Rhynchocalycaceae

Rhynchocalycaceae L.A.S. Johnson & B.G. Briggs, Ann. Missouri Bot. Gard. 71:732 (1984).

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Tree up to 12 m high; young shoots terete or slightly oval in transversal section, glabrous. Leaves opposite, decussate, simple, entire, coriaceous, more or less sessile when young, later shortly petiolate, elliptic to oblong; stipules rudimentary, marcescent. Inflorescence a multifloral, anthotelic panicle, mainly terminal. Flowers small, bisexual, actinomorphic, usually hexamerous, obhaplostemonous, with short hypanthium, slightly perigynous; sepals valvate, broad-based, triangular, and recurved at anthesis, persistent; petals white, distinct, narrowly clawed, with sub-orbicular lacerate lamina, thin, caducous, in bud hood-like, covering the anthers; stamens antepetalous, arising immediately below the petals on inner rim of hypanthium, incurved in bud; filaments more or less terete, longer than anthers; anthers sub-basifixed, versatile, tetrasporangiate, introrse, longitudinally dehiscent; connective elliptical; disc 0; ovary superior, 2(–3)-carpellate, 2(–3)-locular, dorsiventrally compressed; style stout, shorter than ovary, basal part persistent; stigma capitate, papillate; ovules 15–20 per locule, bitegmic, anatropous, crassinucellate, superposed in a single vertical series per locule; placentation axile. Fruit a dorsiventrally compressed capsule, loculicidal at apex, reddish brown. Seeds depressed-ovoid, narrowly winged; seed coat thin and papery, rather smooth, brownish; embryo more or less flattened; cotyledons folded; endosperm 0.

The only species, *Rhynchocalyx lawsonioides* Oliv., is a rare tree in moist forests in southern KwaZulu-Natal and Pondoland (Eastern Cape) in South Africa.

Vegetative Morphology and Anatomy. *Rhynchocalix lawsonioides* is an evergreen, mid-sized tree with a straight stem. The bark is grey with a pink slash, rough but not deeply fissured and with tiny flaking scales (Strey and Leistner 1968). The upper branchlets are opposite or in whorls of three to five. The foliage leaves of *Rhynchocalyx* are provided with two minute, rudimentary stipules situated on either side of the leaf axil at the base of the petiole (Graham 1984). Rudimentary stipules are present in a number of other myrtalean families, including the closely related Crypteroniaceae, Alzateaceae, Oliniaceae and Penaeaceae (Dahlgren and Thorne 1984; Weberling 1968). The midvein of the leaf lamina of *Rhynchocalyx* terminates in a minute glandular tip. Such glandular leaf apices are also present in Oliniaceae and at least some Penaeaceae (Dahlgren and Van Wyk 1988). The upper surface of the leaf blade is dark green, somewhat shiny and with a prominent midrib and secondary veins. The lower surface is greyish-green.

Leaves are glabrous. Stomata are confined to the abaxial epidermis and are intermediate between anomocytic and cyclocytic. The mesophyll is composed of two layers of palisade cells and unlignified spongy tissue. The midrib is adaxially flattened, abaxially prominently raised. Vascular bundles of the primary and most minor veins are bicollateral, with a collenchymatous to parenchymatous unlignified bundle sheath extending to the upper and lower epidermis. Foliar sclereids are unbranched and restricted to the petioles (Rao and Das 1979). Nodes are unilacunar with a single trace. Secondary phloem consists of sieve tubes, companion cells, chambered parenchyma cells, and infrequent thick-walled sclereids. Crystals are present in the form of druses in the ground tissue of leaf lamina and the petiole as well as in the pith and the cortex of twigs. (Information on vegetative anatomy mostly from van Vliet and Baas 1975 and Keating 1984.)

Wood anatomy is characterized by crystalliferous, chambered fibres and heterogeneous narrow rays as well as scanty paratracheal to vasicentric parenchyma surrounded by thin-walled fibres (van Vliet 1975; Baas and Zweypfenning 1979).

Floral Morphology and Anatomy. Flowers are arranged in many-flowered, terminal and/or

axillary, anthotelic panicles (Fig. 144A). Individual flowers are small and inconspicuous. The flowers are bisexual, actinomorphic and obhaplostemonous. Most often they are hexamerous, but penta- and heptamery occur as well. Aspects of floral development and structure were described by Schönenberger and Conti (2003). The sepals are inserted on the rim of a short hypanthium and each sepal is served by three vascular bundles. The petals alternate with the sepals and are inserted on the adaxial side of the hypanthium rim (Fig. 144C). Their development is retarded relative to the sepals in young buds. Each petal is served by a single vascular bundle. Stamens are produced opposite or, more precisely, immediately below the petals on the adaxial side of the hypanthium rim. Stamens are strongly incurved in bud, with their pollen sacs directed towards the hypanthium. The apex of the two-carpellate ovary tapers into a short style with a terminal stigma. Scattered cells with oxalate druses are present in all floral organs, except for the petals.

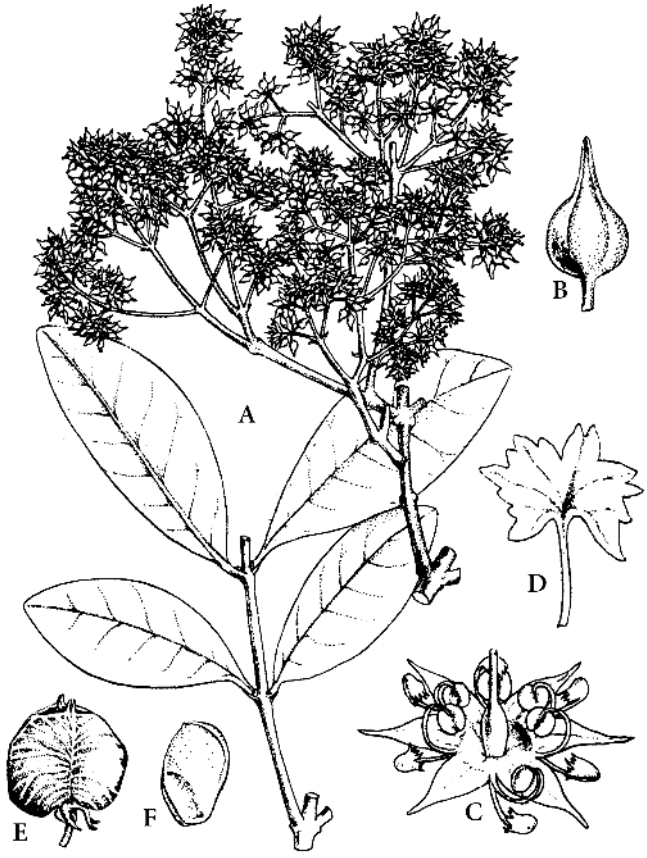

Fig. 144. Rhynchocalycaceae. *Rhynchocalyx lawsonioides*. **A** Part of branch and inflorescence. **B** Flower bud. **C** Anthetic flower. **D** Clawed petal. **E** Mature fruit. **F** Seed. (**A–D** Oliver 1894; **E, F** Strey and Leistner 1968)

Embryology. Embryology was studied by Tobe and Raven (1984). Anthers are tetrasporangiate. The developing anther wall is five cell layers thick. The endothecium and two middle layers are ephemeral. The tapetum is glandular and its cells become two-nucleate before degeneration. At the time of dehiscence, the mature anther wall is composed only of the persistent epidermis. The septum between the two pollen sacs of each theca remains intact even at the time of dehiscence, which is a rather unusual feature among angiosperms. Meiosis in microspore mother cells is accompanied by simultaneous cytokinesis. The shape of the resulting tetrads is usually tetrahedral and often decussate. Pollen grains are two-celled when they are shed.

Ovules are bitegmic, anatropous and crassinucellate. The micropyle is formed by the inner integument. The embryo sac is eight-nucleate and corresponds to the Polygonum type. Endosperm formation is Nuclear. Endosperm is scanty throughout seed development and literally absent in mature seeds. Embryogenesis conforms to the Onagrad type. In mature seeds the embryo is more or less flattened; its cotyledons are folded inside.

Pollen Structure. Pollen has been described by Patel et al. (1984) as tricolporate, heterocolpate with three subsidiary colpi (pseudocolpi), radially symmetrical and isopolar, spheroidal in lateral view and triangular-hexogonal in polar view. The surface is coarse, with many punctae and irregular channels. The foot-layer is well developed in the mesocolpial areas. Columellae are numerous, erect and branched distally, often forming an infratectal granular layer (Muller 1975). The tectum is thick, perforate, with an undulating upper margin which is locally discontinuous. The endexine is very thin in mesocolpial areas but thick at the colpi and subsidiary colpi, and granular in the region of the endoaperture.

Fruit and Seed. The fruit is described as a two- (or sometimes three-)locular, dorsiventrally compressed capsule which is partially loculicidal at the apex (Fig. 144E; Strey and Leistner 1968). The 15–20 seeds in each locule are tightly packed in a more or less distinct vertical row on an axile placenta. As described by Tobe and Raven (1984), the mature seed is depressed-ovoid in shape with a flat mem-