A CONTRIBUTION TO THE LIFE-HISTORY OF *SONERILA WALLICHII* BENN.*

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In continuation with the embryological studies on some of the members of the *Melastomaceæ*, the writer has been able to obtain some interesting facts on the life-history of *Sonerila Wallichii* Benn. which is presented here. A survey of literature indicates that the genus *Sonerila* has received less attention in the hands of the plant embryologists than other genera of *Melastomaceæ*. Ziegler (1925) has given a brief account of the floral morphology of *Sonerila Leopoldii* Hort. particularly with reference to dehiscence of anthers and other details. An account of the megasporogenesis of *Sonerila speciosa* Zenk. has recently been published by George (1938).

The plants of *Sonerila Wallichii* for the present studies were collected in Agumbe, Mysore State. Characteristic pink flowers arranged in subumbellate cincinni are very characteristic of the plants.

The stamens are three in number with quadrilocular anthers. The structural details of the wall of the mature anther cannot be clearly observed owing to the fact that the wall layers get disorganised contributing nutrition to the developing megaspores. However, the wall of the anther (Fig. 1) consists of an epidermal layer, endothecium which is ill-developed, a single middle layer and an innermost tapetum, the cells of which remain uni-nucleate. The microspore mother cells derived from the sporogenous tissue undergo the usual meiotic divisions producing tetrads of microspores. Chromosome counts made in the metaphase plates revealed eight chromosomes, the number however needs to be confirmed in sections of the root tips. Mature pollen grains are ovate to subglobose and show three-nucleate condition (Fig. 2).

The ovary is semi-inferior and is covered by a persistent hairy calyx. The ovary is trilocular and the anatropous ovules, several in each loculus and bitegumentary are arranged on an axile, slightly projecting placenta. The integuments are two layered. They grow beyond the nucellus, and their free

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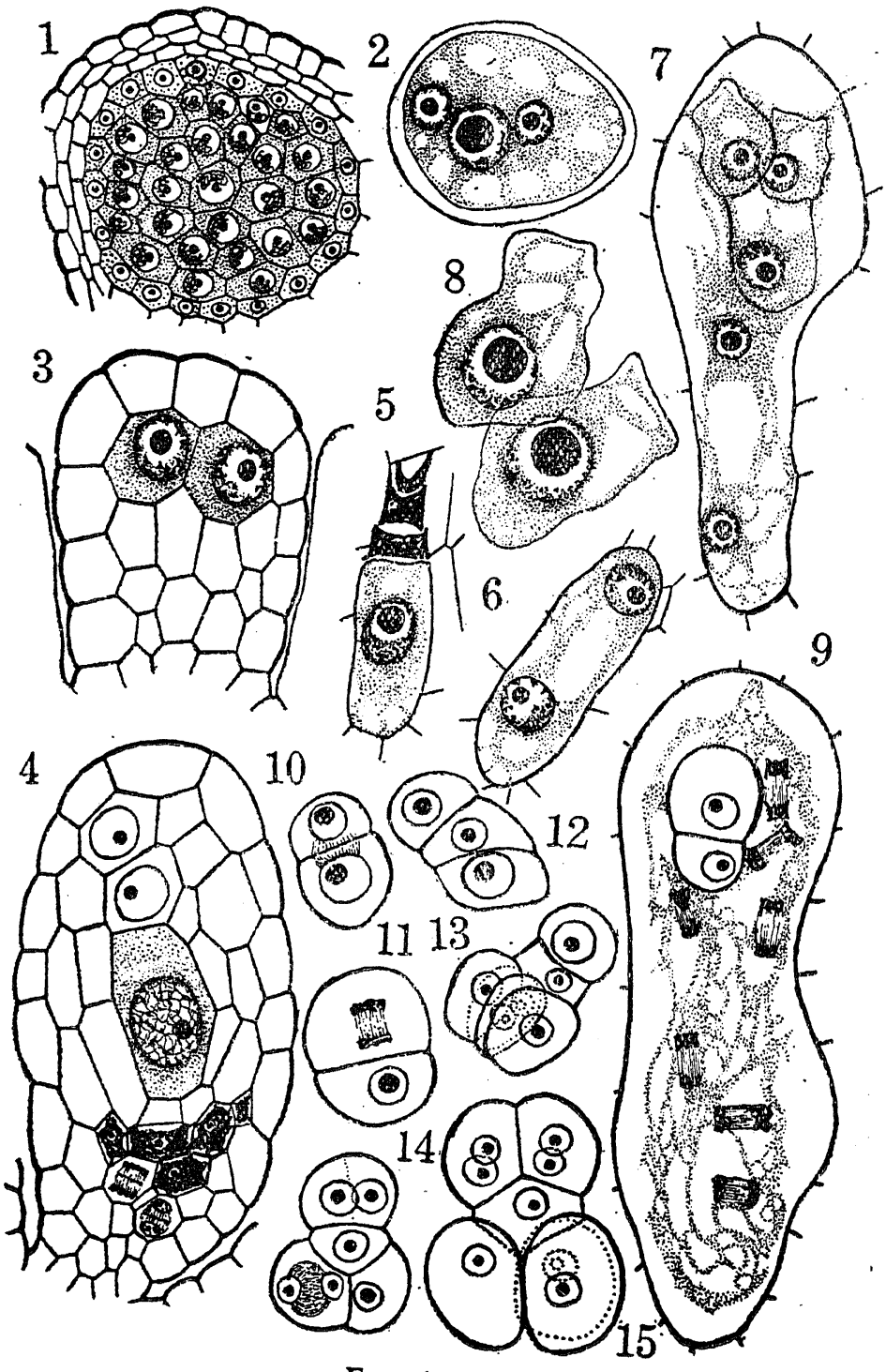
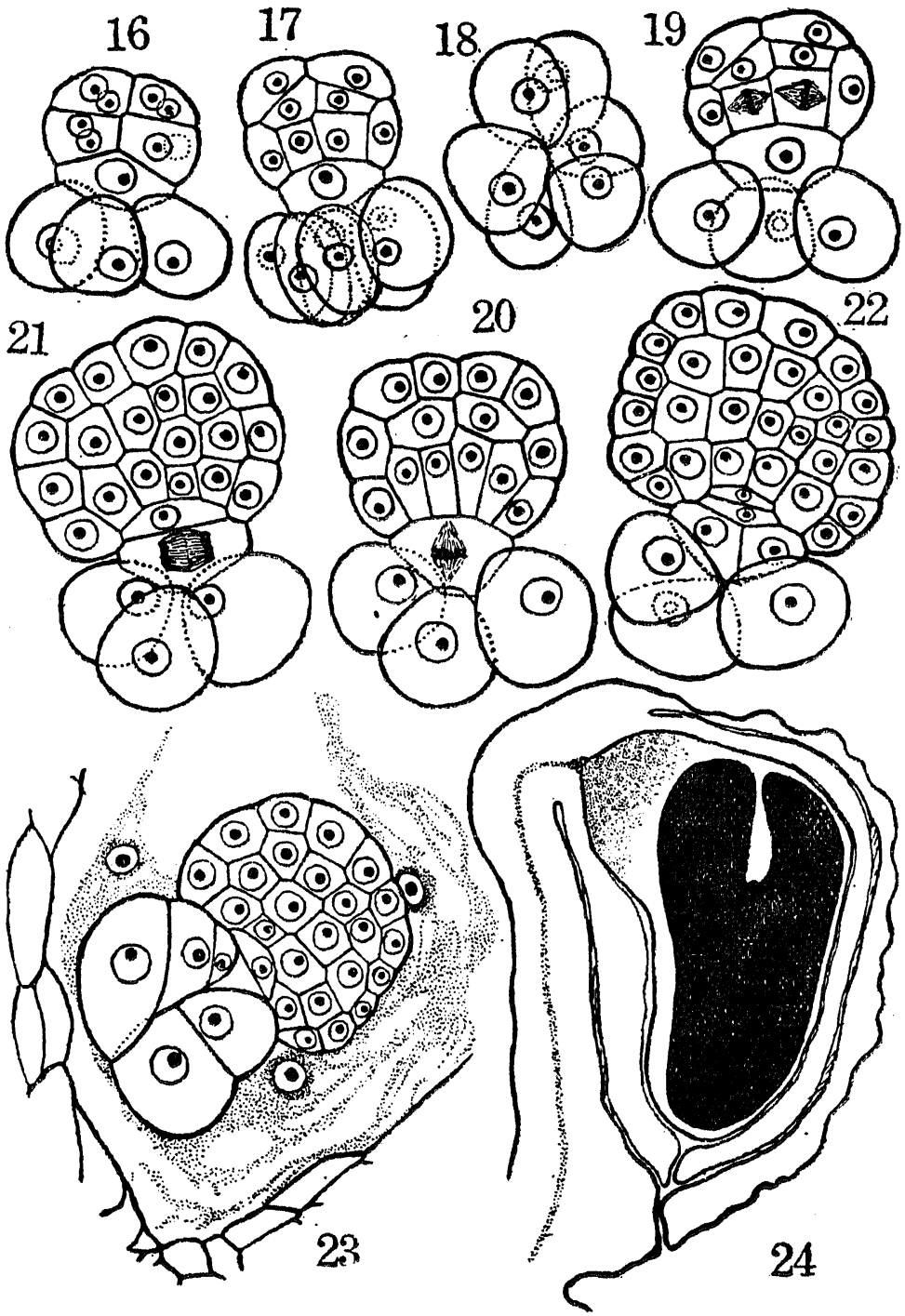


FIGS. 1–15

Fig. 1. Transverse section of an young anther showing wall layers. ×540. Fig. 2. Mature pollen. ×1800. Fig. 3. Multiple archesporium. × 1800. Fig. 4. Megaspore mother cell. ×1800. Fig. 5. Linear tetrad showing three degenerating megaspores and the enlarging chalazal megaspore. ×1800. Fig. 6. Two-nucleate embryo-sac. ×900. Fig. 7. Mature 8-nucleate embryo-sac. ×900. Fig. 8. Egg-like synergids with apical vacuoles. ×1800. Fig. 9. Two-celled pro-embryo with free nuclear endosperm. ×900. Fig. 10. Two-celled pro-embryo. ×900. Figs. 11 and 12. Stages in the formation of three-celled pro-embryo. ×900. Figs. 13–15. Stages in the development of embryo. ×900.



FIGS. 16-24

Figs. 16-22. Stages in the development of embryo. ×900. Fig. 18. The transverse section of the suspensor showing plate of six cells. ×900. Fig. 23. Developmental stages of incipient multiple embryos. ×900. Fig. 24. Showing the mature dicot embryo with chalazal strands in the ovule. ×240.

ends are slighlty dilated. The micropyle is formed by both the integuments and is not so zig zag as in the other members of the Melastomaceæ (Subramanyam, 1942). As in *Sonerila speciosa* (George, 1938) the inner integument is rather thin and is crushed during development. The nucellus is rather massive and is nearly straight.

At the region where the chalazal vascular strand enters the ovule a group of nucellar cells with rich cytoplasmic strands can be differentiated (Fig. 24). These are comparable to the hypostase-like tissue recorded by the writer for the other members of the Melastomaceæ (1942). What is described as nucellar glandular tissue in *S. speciosa* (George, 1938) might refer to this tissue.

The hypodermal archesporium is differentiated simultaneously with the inner integument. Sometimes a multiple archesporium is present (Fig. 3) consisting of two or three cells. Double tetrads were also met with, and in this respect it resembles *Leandra cordifolia* (Subramanyam, 1942). The archesporium divides by a periclinal wall forming the primary parietal cell and the meagaspore mother cell (Fig. 4). As development proceeds, the megaspore mother cell becomes deep seated due to the divisions of the parietal cell.

The megaspore mother cell in the course of its development enlarges in size by crushing the nucellar cells surrounding it. It undergoes the usual heterotypic divisions and forms a linear tetrad of megaspores (Fig. 6). The chalazal megaspore enlarges and develops further. Simultaneous development of the chalazal megaspore as well as the second one has been noticed in many cases similar to the condition recorded by the writer (1942) in *Leandra cordifolia* and *Osbeckia hipidissima.* As in *Osbeckia Wightiana* the upper two megaspores degenerate first.

The development of the functioning chalazal megaspore conforms to the normal type. Mature embryo-sac becomes elongated and slightly dilated at the tip (Fig. 7). The egg apparatus which becomes organised at the micropylar end consists of somewhat elongated synergids with pointed tips. Similar types of synergids have been noticed by George (1938) also. The occurrence of apical vacuoles recorded for other members of the *Melastomaceæ* (1942) is the characteristic feature of the present species (Fig. 8). The antipodals show early degeneration. The entry of the pollen tube is of the porogamous type. The endosperm is free nuclear, the nuclei dividing prior to the fertilized egg. Some of these division stages have been figured (Fig. 9). The endosperm nuclei thus formed become placed in peripheral position. When compared with the other members of the Melastomaceæ, the endosperm nuclei are not so large in number.

During post-fertilization stages, the nucellar cells at the chalaza break down contributing nutrition. The embryo-sac portion also dilates abutting on the degenerated cells. A definite chalazal haustorium is described by George (1938) in *S. speciosa* which according to him digests the glandular

tissue (hypostase tissue ?). It was however noticed by the writer that even before the chalazal end of the embryo-sac dilates, the nucellar cells in that region disorganise. It is doubtful whether any haustorial function be attributed to the chalazal end of the embryo-sac.

The embryo in its development conforms to the *Capsella*-type. The first division of the zygote is transverse and a two-celled proembryo is formed. The upper cell divides again resulting in the formation of a filamentous row of three cells (Figs. 11 and 12). In the case of *L. cordifolia* and *O. hispidissima* the proembryo consists of 5 cells. The chalazal cell develops into the embryo and even prior to any activity on the part of the embryonal cell, the micropylar cell enlarges and divides by vertical wall formation resulting in the production of a longitudinal group of six cells (Figs. 13, 14 and 17). A transverse section at the micropylar region reveals a plate of six cells (Fig. 18).

The terminal embryonal cell begins to assume a more or less spherical shape and divides into quadrants and later on into octants (Figs. 13, 14, 15 and 16). The four upper octants form the stem and cotyledons and the four basal ones the hypocotyl, except its tip. In the octant stage the dermatogen is cut off by periclinal walls and the periblem and plerome are formed afterwards (Figs. 17 and 19). The other histogens are completed by the hypophysis which in the present form is the transformed middle suspensor cell (Figs. 20, 21 and 22). The adult embryo is dicotyledonous and the cells of the embryo contain large quantities of deeply staining reserve materials (Fig. 24).

Occasional tendencies towards the formation of multiple embryos due to the activity of the suspensor cells have been noticed (Fig. 23). Even though their development to any appreciable extent have not been observed, their tendency to divide and form a group of cells is however significant. The nucellar polyembryony observed by the writer (1942) in *Osbeckia hispidissima* has not so far been noticed in any other member of the Melastomaceæ. The division of some of the basal suspensor cells upto the three-celled stage might only be cases of arrested development. Nutritional factors might play an important rôle in these cases.

Summary

An account of the life-history of *Sonerila Wallichii* with reference to microsporogenesis, megasporogenesis and embryogeny is presented in this paper. The chromosome number as determined in the pollen mother cells is eight. The ovules are bitegumentary with mostly a single and rarely

multiple archesporium. Further developmental stages of the multiple archesporium to double tetrad stages have been noticed. A hypostase-like tissue at the chalazal region is prominently seen. The development of the embryo-sac conforms to the normal 8-nucleate type.

Endosperm is nuclear and the type of development of the embryo is akin to the *Capsella*-type. The basal cell of the suspensor divides by vertical walls and forms a vertical group of six cells. Some of these might further develop into groups of cells resembling multiple embryos.

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LITERATURE CITED

1. George, P. C. .. "Observations on the megasporogenesis and embryogeny in *Sonerila speciosa*," *The Presidency College Botany Magazine*, 1938, **5**, 26–29.

2. Subramanyam, K. .. "Gametogenesis and embryogeny in a few members of the Melastomaceæ," *J. Ind. Bot. Soc.*, 1942, **21**, 69–85.

3. Ziegler, A. .. "Beitrage zur Kenntnis des Andrœceoums und der Samen entwicklung einiger Melastomaceen," *Bot. Arch. Mez.*, 1925, **9**, 398–467.