
Lythraceae

Lythraceae J. St.-Hil., Expos. Fam. Nat. 2:175 (1805), nom. cons.

Trapaceae Dumort. (1829). Punicaceae Horan. (1834).

Sonneratiaceae Engl. (1897). Duabangaceae Takht. (1985).

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Trees, shrubs or herbs, frequently with the younger stems quadrangulate; nodes unilacunar. Leaves opposite, seldom whorled or alternate, simple, entire (dentate in *Trapa*), stipulate or estipulate, glandular processes present in the axil at the base of the petiole in most genera; blades membranous or coriaceous, venation brochidodromous. Inflorescences determinate or indeterminate, forming cymes, axillary or terminal racemes, spikes, or thyrses, rarely flowers solitary; the pedicels with prophylls. Flowers generally odorless, actinomorphic, or tending to zygomorphic by increased abaxial orientation of stamens and pistil, truly zygomorphic in *Pleurophora* and *Cuphea*, perfect (dioecious in *Capuronia*), typically perigynous, seldom epigynous or hemi-epigynous, 4–6(8–16)-merous, mono-, di- or trimorphic; floral tube campanulate to tubular, often conspicuously nerved, persistent (except *Lafoensia*), membranous to thick and coriaceous; sepals one half or less the length of the floral tube, valvate, triangular-ovate, acute, often alternating with external appendages (the epicalyx); petals (0–)4–6(–many), inserted on the inner rim of the floral tube, alternating with the sepals, crumpled, pinnately veined, frequently clawed, caducous; stamens typically diplostemonous, sometimes reduced to a single antesepalous or antepetalous whorl, when diplostemonous, then the filaments of the antesepalous whorl longest, inserted near the base of the floral tube or above, anthers dorsifixed, versatile, rarely basifixed, introrse, bilocular, longitudinally dehiscent; gynoecium syncarpous, encircled at the base by nectariferous tissue or the nectary enlarged, forming a unilateral free-standing nectary, or nectary 0; stigma capitate or punctiform, dry or wet; style simple, slender, commonly exserted; ovary superior or less often semi-inferior to inferior, thin- or thick-walled, 2–4(–many)-locular, the septa incomplete at the apex or vestigial and reduced to thin threads; placentation axile, the placenta slender or globose

and nearly free-central at capsule maturity; ovules 2–many. Fruit a dry, thin- to thick-walled capsule enclosed by the persistent floral tube, rarely leathery and berrylike, dehiscent loculicidally, septicidally, or splitting irregularly, infrequently circumscissile or indehiscent. Seeds obpyramidal or oblong to obovoid and convex-concave or lenticular-compressed, winged or not; seed coat with or without inverted epidermal hairs; embryo straight, cotyledons planar (rolled in *Lagerstroemia* and *Punica*), often auriculate or cordate, partially enveloping the short radicle, oily. $x = 8$.

Widely distributed in the subtropics and tropics of both hemispheres, some temperate representatives, comprising 31 genera and c. 600 species.

VEGETATIVE MORPHOLOGY. The family is predominantly woody, with the majority of genera small trees, large shrubs or single to multi-stemmed subshrubs to 15 m. Six genera include tall tree species up to 30 m or more: *Duabanga*, *Sonneratia*, *Lagerstroemia*, *Lafoensia*, *Ginoria*, and *Physocalymma*. Bark in the larger forms is frequently plate-like, pale and smooth, flaking in large irregular flakes to reveal green or coral inner bark. Also common in the family is rough, dark, ridged bark, excorticating in fibrous strips. Young stems of most genera are four-angled, becoming terete with age. Annual and perennial herbs less than 50 cm tall occur in *Ammannia*, *Nesaea*, *Rotala*, *Didiplis*, *Lythrum*, *Peplis*, *Cuphea*, and *Pleurophora*. Most small herb species are associated with aquatic or marsh habitats. In *Pleurophora*, however, the diminutive species are highly adapted desert inhabitants. *Trapa*, with vegetatively distinctive floating and submersed leaves, is unique in the family in having inflated petioles on the leaves at the ends of the branches, which form floating rosettes, and highly dissected leaf-like organs at submerged nodes. Extensive aerenchymatous tissue develops on submerged stems of several marsh-inhabiting or wetland gen-



Fig. 78. Lythraceae. Stand of *Sonneratia alba* in the Marshall Islands, Pacific, with pneumatophores. (Photograph Nancy Vandervelde)

era (e.g., *Ammannia*, *Cuphea*, *Decodon*, *Heimia*, *Lythrum*, *Peplis*, *Trapa*), by production of phellem (Lempe et al. 2001; Stevens et al. 2002), or in *Trapa* by proliferation of the outer cortex (Timonin 1999).

The mangrove genus *Sonneratia* develops an extensive subaerial horizontal root system from which arise numerous vertical pneumatophores (Fig. 78). The pneumatophores are not respiratory organs per se but function by producing two other root types: anchor roots that grow downward, and subaerial, finely branched nutrition roots that extend horizontally outward from the pneumatophore into the uppermost silt layer to absorb incoming nutrients (Troll 1930).

Leaves are predominantly decussate and membranous to coriaceous. The margin is entire, excepting for *Trapa* where the floating leaves are coarsely toothed distally. Venation is typi-

cally brochidodromous. Seemingly uni-nerved, in-rolled heath-like leaves are convergent in white sand-inhabiting species of two sections of *Cuphea*, and in some *Diplusodon* of sandy and rocky campos. Slight leaf dimorphism, mainly in leaf shape, occurs in amphibious species of *Rotala* and *Didiplis* and is pronounced in the aquatic *Trapa* where submerged leaves are linear, entire margined, opposite on the stem, and caducous and floating leaves are rhombic, toothed, alternate in rosettes, and persistent. The leaf-like organs on submerged stems of *Trapa* appear to be highly modified, photosynthetic adventitious roots (Couillault 1973). In *Pleurophora*, the leaf, prophyll, and sepal apices of the desert species are modified to rigid spines. In *Lawsonia* and *Punica*, branch tips become hardened spines, reflecting the dry eastern Mediterranean-Eurasian origins of these well-known cultivated plants. Subapical, porate chambers are present on the undersides of leaves of *Lafoensia* (Fig. 84C), *Capuronia*, *Galpinia*, *Sonneratia*, and *Punica* (Ross and Suessenguth 1926; Rao and Chakraborti 1982; Belin-Depoux 1989). These act as hydathodes, salt-secreting glands, or nectaries.

Stipules, when present, are minute and caducous. *Trapa* is exceptional in bearing stipules that split to the base and appear as multiple scarious stipules at a node. Weberling (1984) has described intrapetiolar stipular processes in Lythraceae and other families of Myrtales that are fleshy, sometimes secretory, hair-like appendages at the base of the petiole in the leaf axil.

VEGETATIVE ANATOMY. Most genera are glabrous or, at most, pubescent. *Diplusodon* can have unusual, tufted trichomes and *Lagerstroemia* sect. *Trichocarpidium* has dendritic trichomes. The trichomes of *Pleurophora* and *Cuphea* include multicellular hairs secreting resinous exudates, and in *Cuphea* especially, other unicellular types, including malpighiaceae cystolithic hairs. Globose, multicellular glands with elongate necks or with spinulose surfaces characterize *Adenaria*, *Koehneria*, *Pehria*, *Woodfordia*, *Pleurophora*, *Cuphea*, and *Lourteella*.

Leaf structure in the family has been studied by Keating (1984). It is relatively homogeneous and most closely resembles that of Onagraceae, excepting for *Trapa*. Leaves are dorsiventral with adaxial and abaxial epidermal layers the same size, except in *Punica* p.p. and *Duabanga*; mucilage cells large, frequent; stomata on one or both surfaces, seldom sunken, mainly anomocytic; palisade lay-