

168. BIXACEAE

Family description by M.J.M. Christenhusz.

Evergreen trees or shrubs. Leaves alternate, simple, entire, palmatinerved, long-petiolate, stipulate. Flowers 5-merous, bisexual, actinophorphic, hypogynous; stamens numerous, the anthers horseshoe-shaped, opening with small apical slits; ovary superior, syncarpous, 2-carpellate. Fruits usually covered in long soft bristles, sometimes smooth; seeds numerous, obovoid. 1 gen., 5 spp. Tropical America, cultivated and naturalised elsewhere in the tropics.

This family is very closely related (and should probably be united with) the Cochlospermaceae, which differs in having palmately lobed or divided leaves (instead of entire), and fruits dehiscing by 3-5 (instead of 2) valves. *Diegodendron humbertii* Capuron from Madagascar (formerly in Ochnaceae or Diegodendraceae) should also be included in Bixaceae.

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1. *Bixa* L.

Orellana Kuntze

By M.J.M. Christenhusz.

Trees or shrubs with reddish or yellowish sap. Leaves, fruits and young parts covered in peltate scale-like hairs, the young stems and petioles also with glandular dendritic hairs. Leaves alternate, simple, usually cordate at the base; stipules caducous; petioles pulvinate. Inflorescence a terminal thyrsoid. Flowers large and showy; pedicels covered in dendroid, peltate, glandular hairs, with 5 glands below the calyx; sepals 5, free, caducous; petals 5, free, alternating the sepals, white or pink. Fruits dehiscing into 2 valves; seeds obovoid, covered in a bright-orange sarcotesta containing the pigment bixin. Flowers opening in the morning and wilting in the afternoon, usually

pollinated by bees, who visit the flowers for the abundantly produced pollen (Poppendieck, 2003). 5 spp. Tropical America.

In previous studies, *Bixa* was often treated as a genus consisting of a single variable species, *Bixa orellana*. Recent morphological studies (Baer, 1976; Garwood, 1994; Dempsey & Garwood, 1994) show, however, that there are five ecologically restricted species that are morphologically well distinguishable.

1. Fruits oblate-cordate, the bristles slender (or absent in cv. “*Leiocarpa*”); lower leaf surface sparsely scaly (6-27 per mm²) leaving much of the lamina visible, the peltate hairs relatively small (44-75 µm in diameter) usually uniformly brown; trees of thickets on well-drained soil, often cultivated.

1. *B. orellana*

1. Fruits (depressed) globular, the bristles tapered, coarse; lower leaf surface densely scaly (29-70(-156) per mm²) almost completely covering the lamina, the peltate hairs relatively large (42-116 µm in diameter) often with a lighter margin; trees of stream and river banks and on seasonally inundated, often waterlogged soil, rarely cultivated.

2. *B. urucurana*

1. *Bixa orellana* L., *Sp. Pl.* 512 (1753). Lectotype (designated by Wijnands, 1983: ‘Habitat in America calidior’, Herb. Clifford: 211, *Bixa* 1 (BM-000628766!)). N.v.: Achote, Ch, Y, H; achiote, H, ES, CR; achiote montés, ES; annatto, B; boruca, CR. Illustr.: Maas & Westra, *Neotrop. Pl. Fam.* 228, t. 69A (2005).

Bixa acuminata Bojer, *B. americana* Poir., *B. orellana* L. forma *leiocarpa* (Kuntze) J.F. Macbr., *B. orellana* var. *leiocarpa* (Kuntze) Standl. & L.O. Williams, *B. tinctoria* Salisb., *Orellana americana* Kuntze, *O. americana* var. *leiocarpa* Kuntze.

Much branched tree to about 10 m. Leaves 4.5-20 × 1.5-13 cm, ovate, sparsely scaly below, the scale-like hairs 6-27 per mm², leaving much of the lamina visible, the hairs relatively small (44-75 µm in diameter) usually uniformly brown, the base rounded-cordate, the margins entire, the apex acuminate; petioles 1-11 cm. Flowers with the sepals 0.2-0.5 mm, the glands c. 1 mm; petals 1.8-2.2 × 0.7-1.2 cm, lanceolate, white to dark pink; stamens white or tinged pink; style orange. Fruits 1.8-4 cm in diameter, oblate-cordate, often pointed, the bristles slender or absent. *Wet or dry thickets usually at lower elevations, forming extensive almost pure stands in some places, avoiding waterlogged soil, commonly planted and naturalised.* T (Novelo R. & Ramos V. 1734, MO); Ch (*Reyes-García* 2343, BM); Y (*Ucan* 4257, MO); C

(Cabrera y Cabrera 14874, MO); QR (Cabrera & Cortez 354, BM); B (Whitefoord 3169, BM); G (Harmon & Fuentes 5697, MO); H (Saunders 638, BM); ES (Monro & Sidwell 2792, BM); N (Bunting & Licht 1070, BM); CR (Döbbeler 1023, BM); P (Peterson & Annable 6893, MO). 0-1100 m. (Mexico, Mesoamerica, Colombia, Venezuela, Guayanas, Ecuador, Peru, Bolivia, Brazil, Paraguay, Argentina, Antilles; cultivated and naturalised elsewhere.)

Dempsey & Garwood (1994) described intermediate forms between *Bixa orellana* and *B. urucurana* that can be recognized by intermediate scaliness on the lower leaf surface and oblate fruits with slender bristles. The species are more distinct in South America but approach each other in Mesoamerica, especially in Costa Rica and Panama.

Bixa orellana “Leiocarpa” is a cultivar that is common in cultivation and can be easily recognized by the smooth fruits that lack bristles for the most part. H (Proctor 38945, BM); N (Lévy 141, K).

The orange coloring, derived from the sarcotesta (pulp) covering the seeds, is used worldwide to color food, soap, and other cosmetic products. In the past it was also used to dye fabric. The Native Americans used it as body paint that works as an insect repellent at the same time. The plant was most probably already cultivated in pre-Columbian times and may therefore have spread across Tropical America by anthropological means. The bark has strong fibers, suitable for cordage. It is sometimes used for fencing, since the leaves are not eaten by cattle or goats.

2. *Bixa urucurana* Willd., *Enum. Pl.* 1: 565 (1809). Holotype: Brazil, *Hoffmannsegg s.n.* (B-W-10102-010!). N.v.: Achote, ES; achote, bija, P. Illustr.: not found.

Bixa orellana L. var. *urucurana* (Willd.) Kuntze ex Pilg., *B. sphaerocarpa* Triana, *B. upatensis* Ram. Goyena, *Orellana americana* Kuntze var. *urucurana* (Willd.) Kuntze.

Branched tree to about 10 m. Leaves 5.2-27 × 2-21 cm, (broadly-)ovate, densely scaly below, the scale-like hairs 29-70(-156) per mm², almost completely covering the lamina, the hairs relatively large (diameter 42-116 µm), brown in the middle with a lighter margin, the base rounded-cordate, the margins entire, the apex acuminate; petioles 1-17 cm. Flowers with the sepals 0.2-0.5 mm, the glands c. 1 mm; petals 1.5-2 × 0.7-0.9 cm, lanceolate-elliptic, white to pink, the apex rounded;

stamens pink. Fruit 1.5-5 cm in diameter, (depressed) globular, the bristles coarse, tapered. *Along stream and river banks and in seasonally inundated or periodically brackish low-lying areas, often on waterlogged soil.* Ch (Ventura & López 422, BM); G (Harmon & Dwyer 4318, MO); H (Nelson & Vargas 5072, BM); ES (Rosales 2087, BM); N (Seymour s.n., BM); CR (Hammel et al. 18115, BM); P (Garwood 1830A, BM). 0-500 m. (Mexico, Mesoamerica, Colombia, Venezuela, Guyana, Suriname, Ecuador, Peru, Bolivia, Brazil.)