pathogen was recorded in sterilized seeds by the blotter paper method. However, the difference is marginal. But it indicates the vital role of seed surface as a carrier of pathogen from one season to the next. Further, the difference in population of the fungus by the blotter and agar plate methods was 20.25% and 11.25% respectively (table 2). The blotter paper yielded more test fungus because in the agar plate method, there are greater chances for the growth of other saprophytes which may utilize the available nutrients from the medium and act as a competitor to the test fungus[4].

The present findings clearly show that the disease perpetuates through infected seeds which is earlier reported in several *Collectotrichum* spp. with many host plants[5,7]. However, *Collectotrichum* spp. can survive with urd bean seed up to 5 years[8]. But in the present study, the pathogen was isolated only for one year. The present observations indicate the potentiality of urd bean seed as a carrier of primary inoculum.

Germination percentage gradually increased with the increase in the storage period. The increase in germination was inversely proportional to the number of seeds carrying viable inoculum. Initially, germination was less, probably due to the maximum density of the active fungus or dormancy of the seeds.

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1. Tripathi, H. S. and Beniwal, S. P. S., *Indian Phytopathol.*, 1977, 30, 273.
2. Neergaard, P. and Saad, A., *Indian Phytopathol.*, 1962, 15, 85.
3. *Proc. Int. Seed Test Assoc.*, 1966, 32, 1.
4. Tempe, J. De., *Proc. Int. Seed Test Assoc.*, 1961, 26, 27.
5. Rai, I. S. and Chauhan, J. S., *J. Res. P. A. U.*, 1966, 3, 32.
6. Agarwal, V. K., Mathur, S. B. and Neergaard, P., *Indian Phytopathol.*, 1982, 25, 91.
7. Singh, R. S., *Plant diseases*, Oxford and IBH Publishing Co., New Delhi, p 391.
8. Siddiqui, M. R., Mathur, S. B. and Neergaard, P., *Seed Sci. Technol.*, 1983, 11, 353.

STRUCTURE, ONTOGENY AND SECRETION OF OIL SECRETING GLANDS IN *HIPTAGE ACUMINATA* WALL.

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VOGEL[1] reported the occurrence and function of oil secreting glands in Malpighiaceae and noted for the first time that oil acts as a primary pollinator attractant in plants of this family. Similar glands in *Krameria* (Krameriaceae) are found to secrete oil which contains β-acetate-substituted free acids[2]. Studies on the structure and secretion of lipophilic glands are meagre. The present paper reports the structure, development and secretion of lipophilic glands in *Hiptage acuminata*.

Lipophilic glands at various stages of development were collected from *Hiptage* plants in the University Botanical Garden. The glands were processed for histology and sections 6–8 μm and 1 μm thick were cut and stained. Observations and photomicrography were carried out using a Carl-Zeiss Photomicroscope-1 and a Carl-Zeiss epifluorescence microscope using u.v. range filters.

The lipophilic glands are greenish-yellow and are found at the base of each of the five sepals (figure 1A). Each gland is bifid and kidney-shaped (figure 1B) and originates from a group of epidermal and sub-epidermal cells on the abaxial surface of the sepal (figure 1C, D). The epidermal cells divide anticlinally and give rise to a single-layered secretory palisade-like epithelium. The sub-epidermal cells divide in all planes and form the sub-epithelial tissue. The epithelial cells are elongated, palisade-like, darkly stained and contain granular cytoplasm (figure 1E, F). A branch of vascular bundle from the pedicel diverges into the sub-epithelial tissue (figure 1E). It is mainly composed of phloem. Observations using epifluorescence microscopy confirmed the presence of lipid in the epithelial cells during secretion (figure 1G). Thin-layer chromatography indicated the presence of fatty acids and sitosterol components. In addition, two lower spots, probably indicating short-chain fatty acids, were also detected. They are yet unidentified. During secretion the lipophilic material accumulates beneath the cuticle lifting the cuticle from the epithelial cells. Finally the cuticle breaks open to release the secretion.

In the Malpighiaceae the Old World representa-

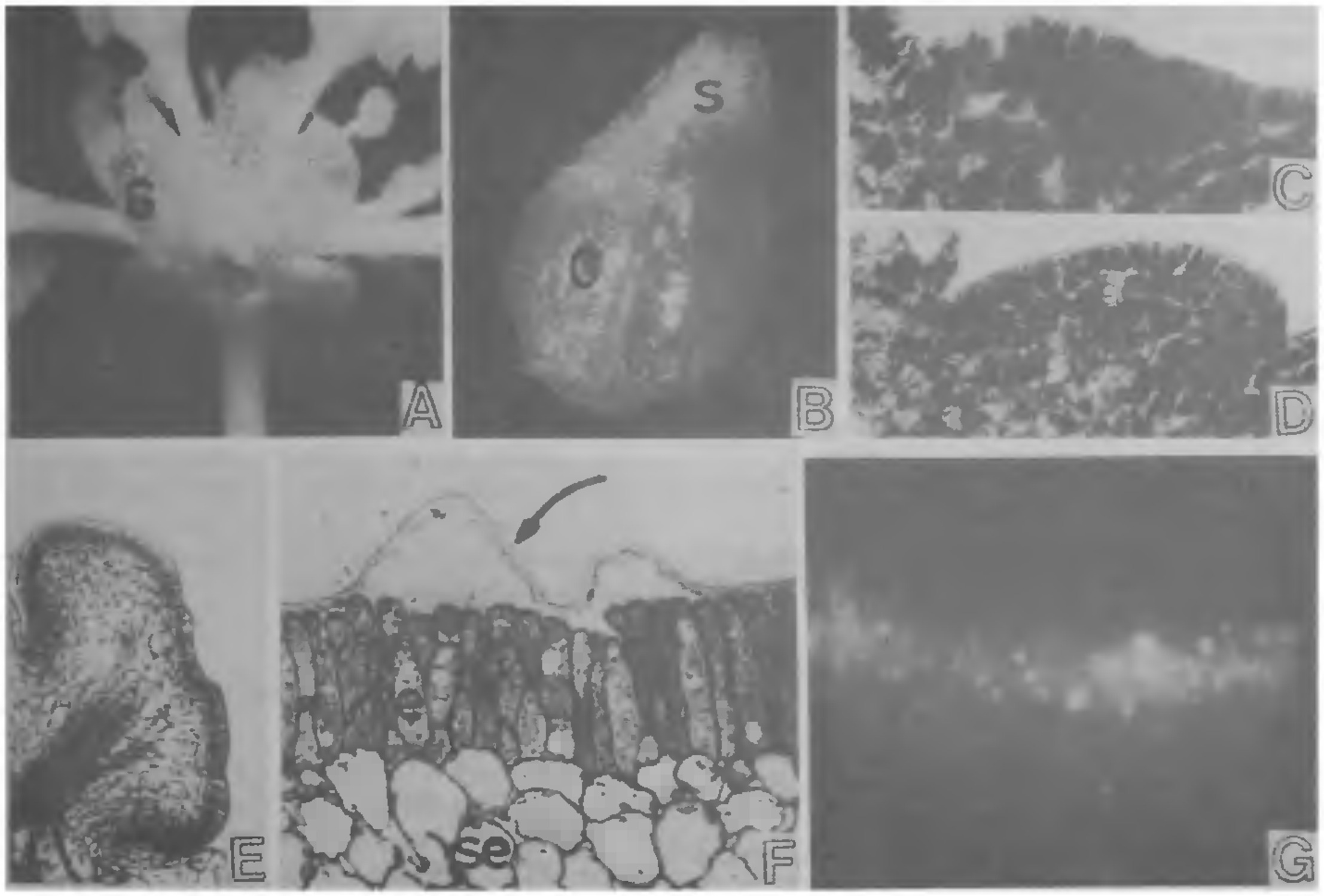

Figure 1A–G. **A.** Tessovar photograph of *Hiptage* flower showing lipophilic glands on sepals; **B.** A sepal abaxial surface showing bifid lipophilic gland; **C and D.** Sections showing developmental stages of lipophilic gland (C. ×496) (D. ×368); **E.** LS of sepal showing a mature lipophilic gland with prominent vascular supply (arrow) (×130); **F.** TS of lipophilic gland at the secretory stage. Note the lifted cuticle (arrow) (×384) and **G.** Epifluorescence photomicrograph showing lipophilic deposition in the epithelial cells at the secretory stage (×780). [G, Gland; S, sepal; e, epidermal cell; se, sub-epidermal cell.]

tives are said to possess nectaries while the New World species have lipophilic glands or elaiophores[3]. Baker[4] analysed the lipophilic secretions of Malpighiaceae and traced small amounts of main nectar sugars and amino acids. This probably indicates that the lipophilic glands are derived from extrafloral nectaries. Similarities in the structure and manner of secretion support this view. It will be interesting to analyse the secretory material in detail for any unusual fatty acid or steroid component. This may not only reveal novel kinds of compounds but new hymenopteran metabolic pathways as well, since these secretions reportedly attract pollinators[1].

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1. Vogel, S., *Eleventh Int. Bot. Congress Abstr.*, 1969, p. 229.
2. Simpson, B. B., Neff, J. L. and Siegler, D., *Nature (London)*, 1977, **267**, 150.
3. Faegri, K. and Vand der Pijl, L., *The principles of pollination ecology*, 1979, p. 69.
4. Baker, I., *Bot. Gaz.*, 1978, **139**, 322.