spreading at maturity. Conidiophores erect, hyaline, simple, aseptate, cylindrical, without terminal proliferation, 5–10 μm × 1–2 μm. Conidia produced singly, long, fusiform fulcate, 3 septate, tapering at each end, gently constricted at the septum, smooth walled, measure 28–37·5 (31) μm long, 4–5 (4·5) μm wide. Two medium cells 15·5–20 (17) μm long are pale brown to olivaceous and separated from the hyaline end cells by the transverse septum. Apical cell is long, conical, truncated by a short stout apical appendage measuring 6·7 (6·5) μm barely distinguishable from the apical cell. The basal cell is long truncate with distinct marginal frill. The basal appendage is exogenous, stout, hyaline, unbranched and 6·5–10 (7·5) μm in length.

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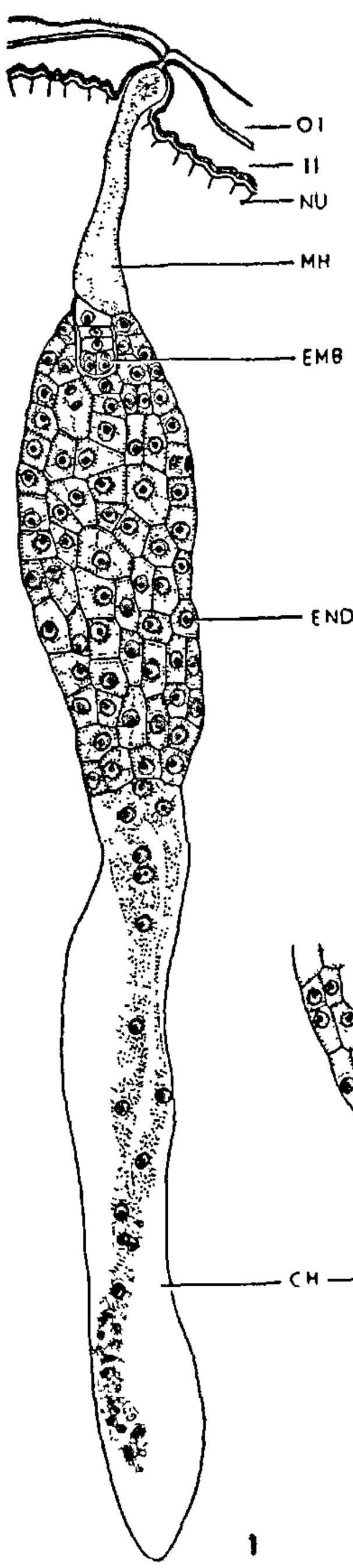
ENDOSPERM OF *SCLERIA FOLIOSA* HOCHSTETTER Ex A. RICHARD

The endosperm in the Cyperaceae has been remarkably uniform in being nonhaustorial and in following the nuclear ontogeny. However, our investigations on *Scleria foliosa* revealed some strikingly unusual features which have not been previously described in any other taxa of the family, and these are presented here.

The endosperm development is of the nuclear type. The primary endosperm nucleus, by repeated free nuclear divisions, gives rise to several nuclei which become distributed in a thin peripheral layer of cytoplasm. The central part of the endosperm is occupied by a large vacuole. At the binucleate stage of the endosperm, a tubular extension is formed at the micropylar end of the embryo sac. This outgrowth reaches the micropyle and functions as the micropylar haustorium. It remains enucleate with a relatively scanty cytoplasm (Fig. 1).

The centripetal wall formation begins around the proembryo and is restricted only to upper one-third of the endosperm forming the endosperm proper (Fig. 1). The chalazal part which remains coenocytic elongates right up to the base of the nucellus. It has dense cytoplasm and often shows "nodule-like" nuclear aggregations and serves as the chalazal haustorium (Figs. 2 and 3). The latter destroys the nucellar cells adjacent to it and remains active up to the late globular stage of the proembryo. As the growth of the cellular endosperm increases, the chalazal haustorium folds up and eventually degene-



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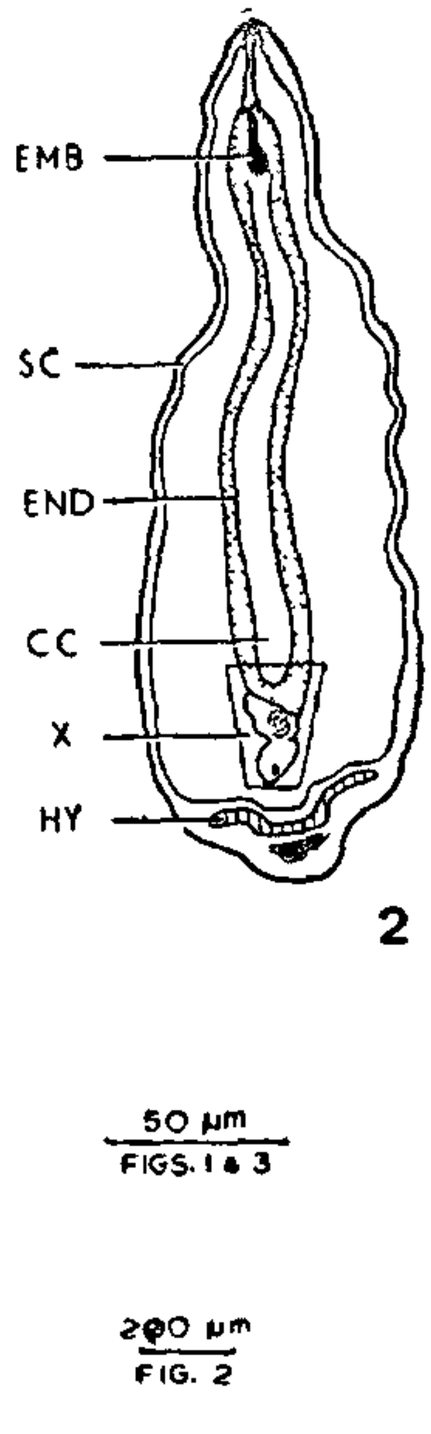

2

50 µm
FIGS. 1 & 3

200 µm
FIG. 2

3

Figs. 1-3. Endosperm of *Scleria foliosa*. Fig. 1. Cellular endosperm with micropylar and chalazal haustoria. Fig. 2. L.S. of seed showing a central cavity in the endosperm. Fig. 3. Portion marked 'X' in Fig. 2 is enlarged to show nuclear aggregations in the chalazal haustorium.

(CC, central cavity; CH, chalazal haustorium; EMB, proembryo; END, endosperm; HY, hypostase; II, inner integument; MH, micropylar haustorium; NU, nucellus; OI, outer integument; SC, seed coat).

rates. However, its remnants are noticeable even at the older stages of the seed. Thus, the endosperm of *Scleria foliosa* differentiates into micropylar haustorium, endosperm proper and chalazal haustorium. As the development proceeds, some of the cells in the central core of the endosperm proper disintegrate as they fail to keep pace with the rapidly expanding peripheral endosperm tissue and results in the formation of a central cavity (Fig. 2) which persists even at maturity.

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SOLUBILITY DIFFERENCES OF POLLINIAL AND POLLEN WALLS OF ASCLEPIADACEAE AND THEIR SIGNIFICANCE

THE chief constituent of pollen exine is sporopollenin —a polymer of carotenoids resistant to biological and chemical degradation[1]. Sporopollenin is also reported to be a major constituent of the sac-like pollinial walls that enclose the pollen grains of *Calotropis*[2,3] and *Pergularia*[4] (Asclepiadaceae). The similarity in the chemical constitution of pollen and pollinial walls is demonstrated by their acetolysis resistance and solubility in the sporopollenin specific solvent of fused KOH as well as by various cytochemical tests.

Although pollen exines are basically composed of poropollenin, the ectexine (exine-I) and the endexine (exine-II) respond differently to stains[5]. More significantly, solvents like 2-aminoethanol dissolve exine-I while exine-II remains insoluble. This preferential solubility suggests the chemical dissimilarity of the sporopollenin of exine-I and II of pollen walls. Would such zonal differences in solubility exist in the predominantly sporopollenin containing pollinial walls of Asclepiads? This possibility is examined and the results are presented in this report.

Pollinia of the following genera of Asclepiadaeeae were tested: *Asclepias, Calotropis, Ceropegia, Daemia, Hoya* and *Tylophora*. The controls used were the pollen grains of 5 non-asclepiadaceous genera (*Cosmos, Tridax, Zinnia, Mussaenda* and *Paspalum*). Both pollinia and pollen grains were treated in cold and hot 2-aminoethanol and in solvent systems of sodium chlorite + acetic acid and ammonium hydroxide + hydrogen peroxide. These reagents have already been tested on pollen walls and are reported to dissolve, degrade or swell exine-I without any apparent action on exine-II[6].

Cold 2-aminoethanol has only slight reaction on pollen and pollinial walls. Within 2 min of contact with the solvent, the walls take a pale yellow colour and by 10 min the pollen grains appear to be slightly swollen with the intine bulging out through the germ pores. As for the pollinia, there is no evident swelling but the outline of the germinating region becomes wavy and more distinctive. Both pollen and pollinial walls showed no signs of disintegration even after a day in cold aminoethanol.

In contrast, hot 2-aminoethanol reacted with pollen and pollinial walls leading to partial or full dissolution. The exine-I of non-asclepiadaceous pollen grains dissolved but not their exine-II. However, the walls of Asclepiad pollinia completely dissolved without leaving any resistant layer or membrane resembling exine-II.

The process of dissolution of pollinial walls of all Asclepiads in aminoethanol at 70° C is basically similar and may be summarized as follows. Within 1 min of contact with the hot solvent, the pollinium turns pale yellow. The structural continuity of the pollinium is lost within 15 min and as dissolution progresses, wall material appears as globules. By 20 min, no trace of the pollinial wall could be recognised and the enclosed pollen grains separate. Interestingly, the walls of the freed pollen grains retain their identity and remain insoluble even after an hour in the solvent. Thus, the sporopollenin containing pollen and pollinial walls of Asclepiads show differential solubility in hot 2-aminoethanol.

Effects of other solvent reagents are equally revealing. Sodium chlorite + acetic acid system degrades exine-I resulting in loss of structural identity but leaving some residues of the wall material behind. Exine-II is impervious to these chemicals. However, in all Asclepiad genera, these solvents completely degrade the pollinial walls but not the walls of the enclosed pollen grains. Similarly, ammonium hydroxide and hydrogen peroxide, which cause the swelling of exine-I without altering the nature of exine-II, bring parallel responses in pollinial and pollen grain walls respectively of Asclepiads. In short, the action of solvent systems on pollinial walls and exine-I of pollen walls is similar.

The differential response of exine-I and II to solvents may be interpreted on the basis of the presence of