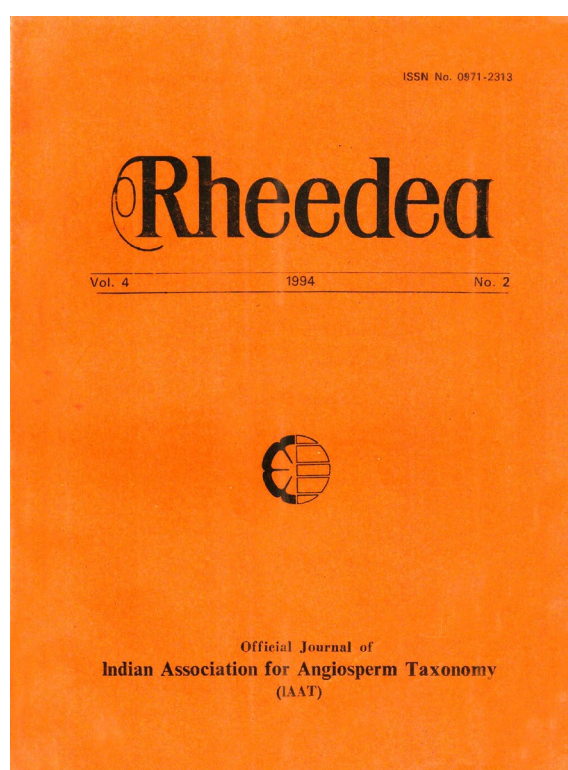




Floral anatomy and the affinities of Byblidaceae

Sandhya Rani R.



How to cite:

Rani R.S. 1994. Floral anatomy and the affinities of Byblidaceae. *Rheedeia* 4(2): 144–150.

<https://dx.doi.org/10.22244/rheedeia.1994.04.02.13>

Published in print: 31.12.1994

Published Online: 01.01.2022

Floral anatomy and the affinities of Byblidaceae

R. Sandhya Rani

Department of Botany, Nizam College
Basheerbagh, Hyderabad - 500 001

Abstract

The floral anatomy of *Byblis liniflora* and *B. gigantea* is studied. The flower is regular, bisexual, tetracyclic and pentamerous. The adnation among the floral parts leads to a tendency towards epigyny. The sepals are three traced and show contorted aestivation in *Byblis liniflora* and imbricate aestivation in *B. gigantea*. The petals and the stamens are single traced. The semi-inferior, 2-carpellary syncarpous ovary is bilocular and the carpels are 3-traced. Placentation is interpreted anatomically as parietal. The style is vascularised by the dorsal bundles. The affinities of Byblidaceae, with such allegedly related families as Pittosporaceae, Stegnospermataceae, Tremandraceae and Vivianiaceae are discussed in the light of the data from the present study and the available data from collateral disciplines.

INTRODUCTION

The unigeneric Byblidaceae represented by two species viz. *Byblis liniflora* and *B. gigantea* is endemic to Australia. Because of its insectivorous syndrome, the genus was included in Droseraceae by Bentham and Hooker (1862-1883). Diels (1930) accorded *Byblis* the status of an independent family, Byblidaceae, and the same has been supported by subsequent workers (Wettstein, 1935; Thorne, 1968; Vani-Hardev, 1972 and Dahlgren, 1983). The family has been placed under Rosales (Emberger, 1960; Melchior, 1964; Stebbins, 1974; Benson, 1979; Cronquist, 1981), Saxifragales (Takhtajan, 1980; Ryuleau, 1981), Droserales (Goldberg, 1986) and Pittosporales (Hutchinson, 1973; Dahlgren, 1983; Young, 1981; Thorne, 1992).

The floral anatomy of Byblidaceae is unknown and the present study is an attempt in this direction.

MATERIAL AND METHODS

The herbarium materials of *Byblis liniflora* Salisbury and *B. gigantea* Lindley were processed following Narayana (1964). Serial transverse sections, cut at a thickness of 9—12 microns, were stained in Ehrlich Haematoxylin and counterstained with Erythrosin.

Floral anatomy of Byblidaceae

OBSERVATIONS

Flower:

The flower is pedicellate, bisexual, regular, perigynous and 5-merous except the gynoecium which is bicarpellary (Figs 11, 23). The different floral parts, which show adnation, become free at higher levels (Figs 9, 10, 21-23). The sepals are the first to separate from the hypanthium (Figs 7, 8, 20, 21). They are free with quincuncial aestivation in *B. gigantia* (Figs 22, 23) and contorted aestivation in *B. liniflora* (Figs 9-12). At a higher level the ovary becomes free from the corolla tube to which the staminal filaments are adnate (Figs 11, 23). After the separation of the staminal filaments, the corolla tube breaks into five units which show contorted aestivation (Figs 12, 25). The androecium consists of five free alternipetalous stamens (Figs 10-12, 23, 25). The anthers are tetrasporangiate and the sporangia are arranged in two lateral pairs (Fig 25). The gynoecium is bicarpellary, syncarpous and bears several ovules on massive placentae (Figs 11, 12, 23, 24). The ovary becomes unilocular above the ovule-bearing region. The style shows a styler canal and terminates in capitate hairy stigmas (Figs 26, 27).

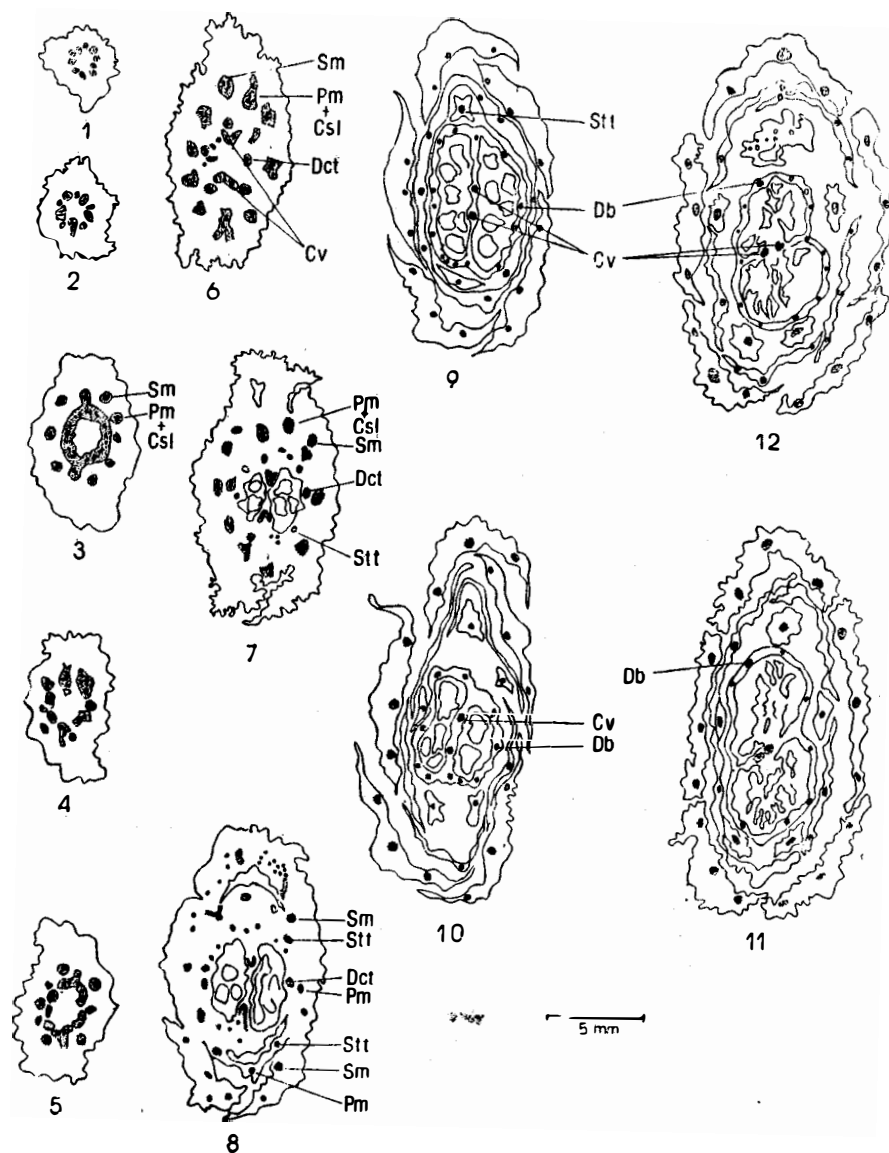
Floral anatomy:

The pedicel shows ten vascular bundles arranged in a ring (*B. liniflora*) or otherwise (*B. gigantia*). From the main stele five sepal midrib traces depart (Figs 2, 14). They are followed by five conjoint petal midrib and common sepal lateral traces (Figs 3-6, 14-18). As a result of their tangential division, the lateral traces of adjacent sepals and petal midrib are demarcated towards exterior and interior respectively. The former diverge to the sides and enter the sepals before they separate from the hypanthium (Figs 7, 8, 19, 20). After the organisation of the petal midribs, the main stele assumes a circular outline from which five staminal traces are organised along the sepal radii (Figs 7, 18, 19). After the departure of the staminal traces, the main stele resolves into two dorsal bundles, 2 common ventral bundles and a number of smaller bundles in *B. liniflora* (Figs 7-12), while it resolves into only dorsal and common ventral bundles in *B. gigantia* (Figs 23-25) with anatomically parietal placentation. The common ventrals lying in the septum are completely utilised in the ovular supply, while the dorsal bundles extend into the style and undergo branching as they reach the base of the hairy stigmas (Figs 26, 27). From the above observations it is evident that the traces for the different floral parts do not show any adnation, though the same is apparent in the external morphology.

DISCUSSION

It is held that the Byblidaceae is related to Pittosporaceae, Stegnospermataceae, Tremandraceae and Vivianiaceae (Hutchinson, 1973).

R. Sandhya Rani



Figures 1—12. *Byblis liniflora*. Serial transverse sections of flower buds showing the origin and distribution of the traces to the different floral parts. (Sm - Sepal midrib, Sl - Sepal lateral, Csl - Common sepal lateral, Pm - Petal midrib, Stt - Staminal trace, Dct - Dorsal carpellary trace, V - Ventral bundle, Db - Dorsal bundle, Cv - Common ventral, Stf - Staminal filament).

Floral anatomy of Byblidaceae

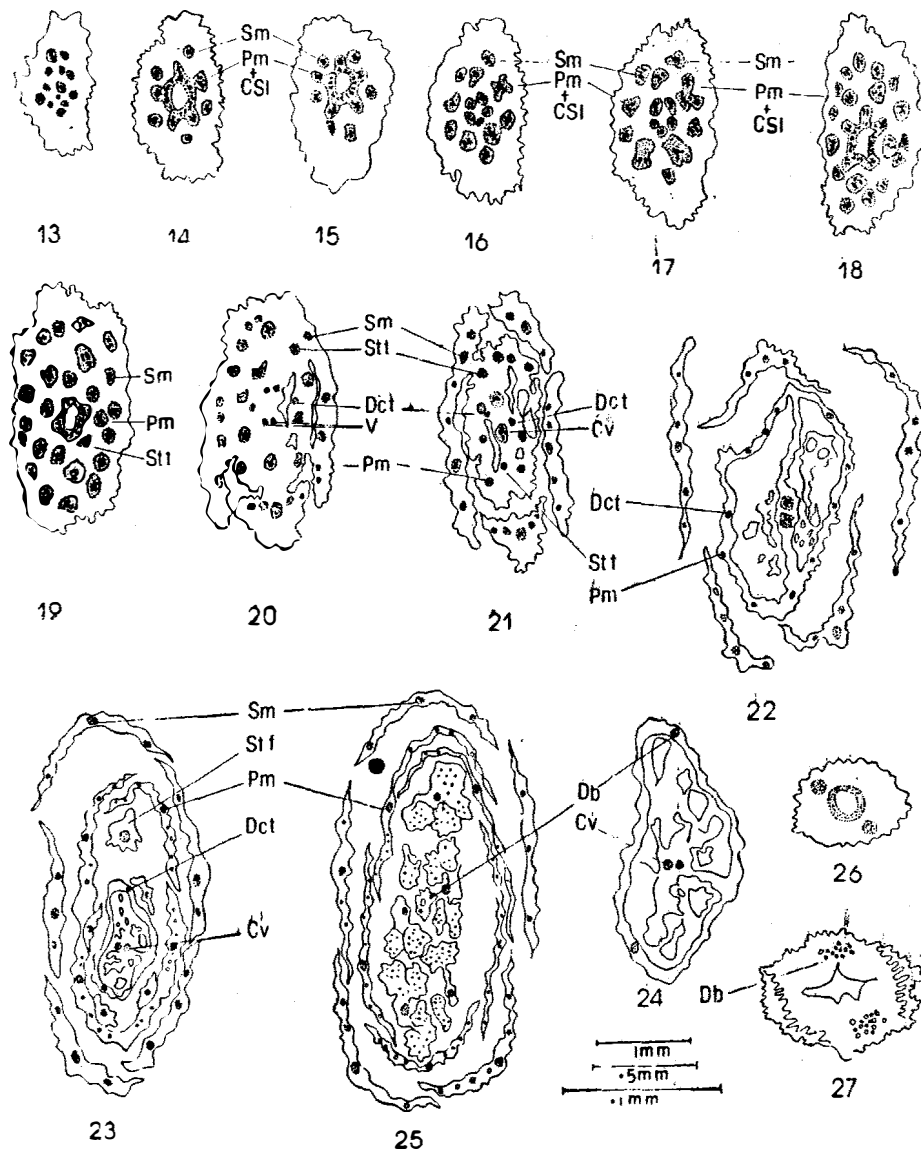
The Byblidaceae and the Pittosporaceae, with the exception of *Pittosporum*, some species of which occur in India and Africa, are endemic to Australia. They resemble one another in having tetracyclic and pentamerous floral plan (present study; Radhakrishnaiah, 1977). However, in the adnation among the floral parts and absence of a disc like region below the ovary, the Byblidaceae stand distinct from Pittosporaceae (present study). In such embryological characters, as bitegmic anatropous ovules, endothelium, cellular endosperm (Davis, 1966; Johri *et al.*, 1992) and seed coat structure (Corner, 1976), Byblidaceae differ from pittosporaceae.

In the presence of secretory canals, small vessels, simple perforation plates, 3—7 cell wide wood rays, septate fibers and paratracheal parenchyma, Pittosporaceae stand apart from Byblidaceae (Metcalfe and Chalk, 1950; Carlquist, 1976a). Carlquist, who worked on the wood anatomy of Byblidaceae and Roridulaceae concluded that wood anatomy of *Byblis* is consistent with relationship to Roridulaceae and its placement in orders variously recognised as Rosales and Pittosporales (Carlquist, 1976a, b).

The Byblidaceae stand apart from Stegnospermataceae in the presence of capitate glands on leaves, tetracyclic flowers, adnation between floral parts, haplostemonous androecium, epipetaly of stamens, 2 carpellary syncarpous, 2-locular ovary with numerous ovules on swollen placentae, anatomically parietal placentation and single style (present study; Suvartha, *et al.* 1984), paracytic stomata and scalariform perforation plates (Metcalfe and Chalk, 1950, 1979), 3-colporate pollen grains (Erdtman, 1952), porous dehiscence of anthers, anatropous tenuinucellate ovules, endothelium, cellular endosperm and straight embryo (Davis, 1966; Johri *et al.*, 1992) and seed coat structure (Corner, 1976). The Stegnospermataceae stand distinct in the presence of betalains and sieve tube plastids of P-III subtype with polygonal protein crystalloid and C4 photosynthetic pathway (Mabry, 1977).

The Tremandraceae besides being endemic to Australia, resemble Byblidaceae in the 4-cyclic and 5-merous flowers (except the gynoecium which is 2-merous). However, the flowers of Byblidaceae are perigynous while they show hypogynous floral plan in Tremandraceae. The perianth in Byblidaceae is imbricate, while it is valvate or induplicate valvate in Tremandraceae. The androecium is haplostemonous and epipetalous in Byblidaceae, whereas in Tremandraceae they are haplostemonous / obdiplostemonous (Suvartha, *et al.*, 1984; Laxmi and Narayana, 1987; Sandhya Rani, 1994). The Byblidaceae differ from Tremandraceae in having endothecium, tenuinucellate ovules (Johri *et al.*, 1992), thick walled and nonmucilagenous epidermis, paracytic stomata, homogenous rays (Metcalfe and Chalk, 1950), simple perforation plates and

R. Sandhya Rani



Figures 13—27. *Byblis gigantia*. Serial transverse sections of flower buds showing the origin and distribution of the traces to the different floral parts. (Sm - Sepal midrib, Sl - Sepal lateral, Csl - Common sepal lateral, Pm - Petal midrib, St. t - Staminal trace, Dct - Dorsal carpellary trace, V - Ventral bundle, Db - Dorsal bundle, Cv - Common ventral, St. f - Staminal filament).

Floral anatomy of Byblidaceae

fibriform cells (Carlquist, 1976a, 1977) 3-colpate and oblate-spheroidal pollen (Erdtman, 1952), and noncyanophoric (Gibbs, 1974) features.

While Byblidaceae are endemic to Australia, the Vivianiaceae are confined to South America. The flowers in Vivianiaceae are 5-cyclic, but they are 4-cyclic in Byblidaceae. Though pentamery is apparent, the gynoecium is 3- and 2-merous in Vivianiaceae and Byblidaceae respectively. The androecium is haplostemonous in Byblidaceae, whereas in Vivianiaceae it is obdiplostemonous. Adnation among the floral parts present in Byblidaceae is absent in Vivianiaceae. Anatomically the Vivianiaceae are more akin to Geraniaceae (Carlquist, 1975) and not to Byblidaceae.

Unless some more data from collateral disciplines reinforce the admittedly meagre present one, the relationships of Byblidaceae with the remainder of Pittosporales cannot be confirmed.

Acknowledgements

I place on record my grateful thanks to Prof. M. Radhakrishnaiah for guidance. I express my deep sense of gratitude to Dr. L. L. Narayana for going through the manuscript and constructive criticism. My sincere thanks are due to late Mr. R. Kuchel and Dr. H. J. Eichler of Adelaide for providing me the herbarium material.

Literature cited

- Benson, L. D. 1979. *Plant Classification*, Lexington, Mass. 2nd Edition.
- Bentham, G. & Hooker, J. D. 1862-1883. *Genera Plantarum*. London.
- Carlquist, S. 1975. Wood anatomy and familial status of *Viviania*. *Aliso* 11 (2): 159-165.
- Carlquist, S. 1976a. Wood anatomy of Byblidaceae. *Bot. Gaz.* 137 (1): 35-38.
- Carlquist, S. 1976b. Wood anatomy of Roridulaceae: Ecological and Phylogenetic implications. *Amer. J. Bot.* 63 (7): 1003-1008.
- Carlquist, S. 1977. Wood anatomy of Tremandraceae: Phylogenetic and ecological implications; *Amer. J. Bot.* 64 (6): 704-713.
- Corner, E. J. H. 1976. *The Seeds of Dicotyledons*. Cambridge.
- Cronquist, A. 1981. *An Integrated System of Classification of Flowering Plants*. New York.
- Dahlgren, R. 1983. General aspects of angiosperm evolution and macrosystematics. *Nord J. Bot.* 3: 119-149.

R. Sandhya Rani

- Davis, G. L. 1966. *Systematic Embryology of the Angiosperms*. New York.
- Diels, L. 1930. Byblidaceae. In A. Engler and K. Prantl, (eds.) *Die Natürlichen Pflanzenfamilien* Part 13 A. 286-288. Leipzig.
- Emberger, L. 1960. Les Vegetaux. Vasculaires, In M. Chadeaud & L. Emberger, *Traite de Botanique Systematique*. Paris.
- Erdtman, C. 1952. *Pollen Morphology and Plant Taxonomy: Angiosperms* Stockholm.
- Gibbs, R. D. 1974. *Chemotaxonomy of Flowering Plants*. London, Vol I-IV.
- Goldberg, A. 1986. *Classification, Evolution and Phylogeny of the Families of Dicotyledons*, Washington.
- Hutchinson, J. 1973. *The Families of Flowering Plants*. Oxford. 3rd Edn.
- Johri, B. M., Ambegokar, K. B. & Srivastava, P. S. 1992. *Comparative Embryology of Angiosperms*, London.
- Laxmi, K & Narayana, L. L. 1987. The floral anatomy of *Tetratheca affinis* Endl. (Tremandraceae). *J. Swamy Bot. Cl.* 4 (1): 45-47.
- Mabry, T. J. 1977. The order Centrospermae. *Ann. Miss. Bot. Gard.* 64: 210-220.
- Melchior, H. 1964. *Engler's Syllabus der Pflanzenfamilien*, Berlin. Ed. 12.
- Metcalf, C. R. & Chalk, L. 1950. *Anatomy of the Dicotyledons*. London. Vol. I & II.
- Metcalf, C. R. & Chalk, L. 1979. *Anatomy of the Dicotyledons*. London. Vol. I & II.
- Narayana, L. L. 1934. Contribution to the floral anatomy and embryology of Linaceae. *J. Indian Bot. Soc.* 43: 343-357.
- Narayana, L. L. & Suvartha, C. 1984. Floral anatomy of Stegnospermataceae. *Acta Bot. Indica* 12. 207-209.
- Radhakrishnaiah, M. 1977. *A Contribution to the floral anatomy of Pittosporaceae*. Ph.D. Thesis. Kakatiya Univ. Warangal.
- Rouleau, E. 1981. *Guide to the generic names appearing in the Intex Kewensis and its Fifteen Supplements. Pars IV: Conspectus Systematis*, Quebec.
- Sandhya Rani, R. 1994. Floral anatomy of Tremandraceae. *J. Indian Bot. Soc.* (in Press) ;
- Stebbins, G. L. 1974. *Flowering Plants: Evolution above the species level*, Cambridge.
- Suvartha, C. & Narayana, L. L. 1981. Floral anatomy of *Stegnosperma helimifolium* Benth. *Curr. Sci.* 50: 138-139.
- Suvartha, C.; Satyavathi, M. & Narayana, L. L. 1984. Floral anatomy of *Tetratheca afoliata* FVM (Tremandraceae). *Curr. Sci.* 53: 866-867.
- Takhtajan, A. 1980. Outline of the classification of Flowering Plants. *Bot. Rev.* 46: 225-359.
- Thorne, R. F. 1968. Synopsis of a putatively phylogenetic classification of the flowering plants. *Aliso.* 6: 57-66.
- Thorne, R. F. 1992. Classification and geography of the Flowering Plants. *Bot. Rev.* 58: 225-350.
- Vani-Hardev, A. 1972. Systematic embryology of *Roridula gorgonias* Planch. *Beitr. Bidl. Pflanzen* 48: 339-351.
- Wettstein, R. Von. 1935. *Handbuch der Systematischen Botanik*. Wien.
- Young, D. A. 1981. Amended outlines and indices of six recently published systems of Angiosperm classification. *Phytologia* 51: 146-156.