A WHITEFLY TRANSMITTED YELLOW MOSAIC DISEASE ON GROUNDNUT (*ARACHIS HYPOGAEA* L.)

DURING 1978, a yellow mosaic was observed on groundnut (*Arachis hypogaea* L.) cv. Kopergaon-3 in Andhra Pradesh Agricultural University farm, Hyderabad. The disease is characterized by bright yellow patches on the leaves with shortening, thickening and slight upward curling of leaves. Investigations were undertaken to establish its identity and also its relationship with the yellow mosaic disease reported on pulse crops[1–4].

Mechanical transmission of the disease by preparing the inoculum in 0·1 phosphate buffer, pH 7·0 containing 0·02 M 2-mercaptoethanol was negative. Graft transmission of the disease by cleft method was successful and the symptoms were observed on grafted plants within 15–20 days.

The *Bemesia tabaci* Genn. colonies maintained on tomato, were allowed two days acquisition access period on disease source and fifteen insects were transferred to each individually caged test plants. The insects were allowed on an inoculation access feeding of two days and were killed by spraying 0·1% Dimethoate (Rogor 30 EC). Groundnut plants exposed to viruliferous whiteflies took 18–25 days to show typical symptoms.

The virus was transmitted to the following hosts through whitefly vector: *Phaseolus aureus* Roxb., *P. mungo* L., *Dolichos lablab* L., *D. biflorus* L. and *Cajanus cajan* (L.) Millsp. reacting with bright yellow mosaic. Groundnut cv. TMV–2 produced necrosis on the leaves with slight curling and thickening of leaves. This reaction was confirmed by back indexing on Kopergaon-3.

In transmission, host range, and symptoms, the yellow mosaic on groundnut reported here resembled mung bean yellow mosaic disease[5]. This is the first report on the occurrence of a whitefly transmitted yellow mosaic on groundnut.

The authors are grateful to Dr. D. V. R. Reddy, ICRISAT, for the guidance in preparing the manuscript.

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EFFECTS OF PARASITISM ON THE NEUROSECRETORY CELLS OF THE HOST, *LYMNAEA LUTEOLA*

THE studies conducted on different aspects of host parasite relationship of the two freshwater snails, *viz.*, *Lymnaea luteola* and *Melanoides tuberculatus* have revealed that the larval trematodes cause structural changes and bring about physiological aberrations in these molluscan hosts[1]. Parasitic castration due to larval trematodes has also been reported in *Musculium partumeium*,[2] *Lymnaea stagnalis*[3] and *Indoplanorbis exustus*[4].

The fecundity (the egg production) of the host, *L. luteola* was also reduced considerably as a result of gonadial invasion by the larval trematodes[1]. Chintawar[5] observed that neurosecretions of *I. exustus* are involved in reproduction. Joosse[6] and Hanumante *et al.*[7], reported a series of changes in the neurosecretory cells of molluscan hosts due to larval trematode infections. The present investigation was undertaken to observe the changes in the neurosecretory cells of the freshwater pulmonate snail, *Lymnaea luteola* infected with the larval stages of *Echinostoma revolutum*. The earlier studies were conducted on the naturally infected snails, but in the present study the snails were infected under laboratory conditions with known number of miracidia (infective stage) of *Echinostoma revolutum*.

The freshwater snails, *Lymnaea* (*Pseudosuccinea*) *luteola F. typica* Lamarck were collected from the ponds surrounding the campus area, Osmania University and were acclimated to the laboratory conditions for three weeks. The water in the aquaria was replaced daily with fresh chlorine free tap water. They were fed with *Spinacea oleracea* leaves. The metacercarial stages of *Echinostoma revolutum* collected from the naturally infected snail hosts were fed to the chicks and maintained in the laboratory for 3 weeks. After 3 weeks the eggs of the parasites were collected from the faeces of the experimental chick. The released miracidea were collected and each *L. luteola* was infected with 10 miracidea. The normal and infected snails were maintained separately in two different aquaria. The parasitized snails released the cercariae after four weeks. At this stage the cerebral ganglia of the infected snails and the controls were dissected and were fixed immediately in Bouin's fluid for 24 hours. After the usual histological processing, the tissues were embedded in paraffin wax and sections were cut at 6 μm; they were stained with chromealum haematoxylin phloxin method of Gomori[8]. The neurosecre-

tory material intensity was measured following the method of Nagabhushanam and Hanumante[8].

The cerebral ganglion of *L. luteola* consists of a dorsal and a ventral part. In the cerebral ganglion three types of neurosecretory cells have been observed. These three types of cells are designated as A, B and C cells. The A cells (larger) and C cells (very small) are stained blue black with Chromealum Haematoxylin, whereas the B cells (smaller than A cells) took the red colour of phloxin. The measurements of neurosecretory cells and neurosecretory material intensity are given in Table I.

TABLE I

Changes in the B-neurosecretory cells of L. luteola *infected with the cercariae of* E. revolutum *as compared to controls*

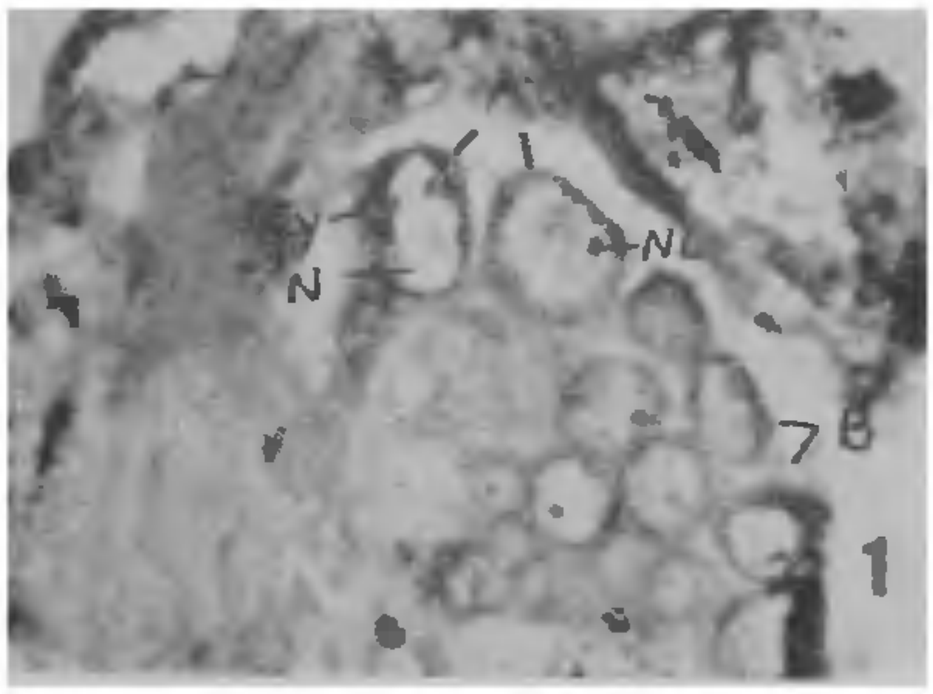
Values are Mean ± S.D. of 15 cells/10 individual observations

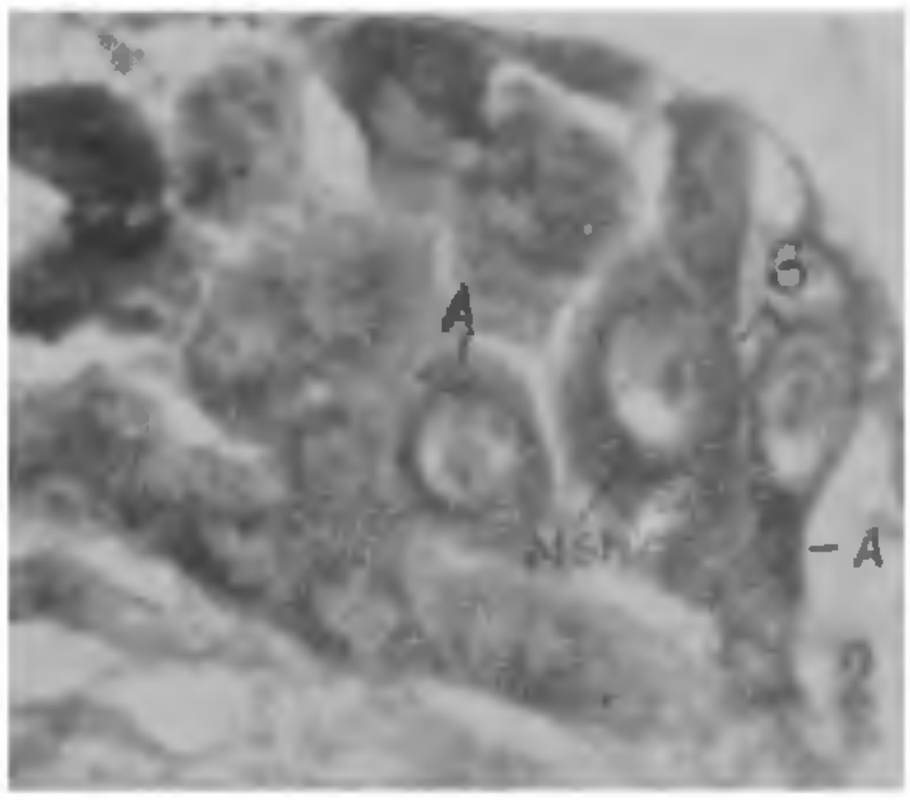
	Cell diameter	Nuclear diameter	Neuro-secretory material intensity No.
Controls	42·32 ± 8·61	8·86 ± 0·14	2
Infected	71·85* ± 9·24	10·34** ± 0·15	5

* $P < 0{\cdot}001$; ** $P < 0{\cdot}005$.

No detectable variations have been observed in the A and C cells but some changes have been observed in the structure of B cell, thus the changes in the B cells have been taken into account. The increases in B cell diameter and nuclear diameter are significant at 1% and 5% levels respectively. The intensity of neurosecretory material has also increased in the parasitized snails (Fig. 2). Slight neurosecretory material has been observed in the controls (Fig. 1). The neurosecretory material was found in the perikarya and axons of the cells in the infected snails, and its intensity can be designated as No. 5. Many big vacuoles were observed in the nuclei of both the types of cells of control snails which resulted in pushing the nucleolus to one side (Fig. 1). But not many vacuoles have been observed in the infected snails, hence there is little displacement of nucleoli in them. The centrally located nucleoli can be clearly seen in B cells (Fig. 2).

The structure of cerebral ganglion of *L. luteola* is similar to that of *L. stagnalis*[6] and different from that of *I. exustus*[5] which has only two types of neurosecretory cells. It is clear that the increased nuclear diameter of B cells in the infected *L. luteola* has led to the increased synthesis of neurosecretory material of the parasitized snails. The neurosecretory material has also been observed in the axons, which suggests that this material is transported through this region. Joosse[6] reported that the neurosecretory cells of infected *L. stagnalis* are destitute of neurosecretory material and Hanumante *et al.*[7], reported an increase of this material in *I. exustus*.





FIGS. 1–2. Fig. 1. The neurosecretory cells (A and B) of normal *L. luteola*. Note the low activity of neurosecretory material and the presence of vacuoles, × 450. Fig. 2. The neurosecretory cells of infected *L. luteola*. Note the increased neurosecretory material in the B-cells and its presence in the axons, × 450.

The exact cause for the observed changes in the B cells is not definitely known at this stage. It may be due to the secretions of toxic substances produced by the parasites. The histopathological and physiological changes observed in *L. luteola* due to parasitism[1] might have caused indirectly the changes in the neurosecretory cells or it may be due to the invasion of the gonads of the host by the larval trematodes. Since, marked changes have been observed in the gonads and the neurosecretory cells of this host during parasitism, it can be said that the latter are involved in the regulation of gonads.

One of the authors (GVRK) wishes to thank UGC for financial assistance.

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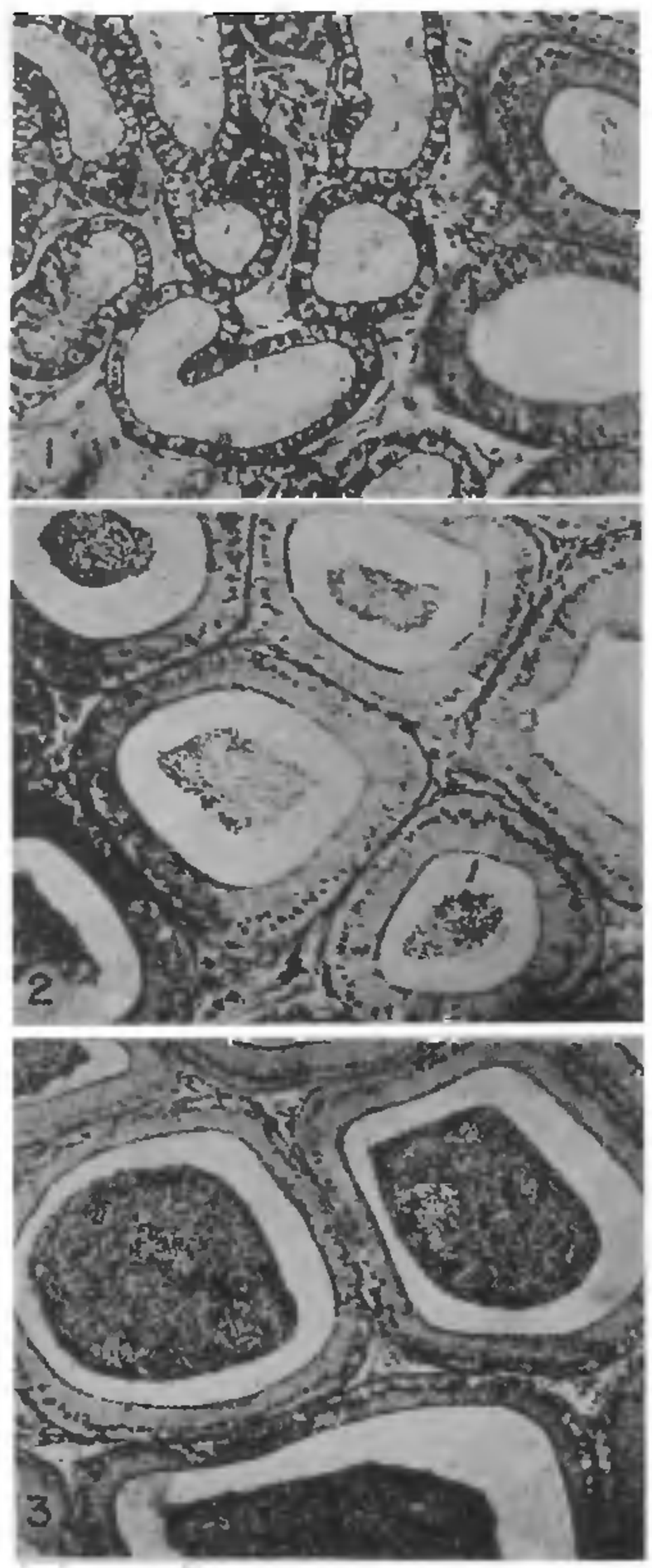
REGIONAL DISTRIBUTION OF STEROIDOGENIC ENZYMES IN THE EPIDIDYMIS OF THE LIZARD, *PSAMMOPHILUS DORSALIS* (GRAY)

EPIDIDYMIS is a novel accessory reproductive organ making its first appearance in reptiles in vertebrate evolution at the advent of terrestrialization and internal fertilization. It has reached its culmination in mammals where it shows regional differentiation and functional adaptation[1]. Several enzyme systems involved in steroid metabolism have been reported in the epididymis and these enzymes are shown to exhibit differential activity in different regions of the epididymis consequent on the assumption of the functions of physiological maturation of spermatozoa[2–6]. The seemingly simple reptilian epididymis which may perform the same functions also seems to have the necessary enzyme systems for steroid metabolism[7–9]. The present study reports for the first time the regional functional differentiation of the epididymis of the lizard, *Psammophilus dorsalis*.

Sexually mature lizards were collected during breeding season (May–August). The animals were autopsied by decapitation, the epididymides were removed. One of the epididymides was immediately frozen at — 20° C and 16 μ thick sagittal sections were cut in a cryostat maintained at —20° C. Air-dried cryostat sections were incubated in serological water bath at 37° C for one hour in appropriate incubation medium containing different substrates, co-factors and tetrazolium salt. Δ^5–3β-hydroxysteroid dehydrogenase (Δ^5–3β-HSDH) and 17β-hydroxysteroid dehydrogenase (17β-HSDH) were localized according to Baillie *et al.*[10]. Parallel cryostat sections were also incubated to demonstrate glucose-6-phosphate dehydrogenase (G–6–PDH) and reduced nicotinamide adenine dinucleotide ($NADH_2$) diaphorase as per the method of Altman[11] and Chayen[12]. The intensity of enzyme activities was visually quantitated. The other epididymis was fixed in Hollande-Bouin, following usual dehydration and paraffin embedding, sagittal sections were serially cut at 6 μ thick and stained in Haematoxylin-Eosin for histological observations.



FIGS. 1–3. Paraffin sections of the epididymis showing epididymal tubules and epithelial cell height in the anterior (Fig. 1), middle (Fig. 2) and posterior (Fig. 3) regions. Haematoxylin-Eosin, × 63.