DEVELOPMENT OF EMBRYO SAC IN *PARACAUTLEYA BHATII* R. M. SMITH ZINGIBERACEAE

M. R. GURUDEVA and R. K. SOMASHEKAR
Department of Botany, Bangalore University, Bangalore 560 056, India.

THE family Zingiberaceae is represented in India by 21 genera which include more than 200 species[1]. Recently, Smith[2] created a new genus, *Paracautleya* based on the material collected near Manipal, Karnataka.

Embryological work on the family is meagre. Literature survey showed that Mauritzon[3] has reviewed the earlier work and several subsequent contributions have been reported[4–9]. The following account deals with the ontogeny and organization of the embryo sac of *Paracautleya bhattii*, R. M. Smith, collected near Udupi, Karnataka.

The ovules which may number upto 10 are anatropous, crassinucellate and bitegmic (figure 1), and are borne towards the base of the imperfectly developed trilocular inferior ovary.

The hypodermal archesporium is single-celled and is organised very early in the ovular primordium (figure 2). It divides to form the primary parietal and primary sporogenous cells. The former undergoes anticlinal divisions to form a parietal layer of 2–4 cells. The primary sporogenous cell enlarges and functions as the megaspore mother cell (figure 3). After meiosis-I, it gives rise to two superposed dyad cells (figure 4). During meiosis-II, the upper dyad cell divides vertically and the lower transversely resulting in a T-shaped tetrad of megaspores (figures 5, 6). Occasionally, the upper dyad cell degenerates, and the lower one completes the second meiotic division causing two unequal megaspores. Thus generally, a triad composes of a non-functional dyad cell and a small micropylar megaspore, and a large functional chalazal megaspore (figure 7). In any case, only the chalazal megaspore functions.

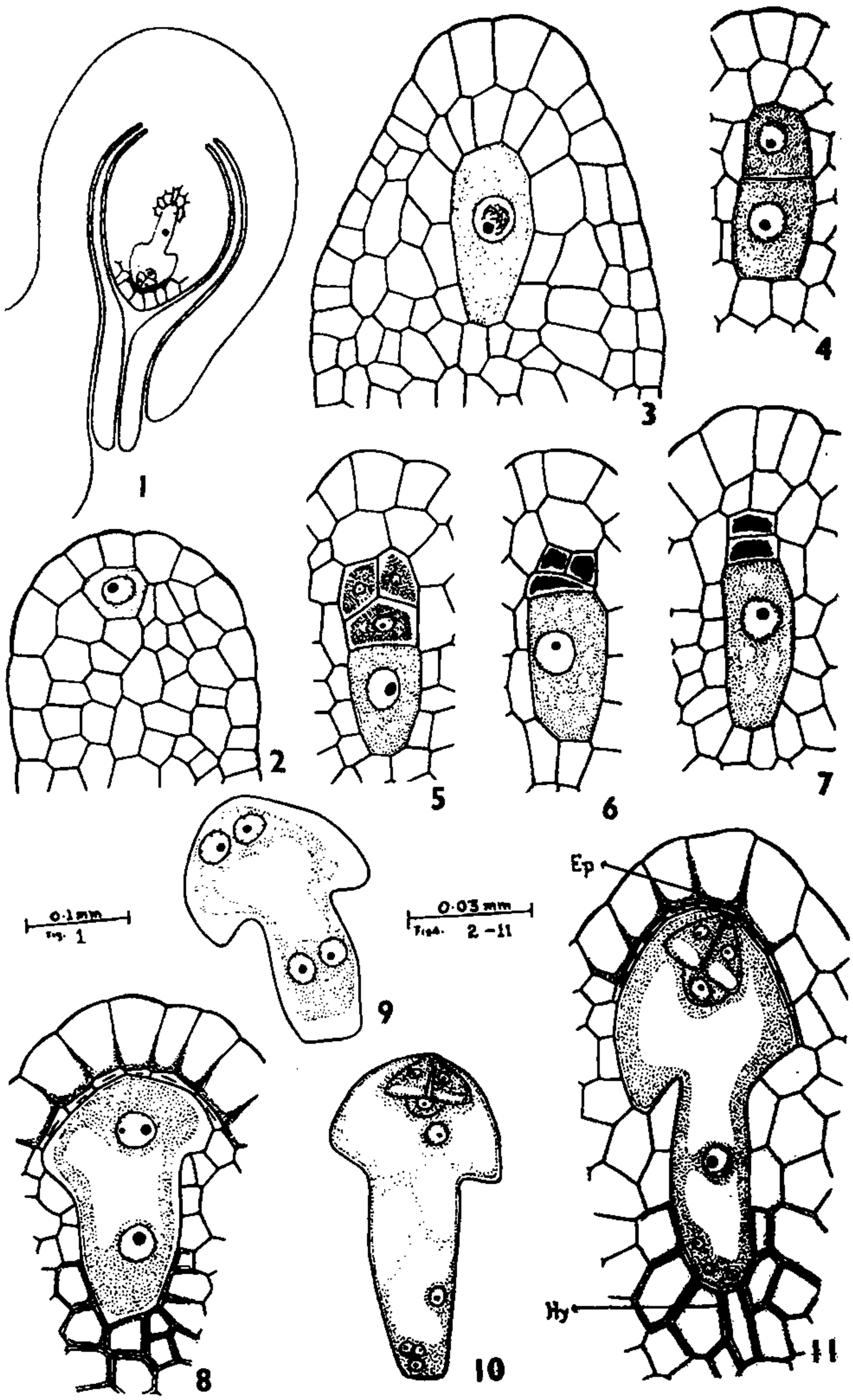
The functional megaspore enlarges in size as small vacuoles appear in the cytoplasm. Its nucleus divides to form two daughter nuclei which drift apart by a central vacuole, thus establishing polarity in the embryo sac (figure 8). Later, the two polar nuclei divide synchronously to render the embryo sac four-nucleate (figure 9). Subsequently, all the four nuclei divide simultaneously and give rise to two quartets, one being located at the micropylar end and the other confined to the chalaza of the embryo sac. The micropylar quartet of nuclei contributes to the formation of egg apparatus and a micropylar polar, while three of the chalazal group act as antipodal nuclei, the fourth nucleus functioning as the chalazal polar (figure 10). The two polar nuclei move towards each other and fuse forming secondary nucleus which is located in the narrow chalazal caecum.

During its development as seen at maturity, the embryo sac enlarges at the cost of surrounding nucellar cells. The micropylar half broadens, while the chalazal half remains as extended caecum. It remains within the confines of the nucellus which has micropylar abutting epistase and chalazal hypostase (figure 11). The egg apparatus consists of two conical juxtaposed synergids having posterior vacuole and a large egg. The antipodals remain free nuclear at the chalazal end of the caecum.

The mode of embryo sac development in this new genus is, therefore, monosporic and 8-nucleate. It is in complete agreement with the earlier findings in the other members of the family[7–9], with regard to its ontogeny, shape, structure and its location within the nucellus having an epistase on its micropylar end and a hypostase below its chalazal region.

3 May 1985; Revised 25 June 1985

1. Chakravorti, A. K., *Sci. Cult.*, 1948, **14,** 137.
2. Smith, R. M., *Notes R. Bot. Gard.*, Edinb., 1977, **35,** 365.
3. Mauritzon, J., *Acta Univ. Lund.*, 1936, **31,** 1.
4. Banerji, I., *J. Indian Bot. Soc.*, 1940, **19,** 181.
5. Raghavan, T. S. and Venkatasubban, K. R., *Proc. Indian Acad. Sci.*, 1941, **B13,** 325.
6. Harling, G., *Syensk Bot. Tidskr.*, 1949, **43,** 357.
7. Panchaksharappa, M. G., *J. Karnatak Univ.*, 1961, **6,** 49.
8. Panchaksharappa, M. G., *Phytomorphology*, 1962, **12,** 418.
9. Panchaksharappa, M. G., *Phytomorphology*, 1966, **16,** 412.



Figures 1–11. **1.** L. S. anatropous ovule; **2.** L. S. ovule primordium showing hypodermal archaesporial cell; **3.** L. S. ovule showing megaspore mother cell; **4.** dyad; **5.** T-shaped tetrad of megaspores; **6.** enlarged chalazal megaspore; **7.** a triad; **8.** L. S. micropylar portion of the nucellus showing 2 nucleate membryo sac; **9.** four nucleate embryo sac; **10.** organized embryo sac. Note the two polar nuclei; **11.** Mature embryo sac. Note the epistase above and hypostase below (e. epistase, Hy, hypostase).