

indica (Fabricius) as an ectoparasite under temperate conditions. In Egypt, the mite was reported to cause considerable mortality among diapausing pink bollworm larvae in double seeds and dry bolls under storage conditions⁴⁻⁷. The behaviour and potential of this mite in killing diapausing bollworm larvae have not been studied so far.

Pink bollworm, *P. gossypiella* (Saunders) is the most destructive lepidopterous pest of cotton in Northern India and from November onwards it undergoes a state of diapause in its larval form. During February and March 1983, while observing larval population trend in double seeds in the samples collected from various places in Haryana, an ectoparasitic mite, *P.*



Figure 1. Paralysed and shrink larvae due to attack of *P. herfsi*.



Figure 2. Gravid females of mites covering the body of exposed larvae.

herfsi (Oudemans) was found to be widely associated with pink bollworm larvae and produced 20 to 80 % mortality. Each larva harboured 20 to 100 mites. As a result of the loss of haemolymph, the larvae show signs of paralysis and shrink in size (figure 1). Even up to 300 gravid females were found to survive on a single larva when exposed to mite infestation (figure 2). Five females killed a single larva in 5 days but 20 females produced the same effect within 12 hr of their release at 25°C and 75 % humidity. As a result of the mite injury, the larva initially becomes yellowish and finally dies. Once the mite female settles over the body of the larva, it remains in constant association with the site, develops quickly and its opisthosoma increases up to 2.1 mm diameter. This mite may prove helpful in suppressing the population of pink bollworm in India if its practical utilization is further explored.

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PRESENCE OF CEPHALIC MUCOUS GLANDS IN *ALPHEUS EDWARDSI* (AUDOUIN)

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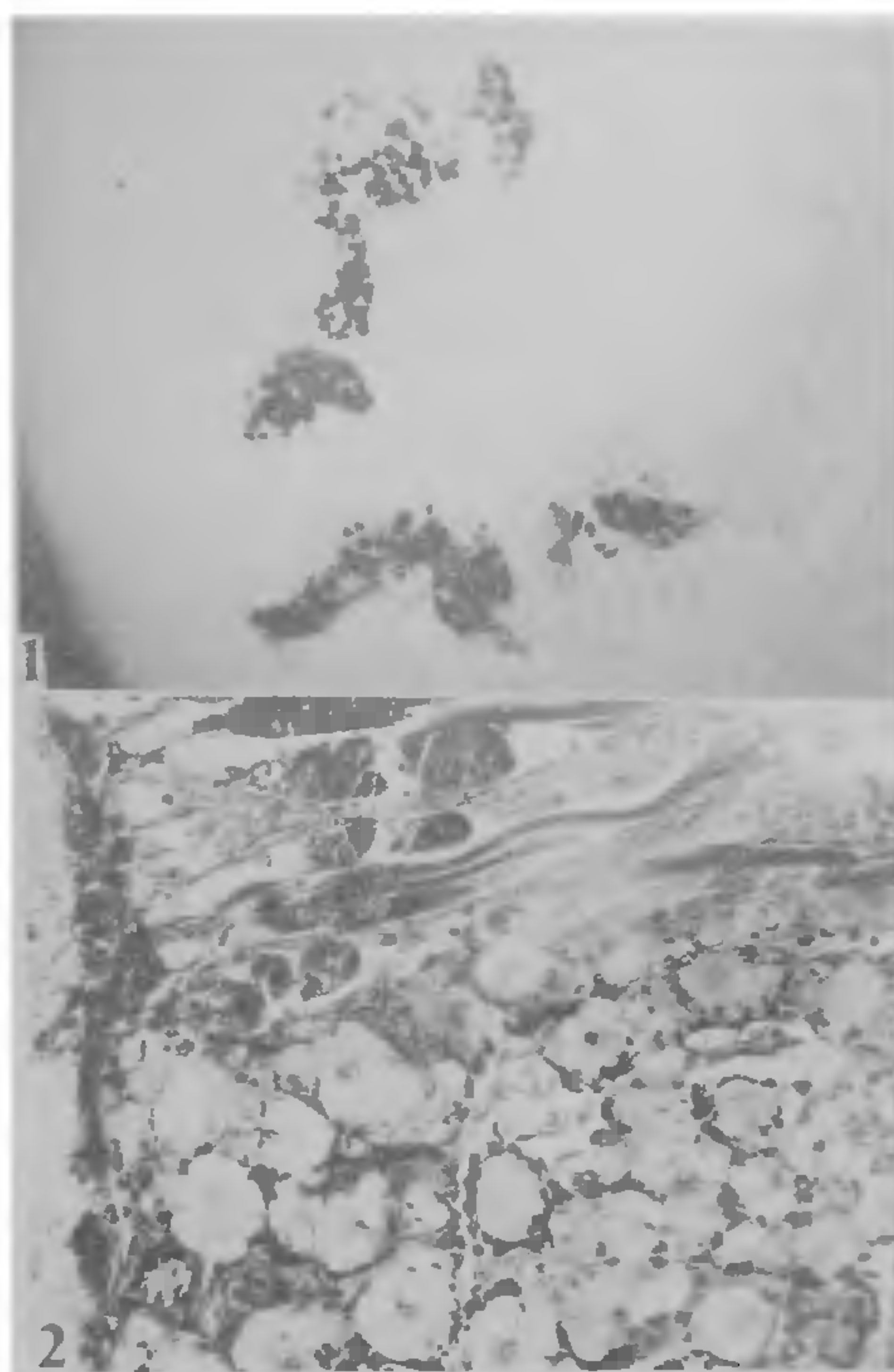
THE decapods among Crustacea offer interesting examples of highly specialised nature of feeding and digestion. The mechanism involved in these processes has been well studied in many aspects. There are,

however, gaps in our knowledge of these aspects in natantians. *Alpheus edwardsi* (Audouin), a decapod natantian, is a common intertidal shrimp along Waltair Coast. The histological structure of mucous glands and their function in this shrimp are studied in the present work.

The structure and distribution of mucous glands in association with oesophagus have been studied by many workers. In many decapod crustaceans, it has been reported that in the connective tissue of the oesophagus and at the junction of mid and hindgut regions, a large number of glandular structures occur. These have been referred to differently by various authors as oesophageal, salivary or tegumental glands and hindgut or intestinal glands based on their position in the body¹⁻⁷. Similar natured glands have also been found in *A. edwardsi*, but are not distributed in the connective tissue of the oesophagus. An area of glandular tissue on each side of the opening of the mouth represents these glands. Similar type of glands also occur abundantly in the labium and labrum (figure 1). However, the density of these glands is high in the labium, labrum and anterior region of the oesophagus, but decreases towards the posterior part. The majority of the mucous glands in *A. edwardsi* is confined to the cephalic region of the body and because of their mucous secretion, they are designated as cephalic mucous glands in the present study. A few mucous glands were also observed at the posterior part of the rectal bulb, but these have never been found at the junction of mid and hindgut regions of this shrimp as reported in other crustaceans.

Histologically the mucous glands in *A. edwardsi* and those in other crustaceans are similar. These glands are spherical and appear as rosette-shaped in sections. Each gland is formed of 6 conical cells with their apices pointing towards the gland lumen (figure 2). The cytoplasm of the cells is clear, homogeneous containing a large basal nucleus. Intracellular ducts arise from the central cavity in each gland, to convey the secretions into the lumen of the oesophagus. The cephalic mucous glands in *A. edwardsi* are distributed in four groups. The dorsal group of glands occurs in the upper lip or labrum, ventral group of glands are seen in the lower lip or labium. A pair of lateral groups is found on each side of the mouth in the glandular tissue.

Several functions have been attributed to the mucous glands of oesophagus and hindgut by various authors⁸⁻¹². In the present study it has been found that these glands subserve the function of lubrication and allow the free passage of food material from



Figures 1 & 2. 1. Section of lips showing the distribution of mucous glands (Azan). 2. A group of cephalic mucous glands (Azan).

mouth into the oesophagus. Since there are no other major sites of mucous synthesis in other parts of the alimentary canal, large amounts of mucoid material come from the glands present surrounding the mouth. During feeding, due to the contractions of the oesophageal muscles, the mucous glands which are abundant near the mouth get compressed and cause their secretions to be discharged into the lumen. Here the mucoid material entangles with the food and acts as a lubricant to facilitate ingestion and passage of food along the oesophagus. A parallel mechanical function may also be attributed to the rectal bulb glands, whose secretions would serve in the movement and possibly binding of the faecal material. Therefore, the role of cephalic mucous glands in the initiation of digestion cannot be ignored.

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ANNOUNCEMENTS

BORLAUG AWARD

Dr N. S. Subba Rao, Head of the Division of Microbiology, Indian Agricultural Research Institute, New Delhi has been chosen for the prestigious Borlaug award for 1982 for his outstanding contributions on the application of biological nitrogen fixation and biofertiliser technologies for improving agricultural production. Dr Rao has evolved efficient strains of nodule bacteria (rhizobium) for diverse leguminous crops. He has recently developed a new azospirillum

biofertiliser for sorghum and millets. He has carried out fundamental and applied work on soil microbiological research and on soil microbiological problems related to plant growth.

The award, instituted by the Coromandal Fertilisers Limited in honour of the Nobel Laureate, Dr. Norman E. Borlaug, is given to eminent Indian Agricultural Scientists. It carries a gold medal, a citation and a cash award for Rs. 10,000/-.

INDIAN SOCIETY OF DEVELOPMENTAL BIOLOGISTS

The Indian Society of Developmental Biologists with the Department of Science and Technology, Government of India is organising a Developmental Biology Training Course for University and College teachers to familiarise them with the embryonic and postembryonic developmental stages of various animals, and to teach techniques for manipulating the same.

The course will be of one week duration and held at Allahabad in mid-March 1984. The number of par-

ticipants will be restricted to a maximum of 20 only. The participants or their sponsoring institutions will have to bear the expenses for travel of participants but expenses incurred on laboratory materials and food will be borne by the organisers.

All intending participants are requested to write at their earliest and giving their biodata, to the Secretary Indian Society of Developmental Biologists, Dr. Suresh C. Goel, Zoology Department, University of Poona, Poona 411 007.
