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FEMALE ACCESSORY GLANDS WITH THEIR PROBABLE HOLE IN A SYRPHID FLY, *ERISTALIS ARVORUM* FABR.

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Female *E. arvorum* possesses a pair of accessory gland which is tubular and highly branched structure opening into the genital chamber at its antero-lateral walls. Each accessory gland cell functions as a unit gland and comprises a large round or oval shaped reservoir which stores the secretory material and has an efferent ductule through which the secretions are channeled into the lumen of the gland. The lumen is lined by cuticular intima. The secretion of accessory gland is mainly proteinous with only traces of carbohydrates. Glands have thus supplementary function in storing the spermatozoa but their secretions are mainly helpful in protecting the eggs and attaching them to the substrate as the glands are empty after oviposition.

INTRODUCTION

The role of the female accessory glands in Diptera has not been well understood. Varied functions have been attributed to them by various workers in different species (Ulrich, 1963; Chapman, 1972; Rossignol *et al.*, 1977; Sareen & Pannu, 1983; Sareen *et al*, 1985; Sareen & Sood, 1985). No studies have been performed on female accessory glands in Syrphidae, one of the economically important families of Diptera, in being aphidophagous and very good pollinator of some major crops. The studies deal with the structure and probable role of the accessory glands in the female syrphid fly, *Eristalis arvorum*.

MATERIAL AND METHODS

The adult female flies before and after oviposition were collected from

the blossoms in the botanical gardens of Panjab University, Chandigarh. They were dissected out in physiological saline and the accessory glands were fixed in Bouin and Helly; paraffin sections were cut at 7 μm.

For morphological studies sections were stained with Delafied's haematoxylin and eosin. Periodic acid Schiff test (PAS; Hotchkiss, 1948) demonstrates carbohydrates. Mercuric bromphenol blue (Hg-BPB; Mazia *et al*, 1953), alkaline fast green (Pearse, 1968) for basic proteins and ninhydrin Schiff for-NH_2 groups were employed. Feulgen technique (Feulgen & Rossenbeck. 1924) along with omission of N HCl hydrolysis was used for detection of DNA.

RESULTS

Female accessory glands fo *E. arvorum* comprise a pair of slender tubular and branched structures opening into the genital chamber at its antero-lateral walls. Each accessory gland lies convoluted in the seventh abdominal segment and its thickness (46μm) remains constant throughout its length. The glands are full of secretions in the ovulating flies (Fig. 1).

The accessory glands consist of small scattered epithelial cells inner to the cuticularized lumen, with prominent nuclei and indistinct cell boundaries (Figs. 1&2) Surrounding the epithelial cells are the glandular cells which are cuboidal. Each of the gland cell functions as a unit gland. It comprises a large round reservoir which measures around 36 μm (Fig. 3). The secretory material from it is channeled into the lumen of the gland through a small efferent ductule (Fig. 4). A round nucleus is present in the basal region of each gland cell which contains a single nucleolus along with irregular chromatin material (Fig 2).

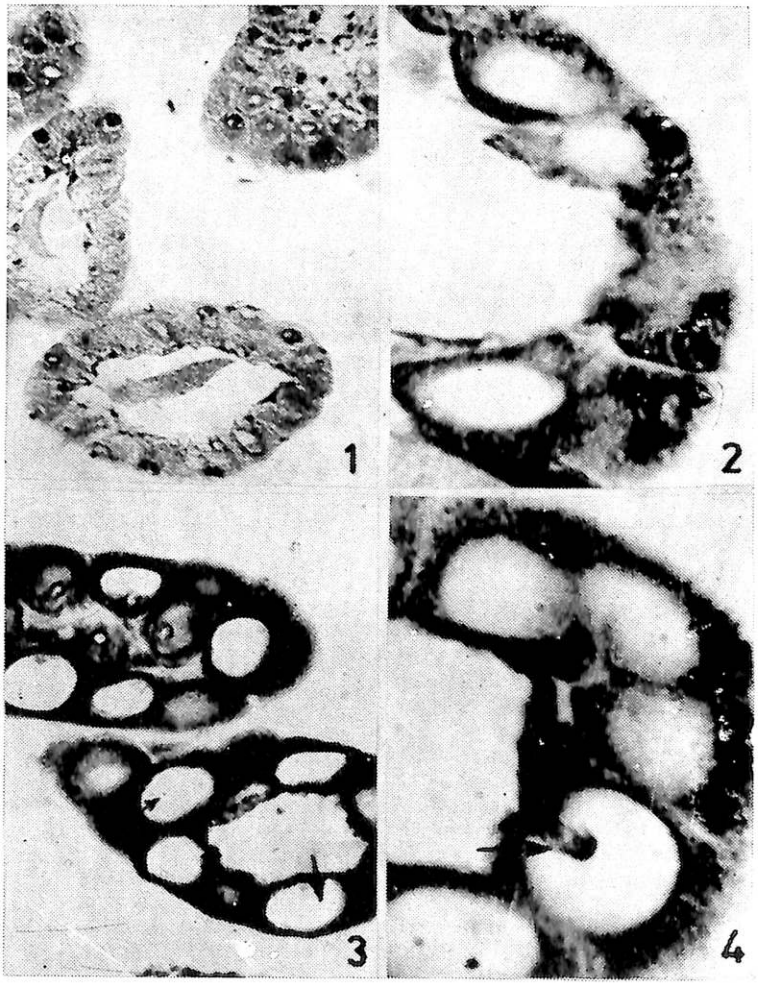
The granular secretion is seen in the gland cell as well as the lumen of accessory gland (Figs. 1&6) The cytoplasm of the gland cells is rich in ribonucleoproteins. The cytoplasm and the secretory products show the presence of various proteins (–NH_2 groups and basic proteins) as they are positive to ninhydrin Schiff, mercuric bromphenol blue and alkaline fast green (Fig. 1, 3 & 5). They were slightly positive to PAS test (negative after acetylation and positive after KOH reversal) and Best carmine test (negative after malt diastase pre–treatment) showing the presence of 1 : 2 glycol groups and glycogen in comparatively lesser amount (Figs 7 & 8). The nuclei of gland cells are stained pink in Feulgen showing the presence of DNA.

The cuticular apparatus which comprises the chitinous intima and ductules is negative to all the histochemical tests applied except it gives positive tests

with mercuric bromphenol blue and a'kaline fast green (Figs. 1 & 4).

DISCUSSION

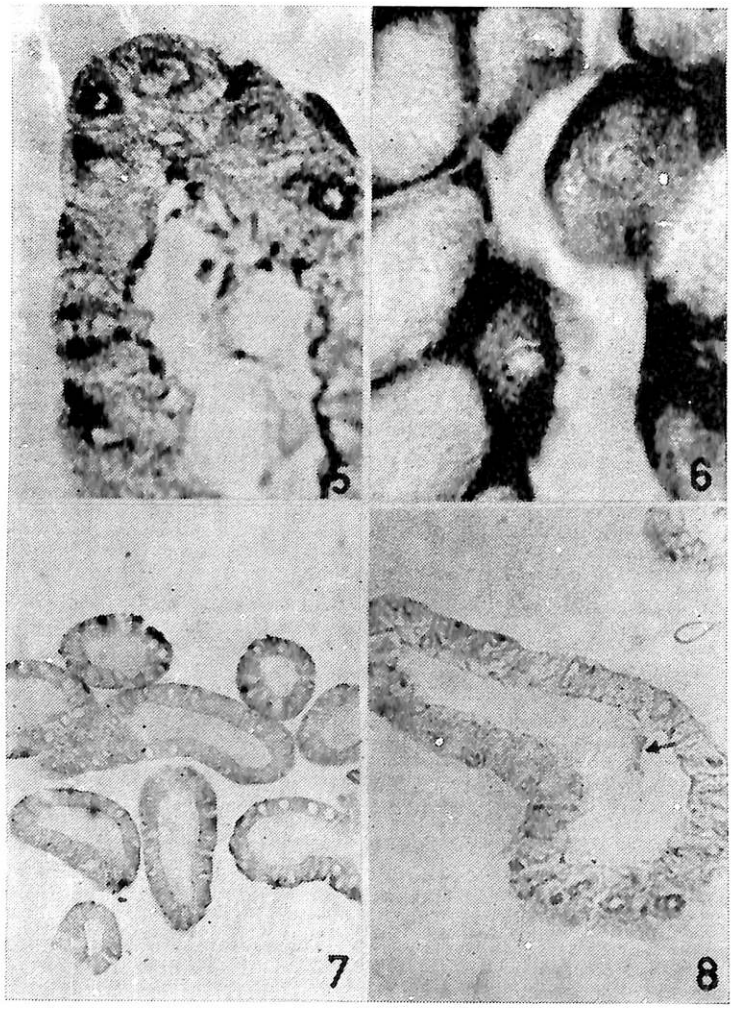
The secretion of the female accessory glands is mainly proteinous and contains only traces of 1 : 2 glycol groups and glycogen It can be concluded from these observations that these glands in *E arvorum* have only minor or supp-



Figs. 1–4. 1. T. S. of accessory gland showing proteinous secretions in lumen, Helly/ninhydrin-Schiff; 2. Prominent nuclei of gland cells, Helly/haematoxylin-eosin; 3. Large reservoirs (arrows), Helly/mercuric bromphenol blue; 4. Cuticularized lumen and efferent ductule (arrow), Helly/mercuric bromphenol blue.

lementary function in storing the spermatozoa in spermathecae but they might be helping to from the glue for attachment of the eggs to their substrata because the glands were empty after oviposition, it may be presumed that their secretion has been utilized in covering the eggs.

They are highly branched structures and all the gland cells are of one type. Each gland cell acts as a unit gland and the presence of a large reservoir



Figs. 5–8. **5** Section of accessory gland showing prominent nuclei of gland cells and indistinct cell boundaries with cuticular intima lining the lumen, Helly/alkaline fast green; **6**. Granular secretions in the cytoplasm of the gland cells, Helly/mercuric bromphenol blue. **7**. Polysaccharide nature of secretion in lumen, Helly/periodic acid-Schiff; **8**. Glycogen contents in secretion (arrow), Bouin/Best carmine.

in the gland cells is its most obvious adaptation to the secretory function and their branched unique strucutre might be helping to increase the surface area. Similar type of accessory glands but unbranched have also been reported in other Dipterans, *Chrysomia megacephala* and *Physiphora aenea* (Sareen *et al.*, 1985).

The efferent ductules are undoubtedly chitinized since they are confluent with the cuticular lining of the gland lumen. According to various workers (Clements & Potter, 1967; Gupta & Smith, 1969) the structural proteins of feltwork and of the tubule is resilin. It has also been reported that efferent ductules pick up the same stain as by chitinous intimal lining of the lumen of the gland of some other Dipterans (Sareen & Pannu, 1983; Sareen *et al.*, 1985).

The present results are also in concurrent with many other reports (Ulrich, 1963; Nayar, 1965; Chapman, 1972; Sareen & Pannu, 1983; Sareen *et al*, 1985; Sareen & Sood, 1985) that accessory glands in female Dipterans perform two main functions (i) protecting the eggs as visible by their state after oviposition (ii) nutritive for spermatozoa which have been received by the female after copulation.

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