Phyton (Austria)	Vol. 15	Fasc. 1—2	123—126	30. 8. 1973

Co-existence of Monosporic and Bisporic Embryo Sacs in *Tellima grandiflora*

By

Sharada RATNAPARKHI *)

With 1 Figure

Introduction

Ontogenetic variability of the embryo sac development in the same species is rather rare. HJELMQVIST 1951 in *Tridax trilobata* (Compositae), JOHRI & VASIL 1956 in *Ehretia laevis* (Boraginaceae), VIJAYARAGHAVAN & RATNAPARKHI 1972 in *Alectra thomsoni* (Scrophulariaceae) observed co-existence of Polygonum and Allium types of embryo sac development. The present communication reports the occurrence of two types of embryo sac development in *Tellima grandiflora* PURSH, a herbacious member of the Saxifragaceae.

I am grateful to Professor B. M. JOHRI for encouragement and Dr. M. R. VIJAYARAGHAVAN for suggestions.

Material and Methods

The material was collected and fixed in F.A.A. (formalin 5cc; acetic acid 5cc; 70 per cent ethanol 90cc) by Prof. Dr. Th. ECKARDT, Director, Botanical Garden and Museum, Berlin, Germany. Conventional methods of dehydration, infiltration and embedding were followed. Sections were cut between 5 and 15 microns on rotary microtome. Safranin fast green combination was used for staining.

Observations

The ovules are anatropous, bitegminal and crassinucellar. Usually one, but sometimes 3 to 6 hypodermal archesporial cells are differentiated

*) Miss Sharada RATNAPARKHI, Departmen oft Botany, University of Delhi, Delhi-7, India.

in the ovular primordium. Only one archesporial cell, however, develops further.

Monosporic, Polygonum type: The archesporial cell divides periclinally forming a outer primary parietal cell and an inner sporogenous cell. The former by anticlinal and periclinal divisions forms parietal tissue, while sporogenous cell enlarges and functions as megaspore mother cell (Fig. 1 A). Through meiosis, the megaspore mother cell produces a dyad (Fig. 1 B) which is followed by the formation of a linear or a T-shaped tetrad of megaspores (Fig. 1 C, D). The chalazal megaspore functions while the three upper non-functional megaspores degenerate and are discernable as dark bands up to 4-nucleate embryo sac stage (Fig. 1 E, G). The nucleus of the functional megaspore undergoes three successive mitotic divisions to produce an 8-nucleate embryo sac (Fig. 1 L). Rarely, other cells of the megaspore tetrad, besides the normal chalazal cell, also become binucleate (Fig. 1 F).

Bisporic, Allium type: The megaspore mother cell undergoes meiosis I and gives rise to the dyad of which the upper cell is smaller (Fig. 1 H). Gradually the micropylar cell degenerates (Fig. 1 K). The second division in the lower dyad cell results in a 2-nucleate embryo sac (Fig. 1 I) and the nuclei are gradually pushed apart by the formation of a large vacuole between them (Fig. 1 K). Rarely, the nucleus of the micropylar dyad cell also divides forming binucleate cell (Fig. 1 J), but ultimately this cell degenerates. Two more divisions in the chalazal dyad cell produces four and eight nucleate embryo sacs. Mature embryo sac consists of a broad micropylar and a narrow chalazal end (Fig. 1 L). The former encloses the egg apparatus and latter the three antipodal cells.

Discussion

In the family *Saxifragaceae* the development of the female gametophyte is of the Polygonum type (Beamish 1963, Chapman 1933, Herr 1954, Mauritzon 1933, Saxena 1969). Pace 1912 investigated *Saxifraga ligulata, S. cordifolia, S. sponhemica, S. crassifolia* and observed Polygonum type whereas Rau 1970 commented, that in some species of *Saxifraga* the failure of the lower dyad cell to divide results in bisporic mode of development. In *Tellima grandiflora*, however, micropylar dyad cell degenerates and the embryo sac development follows the Allium type (Maheshwari 1950).

Interestingly, in this family, in a tetrad besides the normally functional chalazal megaspore, other cells of the tetrad also become active (Herr 1954, Saxena 1969). In *T. grandiflora* not only such a condition was observed but also all the three cells in a tetrad become binucleate. In the *Saxifragaceae*, both the monosporic and bisporic types of embryo sac development are reported, and the former is more common. The co-existence of

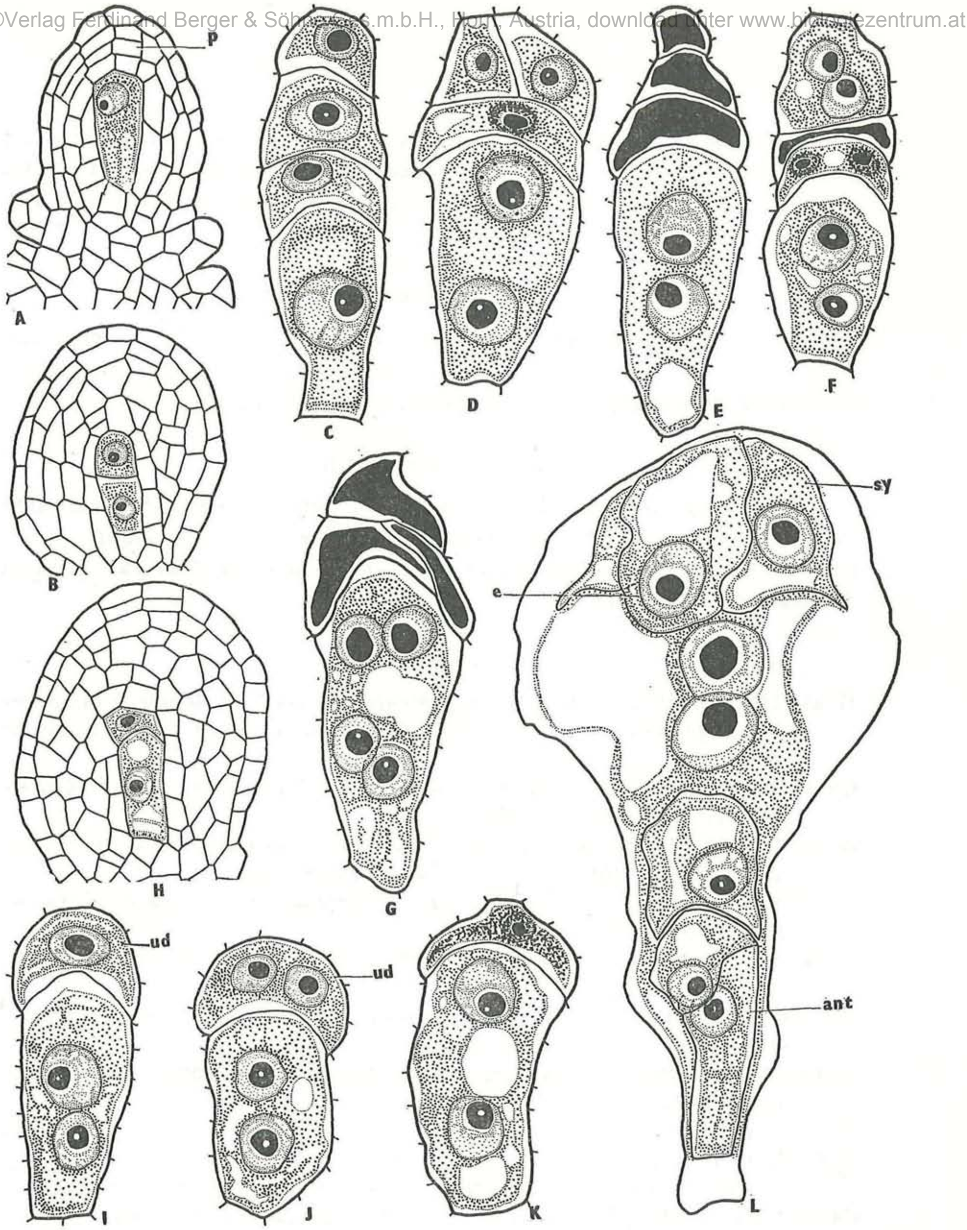

Fig. 1. *Tellima grandiflora*, Megasporogenesis and development of female gametophyte (ant = antipodal cells, e = egg, p = partietal tissue, sy = synergid, ud = upper dyad cell). — A: Longitudinal section of young ovule showing the megaspore mother cell, note the initiation of integuments; × 348. — B: Dyad; × 348. — C—E: Linear and T-shaped tetrads, E shows degenerating micropylar megaspore; × 836. — F: Megaspore tetrad showing three binucleate cells; × 836. — G: Four nucleate embryo sac with three degenerated non-functional megaspores; × 836. — H: Dyad, note the smaller upper dyad cell; × 348. — I—K: Dyad, with binucleate chalazal cell, in J the upper dyad cell is also binucleate, whereas in K it is degenerated; × 836. — L: Organised eight nucleate embryo sac; × 836.

both types of embryo sac development, however, in the same species has not been reported earlier. The occurrence of both Polygonum and Allium types of development of female gametophyte in *T. grandiflora* is the first report in this family.

Summary

In *Tellima grandiflora* ovules are anatropous, bitegmic and crassinucellate. Co-existence of monosporic, Polygonum and bisporic, Allium types of embryo sac development is reported in this taxon.

Zusammenfassung

Tellima grandiflora besitzt anatrope, bitegmische, krassinuzellate Samenanlagen. An der Sippe wurde die Embryosackentwicklung sowohl nach dem einsporigen Polygonum-Typ wie auch nach dem zweisporigen Allium-Typ beobachtet.

References

Beamish K. I. 1963. Meiosis in megasporocytes and development of megagametophyte in *Saxifraga integrifolia* Hook. — Can. J. Genet. Cytol. 5: 146—149.

Chapman M. 1933. The ovule and embryo sac of *Saxifraga virginiensis*. — Amer. J. Bot. 20: 151—158.

Herr J. M. 1954. The development of the ovule and female gametophyte in *Tiarella cordifolia*. — Amer. J. Bot. 41: 333—338.

Hjelmqvist H. 1951. The embryo sac development of *Tridax trilobata*. — Bot. Notiser 104: 180—187.

Johri B. M. & Vasil I. K. 1956. The embryology of *Ehretia laevis* Roxb. — Phytomorphology 6: 134—143.

Maheshwari P. 1950. An Introduction to the Embryology of Angiosperms. — New York.

Mauritzon J. 1933. Studien über die Embryologie der Familien *Crassulaceae* und *Saxifragaceae*. — Diss. Lund.

Pace L. 1912. *Parnassia* and some allied genera. — Bot. Gaz. 54: 306—329.

Rau M. A. 1970. *Saxifragaceae*. — Symposium on Comparative Embryology of Angiosperms. Indian National Science Academy. New Delhi: 90—92.

Saxena N. P. 1969. Studies in the family *Saxifragaceae*. III. A contribution to the morphology and embryology of *Astilbe rivularis* Ham. — J. Indian bot. Soc. 48: 368—374.

Vijayaraghavan M. R. & Ratnaparkhi S. 1972. Some aspects of embryology of *Alectra thomsoni* Hook. — Phytomorphology 22 (In Press).