Bixa orellana

L.

Bixaceae

LOCAL NAMES
Arabic (galuga); Bengali (latkan); Creole (chiót,woukou); English (lipstick tree,arnato tree,annatto tree); Filipino (sotis,echuete); French (chiote,annatto,roucou,rocouyer,annato); Hindi (latkan); Indonesian (kunyit jawa,kesumba,jarak belanda); Javanese (galugu,galinggem,kasumba,somba keling); Khmer (châm'-puu,châm-puu chrâluek); Lao (Sino-Tibetan) (satii,kh'am,somz phuu); Malay (jarak belanda,galuga,kunyit jawa,kesumba); Portuguese (urucum); Spanish (bija,anato,achiote); Swahili (mzingefuri); Tamil (japhara); Thai (kam tai,kam set); Vietnamese (diêù nhuôm,siêm phung)

BOTANIC DESCRIPTION
Bixa orellana is an evergreen shrub or small tree, 2-8 m high; trunk up to 10 cm in diameter; bark light to dark brown, tough, smooth, sometimes fissured, lenticellate; inner bark pinkish towards the outside with orange sap, slightly bitter; twigs green with minute, rusty, reddish-brown scales, becoming dark brown.

Leaves spirally arranged, simple, stipulate, ovate, 7.5-24 x 4-16 cm, shallowly cordate to truncate at base, longly acuminate at apex, green or dark green above, grey or brownish-green beneath; scaly when young, glabrous; petiole terete, thickened at both ends, 2.5-12 cm long.

Flowers in terminal branched panicles, 8-50 flowered, fragrant, 4-6 cm across; pedicel scaly, thickened at the apex, bearing 5-6 large glands; sepals 4-5, free, obovate, 1-1.2 cm long, caducous, covered with reddish-brown scales; petals 4-7, obovate, 2-3 x 1-2 cm, pinkish, whitish or purplish tinged; stalks scaly; stamens numerous, 1.6 cm long; anthers violet; pistil 1.6 cm long, composed of bristly 1-celled, superior ovary; style thickened upwards, 12-15 mm long; a short, 2-lobed stigma.

Fruit a spherical or broadly elongated ovoid capsule, 2-4 x 2-3.5 cm, flattened, 2 valved, more or less densely cloaked with long bristles, green, greenish-brown or red when mature; seeds numerous, obovoid and angular, 4.5 mm long, with bright orange-red fleshy coats.

'Bixa' is derived from a local South American name.

BIOLOGY
The flowers are pollinated by honeybees, and the fruit matures 5-6 months later. Seed-grown plants take longer to flower than vegetatively propagated ones, and do so sparingly. Under favourable conditions, fruiting commences 18 months from planting or earlier, and full crops of seeds are obtained after 3-4 years. In Puerto Rico and the Virgin Islands, flowering occurs mainly in spring and fruiting chiefly in the summer.

Fruit in Brazil (Anthony Simons)

Tree: Tree planted as a live fence. (Rafael T. Cadiz)

Immature fruit (Rafael T. Cadiz)

ECOLOGY
B. orellana requires a frost-free, warm, humid climate and a sunny location. It can grow in tropical to subtropical climates where rainfall is distributed throughout the year.

BIOPHYSICAL LIMITS
Altitude: Up to 2000 m, Mean annual temperature: 20-26 deg C, Mean annual rainfall: 1250-2000 mm

Soil type: B. orellana grows on almost all soil types, with a preference for well-drained, neutral and slightly alkaline soils. It grows into a larger tree when planted in deeper and more fertile soil, rich in organic matter.

DOCUMENTED SPECIES DISTRIBUTION

Native: Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, El Salvador, French Guiana, Guatemala, Guyana, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Surinam, Uruguay, Venezuela

Exotic: Angola, Brunei, Cambodia, Dominican Republic, India, Indonesia, Jamaica, Kenya, Laos, Malaysia, Myanmar, Philippines, Spain, Tanzania, Thailand, US, Vietnam, Zanzibar

The map above shows countries where the species has been planted. It does neither suggest that the species can be planted in every ecological zone within that country, nor that the species can not be planted in other countries than those depicted. Since some tree species are invasive, you need to follow biosafety procedures that apply to your planting site.

PRODUCTS
Food: In Mexico, Spain and the Philippines, the thin pigmented pulp covering the seeds is used as a condiment.

Fodder: Bixa meal, which remains after extraction of the pigment from the seed, is a useful additive to poultry feed and can replace 30% of the maize in the food. However, the seed embryo contains a poisonous alkaloid, so it is not wise to use the residues from the extraction process directly.

Apiculture: The flowers are a source of nectar for honey.

Fuel: It is said that fire can be started by the friction of 2 pieces of the soft wood.

Fibre: Fibre for cordage has been obtained from the bark of B. orellana.

Timber: The sapwood is whitish and the heartwood light brown or yellowish. The wood is soft, light weight (specific gravity 0.4), porous, weak and not durable.

Gum or resin: Bark from the branches of the trees yields a water-soluble gum that is similar to gum arabic.

Tannin or dyestuff: The extract from the pigment coating the seeds yields a harmless, non-carcinogenic dye, used as colouring for food, especially dairy products. This dye was also used by Amerindians as war paint and was used in dying wool, cotton and silk, but the colour rapidly fades when exposed to light and air. The dye obtained from the seed is used in manufacturing cosmetics.

Essential oil: Seeds contain a characteristic pleasant-smelling oil.

Poison: A waxy substance that has paralytic action on mammalian intestinal parasites is present in the seed coat. Bixin extracted from the seed coat is used in India as an insect repellent.

Medicine: Leaves are applied to the head and to sprains to relieve aches; a decoction is gargled as a cure for mouth and throat infections. Leaves may also be used in baths to relieve colic or to get rid of worms in children. A root decoction is taken orally to control asthma. A macerated seed decoction is taken orally for relief of fever, and the pulp surrounding the seed is made into an astringent drink used to treat dysentery and kidney infection. Oliguria and jaundice are treated using root teas; infusions of root in water and rum are used to treat venereal diseases. The dye is used as an antidote for prussic acid poisoning caused by poorly treated Manihot esculenta. Seeds are used as expectorant.

Other products: Annatto paste filters out the ultraviolet rays of sunlight, thereby protecting the skin from excessive sunburn.

SERVICES
Intercropping: B. orellana has been successfully cultivated with young citrus groves.

TREE MANAGEMENT
Seeds are sown at a spacing of 25 x 10 cm and at a minimum depth of 2.5 cm because of their long taproots. Seedlings are planted out from the nursery after about 4 months, when they are about 15-25 cm in height. When planting them out, precautions should be taken to minimize sun scorch and damage to the roots. Weeding must be done as often as possible to keep the young trees free of weeds, but care must be taken not to disturb the roots. Mulching is necessary if there is not enough rainfall to keep the soil moist. Pruning is practiced to produce a canopy that is easy to harvest, although this may impede a 2nd harvest from the same branch within the same year. The mature fruit bunch is cut with sharp clippers just above the node below the branch; this way a 2nd crop may be collected in a 12-month period.

GERMPLASM MANAGEMENT
Reported yields are 4.5-5 kg of dried seed/tree per year. Storage behaviour is intermediate; seeds tolerate desiccation to 10% mc, but further desiccation to 4.2% mc reduces viability. Longevity is reduced for seeds stored at -20 deg. C. Sun-dried seeds retain viability for over 1 year, but germination reduces to 12% when stored for 3 years. Seeds stored for 12 months at 23 deg. C and 45% r.h. or 9.8% mc experience no loss in viability; little loss is experienced with seeds at 9.8% mc and 5 deg. C, while storage temperatures of 5 deg. C and -20 deg. C damage the viability of seeds at 4.2% mc.

PESTS AND DISEASES
B. orellana is susceptible to attack by Heleoptis spp., and heavy damage may be inflicted by Selenothrips rubrocinctus. Borers can damage the seed. In El Salvador, Venezuela and Brazil, B. orellana suffers from the leaf fungus Oidium bixae, which attacks mainly young fruits and pods; pods densely covered by bristles are more susceptible to attack because they retain moisture. In El Salvador, leaf damage is caused by Cercospora spp., and in Indonesia, the fungus Corticium salmonicolor has been observed.

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SUGGESTED CITATION

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