PRELIMINAR REPORT ON THE PRESENCE OF TEGUMENTAR GLANDS IN THE THORAX OF MELIPONINAE BEES (HYMENOPTERA, APIDAE)

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(With 3 figures)

ABSTRACT

This is a first report on the presence of glandular cells in the lateral tegument of the mesothorax of Meliponinae bees. The cells are of the insect class III glandular cells and are present in queens, workers and males. The glands are more developed in queens than in workers, and in workers than in males.

Key words: mesothorax, glands, tegument, male, worker, queen.

RESUMO

Relato preliminar da presença de glândulas tegumentares no tórax de abelhas da subfamília Meliponinae (Hymenoptera, Apidae)

Este é um primeiro relato sobre a presença de células glandulares no tegumento lateral do mesotórax de abelhas da subfamília Meliponinae. Trata-se de células glandulares de classe III que estão presentes em rainhas, operárias e machos. As glândulas são mais desenvolvidas nas rainhas que nas operárias e nestas mais que nos machos.

Palavras-chave: mesotórax, glândulas, tegumento, macho, operária, rainha.

INTRODUCTION

The bees have exocrine glands distributed overall body, some of them structured as distinct organs, as the glands of the salivary system, and others as modified epidermal cells: the tegumentary glands (Cruz-Landim, 1996).

The tegumentar or dermal glands were separated in three different classes by Noirot & Queenedey (1974, 1991), two of them, the class I and III present in bees. The glands with class I cells are represented by zones of secretory epithelium along the tegumentar epidermis. Examples are the wax glands described by Dreyling (1903) and Rösh (1927) in the honeybee ventral abdomen.

The class III are represented by groups of globular secretory cells individually connected to the tegument by excretory canaliculi, as the scent glands of the VII tergite of the honeybee workers (Jacobs, 1924; McIndoo, 1914).

Along the time other glands of both classes were described by several authors in head and abdomen (Bordas, 1895; Heselhaus, 1922; Koschewnikov, 1900; Cruz-Landim, 1963; Renner & Baumann, 1964; Cruz-Landim *et al.*, 1980; Mota, 1982, 1988; Mota & Cruz-Landim, 1988; Cruz-Landim & Mota, 1993) in honeybee and meliponine bees. Cruz-Landim & Silva de Moraes (1994) reported also the presence of both classes of glandular cells in the tibia of *Apis mellifera, Melipona quadrifasciata anthidioides* and *Scaptotrigona postica*.

To the thorax, Vison *et al.* (1986), Vinson (1994) & Minckley (1994) reported the presence of a mesosomal glands in Xylocopini. According to Vinson (1994) this glands consist of an invagination of the intersegmental membrane between

the propodeum and metatergum, forming a series of finger like pouches beneath the cuticle. The cells of this gland are type I. Other types of tegumentary glands in the bee's thorax are unknown. The sole gland described in this part of the body, in the imago, being the thoracic labial or salivary gland, that although having its secretory portion in this part, opens into the glossa. The scope of this paper is to report the presence and location of some tegumentar glands found in the thorax of some species of meliponine bees.

MATERIAL AND METHODS

Adult bees were collected in the hives, cooled to 4ºC and their head, abdomen, wings and legs removed. The thoraxes (pro-podeum and thorax) were fixed in 4% paraformaldheyde in 0,1M phosphate buffer, pH 7.0 for 5 h during which the samples were submited to vacuum in the first hour. The samples were washed in the buffer. For scanning electron microscopy (SEM), samples were dehydrated in a graded series of ethanol and critical point-dried, covered with gold and examined with a Jeol JMS P 15 electron microscope.

Samples for light microscopy were dehydrated until 95% ethanol, embedded in JB4 historesin and sectioned with glass knives. The sections, 6 μm thick were stained with hematoxylin and eosin.

RESULTS AND DISCUSSION

Studying histological sections of some meliponine bee's thorax we come across with the presence of glandular cells in the lateral mesothorax.

The Table 1 has the list of species examined and the way the glands occur in the adult individual components of the nest.

The glands are constituted by isolated unicelular secretory units and could be embodied in the Noirot & Quennedey (1974, 1991) class III. These are gland cells of epidermal origin that have an intracellular canal, collector of secretion which are connected to the cuticle by an extracellular excretory canal. The glands are them made of groups of these secretory units or cells.

In the studied bees, the glandular cells groupments locate laterally in the mesothorax, below the wings (Fig. 1, 2A). The cells lay between the tegument and the segmentar muscles of the thorax (Fig. 2A, B). The excretory canaliculus opens to the exterior, among the thoracic hairs, by crossing the cuticle (Fig. 2C). Therefore these glands are different from those discribed by Vinson *et al* (1986), Vinson & Frankie (1990) and Minckley (1994) in location and morphology.

The glands are present in queens (Figs. 3A, B, 4A, B), workers (Figs. 3C, 4C) and males (Figs. 3D, 4D). They seem to be more developed in queens than in workers and males, having bigger and much cells. In queens, the cells tend to be

TABLE 1

Occurrence of Mesothoracic glands in Meliponinae Bees.

	Glandular Occurrence			
			Queen	
Species	**Male**	**Worker**	**Virgin**	**Laying**
Plebeia remota	+	–	+	–
Trigona spinipes	–	+	–	+
Trigona recursa	–	+	–	–
Schwarziana quadripunctata	–	+	–	+
Nannotrigona testaceicornis	+	+	+++	++
Scaptotrigona postica	+	+	+++	++
Mourella sp	–	+	–	–

+ poorly developed; ++ well developed; +++ very well developed; – not observed.

bigger in the virgin (Figs. 3A, 4A) and smaller and with irregular surface in the physogastric ones (Figs. 3B; 4B). In all individual the cytoplasm shows a clear space around the intracellular canal, considered as indicative of the presence of some secretion. However, when compared virgin and physogastric queens, although the first have bigger glandular cells, the second seem to have more secretion accumulated in them. The secretion appears as an extensive cytoplasmic vacuolization (Fig. 3B). In workers the glands also seem to be more active than in males. The workers have bigger cells, with large nuclei and vacuolated cytoplasm (Fig. 3C).

Thoracic glands constituted by class III cells were reported in ants' metapleural gland by Schoeters & Billen (1992). The metapleural gland is considered characteristic of ants, not being

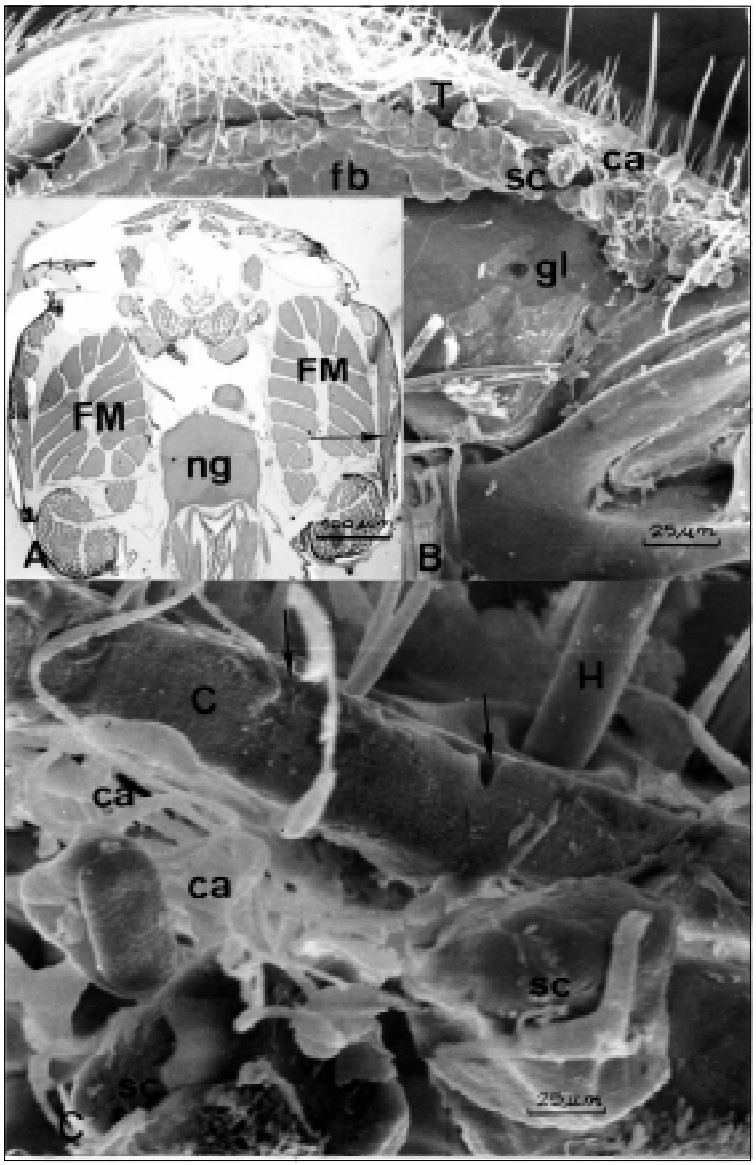

Fig. 1 — Mesothoracic glands (gl) of *Scaptotrigona postica*. A. Optic micrography of a cross section of the thorax in the mesothorax showing the gland (arrow) locations. B. Scanning electron micrography showing the gland cells (sc) below the tegument (T). C. Scanning electron micrography showing the excretory canals (ca) openings (arrows) in the cuticle (C) fb = fat body; FM = flight muscles; ng = nervous ganglion; H = thoracic hair.

present in other Hymenoptera. But, the reported gland have a location similar to the metapleural and the same type of glandular cell. This is however a preliminar report and more investigation must be done on these and in other species in order to understand correctly the extent of the occurrence of these glands and their possible function.

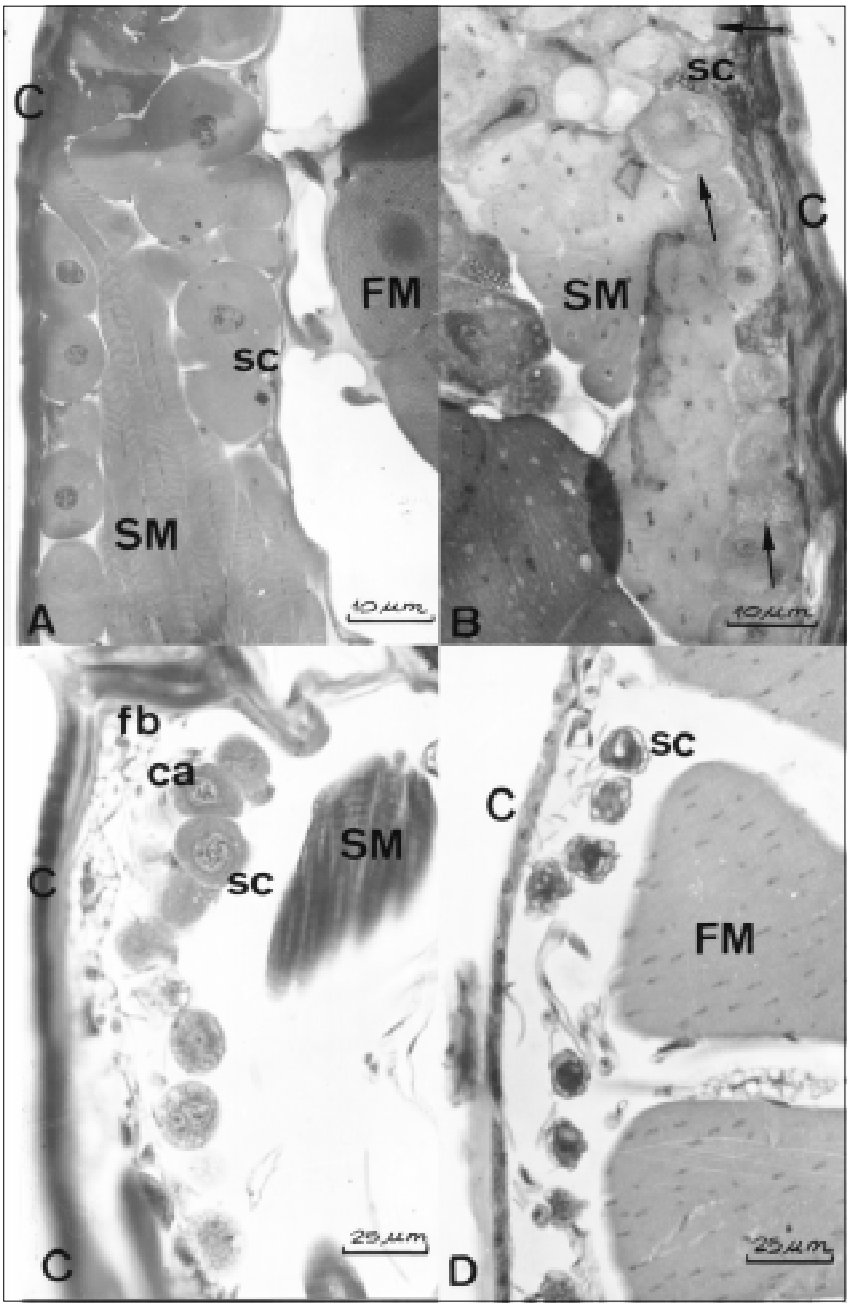

Fig. 2 — Mesothoracic glands of *Nannotrigona testaceicornis.* A. Virgin queen; B. Physiogastric queen; C. worker; D. male C = cuticle; sc = secretory cells; SM = segmentar muscles; FM = flight muscles; ca = excretory canals; fb = fat body. The arrows show intracellular secretion.

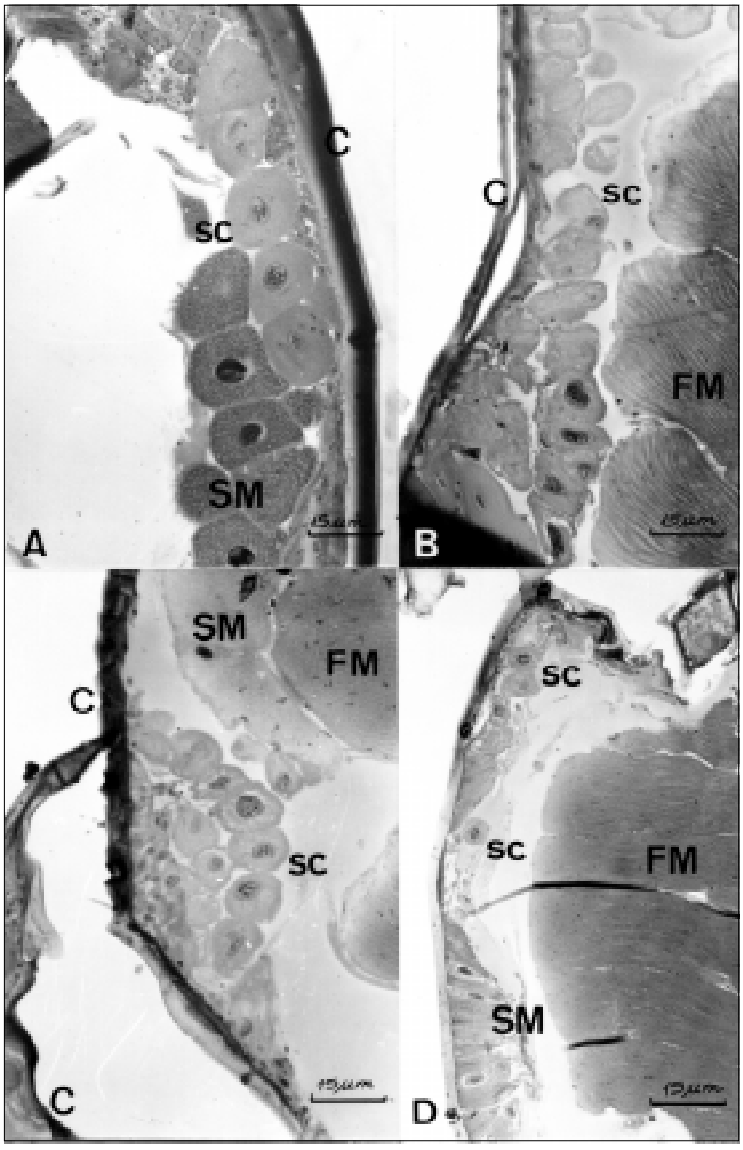

Fig. 3 — Mesothoracic glands of *Scaptotrigona postica*. A. Virgin queen; B. Physogastric queen; C. worker; D. male. sc = secretory cells; C = cuticle; SM = segmentar muscles; FM = fligh muscles.

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