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MORPHOLOGY AND CHEMICAL COMPOSITION OF METATHORACIC SCENT GLANDS IN *CORIDIUS JANUS* (HETEROPTERA)

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ABSTRACT – One of the general defining characters of the heteroptera is the presence of metathoracic scent glands (MTG). Using scanning electron microscopy the morphology of the metathoracic scent glands (MTG) of *Coridius janus* was studied. The transverse duct is provided with a chitinous lid, which acts as a value. The transverse duct opens out side ventrally by a pair of ostiole located at the base of the coxae of the third pair of legs nearer of the ostioles .The metathoracic scent glands are composed of a median reservoir and a pair of accessory glands is connected to the reservoir by a chitinous duct. A groove like structure extends down wards from the ostiole. While this structure is long and wide, its ostiole is ovel; Extracts of the volatile fractions from adult metathoracic scent glands secretions were analysed by Capillary Gas Chromatography mass spectrometry (GC-MS) and exhibited a typical pentatomid composition. Seven chemical compounds were identified, investigated and the biological functions of the glandular secretions were discussed, In the analyses of the metathoracic scent glands of adult of *C.janus* 4,5 Dimethyl diazole ,(E)-2-Hexenyl acetate, O-iso butenyl phenol, Undecane, undecylamine, 1,12-Dodecan-diol and N-methyl dodec-6,10 diene amine. The function of the scent secretion is defensive against predators.

Key words : *Coridius janus*, metathoracic scent glands, gass chromatography, mass spectrometry, scent secretion.

INTRODUCTION

The scent glands confined to thoracic region are known as metathoracic scent glands. Generally metathoracic scent glands are present in adult only. The Morphology of metathoracic scent glands (MTG), with reference to family pentatomidae have been Studied (Chowdhari *et al*, 1965; Gilby and Waterhouse,1967; Ahmad and Khan, 1973; Ishwiwatari, 1974; Janaiah, 1978, Leela Kumari *et al*, 1984; Surender 1988; Neelima Kumar and Kumar, 1993; Vidya Sagar, 1995; Williams, 2001; Durak *et al*, 2007; 2008; 2009). Some scientists have studied the metathoracic scent glands and identified their secretions (Blum *et al*, 1960; Waterhouse *et al*, 1961; Ishiwatari, 1974; Waterhouse and Gilby, 1964; Games and Staddon, 1973; Jackson, 1983; Surender, 1988; Vidya sagar, 1995; Srinivasulu *et al,* 1996; Williams, 2001; Durak *et al,* 2007; Durak *et al,* 2009). The present investigation deals with the structure, chemical analysis and function of the metathoracic Scent glands of the adult of *Coridius janus*.

MATERIALS AND METHODS

Adult bug of *Coridius janus* (Red bug) were collected from *Coccinia grandis* L. (Cucurbitaceae) plants near Kakatiya University campus, Warangal and maintained in the laboratory on host plant leaves at room temperature for one or two weeks. The secretion was collected from the metathoracic scent glands of 100 bugs by placius Micro Capillaries against the openings of the metathoracic scent glands (MTG) the light yellow scent secretion was collected, the secretion was analysed by gas chromatography and Mass spectrometry (GC-MS) and the scent components were identified with the help of authentic samples obtained from ICN, K and K Laboratories, Newyork. Scent secretions of adult of *C. janus* were carried out on the GC-MS data were obtained on a Shimadzu QP-2000 instrument at 70 eV and 250^{0}C. GC column : ULBON HR-1 (Unless otherwise specified) equivalent to OV-1, fused silica Capillary - 0.25 mm X 25m with film thickness -0.25 micron. The other conditions are given on the GC-MS trace. An entry such as 100-6-10-250 means that the intitial temperature was 100^{0}C for 6 minutes and then heated at the rate of 10^{0}C per minute to 250^{0}C. Carrier gas (helium) flow: 2ml per Minute. The samples (unknown and authentic) of 0.3µl to 0.5µl. were injected through sample boat; the column was held at 10^{0}C for one minute, programmed for 10^{0}C - 250^{0}C at 6?c / minute and then held at 250^{0}C for 25 minutes. All the spectra were run at 70eV at source temperature of 250^{0}C (manifold temperature).

RESULTS

The adults of *Caridius janus* have one median Ventral reservoir with a pair of lateral glands or accessory glands and a pair of regulatory muscles situated mid Ventrally in the metathoracic region below the nerve cord (Figure-1). The gland looks like a bilobed structure and becomes

shrink and folded when there is no much scent filled in it, metathoracic scent gland is covered by a thin layer of glandular reddish epithelial layer. All around the ventral margin of reservoir, the main duct runs zig-zag like the neck-lace (Figure-2) on the both lateral sides of the metathoracic reservoir, a pair of colourless lobulated and tubular structures called lateral or accessory glands (Figure-3). In adult males the scent glands measures 4.00 ± 0.37mm in length 3.25 ± 0.33mm in width and weight 638.30 ± 79.60µg; while in female it is larger than males. It measures 5.25 ± 1.03 mm in length 4.11 ± 0.78 mm in width and weight 713.30 ± 94.38 µg (Table.1). The glands opens out side Ventrally by a pair of Ostioles located at the base of the coxae of the third pair of legs nearer to the Ostioles.

Gas chromatography and mass spectral (GC-MS) analysis of secretions from the metathoracic scent glands showed chromatogram consisting of mainly eight peaks (Figure-4). First Seven peaks have been identified as 4,5 Dimethyl thiazole, (E)-2- Hexenyl acetate, O-iso butenyl phenol, Undecane, Undecylamine, 1,12- Dodecan –diol, and N. methyl dodec- 6,10 diene amine and last peak could not be identified (Table.2).

DISCUSSION

The morphology of the metathoracic scent glands of *C. janus* is more or less similar to other pentatomid bugs of *Chrysocoris purpureus* (Janaiah, 1978), *Tessaratoma javanica* (Janaiah, 1978), *Halys dentatus* (Surender, 1988), *Cyclopelta succifolia* (Vidya sagar, 1995), *Graphosoma lineatum* (Durak *et al*, 2009). The scent secretion of metathoracic scent glands contains ester, hydrocarbons, alcohol, amaine, phenol; and thiazol compounds.

In scent secretion of *coridious janus* cantain (E)-2-Hexenyl acetate is ester compound is irritant when spilled the scent on the human skin it caused burning sensation follwed by formation of blisters. It is also identified in *C. sayi* female adult (H siao-Yungo Ho *et al,* 2001).

In *Coridius janus* the metathoracic scent glands have got n-undecane, the compound are found in metothoracic scent gland of *H. dentatus* and also similarly identified in scent glands of rice sting bug, this is partially protective (Blum *et al,*1960,1961, 1985) . This compound are irritant if spilled on the skin, it causes itching and burning sensation.

Ramamurthy and Krishnandam (1967) Suggested the scent secretions in pond skater, *Gerris spinaolae* had no role as a sex- pheromone or defensive, but it acted as hydrofuse substances, which was essential for skating on water surface. Leela Kumari et al (1984) reported in *C. purpureus,* the secretion from the metathoracic scent glands of male of *T. javanica* had no response in the female of the same species. However the secretions had a lethal effect of black and red ants (Janaiah *et al,* 1979).

1,12 dodecan – diol a alcoholic compound for the first time identified in the metathoracic scent secretion of adult *C.janus.* Benzyl alcohol , 2- phenyl ethanol, aromatic alcohols identified in the volatile material of male coreid bug *Leptoglossus australis* (Gough *et al*, 1985). Benzyl alcohol seems to be predictable component in the genus, and it is common to all seven species of Leptoglossus studied although ranging in amount from 31% *(L. australis)* to 100% *(L.appositus)*. 2- Phenyl ethanol a major component (42%) in *L. australis* has recorded previously only in one N. American species *(L. gangagra* 100%).

In present investigation Undecylamine and N. methyl dodec 6,10 diene amine from the metathoracic scent secretion of *C. janus* in which N. methyl dodec 6,10 diene amine identified in both the scent secretions of larvae (Nymph) and adults. For the first time these two amine compounds investigated and there are corrosive, toxic and irritating valcurone Dazzine and Vita Finzi (1974) reported, 5- hydroxy trypt amine in Chilopoda histamine, found in Orthoptera. Heteroptera, Diptera and Hymenoptera, trimethyl endiamine spermine identified in scent secretion of Araneae the proper function of these amines in scent secretion in not yet discovered.

O- iso butenyl phenol is newly identified in metathoracic scent secretion of *C. janus,* it is a flavourable liquid and irritating when disturbed the insect. The phenol compounds, O- Cresol, P-Cresol, O-methyl phenol, 2-5 dichloro phenol were reported defence secrertion of poly desmida, Julida, arthroptera and Coleoptera insects (Volcurone dazzani and Vita Finzi, 1974) in *C. janus* scent secretion of metathoracic gland contain thiazole Compound of 4,5 Dimethyl thiazole. It is not yet found in other scent component of insects, it is highly irritent. In the present investigation when the scent secretion from the metathoracic Scent gland of adults spilled on the skin, it caused burning sensation fallowed by formation of blisters which remained for a few hours and left a yellow stain on the skin. Blisters remained for 5 to 6 days and skin pealed off subsequently, so the scent from metatharocic scent gland are defensive and protecting the insects from the predators.

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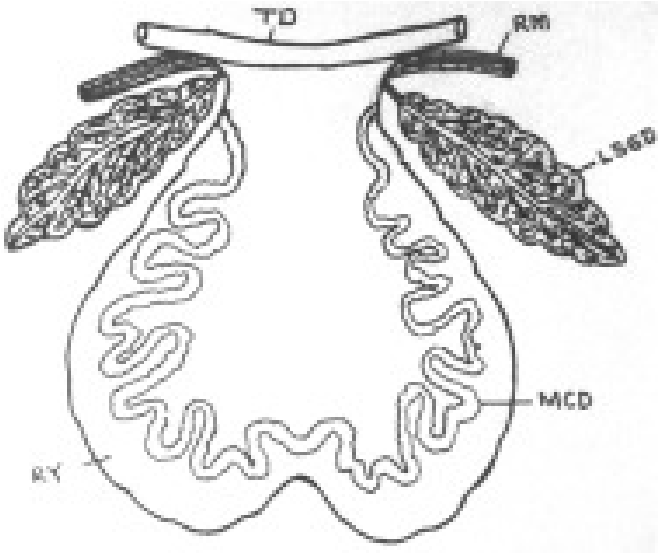

Fig. 1 : Metathoracic scent gland in adult *Coridius janus* (Ventral view)

TD = Transverse duct
RM = Regulatory muscle
LSGD = Lateral scent glands (or) Accessory gland
RV = Reservoir
MCD = Median collecting duct

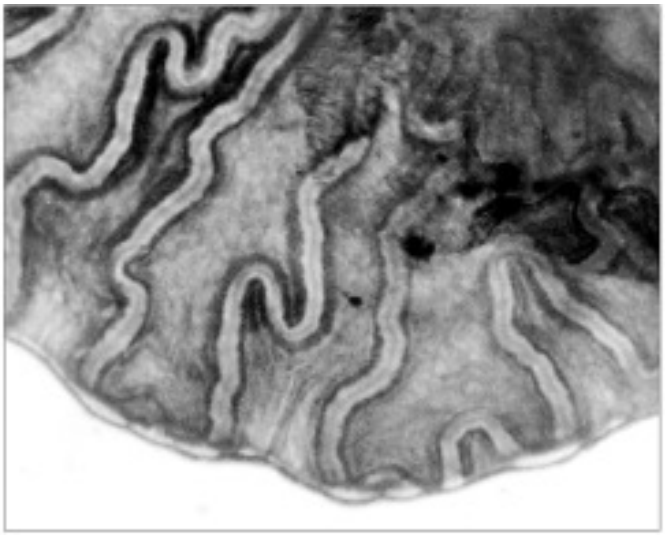

Fig. 2 : Main collecting duct of metathoracic scent gland (ventral view) in adult *C.janus* x ca 4 x 10 x 1.32.

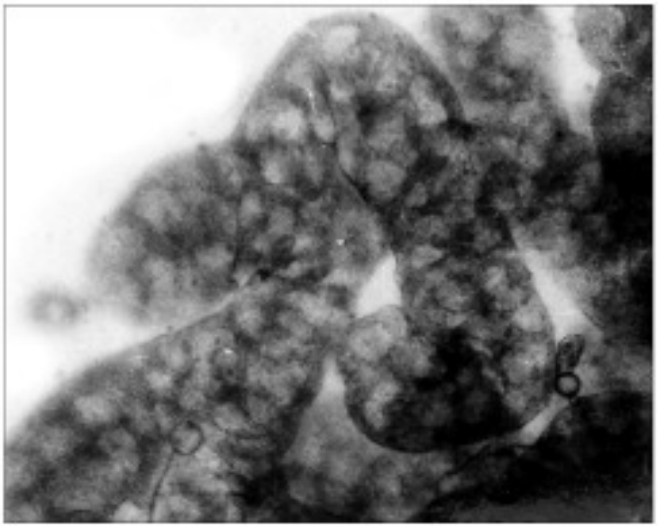

Fig. 3 : Lateral scent gland (Accessory gland – ASGL) of *C.janus* (adult) x ca 10 x 10 x 1.32.

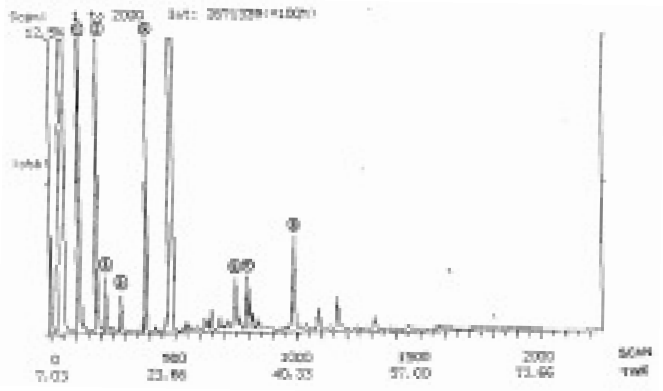

Fig. 4 : Gas Chromatographic (GC) analysis of metathoracic scent glands secretions of C.janus (Adult)

Table 1 : Measurements in mm and weight in µg of metathoracic scent glands of *Coridius janus*

Sl. No.	Coridius janus	Length mm	Width mm	Weight (µg)
01	Male	4.00 ± 0.37	3.25 ± 0.33	638.30 ± 79.60
02	Female	5.25 ± 1.03	4.11 ± 0.78	713.30 ± 94.38

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