A CONTRIBUTION TO THE EMBRYOLOGY OF *UTRICULARIA SCANDENS* OLIVER

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CONSIDERABLE amount of work has been done on the embryology of the genus *Utricularia*[1-7]. The genus *Utricularia* exhibits some interesting features embryologically. The notable among them are the endosperm haustoria and the undifferentiated embryo.

The present account deals with the embryology of *Utricularia scandens* Oliver. The plant is a minute twiner. It is often found growing in association with *Utricularia wallichiana*. The material for present investigation was collected near Hassan (Karnataka State). Flowers and fruits were fixed in F.A.A. After dehydration and paraffin embedding sections were cut at 10–12 μ and stained with Heidenhein's haematoxylin and eosin.

The flowers are very small, blue in colour, borne on slender scapes. Seeds are minute, reticulate and scrobiculate.

The ovules are anatropous, unitegmic and tenuinucellate. Occasional hemianatropous ovules have been noticed. Placental nutritive tissue is seen at the micropylar part of the ovule (Fig. 11 at corner). A hypodermal archesporial cell arises when the ovule is still erect (Fig. 1). In about 3% of the ovules three archesporial cells have been noticed (Fig. 2). Multiple archesporium is reported earlier in *Utricularia flexuosa* and *Utricularia reticulata*[4-5]. The archesporial cell directly develops into the megaspore mother cell (Fig. 3). In no case more than one megaspore mother cell has been observed. The megaspore mother cell undergoes reduction division and forms a linear tetrad of megaspores (Figs. 5–7). Usually the chalazal megaspore alone is functional and the rest degenerate. But in some ovules two megaspores, *i.e.*, the chalazal two show signs of development (Fig. 4). The functional megaspore divides thrice and develops into an eight-nucleate embryo sac of the Polygonum type (Figs. 8–12). The organised embryo sac is seven-celled (Fig. 12). The embryo sac is extra ovular. The antipodals are three in number and are organised as cells. The endothelium does not cover the embryo sac completely. It is restricted only to the central region of the embryo sac. Fertilization is porogamous. The first division of the primary endosperm nucleus is transverse to the long axis of the embryo sac (Fig. 13) and it is followed by the formation of a wall (Fig. 14). The endosperm is *ab initio* cellular. The chalazal cell divides first. The plane of division may be transverse (Fig. 17) or longitudinal (Fig. 16). While this is the usual pattern of division during early endosperm development, interesting variations are observed in some ovules. In some cases, the primary endosperm nucleus divides twice to form four superposed endosperm cells (Fig. 18). In such ovules the middle two cells develop into endosperm proper while the micropylar and chalazal cells develop into haustoria. In very few instances the chalazal endosperm cell becomes coenocytic with a varying number of nuclei (four or five) (Figs. 19–21). The chalazal and micropylar parts of the endosperm develop into haustoria while the middle part develops into endosperm proper. The endosperm haustoria are exactly similar to those of *U. caerulea*[3] (Fig. 22).

The zygote divides only after the initial development of haustoria. The first division of the zygote is transverse (Figs. 23 and 24) resulting in the formation of two superposed cells *ca* and *cb*. Both the cells divide transversely and form a linear proembryo of four cells—*l*, *l'* and *ci* and *m* (Fig. 25). *ci* divides once and forms a suspensor of two cells (Fig. 26). The other three cells undergo further divisions and contribute to the embryo proper. The sequence of divisions in the embryogeny follows the Solanad type. The mature embryo is undifferentiated and similar to that seen in *U. caerulea*[3].

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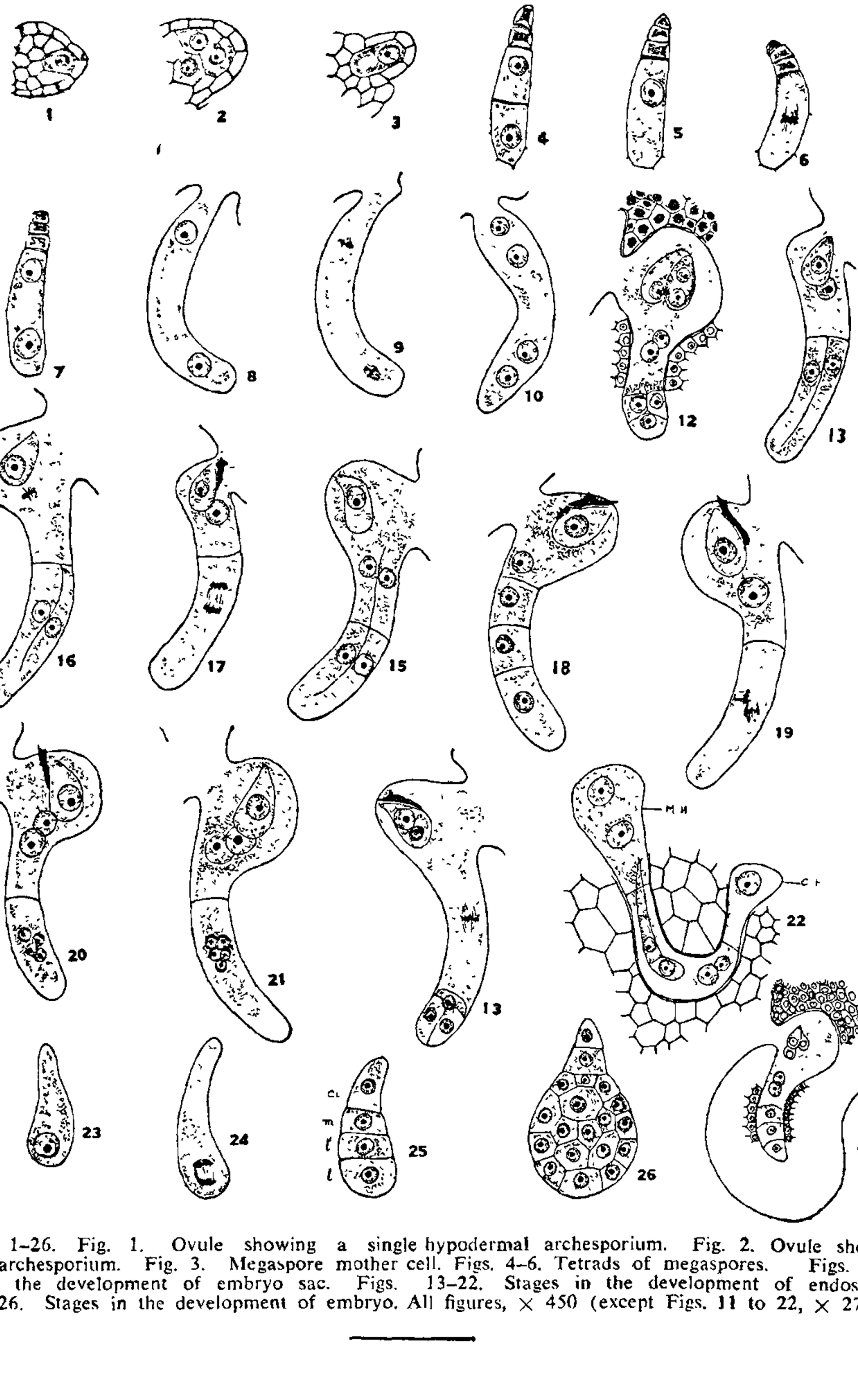

FIGS. 1–26. Fig. 1. Ovule showing a single hypodermal archesporium. Fig. 2. Ovule showing multiple archesporium. Fig. 3. Megaspore mother cell. Figs. 4–6. Tetrads of megaspores. Figs. 7–12. Stages in the development of embryo sac. Figs. 13–22. Stages in the development of endosperm. Figs. 23–26. Stages in the development of embryo. All figures, × 450 (except Figs. 11 to 22, × 270).