

Table 1 Effect of *Cedrus deodara* oil on fecundity and fertility of red cotton bug*.

| Treatment | Total eggs laid/pair | Egg hatch (%) | Survival (%) | Oviposition interval (days) | Incubation period (days) |
|-----------|----------------------|---------------|--------------|-----------------------------|--------------------------|
| T ♂ × U ♀ | 258.20 | 47.92 | 32.98 | 6.50 | 8.20 |
| T ♀ × U ♂ | 268.20 | 68.86 | 48.05 | 6.50 | 8.06 |
| U ♀ × U ♂ | 282.60 | 76.30 | 73.53 | 5.80 | 7.97 |

* Mean of 5 replications

T ♂ × U ♀ = Treated male × untreated female.

T ♀ × U ♂ = Treated female × untreated male.

U ♀ × U ♂ = Untreated female × untreated male.

parts. Acetone-treated pairs were taken as control. Five pairs of insects were taken in each treatment while keeping each pair in a separate beaker. Water-soaked cotton was provided as food. The effect on the following combinations was studied; treated male × untreated female; treated female × untreated male; and untreated male × untreated female. The effect of oil application was recorded on fecundity, incubation period, hatchability and survival of offspring.

The data presented in table 1 reveal that the application of cedarwood oil is effective in prolonging the incubation period and in considerably reducing the hatching percentage and survival of 1st instar nymphs. Although very little effect was observed on the fecundity, the eggs laid by the treated pairs of both the combinations were abnormal with a low percentage of hatching. Among treatments the male-treated combination produced more sterile eggs than female treated. This is suggestive of the fact that the cedarwood oil treatment to male bugs is effective in induction of male sterility. Further, the survival of the 1st instar nymphs within 24 hr of their emergence was also hampered in the case of male treatment. The reduction in control up to 25% was due to natural survival of insect under laboratory conditions. The reason for the mortality of nymphs just after their emergence from the eggs may be due to sublethal effect of the essential oil causing alteration in normal physiology of reproduction. The present findings on the fecundity and hatchability of red cotton bug are in accordance with the observations of earlier investigations on an antigonadal substance². Efforts are being made to find out the active compound responsible for this property.

13 September 1985; Revised 30 December 1985

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QUANTITATIVE CHANGES IN THE GLYCOGEN CONTENT DURING GROWTH AND DEVELOPMENT OF *CHILO PARTELLUS* (LEPIDOPTERA:PYRALIDAE)

SABITA RAJA, S. S. THAKUR,
B. KISHEN RAO and AMARJIT KAUR*Department of Zoology,
Osmania University, Hyderabad 500 007, India.*

INSECTS can regulate the concentration of trehalose in their haemolymph¹, usually at the expense of fatbody glycogen². Metamorphic changes in the holometabolus insects were usually accompanied by substantial depletions of their carbohydrate reserves³⁻⁵. Metabolic control of carbohydrate metabolism is often reflected in quantitative alterations in the glycogen, the major carbohydrate reserve. Hence a study was initiated to note the day-to-day variations in the tissue glycogen content during the development of *Chilo partellus*.

The stem borer *Chilo partellus* is the most destructive pest of *Sorghum vulgare* pers (jowar). For experimental purpose, the above insect was reared in the laboratory on artificial diet⁶ at $27 \pm 1^\circ\text{C}$ and RH $65 \pm 5\%$. Glycogen was extracted from the entire larvae, pupae and adult⁷ and was determined by the method of Carrol *et al*⁸ using d-glucose as the standard and expressed in g/100 g of the tissue.

On the first day of the first instar, the glycogen

concentration was around 3.28 ± 0.08 g/100 g of the tissue. There was a gradual increase throughout the first instar reaching a level of about 3.3 g, on the last day of the first instar; the increase persisted reaching a value of 4.2 g/100 g on the final day of the second instar.

A further increase in the glycogen content was noticed during the third instar larval period. The glycogen level was around 4.8 ± 0.08 g/100 g of the tissue on the first day reaching a level of about 5.9 ± 0.06 g, on the final day of the third instar. At the end of the fourth instar period the glycogen content reached a level of about 9.62 ± 0.05 g/100 g of the tissue. The glycogen content further increased during the fifth instar reaching a maximum of around 15.7 ± 0.08 g/100 g of the tissue on the final day of the fifth instar.

There was a decline in the glycogen content during the pupal period. On the first day of the pupal life the glycogen content was around 15.9 ± 0.2 g/100 g of the tissue and on the final day it decreased to 12.9 ± 0.06 g.

The glycogen content in the adults showed a drastic decrement. In the freshly emerged male moths the glycogen content was around 13.1 ± 0.05 g/100 g of the tissue which decreased to about 9.8 ± 0.08 g, just before its death. In the female moth, on the day of emergence the recorded value was 13.3 ± 0.2 g and on the last day it was 9.6 ± 0.9 g/100 g of the tissue (figure 1).

The level of glycogen in *Chilo partellus* showed a gradual increase during the feeding period i.e. the

larval period, with a temporary decline at each moult. In the fifth larval instar, the accumulation of glycogen was intensified in preparation for metamorphosis.

In *Bombyx mori* during the fifth larval instar, the glycogen content increased from 5–20%⁹. Walker *et al*¹⁰ reported that the carbohydrate content of the haemolymph and fatbody increased during the period of intensive feeding of the desert locust *Schistocerca gregaria*.

Depletion of glycogen prior to each larval moult and during pupation in *Chilo partellus* suggested that they were utilized for energy needs and served as a substrate for chitin synthesis. This supports the observations of Bade and Wyatt¹¹ and Lanartowicz *et al*¹².

The decline in the glycogen content was greater in the adults. This could be due to their utilization in flight fuel energy production and also their probable contribution to the protein build-up in the adults. According to Tate and Wimer¹³ and Watson^{14,15}, the depletion in glycogen in the adults is due to its transformation into proteins and lipids.

Variations in the glycogen content were observed during the life cycle of *Chilo partellus*. It is clear that during metamorphosis *Chilo partellus* rely on glycogen sequestered during the larval periods as an energy source and as substrates for the synthesis of chitin.

SR and AK acknowledge the financial assistance from UGC, New Delhi.

5 November 1985; Revised 6 January 1986

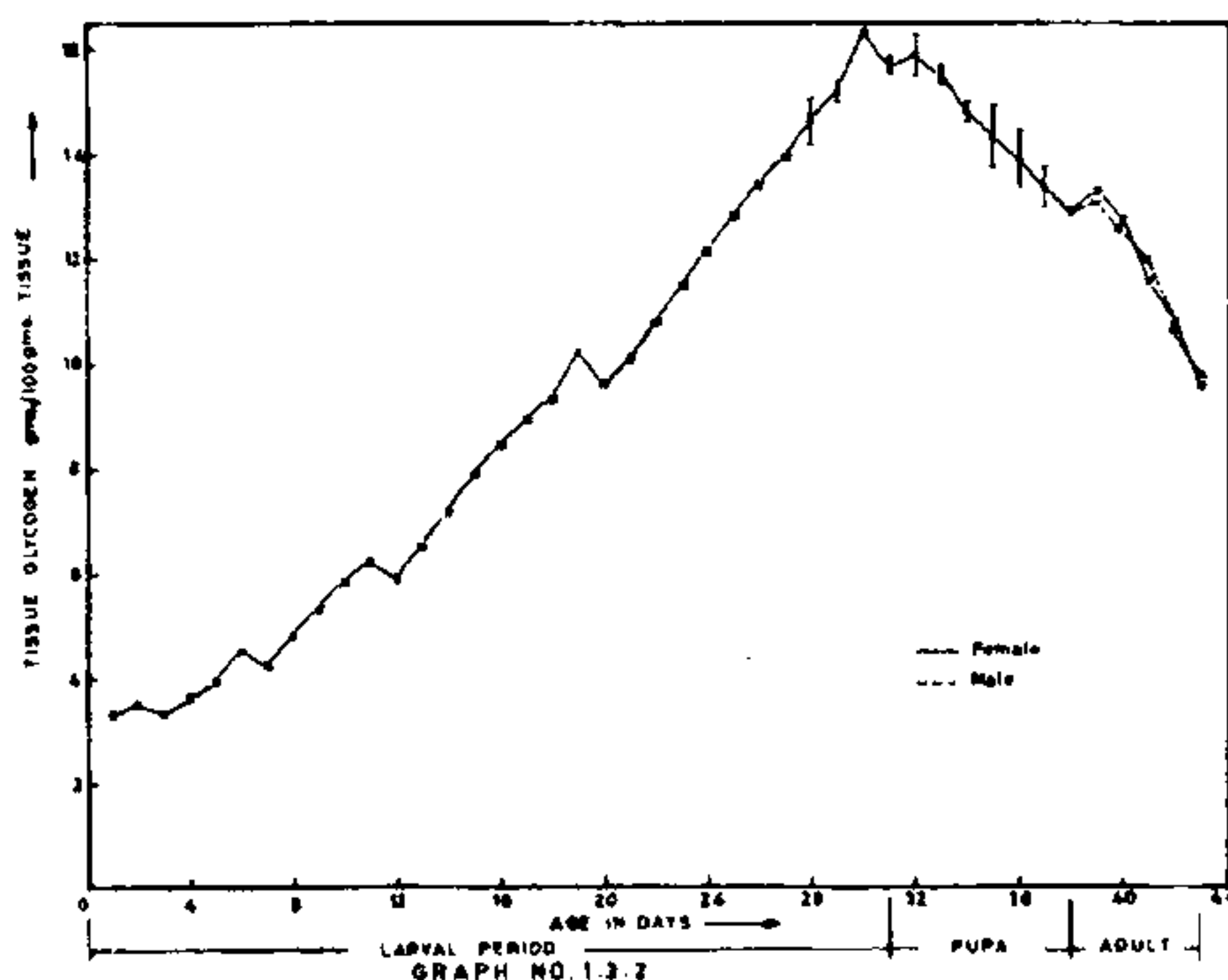


Figure 1. Quantitative changes in the glycogen content of the whole insect extracts during the development of *Chilo partellus*.

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STUDIES ON ULTRASTRUCTURE AND FUNCTION OF THE JAWS OF LAND-LEECH, *HAEMADIPSA ZEYLANICA* (MOQUIN—TANDON)

M. S. POKHARIA

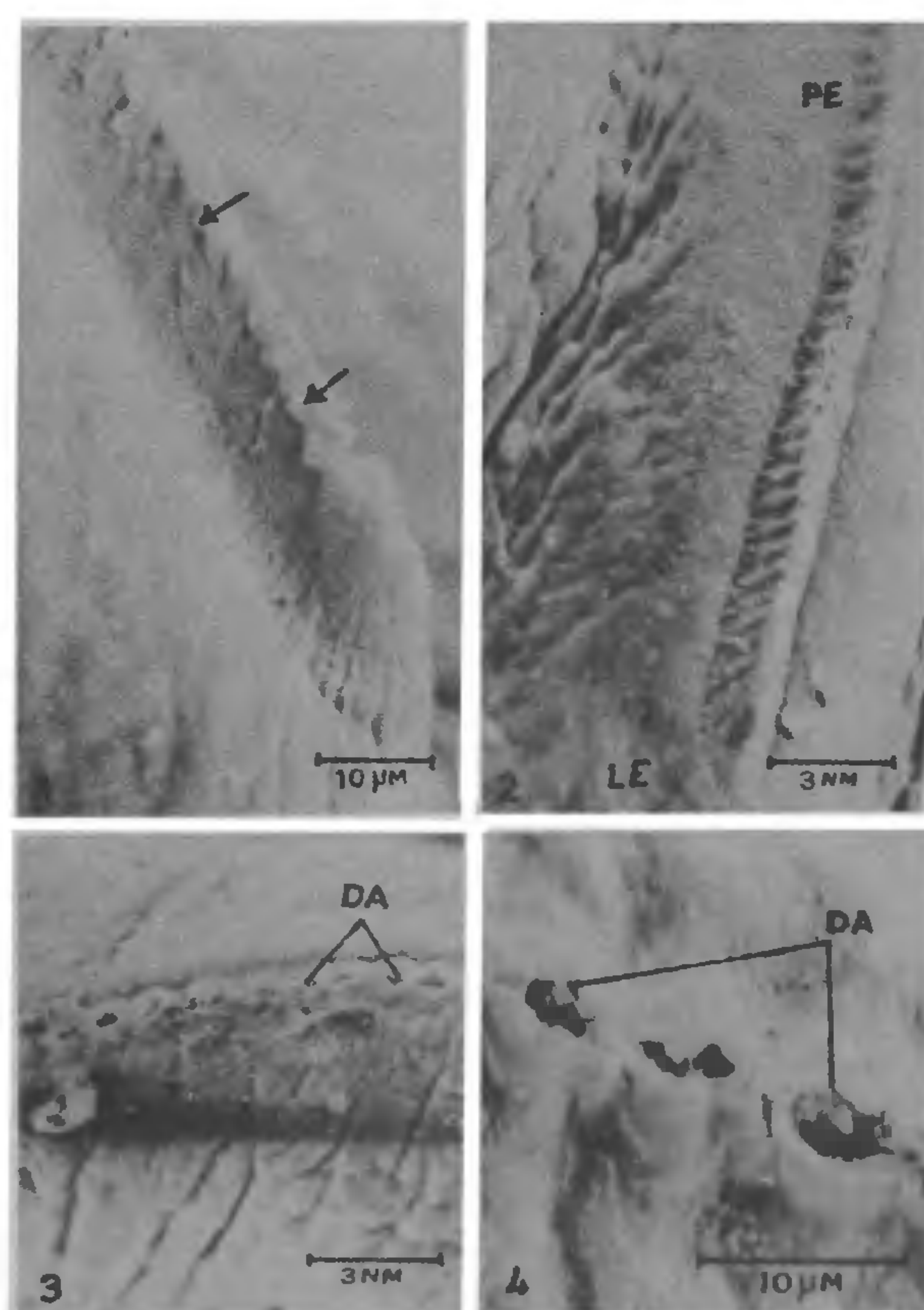
Department of Zoology, University of Lucknow,
Lucknow 226 007, India.

ALTHOUGH considerable work has been reported on the detailed structure of the jaws and biting mechanism of the European leech, *Hirudo medicinalis*¹⁻⁵ and Indian cattle-leech, *Poecilobdella granulosa*^{6,7}, only a scanty account is available for the land-leech, *Haemadipsa zeylanica*, a highly evolved, terrestrial, ectoparasitic sanguivorous Annelid⁸⁻¹⁰. This has prompted the present investigation.

Animals were collected from Pithoragarh, a hill district in the Western Himalayas, and the tissues were fixed in a solution containing 2.5% glutaraldehyde, 1% paraformaldehyde in 0.1 M cacodylate buffer for 4-6 hr at 4°C. Following post-fixation in OsO₄, tissue samples were dehydrated through graded series of acetone and finally critical point-dried in liquid CO₂. The dried samples were mounted on aluminium studs using conductive silver paint and then coated with a thin layer of gold-palladium alloy in a high vacuum evaporator. Samples were examined and photographed under stereoscan (Cambridge 180).

Tri-radiate mouth, lying at the base of the cup-shaped pre-oral chamber, leads into a very short buccal cavity, containing three radially arranged crescentic jaws, embedded in crypts. Two jaws are ventro-lateral in position and are smaller than the third jaw, which is medio-dorsal in position. Each jaw bears an attenuated, sharp and hard dentigerous ridge having a row of minute denticles or "teeth". Such a monostichodont saw-like jaw bears 70 to 99 denticles. A typical denticle is curved outwards. Denticles situated towards the central buccal lumen, are larger in size than those situated peripherally. Another interesting feature, clearly revealed by scanning electron microscopy, is the

presence of intra-denticular and peri-denticular apertures for salivary discharge (figures 1-4). The surface of the jaw is without salivary papillae, but shows aperture-like structures, possibly for pouring out saliva. It is known that for feeding, the leech applies its anterior sucker to the body-surface of the host, pre-oral chamber is flattened, three radially arranged jaws are protruded and moved like a saw to make a tri-radiate "Y"-shaped incision, and the blood is sucked in. Scanning electron microscopy of the jaw gives a detailed insight into mechanism of such a bite by these laterally compressed, semi-circular, monostichodont jaws.



Figures 1-4. 1. Electron photomicrograph of a jaw showing salivary discharge oozing out of the denticular edge (Arrows-salivary discharge). 2. Electron photomicrograph of a jaw showing row of denticles diminishing in size from luminal end (LE) to peripheral end (PE). Note the curved denticles. 3. Electron photomicrograph of a portion of the jaw showing row of denticular apertures (DA). 4. End-on view of a portion of the jaw showing DA.