and sporogony causing hypertrophy which occasionally attains enormous size, sometimes even visible to the naked eye[5]. Moreover, spores of *G. anomala* were found ingested by cells of granular tissue including fibroblast[6] but these cells have not been recognized. It has been reported that the periodic acid schiff-positive granular leucocytes (PAS-GL) change their size and contents when migrating to the brain of minnow *Phoxinus phoxinus* L., feeding the parasite *Diplostomum phoxini* and preventing its effect on the brain and at the end protecting the brain from destruction or damage[7]. These cells attack the parasites and destroy them after 35 days post-infection at 25°C, and 120 days later the remains of the parasites are ingested by these cells. For histochemical study, pieces of ovaries infected with *G. anomala* were fixed with 10% neutral formalin and Rossman's fluid. The paraffin-embedded samples were cut into 7μm thick sections, stained with haematoxylin and eosin (H & E) and with aqueous and alcoholic PAS, a special technique for mast cells[2,7].

Cysts were found surrounded by accumulations of rounded eccentric nucleus cells (figures 1–3). They reacted positively to the PAS stain, identical to the reaction of the PAS-GL which were found in the brain and other sites such as thymus gland and head kidney of *P. phoxinus* in response to the presence of *D. phoxini* after 3–7 days post-infection. These cells were described as a precursor of mast cells[8–10]. In the present investigation, PAS-GL cells were fixed in the thymus gland and head kidney as well but no evidence of these cells was seen in the blood stream.

The concept of an essential rout taken by the PAS-GL cells could, therefore, be suggested, indicating a rapid communication between the ovary damaged by the invasion of *G. anomala* spores and the PAS-GL cells. This rout could be blood born but through the heart which is not as direct as it is in the lymphatic system.

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SEM STUDIES ON SPERMODERM OF SOME GALEGEAE (FABACEAE)

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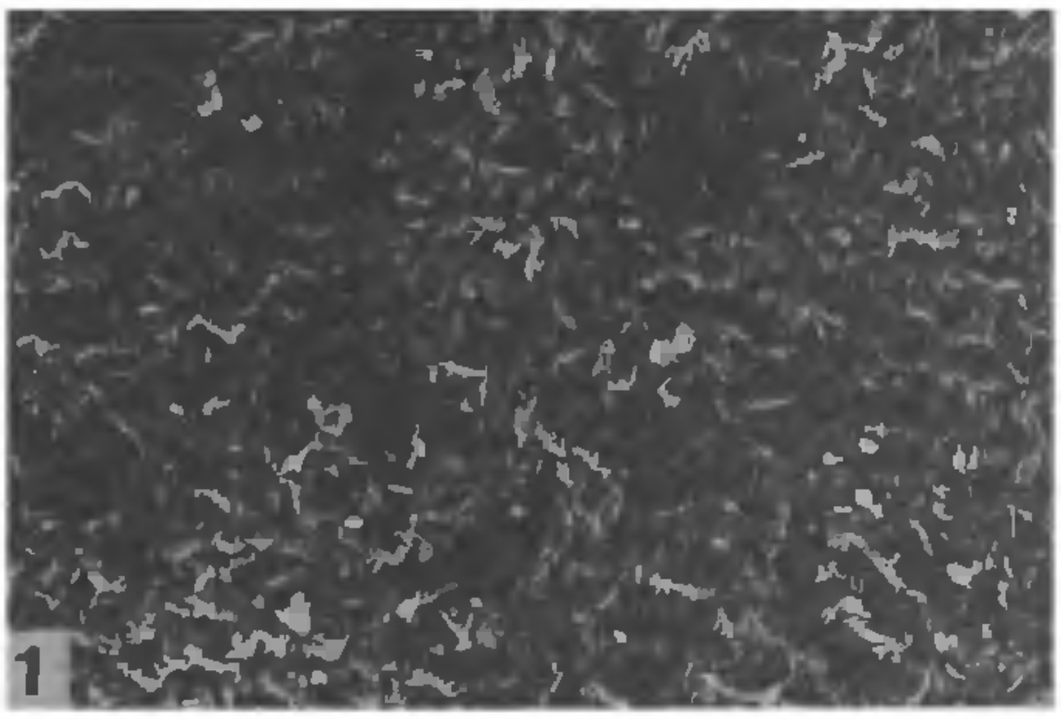
THE tribe Galegeae of subfamily Papilionoideae (Fabaceae) includes 20 genera and 2589 species[1]. A perusal of literature reveals that SEM studies on testa topography in the members of Galegeae have been carried out only on 21 species[2]. The present communication describes spermoderm pattern in 5 taxa of this tribe.

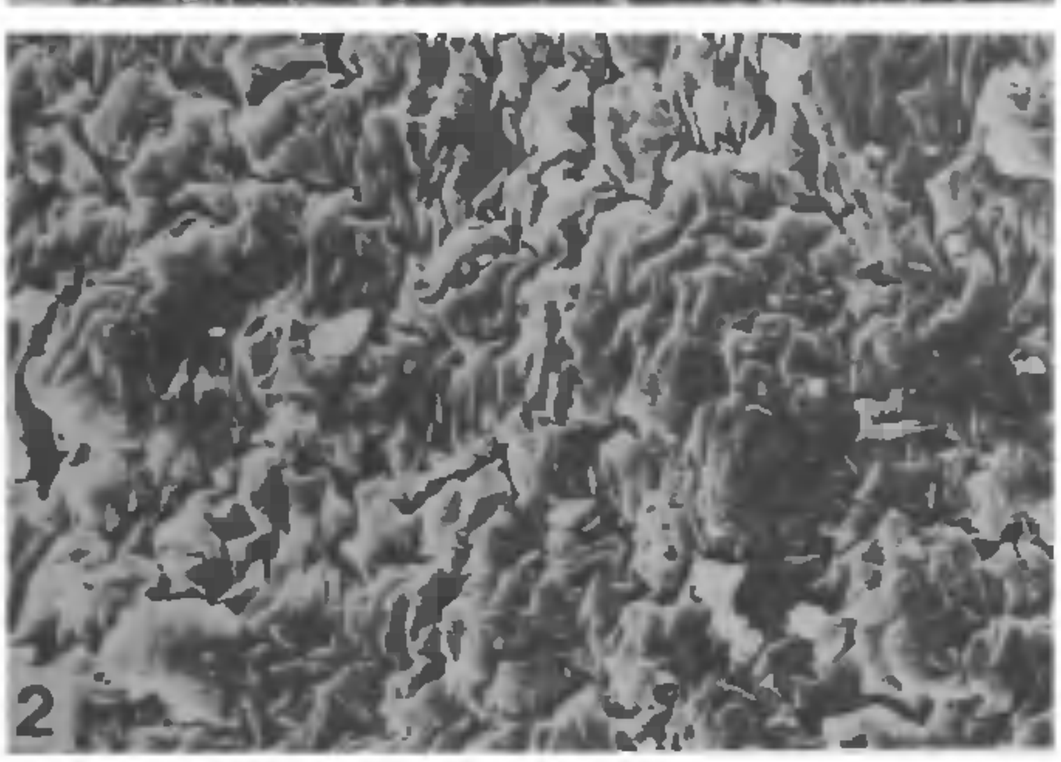
Mature seeds were obtained from the Royal Botanic Gardens, Kew. For SEM, seeds were mounted on brass stubs and coated with a very thin layer of gold (200 Å) in sputter coating unit. Scanning was done on Jeol-JSM-35C SEM at the National Botanical Research Institute, Lucknow. In all seeds, the side below the hilum was scanned at a constant tilt (45°) with the accelerating potential at 15 kV.

Seeds of *Alhagi maurorum* show reticulate ornamentation (figure 1). The reticulae are covered by diagonally oriented cuticular striations which mask the underlying reticulae to a considerable extent. Irregularly distributed flakes of waxy deposition are seen over the spermoderm surface. Reticulate ornamentation has also been reported in *Alhagi persarum*[2].

In *Galega officinalis* seeds show rugulate ornamentation (figure 2). The rugae are covered by some waxy substance which forms a film over the entire surface. Besides this, flakes of wax are seen irregularly distributed over the seed surface.

Seeds of *Oxytropis campestris*, *O. halleri*, and *O. lapponica* reveal a rugulate spermoderm but the

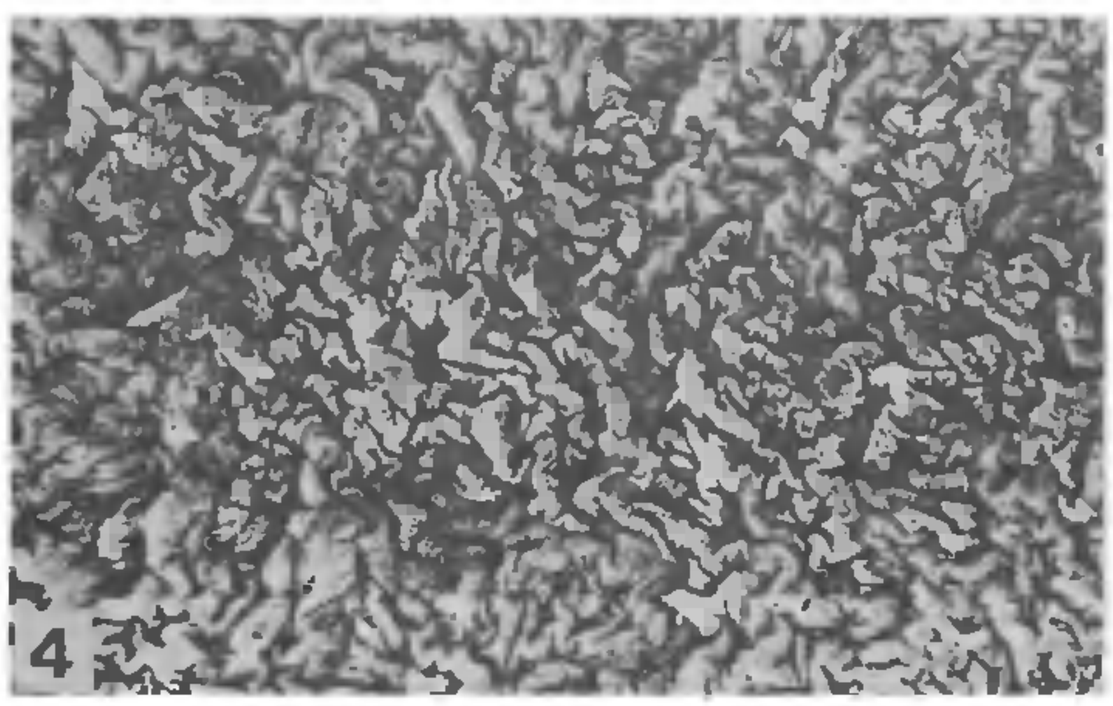


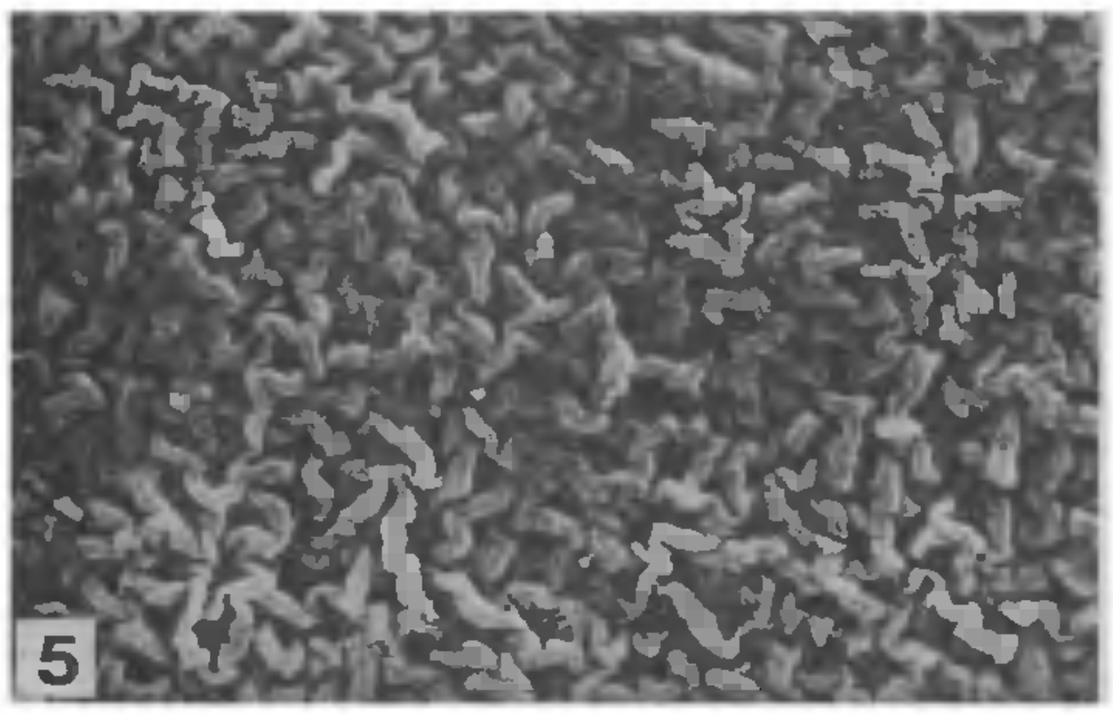


Figures 1 and 2. SEM photomicrographs. **1.** *Alhagi maurorum* (x 2000), **2.** *Galega officinalis* (x 2000).

arrangement of rugae varies to some extent among these taxa. In *O. campestris* the rugae are large, prominent having heavy walls (figure 3). The rugae tend to form reticulae. In *O. halleri* rugae are compactly arranged. This results in narrowing the gaps in between each rugae and the walls are shrinked to a greater extent (figure 4). In *O. lapponica*, on the other hand, spermoderm shows prominent rugae which anastomose each other giving an interwoven appearance (figure 5). The rugae are separated from one another by deep grooves. The spermoderm shows a few sporadically distributed waxy flakes.

Genera of tribe Galegeae are divided into 4 subtribes[1]. A survey of spermoderm pattern in members of tribe Galegeae studied earlier[2] and those studied presently shows that each subtribe is dominated by a definite pattern of spermoderm, viz. Coluteinae (foveolate), Astragalinae (reticulate), Galiginae (rugulate) and Glycyrrhizae (levigate). More data on testa topography in Galegeae are, however, needed to draw definite conclusions regarding the systematic significance of spermoderm pattern in this tribe.





Figures 3–5. *Oxytropis* species, SEM photomicrographs. **3.** *O. campestris* (x 4000); **4.** *O. halleri* (x 4000), and **5.** *O. lapponica* (x 3000).

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