically. The viniclum not fuse with tegument; saccus moderately broad and long (Fig. 1d).

Scanning electron microscopy observation revealed the presence of the following sensilla on the two harps:

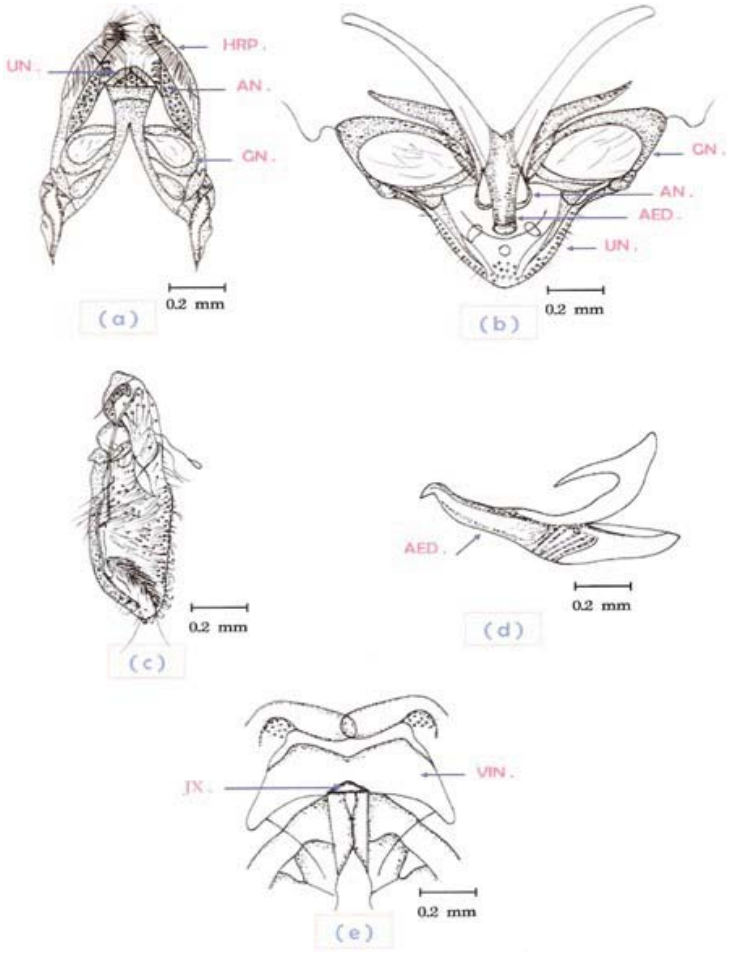


**Fig. 1(a, b, c, d & e):** a = Dorsal view of male genitalia; Hrp = Harps, Un = Uncus, Gn = Gnathos - An = Anullus . b = Ventral view, c = Lateral view, d = Dorsal view of Aedagus ( aed) . e = Dorsal view ; Jx = Juxta, Vin = Vinculum

***1-Sensilla Trichoid ( Sensory Hairs):***

There are different types of trichoid sensilla noticed at two male harps which various in length and shapes as follows:

First one, trichoid sensilla type I is density distributed on the inner and apical margin of male harps (Fig. 2a). Ts I is a long cylindrical slightly curved hair, non porous, based on socket (Figs. 2b and 3c). It means length is 82.43µm. and its diameter mean is 2.07µm. Anderson *et al*. (1995) described similar sensilla and mentioned that these sensillae are for olfaction or for mechano-receptors.

Other types, trichoid sensillae type II and III are found in few number between trichoid sensilla type I (Figs. 3d and 3e). TsII is shorter and more angular shape than TsIII. The length of curved part of TrII is 8.97µm while TsIII is 7.7µm; while the mean length of straight part (from the sensor socket to curved point) of TsII is 2.7µm while TsIII is 15.4µm. They are noticed at the apex of two harps and scattered a long its

arm.

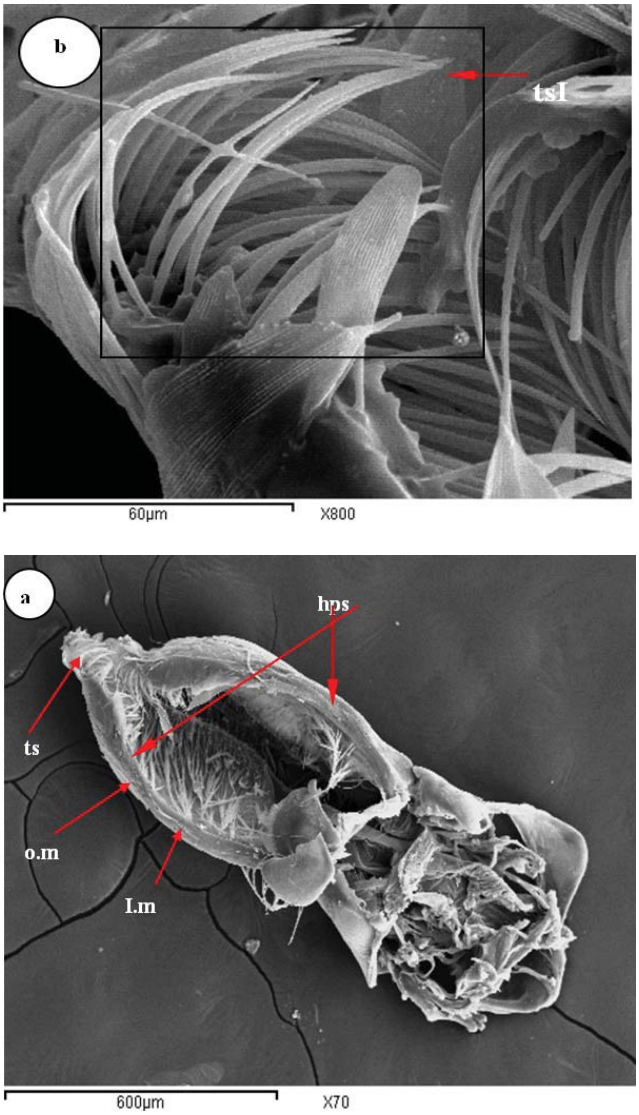


**Fig. 2( a & b):** a, S.E.M. photo of two male clasper ( harps).
I.m= inner margin , e.m = external margin, ts = trichoid sensilla ; b, magnified trichoid sensilla type (I)= tsI

Three types of trichoid sensilla were found on the antennae of *Plodea interpunctella* (Hb) (El-Sayed, 1990) and the potato tuber moth *Phthorimaea operculella* (Zeller) (Sharaby *et al*., 2002). Farazmand and chalika (2008) recorded three types of trichoid sensilla on the Colorado potato beetle larvae are functioning as chemo-mechanoreceptor.

***2- Sensilla Basiconic:***

It is a conical peg hair with a rounded blunt tip and thick multiporous wall Fig. (4f). It is found in inner surface along the harps in between the different types of Ts Fig. (4e). It is mean length 8.99µm. It is similar to sensilla recorded on tarsus of *Rhynchophorus ferrugineus* Sharaby and Dosary (2007) and the sensilla on the antennal segment of *Dinocras cephalotes* larvae Anac-Narcisa (2008).

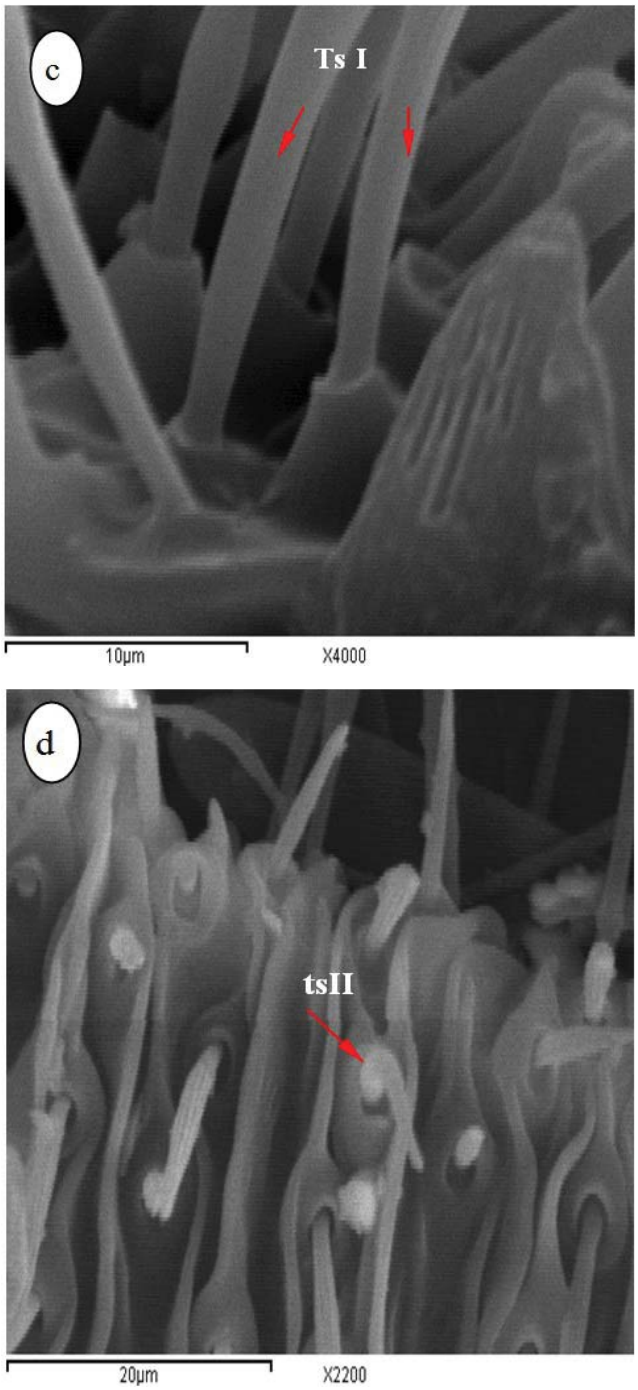


**Fig. 3(c & d):** magnified part of harps showing trichoid sensilla type I and II.

Alm and Hall (1986) mentioned that sensilla basiconic acted as olfaction chemoreceptor. On the other hand, Maher and Thiery (2004) found that sensilla basiconic on tarsus of *Conotrachelus nenuphar* play a role in recognition of egg laying or it is a contact chemoreceptors. Also, Farazmand and chalika (2008)

elucidated that basiconic sensilla are innervations to several receptor cells, so they act as contact chemoreceptor.

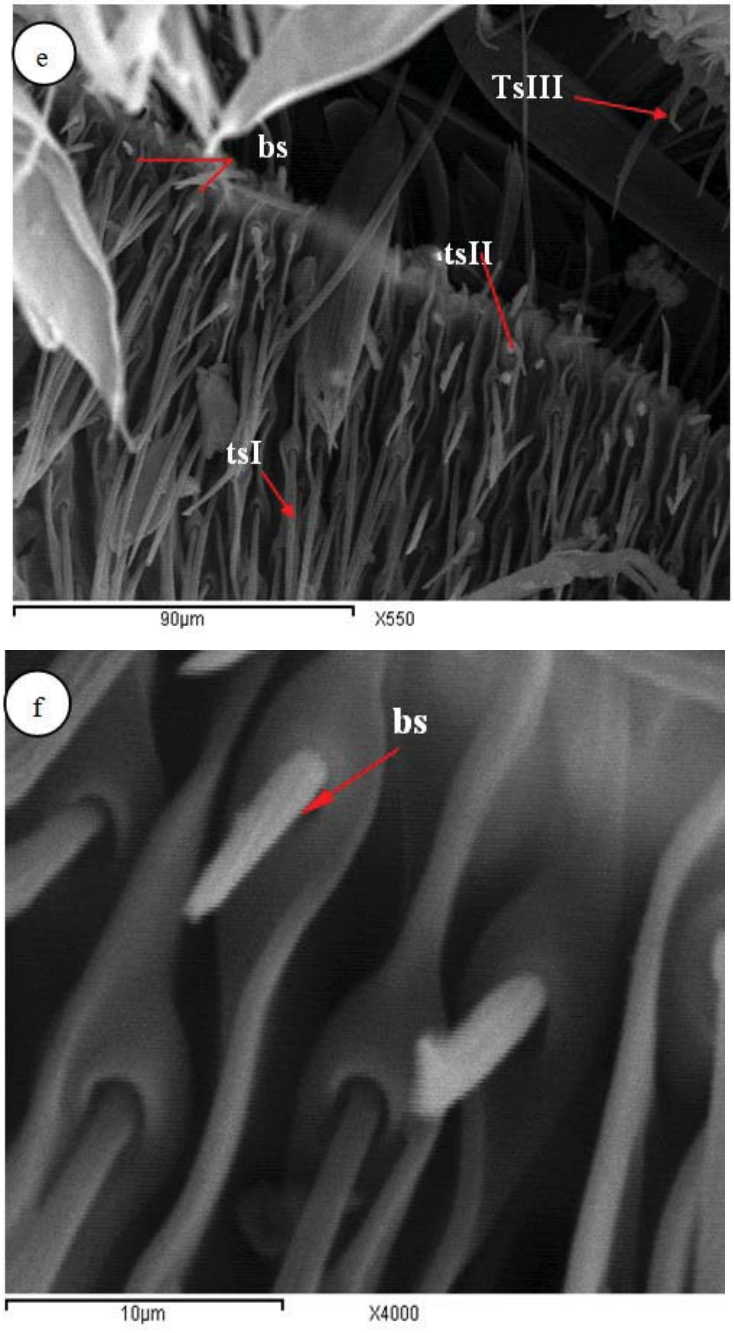


**Fig. 4(e & f):** e, showing trichoid sensilla type I, II and III; f, magnification of basiconic sensilla = bs

***3- Sensilla Coeloconic:***

it is a rounded pit centered by a conical structure with 0.5µm. mean length (Fig. 5., g & h). They distributed along the external margin of two harps; their numbers ranged between 11-13 in each one. sensilla

similar the previous mention one have been reported in, stonefly nymph, *Thaumatoperla alpine* (Burns) (Kapoor 1983 & 1984) & *Perla marginata* (Anac-Narcisa 2008). Schneider and Steinbrecht (1968) mentioned that coeloconic sensilla was chemoreceptor.

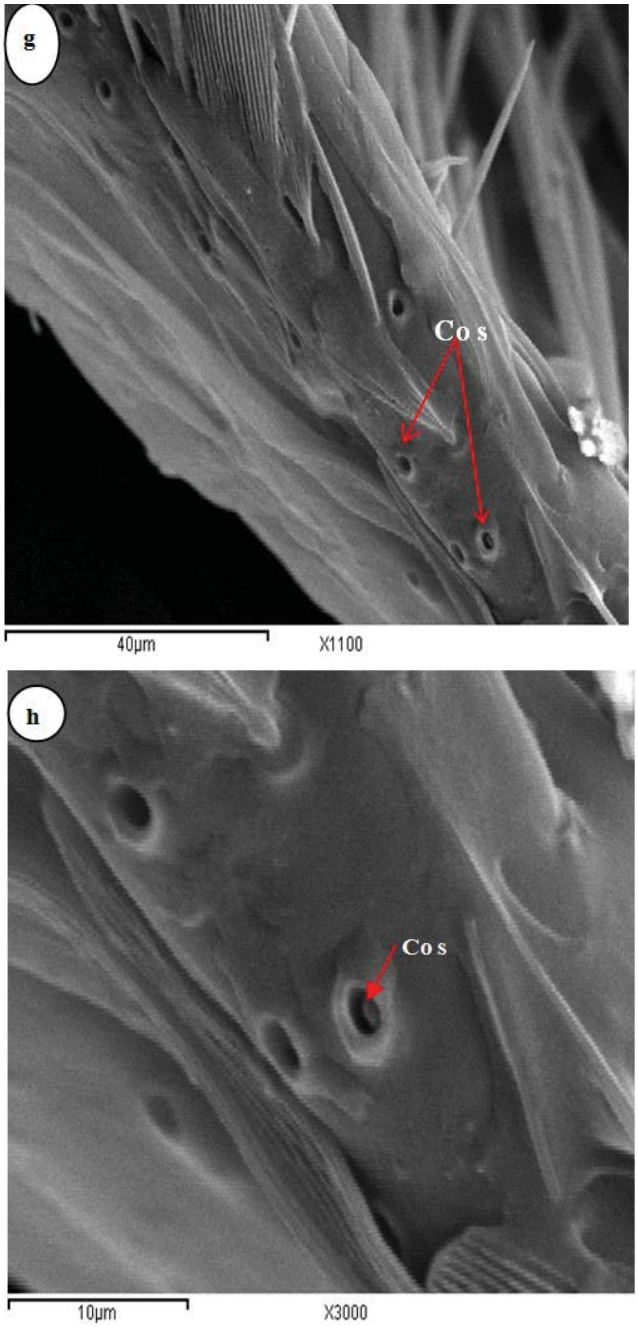


**Fig. 5(g & h):** g ; showing pegs and coeloconic sensilla; h, magnification of coeloconic sensilla.

## REFERENCES

Alm, S.R. and F. Hall, 1986. Antennal sensory structures of Conotrachelus nenuphar (Coleoptera:

Curculionidae). Ann. Ent., Soc. Amer., 79: 324-333.

Anac-Narcisa, NEAGU, 2008. Comparative anatomy of the antennal sensilla of Perla marginata, Dinocaras cephalotes and Perlodes microcephalus (Plecoptera) aquatic insect nymph. Analele Ştiintifice ale Universit tii, Al, I, Cuza Iaşi, s. Biologie animalţ , Tom LIV, 129-134.

Anderson, P., B.S. Hansson and J. Löfquist, 1995. Plant-odour- specific receptor neurons on the antennae of female and male *Spodoptera littoralis*. Physiol. Ent., 20: 189-198.

Boult, E.H. and E.J. Brabazon, 1968. A rotating device for use in metallizing non-conducting scanning electron microscope specimens. Journal of Physiology, 2(1): 565.

El Sherif, A.R.A., 1966. studies on the morphology and biology of the potato tuber moth, *Phthorimaea operculella* (Zeller) (Lepidoptera: Gelechiidae). M.Sc.. Thesis, Agric., Cairo Univ.

El-Sayed, A.M., 1990. Studies on pheromone producing and perceptive organs in Indian moth, *Plodia interpunctella* (tiubn.). M.Sc. Thesis, Fac. of Sci., Ain Shams Univ.

Farazmand, H. and S.Yu. Chalika, 2008. Morphology and ultrastructure of chemosensory sensilla of labio-maxillary complex in the Colorado potato beetle, *Leptinotarsa decemlineata* (Col.: Chrysomelidae), larvae. Journal of Entomological Society of Iran, 27(2): 1-11.

Kapoor, N.N., 1983. Ultrastructure of the sensilla of the stonefly nymph, *Thaumatoperla alpine* (Burns) and Neboiss (Plecoptera: Baetidae). Int. J. Insect Morphology and Embryology, 12(2-3): 157-168.

Kapoor, N.N., 1984. Scanning and transmission electron-microscopy of the developmental stages in the flower- shape sensillum of the stonefly nymph, *Thaumatoperla alpine* (Burns) and Neboiss (Plecoptera: Eustheniidae). Int. J. Insect Morphol. & Entomol., 13(3): 177-189.

Maher, N. and D. Thiery, 2004. Distribution of chemo- and mechanoreceptors on the tarsi and ovipositor of the female european grapevine moth *Lobesia botrana*. Ent. Exper. Appl., 110(2): 135-143.

Menken, S.B.J. and S.A. Ulenberg, 1987. Biochemical characters in agricultural. Agricutural Zoology Review, (2): 305-360.

Radovic, I.T. and P.D. Hurd, 1980. skeletal parts of sting apparatus of selected species in the family Andrenidae (Apoidea: Hymenoptera ). Proc. Entomol. Soc. Wash., 82(4): 562-576.

Schneider, D. and R.A. Steinbrecht, 1968. checklist of insect olfactory sensilla. Symposium of the Zoological Society of London, 23: 279-297.

Sen, A. and B.K. Mitchell, 2001. Olfaction in the Colorado potato beetle: ultrastructure of antennal sensilla in *Leptinotarsa* sp. J. Biosci., 26 (2): 233-246.

Sharaby, A.M. and M.M. Dosary, 2007. Ultra morphology structure of sensory sensillae on the legs and external genitalia of the red palm weevil *Rhynchophorus ferrugineus* (Oliv.). Saudi Journal of Biological Sciences, 14(1): 29-35.

Sharaby, A.M., H.A. Abdel Rahman and S.S. Moawad, 2002. Sensory of the potato tuber moth *Phthorimaea operculella* (Zeller) (Lepidoptera: Gelechiidae). M.Sc. Thesis, Fac. Sci., Ain Shams Univ.