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GYNOECEUM MORPHOLOGY, EMBRYOLOGY AND SYSTEMATIC POSITION OF THE GENUS ERYTHROPALUM

BY

FOLKE FAGERLIND.

Introduction

The genus *Erythropalum* has been described by BLUME (1826). He included it in the family Cucurbitaceae. Later, systematists have placed the genus in different plant families. Part of them considered it to be a member of its own family, Erythropalaceae. The views on the position of the genus or family are shown in the following summary:
1. The family is completely alone (PLANCHON 1854).
2. The genus belongs to Cucurbitaceae (BLUME 1826, DE CANDOLLE 1828, HASSKAHL 1848).
3. The family joins Cucurbitaceae, Passifloreae and Papayaceae (MIQUEL 1855).
4. The genus belongs to Olacaceae (ARNOTT 1838, BENTHAM and HOOKER 1862, VALETON 1886, ENGLER 1889, KOORDERS 1912, RIDLEY 1922, MERRIL 1923).
5. The family joins Olacaceae (VAN TIEGHEM 1896, 1897, GAGNEPAIN 1910, LECOMTE 1907-1912).
6. The genus is related to *Vitis* (BAILLON 1892, he made *Vitis* the tribe Viteae and *Erythropalum* the tribe Erythropaleae and summarized together these two tribes and Olacaceae, Santalaceae, Loranthaceae and others in the family Loranthaceae).
7. The genus is brought together with various Olacaceae, Opiliaceae and Icacinaceae to form a family that is placed in the neighborhood of families that are today classified in Therebinthales and Celastrales (MASTERS 1872-75).
8. The family joins Icacinaceae (GAGNEPAIN 1910, LECOMTE 1907-1912, SLEUMER 1935, 1942).

In Buitenzorg's botanical garden a few individuals of *Erythropalum scandens* BLUME grow. During my stay in Java (1938), I collected material from them in order, if possible, to gain clarity about the correct position of the genus in the system by examining the gynoecium, the ovule, and the megagametophytes. The conditions for this are quite favorable, since Cucurbitaceae, Vitaceae, Icacinaceae and the investigated Santalales representatives - indeed Olacaceae belongs to Santalales - are known to be quite different in terms of gynoecial morphology and embryology. Recently, I was able to expand our knowledge in these areas with respect to Icacinaceae and Olacaceae (FAGERLIND 1945, 1946). This has created better opportunities for a proper assessment.

Gynoecial morphology and embryology.

It has been stated (e.g., SLEUMER 1942) that *Erythropalum* has an apical placenta and pendant ovules. In contrast, the Olacaceae and the Santalales have a central placenta, the base or

“podium” is more or less fused with the partitions of the gynoecium, but the apical part is free. The first preparations I made of young *Erythropalum* flowers convinced me of the incorrectness of the above referenced view (Figure 1 a-b). Gynoecial reconstruction was in complete agreement with what I have demonstrated for the Olacaceae, *Olax*, *Strombosia*, and *Anacolosa* at appropriate age stages (FAGERLIND 1946). To my great astonishment, however, pistil preparations of pressed flowers seemed to confirm the older statements. However, a study of intermediate stages shows that this is the result of secondary transformations.

In primary stages three (rarely two) ovules, radial walls and “pockets” are present, as well as an apical free "central column" (see FAGERLIND 1946), from which a short extension enters the stylar canal. The deepening and increase in volume of the pockets, which goes in parallel with the increase in volume of the ovules, however, is much more extensive than in *Olax*, *Anacolosa* and *Strombosia*. At the same time as this increase in volume, the central column and the radial walls extend in length. Parallel with this is a progressive dilution of their medial parts. As a result, the middle part of the radial walls is gradually broken, which means that the three pockets come secondarily in contact again. The breakthrough points enlarge later and finally protrude over the middle part out of the central column, which also disappears (Fig. 1 c-f). The ovary has become simple through these processes. Actually, the processes just described were known earlier. SLEUMER writes: “primordial ovary three-locular, each with one pendant ovule, but very thin intermediate walls soon disappearing.” Remains of the radial walls and the central column remain basal and apical (Fig. 1 e-f). From the apical remnant hang the ovules. Between the column and the radial walls on one side and the pericarp on the other, there is still a cavity that continues up the stylar canal. The impression that the ovules are hanging from the “ceiling” of the fruit space is in fact incorrect. The placenta is the same as *Olax*, *Strombosia* and *Anacolosa*. The placenta, from which the ovules hang, stands by the dissolution, the tissue however only by the remaining upper part of the radial walls in connection with the wall of the fruit space.

The breakthrough of the central column takes place before a differentiation of the vascular bundle becomes visible. Curiously enough, after the opening, a central vascular bundle is found in the apical remainder of the column (Figure 1 f). From this, a branch goes into each of the three ovules. This vascular system thus has no direct connection with the rest of the plant. Besides that, it is perfectly consistent with the one found in the Olacaceae. The development of the micropyle and the only integument (Fig. 1 g-i) takes place in the same way as with *Anacolosa* and *Strombosia*. As with these, only a single archesporial cell is present, which is converted directly into the EMZ [e___ mother cell]. Occasionally, as a result of the stretching of the archesporial cell, the undivided epidermis layer covering it bulges a little into the micropyle, thus indicating nucellar formation (FIG. 1 g). Later, however, this bulge goes back. The mentioned epidermis layer, as in *Anacolosa* and *Strombosia*, secondary to the growth side, is located in the lateral wall of the micropylar canal (Figure 1 g-i).

The formation of the ES (embryo sac) is normal. It grows well into the micropyle (Fig. 1 f). Its antipodals are small. The cells of the egg apparatus are quite large. Central cell and egg cell have starchy cytoplasm (Fig. 1 j).

The vascular bundle extends to the chalaza and almost to the base of the ES. In the integument, when the ES is mature, one gets a tissue rich in strength, which surrounds the former like a mantle (Figure 1 j).

Systematic position.

The above results show that *Erythropalum*, as far as its gynoecium morphological and embryological characters are concerned, is completely consistent with the Olacaceae except for the dissolution of the separation walls. With the Cucurbitaceae the genus shows no agreement. It would be easy to cite a number of characters suggesting an association between the *Erythropalum* on the one hand and the Vitaceae and Icacinaceae on the other. These features, however, coincide exactly with those of which I have previously shown (FAGERLIND 1946) that they associate Olacaceae with Rhamnales and Celastrales. Thus, they can not be used to support the view that *Erythropalum* is closer to these families than the Olacaceae. On the other hand, one must conclude that *Erythropalum* belongs to the Olacaceae. So the Erythropalaceae family is gone.

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LITERATURE CITED

ARNOTT, G. A. W. 1838: Observations on same new or obscure species of plants. - Mag. Zool. and Bot., Vol. 2. Edinburgh.

BAILLON, H., 1892: Histoire des plantes, T. 11. – Paris.

BENTHAM, G. & HooKER, J. D., 1862: Genera plantarum, Val. 1. – Landon.

BLUME, K. L., 1826: Bijdragen tot de flora van Nederlandsch Indië. – Batavia.

DE CANDOLLE, A. P., 1828: Prodromus systematis naturalis regni vegetabilis, T. 3. – Paris.

ENGLER, A., 1889: Olacaceae. - A. ENGLER und K. PRANTL, Die natürl. Pflanzenfam., [1. Aufl.] Teil 3. Leipzig.

FAGERLIND, F., 1945: Bau des Gynöeeums, der Samenanlage und des Embryosaekes bei einigen Repräsentanten der Familie Icacinaceae. - Svensk Bot. Tidskr., Bd 39. Uppsala.

---------- 1946: Gynöeeummorphologisehe und embryologische Studien in der Familie Olaeaceae. - Bot. Not. 1946. Lund.

GAGNEPAIN, F ., 1910: Comment faut-il comprendre la familIe des Olacaeees? - Bull. Soc. Bot. Franee, T. 10. Paris.

HASSKARL, J. K., 1848: Plantae javanicae rariores. - Berlin.

KOORDERS, S. H., 1912: Exkursionsflora van Java, Bel 2. - Jena.

LECOMTE, M. H ., 1907-1912: Flore generale de L'Indo-Chine, T. 1. – Paris.

MASTERS, M. T., 1872-75: Olacineae. – J. D. HOOKER, Flora of British India, Vol. 1. London.

MERRILL, D., 1923: An Enumeration of Philippine Flowering Plants, Vol. 2. – Manila.

MIQUEL, F. A. VV., 1855: Flora van Nederlandsch Indie. – Leipzig.

PLANCHON, J.-E., Affinites et synonymie de quelques genres nouveaux ou peu connus. - Ann. sei. nat., Sero 4, T. 2. Paris 1854.

RIDLEY, H. N., 1922: The flora of the Malay peninsula, VoI. 1. – London.

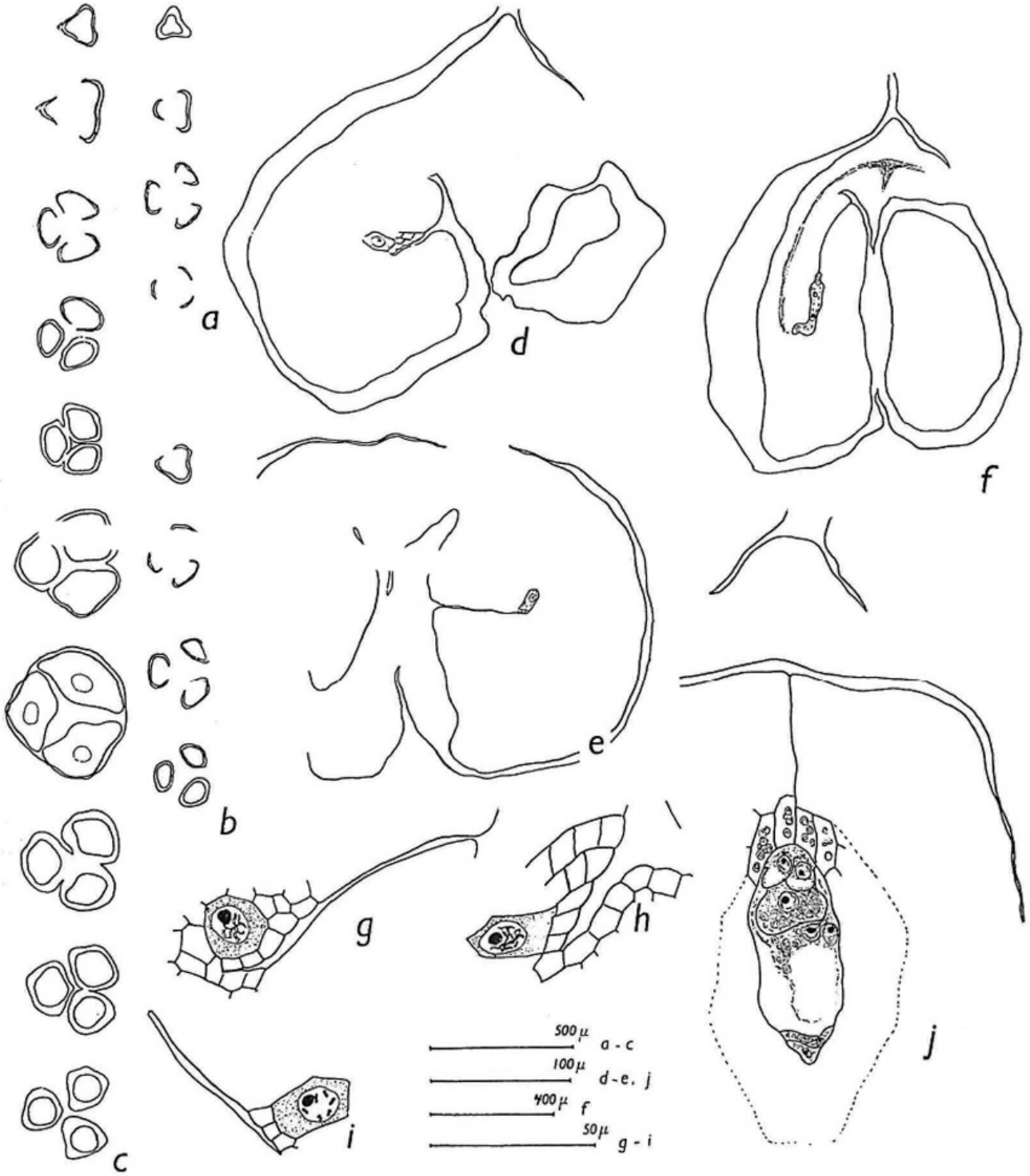
SLEUMER, H., 1935: Olaeaceae. - A. ENGLER und K. PRANTL, Die natürl. Pflanzenfam., 2. AufI. Bd 16 b. Leipzig.

---------, 1942: Erythropalaceae. – Ibid., Bd 20 b. Leipzig.

VAN TIEGHEM, M. P., 1897: Sur les phanerogames sans graines, formant la division des Inseminees. – Bull. Soc. Bot. France, Sero 3, T. 4. Paris.

VALETON, T., 1886: Critisch Overzieht der Olacineae. (Diss.) – Groningen.

Fig. 1. *Erythropalum scandens* BLUME. –- a. Cross section of a very young gynoecium (4 different levels). –- b. That, through a slightly older gynoceum. –- · c. That. through an older gynoecium (10 different levels). –- d–- f. Longitudinal section through fruit compartments and ovules of various ages. –- g–- i. EMZ, "Nucellus" and micropyle. –- j. Mature ES, surrounded by integument tissue. (The dotted line indicates the limit for the "starch coat".)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