

As far as the cytology is concerned, the genus *Piper* is highly controversial. In view of the fact that a large number of species constitute the genus *Piper*, the cytological data seem to be very meagre. Including the present report only 13 species of *Piper* have been cytologically worked out<sup>4-9</sup>. The base number  $x = 13$  tallied with observations on other members of the genus *Piper* were  $x = 12, 13$  and  $14$  chromosomes, has been recorded earlier<sup>10</sup>.

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## STUDIES IN THE LAMIACEAE

### X. A Note on the Sporogenesis and Gametogenesis in *Nepeta hindostana* (Roth.) Haines.

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*Nepeta hindostana* belongs to the tribe Nepetae of the family Lamiaceae. Schnarf<sup>1</sup> and Davis<sup>2</sup> have reviewed the earlier embryological work on the family. A

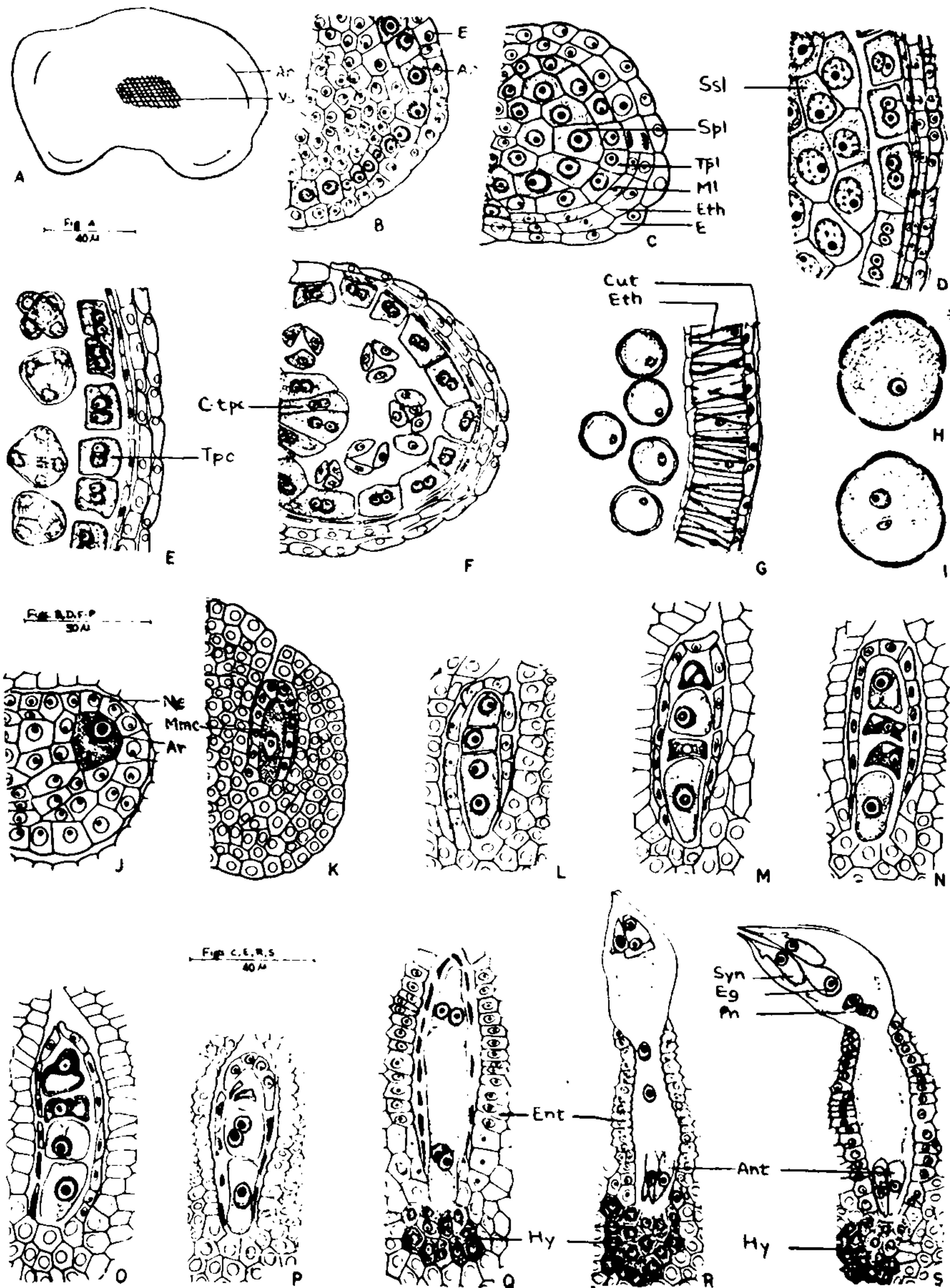
survey of the literature indicates that very meagre work has been done so far, on sporogenesis and gametogenesis. The investigations on sporogenesis and gametogenesis in this family include those of Jaitly<sup>4</sup> on *Hyptis*, *Pogostemon*, *Salvia*, *Ocimum* and *Leucas*, Tiagi<sup>5</sup> on *Leucas* and *Leonotis*, and Joshi and Dwivedi<sup>6</sup> on *Plectranthus*. The present note deals with the sporogenesis and the development of gametophyte in *Nepeta hindostana* (Roth.) Haines.

The anther is tetrasporangiate. In transection, the young anther is rounded in outline and comprises a homogenous mass of cells bound by well defined epidermis. It soon reveals a four lobed appearance and in each lobe some hypodermal cells become more prominent than the rest because of their larger size, radial elongation and conspicuous nuclei (Figs. A, B). These cells undergo periclinal division and produce an outer layer of primary parietal cells and an inner layer of primary sporogenous cells. Periclinal division in the primary parietal layer results in the formation of two secondary parietal layers. The outer secondary parietal layer divides again to cut outer endothecium and inner middle layer, while the inner one functions directly as the tapetum. Thus the anther wall consists of four layers, e.g., epidermis, endothecium, middle layer and tapetum (Fig. C). During later stages of sporangial development the tapetal cells enlarge, vacuolate, enrich in cytoplasmic contents and soon become binucleate (Figs. D-F). In this taxon two types of tapetal cells are present. The connective tapetal cells are comparatively larger than the parietal tapetal cells (Fig. F). The middle layer starts degenerating during the meiotic divisions of the pollen mother cells. The endothelial cells clongate radially and tangentially and acquire characteristic fibrillar thickenings (Fig. G).

The primary sporogenous cells by further divisions give rise to pollen mother cells which undergo meiotic divisions to produce tetrahedral and decussate types of microspores tetrads (Figs. D-F). The microspore nucleus divides asymmetrically to form a small generative cell and a large vegetative cell (Figs. H, I). The pollen grains are hexaporate and shed at two celled stage (Fig. I). Dehiscence of the anther occurs at the junction of the pollen sacs. The endothelial cells at this region lack fibrillar thickenings and the epidermal cells are smaller in size.

The ovular primordia differentiate as outgrowths from the placenta and develop into anatropous, unitegmic tenuinucellar ovules (Figs. J, K). A hypodermal archesporial cell enlarges and functions directly as the megaspore mother cell. The latter undergoes two successive meiotic divisions and forms a linear tetrad of megaspores (Fig. L). Usually the chalazal megaspore functions to form megagametophyte but in addition to that occasionally micropylar (Fig. N),





FIGS. A-S. Sporogenesis and the development of gametophytes in *Nepeta hindostana* (Roth.) Haines. Figs. A-I. Microsporogenesis and the development of the male gametophyte. Fig. A. Cross-section of a



young anther. Fig. B. T.S. anther lobe showing archesporial cells. Figs. C, D. Portions of anther lobes showing differentiation of different layers of anther and 2-nucleate tapetal cells. Fig. E. T.S. anther parts showing meiotic divisions of pollen mother cells. Fig. F. T.S. anther part showing dimorphic tapetal cells. Fig. G. T.S. anther part showing endothelial fibrous thickenings. Fig. H. Uninucleate pollen grain. Fig. I. Bi-celled pollen grain. Figs. J-S. Megasporeogenesis and the development of the female gametophyte. Fig. M. Micropylar and sub-chalazal megaspores show signs of degeneration. Fig. N. Degeneration of sub-micropylar and sub-chalazal megaspores. Fig. O. Functional chalazal and sub-chalazal megaspores. Fig. P. Chalazal and sub-chalazal megaspores have formed uninucleate and 2-nucleate embryo sacs respectively. Fig. Q. Four-nucleate embryo sac, Ent, Hy. Figs. R, S. Eight-nucleate embryo sacs, Ant, Eg, Ent, Hy, Pn, Syn.

(Ant—Antipodal cells; Ar—Archesporial cell; C—tpc—Connective tapetal cell; Cut—Cuticle; E—Epidermis; Eg—Egg; Ent—Endothelium; Eth—Endothecium; Hy—Hypostase; Ml—Middle layer; Mmc—Megaspore mother cell; Ne—Nucellar epidermis; Pn—Polar nucleus; Ssl—Secondary sporogenous layer; Spl—Sporogenous layer; Syn—Synergids; Tpc—Tapetal cell; Tpl—Tapetal layer; Vs—Vascular supply).

submicropylar (Fig. M) and sub-chalazal (Figs. O, P) megaspores may grow further, in addition to the chalazal megaspore but they stop functioning after a short span and only the chalazal megaspore undergoes 3-successive divisions to organize 8-nucleate embryo sac of Polygonum type (Maheshwari<sup>2</sup>). The nucellar epidermis degenerates as the functional megaspore enlarges.

The mature embryo sac is comparatively broad at the micropylar region and narrow in the chalazal part. The egg apparatus consists of a pair of hooked synergids which overlap the egg. The antipodals are organized as regular cells. They degenerate before fertilization. The two polar nuclei fuse to form a secondary nucleus just before fertilization. An endothelium with richly protoplasmic contents surrounds the three-fourth region of the embryo sac (Figs. Q-S).

At four-nucleate embryo sac stage a hypostase is formed by a small group of cells underlying the chalazal end. They show dense contents and thickened walls (Figs. Q-S).

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### A REPORT ON THE CYTOLOGY OF *PASPALUM COMPACTUM* VAR. *FIMBRIATUM*.

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*Paspalum* is a large and diverse genus composed of more than 400 species found in tropical and warm regions of the world. Fourteen species are reported to be occurring in India. Most of the cytological work is carried out by Burson<sup>1</sup>, Burson and Bennett<sup>2-7</sup> and Burson *et al*<sup>8</sup>. According to them the genus has chromosome numbers in multiples of 10, ranging from  $2n = 20$  to 160 with basic chromosome number  $x = 10$  and 12. *Paspalum compactum* var. *fimbriatum* presently investigated is an exception with  $2n = 18$  chromosomes and 9 as the basic number.

*Paspalum compactum* Roth. Var. *fimbriatum* Bor, is a delicate, villous, annual grass rooting at lower nodes. There is no earlier report of chromosome number or karyomorphology. The somatic chromosomes from root tip cells and idiograms are shown in Figs. 1, 3 and 4. The chromosomes are eighteen in number and are of medium size. They are grouped into three types, (i) a single satellited pair with centromere in median region having SAT on short arm, (ii) six pairs of chromosomes having centromere in median region and (iii) two pairs of chromosomes with centromere in sub-median region. The satellite is fairly conspicuous and measures about 0.7 microns. The chromosome length ranges from 1.61 to 2.93 microns. The absolute length of the chromosomes is 20.63 microns.

Meiosis is normal and nine bivalents are formed regularly at diakinesis and metaphase-I Fig. 2. Out of nine bivalents, 5 are rod shaped and 4 ring shaped. Two bivalents are invariably associated with the nucleolus. Anaphasic disjunction is normal. No laggards and micronuclei are observed. Tetrad formation is normal and pollen fertility is 80%.