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STRUCTURE AND FUNCTION OF DISC INVOLVED IN CLOSING MECHANISM OF VALVULAR APPARATUS IN BERRY BUG *HALYS* SPECIES: (HEMIPTERA: PENTATOMIDAE)

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ABSTRACT

The valvular apparatus of metathoracic scent gland including its structure and function describing the operation of muscles involved are highlighted. The closing mechanism of the disc is for the first time correctly described involving the elasticity of the disc.

Key words: Valvular mechanism, scent apparatus, *Halys serrigerae*, *H. qadrii*, Pentatomidae

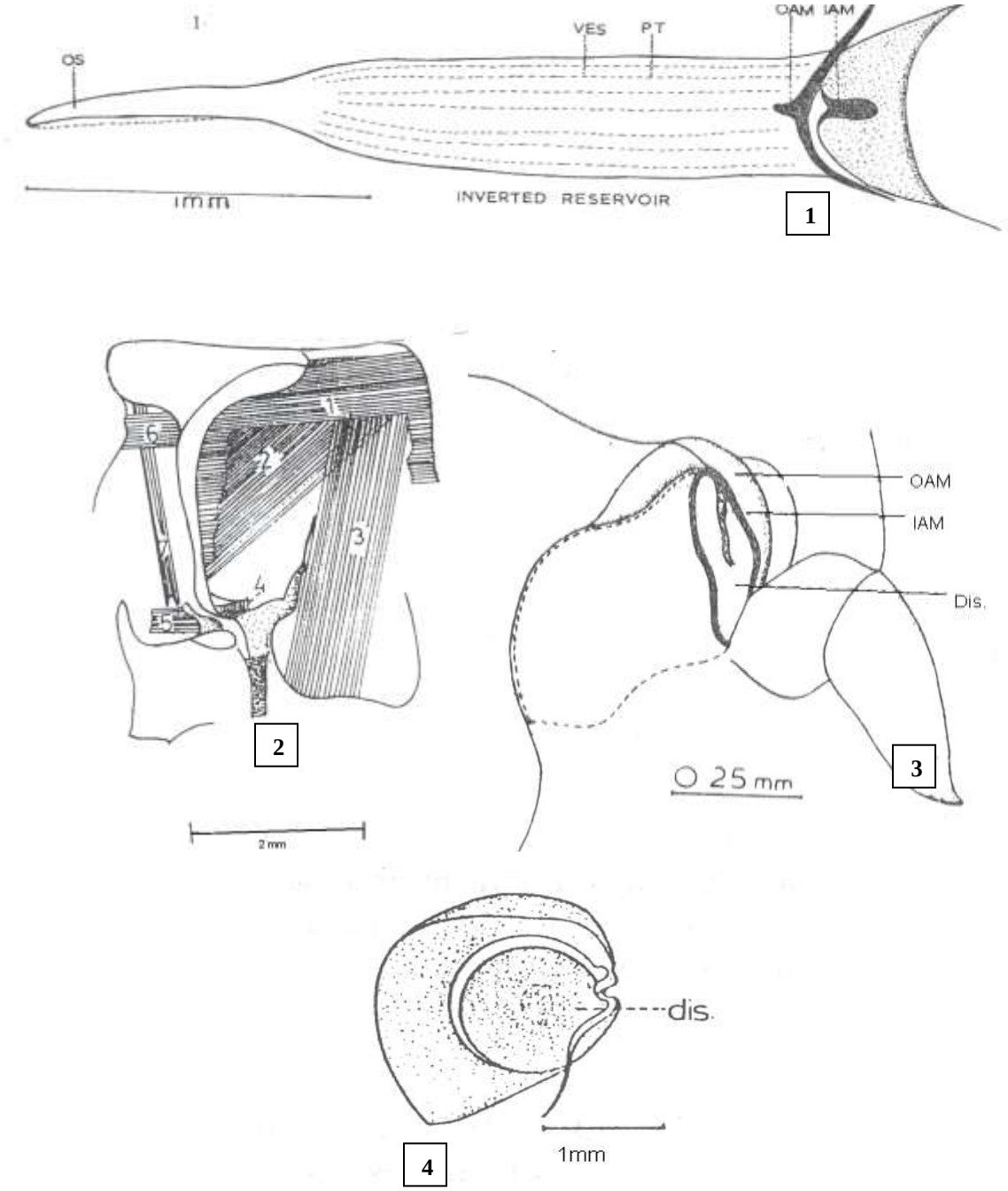
INTRODUCTION

The source of scent among Heteroptera is a pair of glands lying on each side, in the ventral part of metathorax, opening to the exterior through very small apertures located on each side of the metasternum between second and third pairs of legs was recognized by Dufour (1833). Kunckel (1866) working on Pentatomoidea found that the dorsal abdominal glands of the nymphs atrophied in the last instar and were replaced by the metathoracic glands in the adults. Kershaw (1907) noted in the nymph of Pentatominae that the dorsal glands remained in the cast skin as soft yellow sacs enveloping a yellowish fluid, having the same odour as that of the metathoracic glands. Muir (1907) found that species of Pentatominae eject an obnoxious fluid to a distance of 6-12 inches. Birndley (1930) described the detailed account of structure of pentatomid's scent apparatus.

The closing mechanism at the junction of the lateral ducts of the reservoir and the vestibule of the scent apparatus of Heteroptera were for the first time reported by Brindley (1930). Whereas, the various structure of scent apparatus in Heteroptera were also described by Moody (1930), Carayon (1948, 1950) and Gupta (1961, 1964) . Hepburn and Yonke (1971) and Ahmad and Khan (1973) have already reviewed the work done on the valvular mechanism of the scent apparatus in Pentatomoidea. Ahmad and Afzal (1977) highlighted some misinterpretations existing in the literature regarding these structures especially on the work reported by Gupta (1964) and Remold (1963). They described the valvular mechanism in the scent apparatus of *Coridius janus* (F.) with associated sclerites and musculature. They have also shown the attachment of opener muscles for the first time to the disc of valvular mechanism but misinterpreted the closing mechanism of scent apparatus. Staddon (!979) studied the scent glands of Heteroptera. Moreover, a detailed study on scent apparatus had been carried out on 96 species belonging to 25 families of land bug (Geocorisae) of Pakistan by Afzal, (1982). Considering the importance of the valvular mechanism in the functional morphology of the scent apparatus as a whole an attempt is made presently to provide the correct interpretation of the structure and closing mechanism of the disc in *Halys* spp. (*H. serrigera* (Westwood) and *H. qadrii* Abbasi and Ahmad).

MATERIALS AND METHODS

For the study of scent apparatus, the specimens were collected from Berry (*Zizyphus jujuba*), Keeker (*Acacia nilotica and A. arabica*) and Neem (*Azadirachta indica*). The specimens were anesthetized with the help of ethyl acetate and then were embedded in wax contained in Petri dish. The dissections were made in saline water under Leitz binocular microscope as adopted by Ahmad *et al*., (1993). The examination of scent apparatus was made after removing the overlying viscera and removing the alimentary organs. The disc attached with the muscles can easily be pulled out with the help of forceps. All the diagrams were made with the help of squared eyepiece graticule under Leitz binocular microscope on a graph paper to the scale given.



Figs. 1-4 Metathoracic Scent apparatus components of *Halys serrigera* (Westwood) 1. Vestibule showing valvular structure, dorsal view. 2 The musculature of the valvular apparatus. 3. Disc closing the opening of the vestibule. 4. Disc with string. (Abbreviation-DRE: Duct of reservoir, IAM: Inner arm of the valvular apparatus, OAM: outer arm of the valvular apparatus, OS: Ostiole, VES: vestibule, PT: Proximal part of the vestibule, dis: Disc).

RESULTS AND DISCUSSION

In the present findings the same muscular attachments (opener muscles) of the valvular mechanism was observed as shown (Fig. 2) by Ahmad and Afzal (1977) in *Coridius janus* (F.). It was observed presently that the disc (Figs.1-4) closed the terminal orifice of vestibule due to its elasticity, when opener muscles are released in contrast to the claims of Ahmad and Afzal (1977) according to whom the disc closed due to the pressure of the content of the reservoir. Earlier Ahmad and Khanum (1968) made an attempt to describe the flow of the secretion from the ducts of the reservoir into the vestibule and probably misunderstood the presently disclosed disc attached

with opener muscles as inner and outer arm (Fig. 1). The outer arm was described to be attached with the terminal portion of the duct of the reservoir while the inner arm is supposed to be free. However, the present findings are in agreement with Ahmad and Afzal (1977) that the release of secretion for entering into the vestibule from where it is discharged out side through the ostiole is due to the contraction of opener muscles attached to the disc not to the outer arm as mentioned by Ahmad and Khanum (1968). In the present finding the outer and inner arms seem to be extended further and fused to form a round disc and a string was also seen attached with the disc which produces elasticity and helps in the opening mechanism (Fig. 4). Whereas, the muscles are attached to outer rim of disc (Fig. 3) and is found to be well fitted to the opening of vestibule. Moreover, in the early literature authors have not attempted to describe the actual functioning of the valve lid, also not described the mode of the closing of the valve. Staddon and Thorne (1974) have described an analogous condition in *Notonecta glauca* L. where they have shown that the valve is formed by a transversely elongated patch of membrane dividing the vestibule into an anterior compartment. This fold forms the valve at each end of the vestibule as mentioned by Ahmad and Afzal (1977). It is suggested that valvular apparatus in other groups of Heteroptera may also be further investigated on the same lines as found in *Halys spp*. presently.

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