pha alliance also of Coryphoideae, suggesting a close relationship between Corypha and Livistona alliances[2]. The vasculatures of the tepels, stamens and fertile carpels are typical of Coryphoid palms[2,3].

In Palmae the gynoecium usually consists of 3 carpels arranged in a single whorl. A few palms, as *Thrinax*, are unicarpellary. In some abnormal forms 2 or 4 carpels may also be developed. However, the presence of a second whorl of 3 carpels in addition to the normal whorl of 3 carpels as a regular feature in the gynoecium of a palm has not been detected so far. The presence of a second whorl of 3, vascularized, vestigeal carpels as a normal condition in *Licuala spinosa* represents the most primitive gynoecium in palms. Such a structure in this species is indicative of the origin of Coryphoid palms from an ancestral stock with atleast 2 whorls of 3 carpels each.

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EMBRYOGENESIS IN THREE SPECIES OF *VANDELLIA* L.

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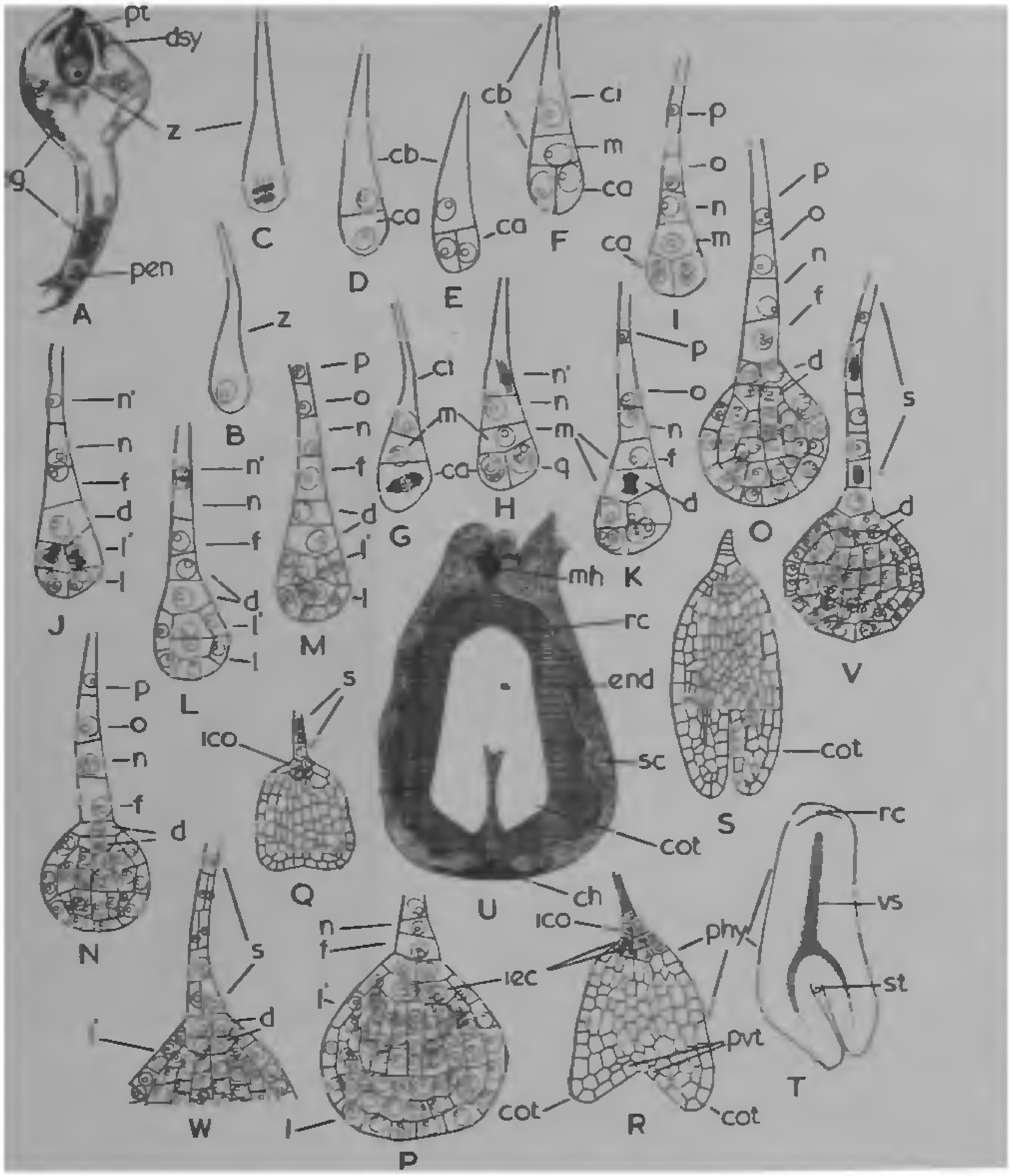
THE study of embryogenesis in Gratioleae of Scrophulariaceae is restricted to a few taxa[1-3]. Three species of *Vandellia* L. (*V. mollugiņoides* Benth., *V. sessiliflora* Benth. and *V. pedunculata* Benth.) have been chosen for study of embryogeny and the observations are detailed in this report.

Fruiting ovaries in different stages of development of the aforesaid species were collected and fixed on the spot in Carnoy's fluid. Customary methods were followed during dehydration an embedding. Sections were cut between 8–12 μm and stained in crystal violet and erythrosin combination.

The zygote elongates appreciably (figures A, B), becomes tubular and remains quiscent of considerable period amidst developing endosperm which is *ab initio* Cellular. The first division of the zygote (transverse) occurs after the initial genesis of the endosperm is completed, resulting in a smaller apical cell *ca* and an elongated basal cell *cb* (figures C, D). The former divides vertically and the latter transversely forming two cells *m* and *ci* (figures E, F); consequently a T-shaped proembryonal tetrad corresponding to A_2 category of Soueges[6] is organised (figure F). However, in *V. sessiliflora* the basal cell *cb* of the two-celled proembryo divides earlier than *ca* (figure G). Soon the two juxtaposed cells derived from *ca* initiate the quadrants, *q* after one more vertical division occurring in a plane perpendicular to the earlier one (figures H, I). Transverse division of the quadrants results in the octants disposed in two superposed tiers of four cells each; the upper tier designated as *l* and lower as *l'* (figures J, K). As the aforesaid developmental changes occur in *ca*, the middle cell *m* of the proembryonal tetrad as well its lowermost cell *ci* segment transversely engendering respectively cells *d, f, n* and *n'* (figures H, J, K). In 4% of the preparations of *V. pedunculata* the cell *n'* divides prior to the organisation of *ca* into octants (figure I). Periclinal divisions occur in the tier *l* and *l'* and delimit dermatogen *de* from an inner group of cells (figure L). Similar division in the inner group of cells of *l'* differentiates the histogens namely the outer periblem *pe* and the inner plerome *pl* (figures M, N). Anticlinal divisions occur in the cells of the dermatogen in the tiers *l* and *l'* (figures M, N). Transverse division occurs in the cell *d* before or after the differentiation of dermatogen in octants (figures K, L, M, N) delimiting an upper daughter cell which functions as the initial cell of the root cortex *iec* and lower cell acts as the initial cell of the root cap *ice*. As a rule these cells engender two plates of four cells each consequence upon two vertical divisions at right angles to one another (figures N, O). Further segmentation in these cells results in the organisation of the root cortex *iec* and the root cap *ico*. In the tier destined to form the cotyledons and shoot apex, both transverse and vertical divisions occur and the embryo eventually passes through the globular (figures N, O, P) and heart-shaped (figures Q, R) stages. Further divisions in the inner group of cells of the tier *l* engender the cotyledonary region *pco* and stem apex *pvt* (figures R, S, T, U), while the cells of the tier *l'* contribute to the hypocotyledonary part *phy* and the initials of central cylinder of stem *icc* (figures R, S, T, U). The cells derived from *f, n* and *n'* build up a short suspensor which is four-celled in *V. mollugiņoides* (figures M, N, O), six to eight-celled in *V. sessiliflora* (figures R, V) and five-celled in *V. pedunculata* (figure S). The uniseriate suspensor ultimately degenerates as the embryo matures (figures U). In *V. pedunculata* a couple of instances have been seen where vertical walls are laid down in some of the suspensor cells (figure W).

The mature embryo in the ripe seed is comparatively massive, straight and well differentiated. It has two cotyledons, shoot apex, a long hypocotyledonary part, a radical and vascular supply to other cotyledons (figure T, U).



Figures A–W. Embryogenesis in three species of *Vandellia* (*Vandellia molluginoides* Benth., *V. sessiliflora* Benth and *V. pedunculata* Benth.). **A.** L. s. part of embryo sac showing zygote, degenerated synergids, pollen tube, endosperm mother nucleus and starch grains, ×725; **B–M.** proembryonal stages, ×900; **N.** L.s. globular stage of the young embryo, ×900; **Q,R.** L.s. heart-shaped embryo, ×900; **S,T.** L.s. mature embryo, ×720; **U.** L.s. mature seed showing the mature embryo with two cotyledons, shoot apex and root cap, ×480; **V.** L.s. globular embryo with suspensor of six cells of which two cells are in division, ×720; **W.** L.s. part of globular embryo with suspensor; note vertical division in some cells, ×720. (*ch*-calazal haustorium; *cot*-endosperm; *mh*-micropylar haustorium; *pen*-primary endosperm nucleus; *pt* persistent pollen tube; *rc* root cap; *sc*-seed coat; *sq*-starcg grains; *st*-shoot tip; *vs* vascular strand)

The genesis of the mebryo in the present species corresponds to Capsella type[4] or Onagrad type[5]. The first proembryonal tetrad falls under A_2 category[6] and its further development corresponds to period I, Megarchetype IV in the series A of the system of embryonic classification of Soueges[6] and is identical to that of *Mimulus ringens*[1], *Lindernia hissopoides*[2] and *Microcarpaea muscosa*[3]. The present species as well as most of the scrophulariaceous taxa, in which embryogeny has been worked out, bear semblance in the functioning of the daughter cell *d* of the middle cell *m* of the proembryonal tetrad as the hypophyseal initial. On the other hand, in *Veronica arvensis*[7], *Veronica persica*[8] and *Veronica agrestis*[10] it is the uppermost derivative of *d* that functions as the hypophyseal cell. Further among scrophulariaceous taxa *Melampyrum lineare*[7] seems to be the only exception, since the cell *m* of the proembryonal tetrad does not form *d* and *f* but organises four circumaxial cells and it is the cell *n*, daughter cell of *ci*, that contributes to the formation of hypophyseal cell; thus the embryogeny in this taxon can be referable to Megarchetype III, despite its resemblance to the other members of the family in having a similar proembryonal tetrad of Category A_2 and embryogeny pertaining to the same period (I) and group of the series A. In view of these variations in embryogenesis, the authors feel an immediate and genuine need for extending the work on embryogeny to as many species of Scrophulariaceae as possible for obtaining a comprehensive picture of the development of embryo which may prove useful for comparative studies that are likely to help in evaluating the relationships of the differnt tribes of the family.

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SEEDLING AND LEAF BLIGHT OF JOWAR BY SEED-ISOLATED *EXSEROHILUM* AND *DRECHSLERA* SPECIES.

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Many of the seed-borne pathogens are virulent parasites with their existence closely linked to that of the seed plant. Some of these fungi cause destructive diseases in crop plants like seedling blight, damping off, etc reducing the germination and emergence, thus affecting the crop yield. In order to find the exact role of seed-borne fungi in causing diseases at seedling stage, test tube agar seedling symptom test[1] was used on four cultivars of sorghum *viz* Swarna, Neerujola (varieties), CSH 6 and 148 (hybrids), which were

Figure 1: Test tube Agar Seedling Symptom Test. Sorghum seedlings showing symptoms produced by *Drechslera sorghicola (D. Sorghicola)* and *Helminthosporium spiciferum* (= *D. spicifera*) Cultivars; A = Swarna, B = Neerujola C = CSH; D = 148.