

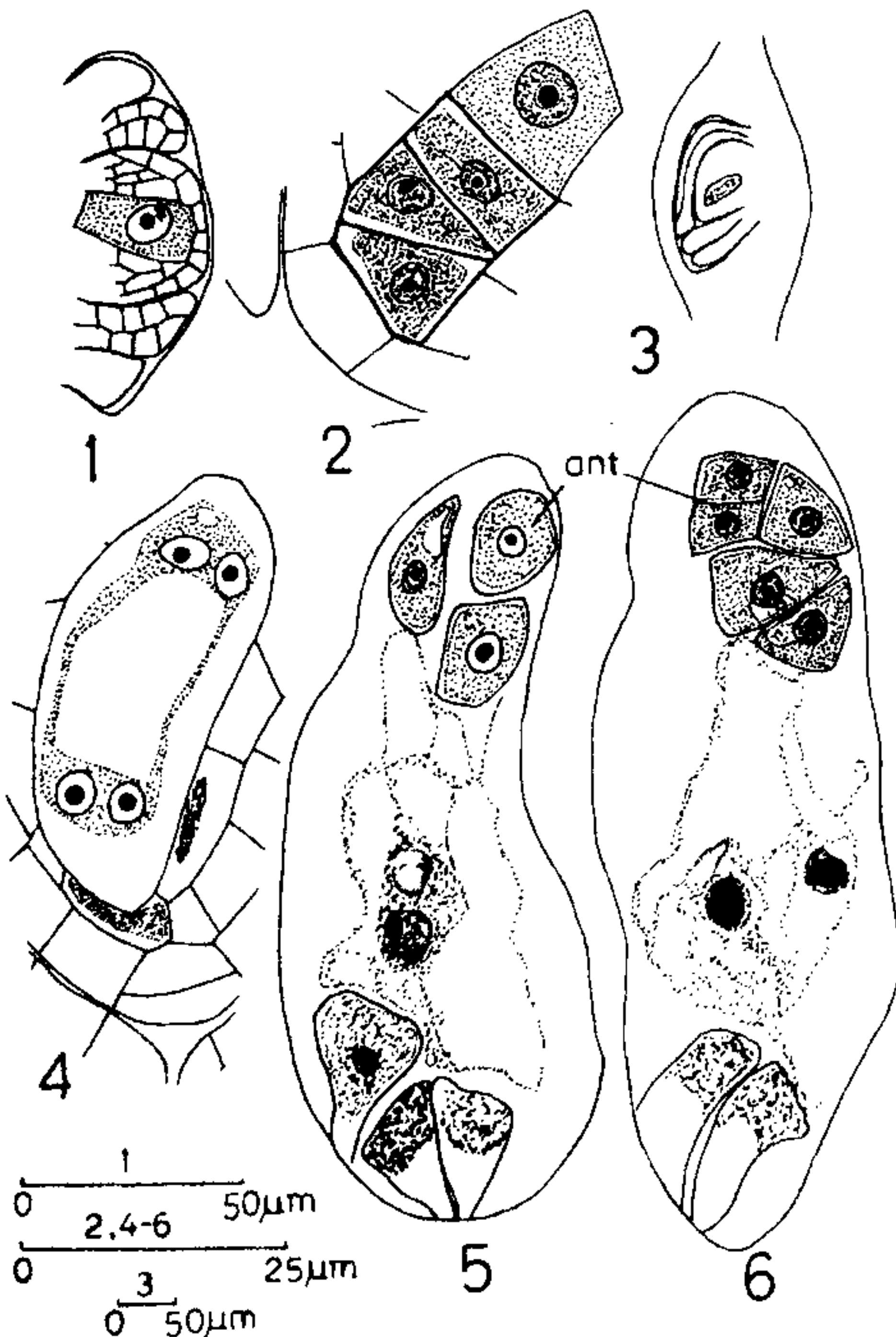
ABORTIVE EMBRYO SACS IN *DESMOSTACHYA BIPINNATA* (POACEAE)

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DESMOSTACHYA BIPINNATA Stapf (Tribe: Eragrosteae) is a perennial grass distributed throughout India, Persia and Africa¹. The present studies were undertaken mainly to determine the reproductive behaviour in this monotypic genus, of which there is no previous record.

The material was collected from natural populations growing at Chandigarh (North India). Three collections were made, one each, in May, June and



Figures 1-6. *Desmostachya bipinnata* 1. V.s of ovule at megaspore mother cell stage; 2. Megaspore tetrad; 3. V.s of ovary and ovule at four-nucleate stage of the embryo sac; 4. Four-nucleate embryo sac; 5-6. Degenerating embryo sacs (ant. antipodals).

July 1985. Pollen viability was assessed using aniline blue in lectophenol, or acetocarmine. Pollen tube growth was observed using FAA fixed pistils following the technique of Ramming *et al*².

The ovary encloses a pear-shaped, bitegmic, tenuinucellate and campylotropous ovule (figure 3). The inner integument is two-layered thick except at the micropyle where it is swollen and comprises three or four layers of cells. The outer integument is slightly shorter than the inner integument. The periclinal divisions in the nucellar epidermis in the vicinity of the micropyle are rare. Ovary wall is thicker at the top and becomes narrow towards the base. All these features are common in taxa belonging to Eragrosteae³ e.g. *Dactyloctenium*, *Eleusine*, *Eragrostis*, *Leptochloa* and *Tripogon*. *Desmostachya* shows none of the embryological features so commonly observed amongst the panicoideae⁵.

A hypodermal archesporial cell in the nucellus increases in size and acts as the megaspore mother cell (figure 1). It undergoes meiosis to form a linear tetrad of megaspores (figure 2). The chalazal megaspore functions and develops into a Polygonum type of embryo sac having an egg, two synergids, central cell with two polar nuclei and three antipodals which proliferate to form 6 or 7 cells (figures 4 and 5). The embryo sac degenerates after this stage (figures 5 and 6). The egg apparatus and polar nuclei are the first to degenerate followed by antipodals. The ovules also gradually shrivel and are finally obliterated. The number of florets in each spikelet varies from five to ten. Examination of a large number of spikelets during the flowering period revealed shrivelled ovules in basal five or six florets while the terminal few contained younger stages of ovules and stamens.

A varying degree of sterility has been previously reported in *Hilaria belangeri* and *H. mutica*⁶, *Digitaria decumbens*⁷, *Dactyloctenium indicum*⁸, *Cymbopogon nardus* var *confertiflorus*, *C. martinii*, *C. parkeri* and *Arundo donax*⁵. The main cause of sterility in *D. bipinnata* appears to be the degeneration of female gametophyte which in turn may be due to self-incompatibility as indicated by the failure of the pollen tube to reach the embryo sac. In *Arundo donax*, degeneration of the megaspore mother cell as such is responsible for sterility while in other taxa such as *Hilaria belangeri* and *H. mutica* degeneration of the female gametophyte may occur any time after megaspore formation and this has been suggested to be the cause of sterility. Degene-

ration of sporogenous tissue is often associated with aposporic mode of reproduction¹⁰ but in the present material, there was no such indication at any stage.

Inability of a species to set viable seed is limited not only to grasses but has also been recorded in members belonging to various other families. Recently Spooner¹¹ demonstrated sterility in one population of *Dentaria diphylla* via abortive embryo sac development which is identical to what has been noticed in *D. bipinnata*.

The production of viable seed is essential for survival and dispersal of a species. *D. bipinnata* reproduces vegetatively through the root stocks but this alone may not be able to account for its distribution over such wide geographical areas as India and Africa. Evidently more populations should be investigated to understand the nature of the reproductive system operative in *D. bipinnata*.

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CYTOCHEMICAL STUDY OF MUCILAGE SECRETING CELLS IN THE OVULES OF *NAJAS MARINA* L

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THE ovules of *Najas marina* L show two groups of secretory cells, one at the base of style and another at the funicle. From these cells secretion commences at the megaspore mother cell stage, reaching maximum just prior to fertilization. Secretory fluid manifests higher concentration of carbohydrates, lipids, total and -SH proteins, RNA and pectic substances gnarled with iron. The present investigation suggests a correlation between this secretion and the growth of pollen tube.

For the present study female flowers of *N. marina* L, containing different developmental stages of ovary, were collected from the greenhouse grown specimens and were fixed in ethanol acetic acid (3:1 v/v). The material was sectioned on a rotary microtome and the sections were stained for RNA (pyronin-G method), DNA (Feulgen reaction), total proteins (bromophenol blue method), -SH proteins (DDD reaction), insoluble polysaccharides (PAS reaction) and cuticle (aniline blue reagent) as suggested by Jensen¹, lipid (Sudan black blue method) and iron gnarled into the acid mucopolysaccharides (hematoxyline method) as mentioned by Pearse² and acid mucopolysaccharides (toluidine blue method) as suggested by Chayen *et al.*³. Squashes of secretory cells were also prepared for study of the above mentioned substances.

The developing ovules of *N. marina* L reveal two groups of secretory cells (figure 1A), one with 15-20 cells at the base of style and the second with 30-40 cells located at the funicle. The latter group is also known as funicular obturator. Each is narrow and elongated with a free broader end protruding into the ovarian cavity (figure 1C). A big elongated or spherical prominent nucleus in each cell shows deep staining reaction for DNA (figure 1B).

The cells are sessile, have a thick aniline blue positive cuticle, and vacuoles in the cytoplasm (figure 1C). Prior to fertilization, viscous colourless water-insoluble substances composed of fine fibrils ooze out. The fluid commences at megaspore mother cell stage and accumulates around the ovule