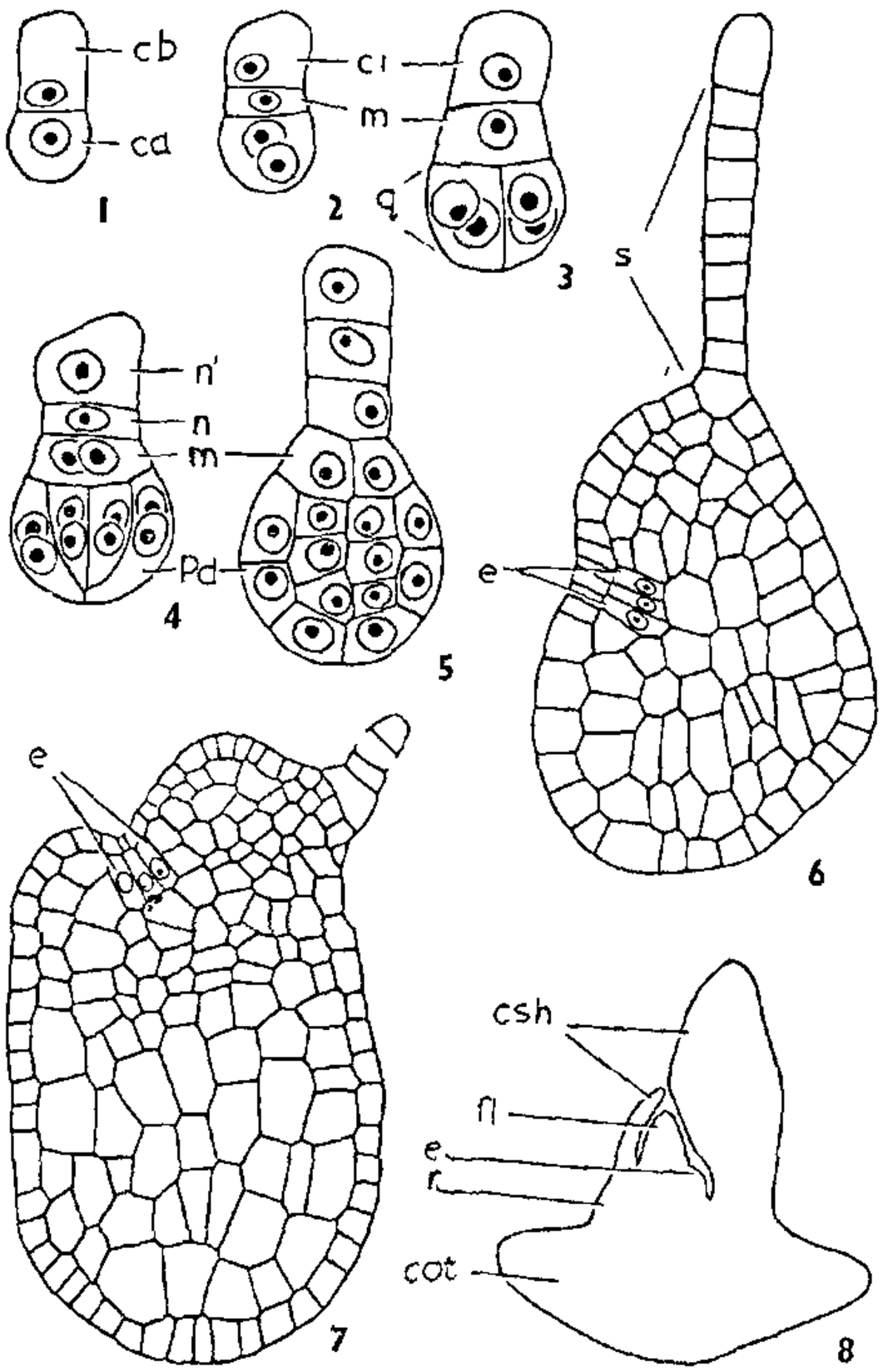
tubular cotyledonary sheath becomes highly oblique and eventually shifted to the basal position displacing the radicle to the lateral position. However, the cotyledon remains terminal (Fig. 8). In this respect, the present study confirms the earlier findings in other species of *Scirpus*[2,5,6,8].



FIGS. 1–8. Fig. 1. Two-celled proembryo. Fig. 2. Proembryonal tetrad. Figs. 3 and 4. Quadrant and octant-stages of proembyro. Fig. 5. Young globular proembryo. Figs. 6 and 7. Embryos showing the formation of depression. Fig. 8. Mature embryo.

(*ca*, terminal cell; *cb*, basal cell; *ci*, lower daughter cell of *cb*; *cot*, cotyledon; *csh*, cotyledonary sheath; *e*, epicotyl; *fl*, first leaf; *m*, middle cell; *n* and *n'*, upper and lower daughter cells of *ci*; *pd*, protoderm; *q*, quadrant; *r*, radicle; *s*, suspensor.)

As is stated earlier, Khanna[3] considered the development of embryo in *Scirpus mucronatus* to be conforming to the Asterad type. Her interpretation appears to have been based on the stages only up to the octant-embryo. In addition, she has not given any evidence on the role played by the basal cell in the formation of embryo, an important feature required to decide the embryonal type[1,4]. In contrast to Khanna's interpretation, the present observations show that the embryo development in *S. mucronatus* conforms to the Juncus variation of the Onagrad type[1].

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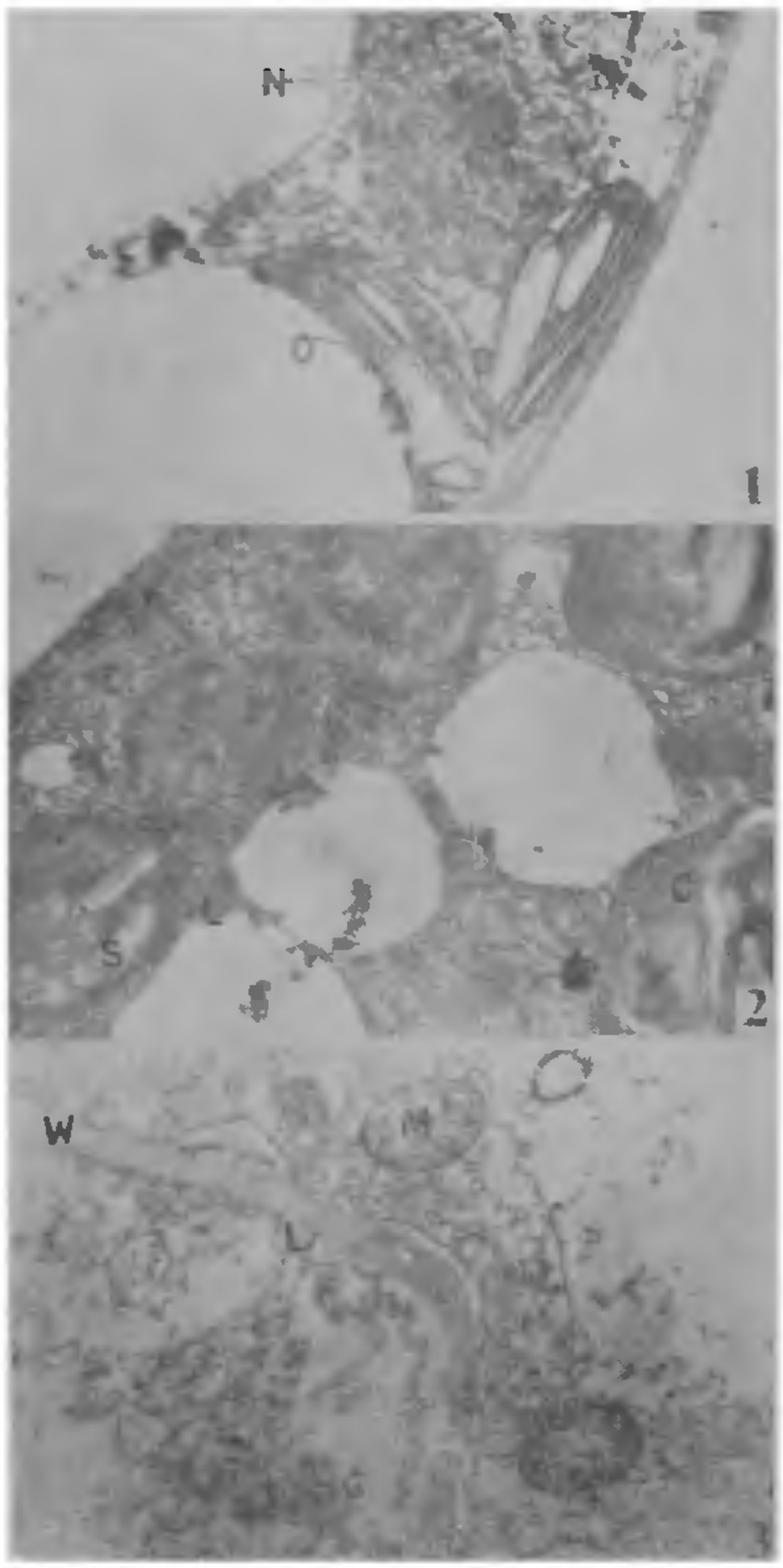
EFFECT OF GIBBERELLIC ACID ON THE ULTRASTRUCTURAL MORPHOLOGY OF THE CELLS OF *LYGODIUM FLEXUOSUM* (L.) SW. GAMETOPHYTE

SOME interesting findings have come to light in the present study. No work has been done in this direction with respect to ferns. However, Ashour[1] *et al.*[1] (1974), studied the effect of GA on the ultrastructure of chloroplast and the content of chlorophyll in the cells of dwarf maize.

Spores of *L. flexuosum* were sown in 2 separate petridishes, each having approximately 500 spores in 1% Knop's sulution at 26° ± 2° C. Soon after the germination of spores (5 or 6 days) 2 mg/ml of GA solution was added to one of the petridishes and allowed to grow for 6 days. A few healthy gametophytes from each set were taken for ultrastructural studies for which the usual method for preparation of ultrathin sections was done. Silver or grey sections were mounted on uncoated copper grids and examined under Hitachi (Hu-HE) electron microscope at 75 kv after double staining with 1% aqueous uranyl acetate and lead citrate. Ultrastructural studies of the cells of the control and the cells of GA treated gametophyte were undertaken. Our observations show that in the cells of GA treated gametophyte, endoplasmic reticulum increases and the cytoplasm gets densely filled up with it. Ribosomes, golgi bodies (Fig. 3), mitochondria and chloroplasts also increase in

number as compared to that of control. The cristae in mitochondria swell up in the cells of GA treated gametophytes (Fig. 3). In cells of the control, fewer starch grains and few osmiophilic bodies (Fig. 1). The ultrastructure of the chloroplast gets significantly altered in GA treated gametophyte cells as chloroplasts become more rounded with starch grains increasing in number and osmiophilic bodies getting reduced in size or totally disppearing (Fig. 2).



FIGS. 1–3. Fig. 1. Structure of different organelles in the cells of the control, ×14·800. Fig. 2. Structure of different organelles after treatment with GA. chloroplast (*c*) filled completely with ribosomes, lamellar structure is disturbed due to large starch grains. Starch grain (*s*) increase in size. Endoplasmic reticulum (E) completely filling cytoplasm. Lipid bodies (L) increased after treatment with GA, × 14·800. Fig. 3. Treated cell. Mitochondria (M) note the swelling of cristae of mitochondria at higher magnification. Golgi bodies (G) number gets increased after treatment with GA. Lipid (L) protrusion of wall and formation of lipid bodies. Wall of cell (*w*), × 26·000. N, Nucleus ; M, Mitochondria ; C, Chloroplast ; O, Osmiophilic bodies ; S, Starch ; W, Wall of cell ; G, Golgi bodies.

chloroplasts are fewer ; they are mostly spindle-shaped and have horizontally disposed lamellae with

A few chloroplasts show disorientation of their lamellae ; their grana thylakoids also swell up. Some chloroplasts get deformed to such an extent that even their fine lamellar structure cannot be made out.

Ribosomes within chloroplasts increase enormously. Cell wall in controls appears perfectly stratified and uniformly thickened whereas in GA treated ones, it becomes more compact and gets irregularly thickened with lipid deposition all along its length (Fig. 3).

Increase in the number of mitochondria, chloroplasts, ribosomes, endoplasmic reticulum golgi bodies and lipid contents along the cell wall and within cytoplasma in the cells of GA treated gametophytes points towards increased activities of the cells. Probably GA helps in such biochemical activities which lead to increase in their number consequently there is increased production of carbohydrate, proteins and lipids. An increase in the number of mitochondria probably indicates higher energy output by the GA treated cells. Deformity of chloroplasts was also observed by Ashour *et al.* (1974). Increase in the number of osmiophilic bodies in the stroma of chloroplasts in the cells of GA treated plants, observed by him, is not substantiated by our studies. On the contrary, we found that these bodies get reduced considerably in number or they totally disappeared within chloroplatst of the GA treated cells. Distortion of lamellae may be caused by an increase in the number of starch grains which in their turn may cause certain amount of compression thereby distorting lammellar configuration of chloroplasts in the GA treated cells.

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