Sabiaceae

Sabiaceae Blume, Mus. Bot. 1:368 (1851), nom. cons.
Meliosmaceae Endl. (1841), nom. rej.

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Evergreen, rarely deciduous trees, scandent shrubs or woody climbers, glabrous or pubescent, very rarely armed with short spines (*Sabia japonica*). Leaves spirally arranged, penninerved, simple or imparipinnate, with dentate or entire margins, sometimes heteromorphic, often on subwoody petiole bases, estipulate, the leaflets often on pulvini. Flowers small, hermaphroditic, actinomorphic or zygomorphic, in terminal or axillary panicles, these often reduced to solitary axillary flowers; the pedicels often very short, provided with 0–numerous minute bracts; sepals, petals and stamens opposite to each other; sepals (4)5, imbricate, free or ± connate at the base, equal or the inner 2 much smaller; petals (4)5, the innermost 2 often much smaller; stamens and staminodes 5; stamens all polliniferous (*Sabia*), or only the 2 opposite the inner petals polliniferous and the 3 other staminodial; thecae unilocellate; filament below the anther often swollen or bearing a collar-like extension (the latter perhaps formed by connective); nectary disk thin, annular, surrounding the base of the ovary, its lobes and ribs, if present, alternating with the stamens; ovary syncarpous of 2(3) carpels, either (all *Ophiocaryon*, very rarely in *Sabia*) the carpels free in the apical part and ending in 2 short stylodia with capitate stigmas, or (*Meliosma*, nearly all *Sabia*) the carpels apically united into a short, cylindric or conical style with a capitate stigma; cells 2(3), each with (1)2 pendulous or horizontal, axile, hemitropous, unitegmic, crassinucellar ovules. Fruit 1-celled or rarely 2-coccous, asymmetric, drupaceous or dry, indehiscent, developing a single seed; endocarp osseous or crustaceous. Endosperm scanty or wanting; embryo with an elongated, curved hypocotyl and 2 flat, folded or coiled cotyledons.

A neotropical and Indo-Malesian family of three genera and c. 52 species, or 15–20 more if in Asian *Meliosma* a narrower species concept is applied.

Vegetative Morphology. *Sabia* has simple leaves whereas, in *Ophiocaryon* and *Meliosma*, these vary from imparipinnate to simple (or unifoliolate?), often in groups of closely related species. Particularly in *Ophiocaryon* leaves can be very large, and pinnae up to 4 dm are reported. Leaf dimorphism is found in many *Ophiocaryon* and some *Meliosma*, sterile shoots often bearing pinnate leaves whereas those of flowering branches are either simple or 1–3-foliolate. In *Meliosma*, saplings and sterile shoots develop a much stronger leaf serration than do mature or reproductive shoots.

Vegetative Anatomy. Salient features are given by Metcalfe and Chalk (1950); notable is the lack of secretory cavities. Hairs are simple-multicellular and sometimes have 2-celled heads. The most recent study of the wood anatomy is by Carlquist et al. (1993). Despite the small size of the family and its restriction to mesic sites, these authors report considerable variation of wood anatomical characters (long scalariform, multiperforate and simple perforation plates; heterocellular to homocellular multiseriate rays; tracheids, fibre tracheids, or libriform fibres as imperforate tracheary elements; presence or absence of silica bodies and calcium oxalate in rays; presence or absence of growth rings of various types; and variations in vessel diameter, vessel density and vessel element length). From the wood anatomical point of view, the authors considered the family fitting best in Rutales (presumably mainly because they found nothing contradicting this traditional placement).

Inflorescences. In *Sabia*, the flowers are arranged in many- to few-flowered axillary panicles or are solitary. *Ophiocaryon* and *Meliosma* have usually many-flowered, large terminal or axillary panicles, in which the flowers are often subsessile.

Flowers. Urban (1895, 1900) has demonstrated that the three genera basically agree in flower

structure, which is 5-merous and in which sepals, petals and stamens are arranged in opposite whorls (Fig. 145C, D), i.e. *they lie on five radii*. The differences in androecium and gynoecium structure do not justify the separation of the genera into two families, an aspect discussed by many authors up to the present (e.g. Cronquist 1981).

The floral organs are disposed in a continuous 2/5 spiral. *Meliosma* has the most complicated structure. The three outer petals are slightly imbricate and completely enclose the stamens and gynoecium (Fig. 146). The two inner petals are strongly reduced and the only two functional stamens are adnate to them. (This has prompted several authors to postulate a trimerous floral structure.) The stamen filaments of *Meliosma* have a collar-like configuration below the anther (perhaps formed by the connective). In bud, the anthers are sharply bent downwards and inwards by a fold of the filament, and the anther cells fit into the cavities of the adjacent staminodes. This complex of fertile stamens and staminodes envelops the pistil, and the staminodes are often somewhat connate at the top and leave a pore through which the tip of the style protrudes. The anther cells burst when the flowers are still in bud but the pollen cannot be released as long as the anther cells are locked in the cavities of the staminodes. At maturity, the bud explodes at the slightest touch, and the stamens snap backwards and fling a puff of pollen into the air. Because anthesis is so short-lived, almost only buds and old flowers are found. This mechanism, reported by van Beusekom (1971), seems to have been observed first by Blume. With regard to floral morphology, *Ophiocaryon* is intermediate between *Sabia* and *Meliosma*: functional stamens are two but the petals are not strongly dimorphic, the filaments are thickened beneath the anther, and the two carpels do not form a common style.

Among early-diverging eudicots, nectary disks elsewhere are found only in Buxaceae and Proteaceae.

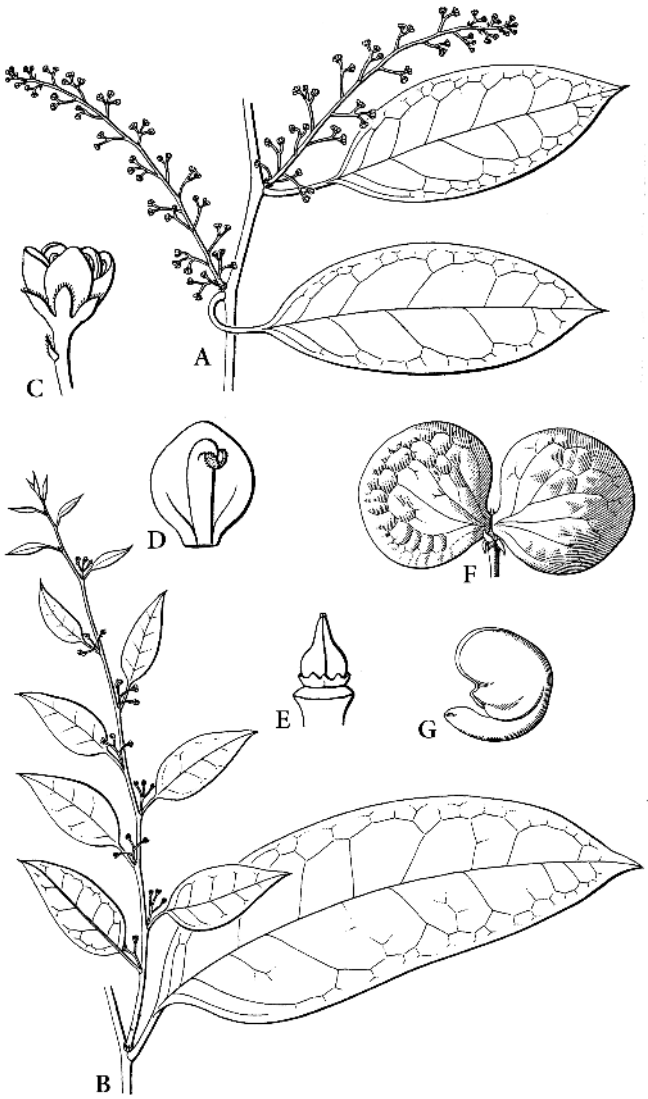

Fig. 145. Sabiaceae. *Sabia limoniacea*. **A**, **B** Habit. **C** Anthetic flower. **D** Petal and, opposite, stamen. **E** Disk and pistil. **F** Fruit. **G** Embryo. (Drawing by Ruth van Crevel; van Beusekom and van de Water 1989)

Karyology. Chromosome counts are available for several *Meliosma* spp. with $2n = 32$, and for *Sabia japonica* with $2n = 24$ (Fedorov 1969).

Pollen Morphology. Pollen (only *Sabia* and *Meliosma* spp. studied) is tricolporate with lalongate ora, (sub-)prolate, and relatively small (up to 34 µm long); the exine is semitectate and more or less distinctly reticulate (Erdtman 1952; Mondal 1990).

Embryology. In *Meliosma* and *Sabia*, the pollen grains are two-celled when shed, and the ovules are much alike in both genera: apotropous, unitegmic and crassinucellar. A parietal cell is cut off from the archesporial cell, and the embryo sac develops according to the Polygonum type. Endosperm development is of the Helobial type (Mauritzon 1936; Davis 1966).

Seeds and Fruits. In *Sabia*, each locule of the two-paired ovary can develop into a drupelet