

## The Genus *Axinandra*—Melastomataceae : A Missing Link in Myrtales ?\*

by

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(With two plates)

The flora of Ceylon contains a number of genera and species which are of great importance for the study of the evolution of the families of Angiosperms. One example of this is the genus *Axinandra* Thwaites with *A. zeylanica* Thwaites in Hooker, Kew Journal 6: 67, 1854 as type species. Other species are known from Malaya and Borneo (see Bakhuizen van den Brink 1946). They are part of the wet lowland rain forests. Close study of this genus in Borneo and in the wet zone of Ceylon has given me the impression that *Axinandra* could be a very old genus which stands somewhere near the roots of the families Lythraceae, Myrtaceae, Melastomataceae and Rhizophoraceae. The flowers are 5-merous with 10 (12) stamens. The petals drop off in a cap while the flowers open. This character occurs in *Eugenia* in Myrtaceae. The pollen sacs of the anther join or almost join at the apex of the stamen. The fruits are capsules opening with 5 valves ; in each locule there are one or two seeds with wings. The calyx tube is no part of the opening fruit. Similar fruits occur in the Indo-Malesian genus *Lagerstroemia* (Lythraceae), in genera of the subfamily *Leptospermoideae* of *Myrtaceae* (see *Leptospermum*, *Tristania* and *Metrosideros*), and in *Macarisia* (Rhizophoraceae)—a genus known from Madagascar. If we look for possible links between *Rosales* and *Myrtales* among primitive Myrtales then we might also pay attention to the Indo-Malesian genus *Crypteronia* which has also capsular fruits and winged seeds and similar anthers ; however, only 5 stamens and flowers without petals. Similarities are not restricted to flowers and fruits. The leaves of *Axinandra* are opposite, they have marginal nerves like those of *Eugenia* (Myrtaceae), *Lagerstroemia* (Lythraceae) and *Crypteronia* (Crypteroniaceae).

In Kew Herbarium the genus *Axinandra* is classified under Lythraceae following the system of Bentham and Hooker, Genera Plantarum. Bakhuizen (1946) follows Baillon (*Adansonia* 12 : 86, 1876 ; litt. not available to me) who moved it to Melastomataceae—subfamily Memecyloideae where he put it close to the Bornean *Dactylocladus* a genus which resembles *Crypteronia* even stronger (stamens 5, styles sticking together even after fruits open.)

The difference with *Macarisia* Thouars is mainly the absence of interpetiolar stipules in *Axinandra* [See Schimper in Engler and Prantl 3 (7-8): 55-56, 1898 and Arienes in Humbert, Flore de Madagascar (1954)]. The genus *Cassipourea* comes from the same cradle as *Macarisia*, Madagascar to Africa and Trop. America, Ceylon and S. India.

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In case we postulate that subfamily Memecyloideae of Melastomataceae, the *Macarisia* tribe of Rhizophoraceae and *Lagerstroemia* in Lythraceae all belong to the earlier phase of development of their families then we could see in *Axinandra* an early genus evolved before there was sufficient divergence of forms to separate the more specialized Melastomataceae, Lythraceae and Rhizophoraceae.

The specialist in tropical American Melastomataceae Dr. J. Wurdack (Smithsonian Institute, Washington DC.) strongly doubts that *Axinandra* is really a kind of missing link (verbal communication). He considers tropical America as the centre of origin of Melastomataceae. It cannot be denied that at present that family has its richest development in that area. However that does not mean necessarily that its origin was there. As regards Subfamilies and tribes as given in Engler's Syllabus 1964, we get the following survey :

Subfamily—Melastomatoideae

Tribe. Tibouchinae—Neotropics

Rhexieae—Neotropics

Microlicieae—Neotropics

Merianieae—Neotropics

Melastomatae—Palaeotropics including the widespread *Osbeckia* Madagascar, W. Africa, S. China—Australia.

Oxysporeae—Palaeotropics, partly also Madagascar.

Sonerileae—Palaeotropics—Madagascar—Indo-Malesia

Dissochaeteae—Palaeotropics—Africa—Malesia

Bertoloniaceae—Neotropics

Miconieae—Neotropics

Blakeeae—Neotropics

Subfamily Astronoideae—Malesia to Polynesia

Subfamily Memecyloideae

*Mouriria*—Tropical America, especially Amazons

*Memecylon*—Trop. Africa, Indo-Malesia, Polynesia, Australia.

From this we can conclude that a fair number of tribes occur in Africa as well as Asia and the subfamily to which *Axinandra* belongs occurs as well in the Neotropics as the Palaeotropics. In case the origin of the family lies in the Neotropics we could expect many tribes to occur in America as well as Africa or in America as well as in Asia. The balance of joint occurrences certainly points to the African-Asian area and Madagascar is still a good centre of this family.

The distribution of *Axinandra*—Ceylon-Malesia is more or less paralleled by a whole series of other genera or even species.

## Species

- Pericopsis mooniana*—Leguminosae, van Steenis, Pac. Plant Areas 2 : 202, 1966.  
*Erythrospermum*—Flacourtiaceae Fl. Mal. I (5): 7, 1954. (incl. Madagascar).  
*Hydnocarpus* section Pleianthera. Flacourtiaceae, Fl. Mal. I (5): 28, 1954.  
*Trichadenia*—Flacourtiaceae. See Map Fl. Mal. I (5): 39, 1954.  
*Osmelia*—Flac.—Fl. Mal. I (5): 78, 1954.  
*Scutinanthe brunnea*—Burseraceae Fl. Mal. I (5): 297, 1954.  
*Suriana maritima*—Simaroubaceae—Fl. Mal. I (6): 197, 1962.  
*Phaleria capitata*—Thymelaeaceae Fl. Mal. I (6): 21, 1960.  
*Pometia pinnata*—Sapindaceae. M. Jacobs, Reinwardtia 6: 109-144, 1962. Pac. Plant Areas 2: 905, 1966.

The link between Rhizophoraceae (*Macarisia*) and *Axinandra* might be denied by the system of Cronquist (1968) who placed Rhizophoraceae in the Cornales next to Nyssaceae, Alangiaceae and Cornaceae. He considers the position in Myrtales to be anomalous because Rhizophoraceae lack internal phloem and commonly have copious endosperm. Metcalfe and Chalk (1950) however mention that *Astronia* and *Dactylocladus* (Melastomataceae) also lack intra-xylary phloem and *Macarisia* has no copious endosperm in the seeds.

Taking into account that *Axinandra* and *Lagerstroemia* have capsular fruits with winged seeds we must assume that their dispersal is only possibly overland or at short distances between islands. Both genera are therefore most likely evolved and dispersed while Madagascar, Ceylon, and Malesia were part of one continent, sometime during the Cretaceous.

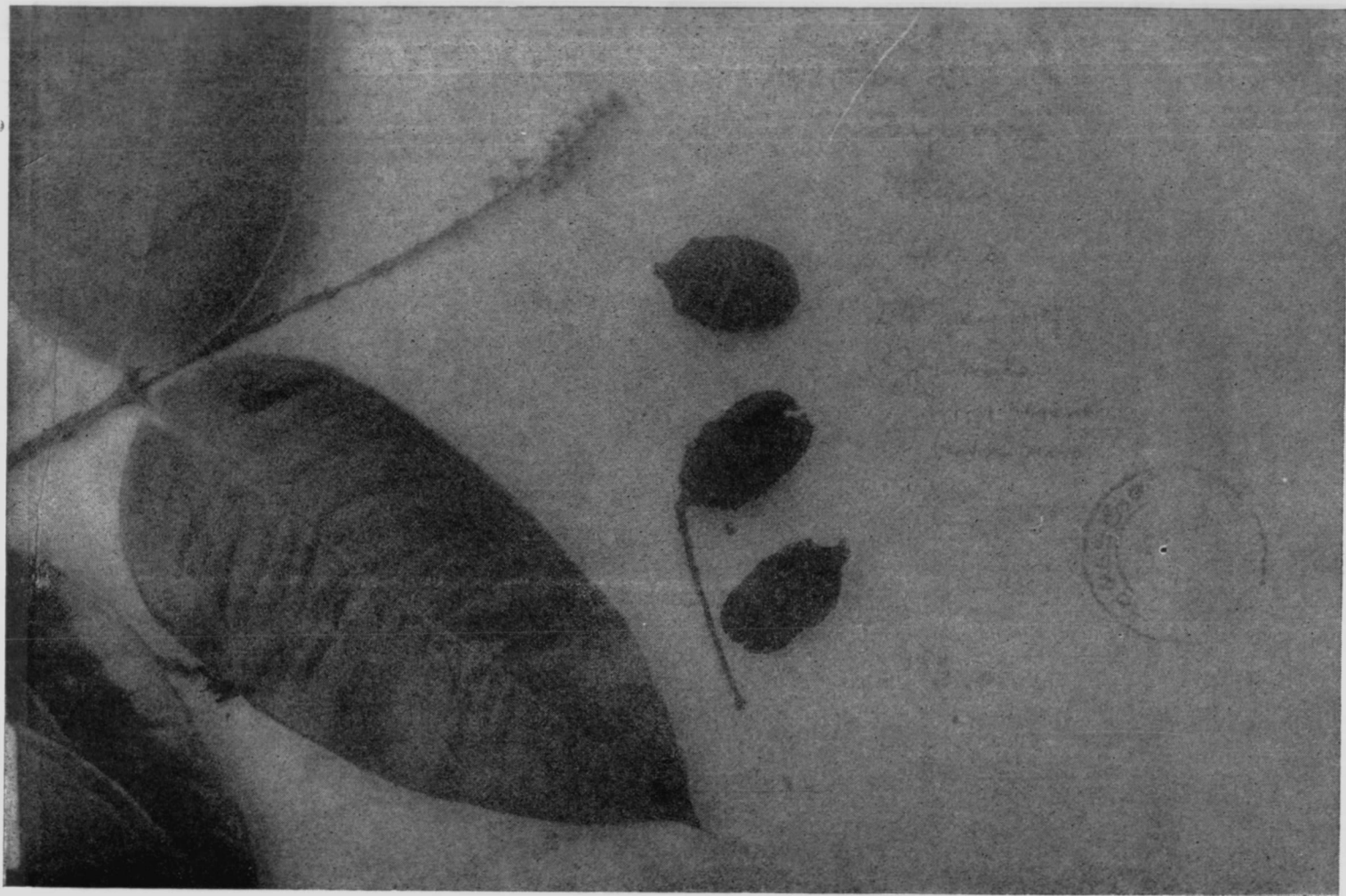
## CONCLUSION

The theory is postulated in this paper that the oldest living genera of Lythraceae, Melastomataceae, Myrtaceae and Rhizophoraceae are those most closely related to the Ceylonese-Malesian genus *Axinandra*—a tree with opposite leaves, marginal nerves, 5-merous flowers, capsular fruits, and thin winged seeds.

When the gross morphology and anatomy of this genus is studied in detail we come to the conclusion that it may be related to the origin of the whole order Myrtales.

## LITERATURE

- ARIENS. 1954 — Rhizophoraceae in Humbert, *Flore de Madagascar*.  
 BAILLON. 1876 — *Adansonia* 12.  
 BAKHUIZEN VAN DEN BRINK. 1943 — A contribution to the knowledge of the Melastomataceae occurring in the Malay Archipelago especially in the Netherlands Indies, *Rec. Trav. bot. neerl* 40: 1-391.  
 CRONQUIST, A. 1968 — *The evolution and classification of Flowering Plants*.  
 ENGLER, A. 1964 — *Syllabus der Pflanzenfamilien II*. Band, 12 Aufl.  
 MEIJER, W. 1968 — *Botanical Bulletin*, Herbarium Forest Dept., Sandakan, Sabah, Malaysia.



*Axinandra zeylanica* Thwaites, Gilimale Forest Reserve, Ratnapura, Meijer 492.



*Aximandra zeylanica* Thwaites, Kanneliya Forest Reserve, Meijer 555.