
Crossosomataceae

Crossosomataceae Engl. in Engler & Prantl, Nat. Pflanzenfam., Nachtr. 1:185 (1897), nom. cons.

V. Sosa

Small to large microphyllous shrubs, rarely arborescent, intricately branched; stems smooth, spinescent, or with hyaline to black trichomes. Leaves alternate or opposite, scattered or fascicled; stipules minute or 0. Flowers solitary, axillary or terminal on short shoots, bisexual or rarely unisexual, actinomorphic, perigynous, with or without a fleshy or thin, glandular, crenately lobed disk; hypanthium present, short and turbinate or enlarged and tubular; sepals (3)4–5(6), equal or unequal in form, ovate, oblong or triangular, persistent; petals (3)4–5(6), distinct, deciduous or persistent, equal or unequal in form, narrowly lanceolate to round ovate, usually longer than sepals, often short-clawed; stamens 4–50, diplostemonous, haplostemonous, or polystaminate, sometimes unequal in length, rarely almost sessile; anthers basifixed; gynoecium apocarpous, 1–5(–9)-carpellate; pistils stipitate or sessile, 1-celled, with 1–2 to many ovules; stylodia short or 0; stigmas capitate. Fruits follicular, ventrally dehiscent, surface smooth or rugose. Seeds disk-shaped, black or brown, with a whitish or yellowish, irregular, fimbriate or fimbriolate aril, 1(2)–many.

A small family of four genera and ca. 10 species, restricted to North America with Mexico. Most species are in xerophytic vegetation.

CHARACTERS OF RARE OCCURRENCE. Young branches turning orange-brown in *Glossopetalon* or with small hyaline projections turning dark in *Velascoa*. Hypanthium enlarged and tubular in *Velascoa*.

VEGETATIVE MORPHOLOGY. Crossosomataceae are small to large shrubs or rarely small trees, sometimes hanging from rocks. They are usually deciduous, intricately and highly branched, often spinescent, and have angled, grooved, or ribbed branches. The bark is yellowish and glossy. The leaves are small, alternate, scattered or crowded,

simple, entire, rarely tridentate, glaucous or pubescent or with small rounded glands on both surfaces, petiolate, subpetiolate or sessile. Some taxa have minute, subulate, linear stipules, which sometimes are connate with the base of the petiole.

VEGETATIVE ANATOMY. The wood of *Glossopetalon* and *Crossosoma* has solitary vessels. The vessel elements are short to medium-length and have simple perforation plates and alternate lateral wall pitting. Tracheid imperforate elements are present; the parenchyma is primarily apotracheal and diffuse, and with multiseriate and uniseriate rays. The leaves of *Glossopetalon* and *Crossosoma* have anomocytic stomata on both surfaces of the leaves. The epidermis has thick outer cell walls; the veins are sheathed by large parenchyma cells, and phloem fibers as well as masses of yellow acicular crystals are present. The mesophyll has an isolateral arrangement of palisade tissue. The water storing tissue consists of large cells extending laterally between veins in the center of the leaf. The nodes of *Crossosoma* are trilacunar with one or three traces. The leaves of *Crossosoma* show a number of xerophytic features that include isolateral leaves, reduced surface and thick blade, a strongly cutinized epidermis and ledges on the guard cells (Metcalf and Chalk 1950; DeBuhr 1978).

FLOWER. Flowers are always solitary and borne on the ends of short shoots and are subtended by narrowed bracts, the outer being small and the inner resembling small leaves. Most taxa have pentamerous flowers with a hypanthium. Perianth parts and stamens arise from the rim of the hypanthium. In *Glossopetalon*, some species have only three petals and three sepals, whereas their number usually varies in the range 4–6. *Apacheria* has four sepals and petals. The hypanthium is variable in form, cup-shaped in *Apacheria*, well developed in *Crossosoma*, deep and enlarged in *Velascoa*; *Glos-*

sopetalum has a fleshy disk. The stamen number is variable, ranging from 6 to 50; in some taxa the stamens are arranged in one to several whorls. Carpels are free, 1–5(–9).

A detailed study of the floral morphology and anatomy of *Crossosoma bigelovii* with a discussion of the relationships among the families of Crossosomatales was given by Matthews and Endress (2005).

EMBRYOLOGY. In *Crossosoma* the ovules are campylotropous, bitegmic and crassinucellar. The development of the embryo sac is of the Polygonum type. Fertilization is porogamous and the endosperm is Nuclear. Centripetal wall formation sets in at the micropylar end at the globular stage of the proembryo, and the endosperm becomes completely cellular by the time the embryo is heart-shaped and contains fatty reserves (Kapil and Vani 1983).

POLLEN. Pollen in the family is tricolporate. In *Apacheria* pollen is subspheroidal or spheroidal, the exine is semi-ectate and per-reticulate, with a heterobrochate reticulum; the colpi are elongated and rounded at ends. The endoapertures are rounded, partially hidden beneath the exine at the equator. Pollen grains in *Velasco* are the smallest among Crossosomataceae. In *Crossosoma*, grains and endoapertures are larger.

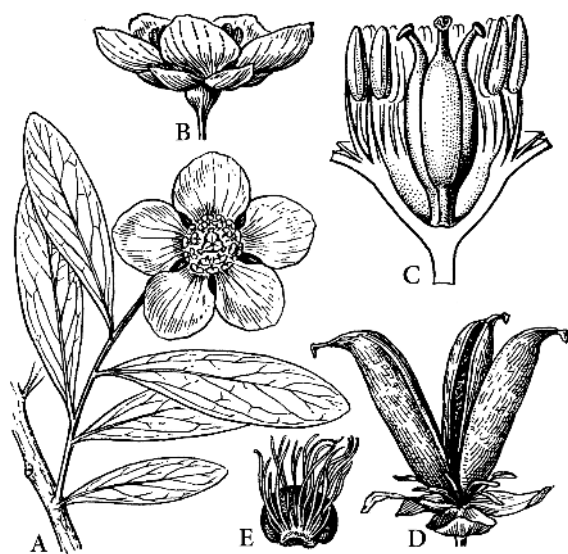


Fig. 32. Crossosomataceae. *Crossosoma californica*. A Flowering branch. B Flower. C Same, vertical section. D Dehiscing fruit. E Seed. (Takhtajan 1981)

FRUIT AND SEED. The fruits are coriaceous, asymmetric follicles. Their surface is often striate. They dehisce along the ventral suture, and release many to 2 or 1 seeds. These are globular-reniform or obovate, white or cream, shiny black or dark brown, smooth or minutely papillate-tessellate, and arillate. In the seed coat of *Crossosoma*, the testa has 4–5 highly sclerotic cell layers partly derived from the outer integument, whereas the tegmen is unspecialized except for the fibrous inner epidermis. The embryo is slender, curved, fleshy, and often embedded in abundant endosperm. The aril is fimbriate and large, or entire and rather small, yellowish or whitish.

PHYTOCHEMISTRY. *Glossopetalon* and *Crossosoma* contain gallic and ellagic acids and cyanidin-3-glucoside; proanthocyanins were not found. *Glossopetalon* leaves contain acacetin 7-O-glycoside, acacetin 7-O-diglycoside, and syringin (Tatsuno and Scogin 1978; Thorne and Scogin 1978).

RELATIONSHIPS WITHIN THE FAMILY. Molecular and morphological studies suggest that *Crossosoma* is basal in the family, followed by *Glossopetalon*, and finally by *Velasco* and *Apacheria* (Sosa and Chase 2003).

AFFINITIES. For a long time, the position of Crossosomataceae remained controversial, but molecular analyses such as those of Soltis et al. (2000), Savolainen, Chase et al. (2000), Cameron (2003) and Sosa and Chase (2003) indicated that Crossosomataceae belong to the Crossosomatales clade that comprises Stachyuraceae, Staphyleaceae, and probably also Geissolomataceae, Ixerbaceae, Strasburgeriaceae, and perhaps Aphloiaceae.

DISTRIBUTION AND HABITATS. Crossosomataceae are mostly xerophytic and restricted to the USA and to Mexico. *Apacheria* is found solely on rhyolitic rock outcrops in Arizona and New Mexico. *Crossosoma* is restricted to the southwestern deserts of the USA and adjacent northwestern Mexico. *Glossopetalon* is centered in the southwestern USA to northern Mexico. *Velasco* is restricted to rocks on pine-cedar-oak forests in Querétaro, Mexico. *Apacheria*, *Crossosoma*, and *Glossopetalon* grow on volcanic rocks in drier habitats such as juniper-pinyon forests or deserts. *Velasco* is found on limestone rocks in oak-pine-cedar forests.