

**LOCAL NAMES**

Creole (saua sap,kowól); Dutch (soursap,sorsaka,zuurzak); English (durian blanda,custard apple,soursop); Filipino (atti,llabanos,guayabano); French (corossol,corosselier,corossolier,corossel,corossol épineux,sappadillo,cachiman épineux,cachimantier); German (Sauersack,Stachelannone,stachliger); Indonesian (nangka seberng,sirsak); Javanese (nangka belanda,sirsak); Khmer (tiep banla,tiep barang); Lao (Sino-Tibetan) (khièp thét,khan thalot); Malay (durina makkah,durian benggala,durian belanda); Portuguese (coração-de-rainha,graviola); Spanish (coração de Rainha,araticu-ponhé,anona espinhosa,catucho,curassol,graviola,guanábana,jaca do pará,pinha azeda,zapote agrio,jaca de pobre); Swahili (mstafeli); Thai (riannam,thurian-khaek,thurian-thet); Tigrigna (anona); Vietnamese (mang câu xiêm)

**BOTANIC DESCRIPTION**

*Annona muricata* is a slender, evergreen tree, 5-10 m in height and 15 cm in diameter; trunk straight; bark smooth, dull grey or grey-brown, rough and fissured with age; inner bark pinkish and tasteless; branches at first ascending with the crown forming an inverted cone, later spreading; crown at maturity spherical due to lack of apical dominance; twigs brown or grey, bearing minute raised dots (lenticels); root system extensive and superficial, spreading beyond the diameter of the crown although shallow rooted; juvenile plants have a taproot that is eventually lost.

Leaves alternate, 7.6-15.2 cm long, 2.5-7.6 cm wide, leathery, obovate to elliptic, glossy on top, glabrous on underside, simple; stipules absent; blade oblanceolate, green on top, paler and dull on under side with fine lateral nerves; a strong, pungent odour; petioles short, 3-10 mm long.

Flower terminal or lateral, large; stalks stout, green, 1.3-1.9 cm long; 3 sepals, minute, inconspicuous, broad, green, 3 mm long, triangular; petals yellowish-green, 6 in 2 whorls of 3, outer petals larger, ovate-acute, valvate, cordate with pointed apex (heart shaped), 4-5 x 3-4 cm, 3 mm thick and fleshy, fitting together at edges in bud and rough on the outside; 3 inner petals, narrow, smaller, nearly 3.8 cm long, thinner, rounded, concave with fingernail-shaped base and overlapping edges; stamens numerous, shield shaped, united below; anthers parallel and opening longitudinally; carpels numerous, overtopping the stamens, each with 1 ovule; pistils white, narrow, 5 mm long, with sticky stigmas.

Fruit 14-40 x 10-18 cm, weighing up to 7 kg, ovoid, heart shaped, an oblong syncarp composed of numerous united pistils, pistils end in a fleshy spine or short base of spine 1.5 mm or more in length, which grows from the style; often asymmetric due to incomplete fertilization of the ovules; epidermis often shining, dark green, with short, fleshy spines covering each carpel; pulp white, fibrous and juicy; seeds shiny, dark brown or black, oblong, up to 2 cm long, 0.7 cm wide.

The genus name '*Annona*' is from the Latin word 'anon', meaning 'yearly produce', referring to the fruit production habits of the various species in this genus.

**BIOLOGY**

Flowers are protandrous, and the pollen is shed as the outer petals open towards the evening. The inner petals open much later and only very slightly, admitting small insects attracted by the fragrance of the flowers. Beetles of several species are important in carrying out natural pollination. Presumably these insects effect cross-pollination, though rather inadequately, for few flowers set fruit and many fruits are misshapen since numerous ovules are not fertilized. Hand pollination is effective in improving fruit yield and quality. Fruiting starts in the 2nd year, and 5-year-old trees produce 10-50 fruits, depending on pollination efficiency and nutrient status. Sporadic flowering and fruiting can occur all year round in favourable conditions.



Fruits (Trade wind fruits)



Flowers (Trade winds fruit)



Soursop (French B.)

**ECOLOGY**

*A. muricata* survives in the humid tropical and subtropical lowlands. It is common on the coast and is found on slopes. Planted for its fruit, it has become wild or naturalized in thickets, pastures and along roads. The species is commonly cultivated in homegardens and is found in rural garden areas on volcanic and raised limestone islands, where it is occasionally naturalized. Trees are not found on atolls. They withstand very little frost.

*A. muricata* occurs throughout the West Indies except in the Bahamas, and from Mexico to Brazil. It is common at Key West but infrequent on the mainland of southern Florida. It is planted in Puerto Rico, commonly on the slopes of Cordillera; also in Vieques, St Croix, St Thomas, St John, Tortolla and Virgin Gorda.

**BIOPHYSICAL LIMITS**

Mean annual temperature: 25-30 deg. C, Mean annual rainfall: Over 1000 mm

Soil type: Prefers loose, fairly rich, deep loams with a pH range of 5.5-6.5.

**DOCUMENTED SPECIES DISTRIBUTION**

- Native: Antigua and Barbuda, Argentina, Bahamas, Barbados, Bolivia, Brazil, Chile, Colombia, Cuba, Dominica, Dominican Republic, Ecuador, French Guiana, Grenada, Guadeloupe, Guatemala, Guyana, Haiti, Honduras, Jamaica, Martinique, Mexico, Montserrat, Netherlands Antilles, Nicaragua, Panama, Paraguay, Peru, Puerto Rico, Sri Lanka, St Kitts and Nevis, St Lucia, St Vincent and the Grenadines, Surinam, Trinidad and Tobago, Uruguay, Venezuela, Virgin Islands (US), Zanzibar
- Exotic: Benin, Cambodia, China, Cote d'Ivoire, Eritrea, Ethiopia, Ghana, Guinea, India, Indonesia, Laos, Liberia, Mauritania, Nigeria, Papua New Guinea, Philippines, Reunion, Senegal, Sierra Leone, Tanzania, Thailand, Togo, Uganda, US, Vietnam



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:** *A. muricata* can be consumed fresh for dessert when fully ripe or mixed with ice cream or milk to make a delicious drink, as is done in Java and in Cuba and other parts of America. However, more often the puree is consumed after squeezing the pulp through a sieve. It can be made into fruit jelly, juice (with sugar added), nectar or syrup. In Indonesia sweetcake ('dodol sisrak') is made by boiling *A. muricata* pulp in water and adding sugar until the mixture hardens. In the Philippines, young fruits with seeds that are still soft are used as a vegetable. Mature but firm fruits may be made into candy of delicate flavour and aroma.

*A. muricata* fruit consists of about 67.5% edible pulp, 20% peel, 8.5% seeds and 4% core by weight. Sugars constitute about 68% of the total solids. The fruit is a good source of vitamins B (0.07 mg/100g) and C (20 mg/100 g) and a poor to fair source of calcium and phosphorus. The most desirable characteristics of the fruit are its extremely pleasing fragrance and flavour.

**Timber:** Sapwood is whitish and heartwood brown. The wood is soft, light (specific gravity of 0.4), not durable; it is rarely used as timber but has been used for ox yokes.

**Poison:** Powder of dried leaves and sap from fresh ones are useful in destroying vermin. A powder or oil from the seeds has been used to kill lice and bedbugs. All tree parts have insecticidal properties and can be used, with fruit as bait, to kill fish.

**Medicine:** The crushed leaves are applied to mature boils and abscesses or are used as a remedy for distention and dyspepsia, scabies and skin diseases, rheumatism, coughs and colds. The leaves may also be used to make a decoction, which is taken orally with salt for digestive tract ailments and to relieve fatigue. A crushed leaf and seed decoction is taken orally for intestinal malaise. A massage of the leaves is good for nervous shock, while a leaf or bark decoction is used for anxiety attacks. Flower or flower bud tea is mixed with honey for colds, chest pain and nerve disorders, and the bark and young fruits, which contain tannin, are used to treat diarrhoea and dysentery. The green bark is rubbed on wounds to stop bleeding.

**SERVICES**

**Intercropping:** Being a small and early-bearing tree, *A. muricata* may be planted as an intercrop between larger fruit trees such as mango, avocado and santol. The *A. muricata* trees are grubbed out when the main crop requires space.

**TREE MANAGEMENT**

The area around the base of the tree should be kept free from weeds or covered with mulch to avoid dehydration of the shallow roots during the dry season. *Annona muricata* can tolerate dry soil conditions, but the trees shed too many leaves if they experience prolonged drought, and in that situation they would benefit from supplementary irrigation. Moderate application of fertilizer and manure increases fruit production and is necessary during the early stages of growth so as to augment the slow growth rate. Trees usually assume a satisfactory form, but in some cases it is necessary to limit the tree to a single trunk by cutting out competing twigs as early as possible.

**GERMPLASM MANAGEMENT**

Seed storage behaviour is orthodox, and the seeds tolerate desiccation to 5%. Long-term storage under ideal conditions is possible.

**PESTS AND DISEASES**

Insect pests include *Bephata maculicollis*, *Ceconata annonella*, *Talponia backeri*, *Thecla ortygnus*, scale insects and Mediterranean fruit fly. The trunk borer *Cratasomus* spp. is a serious pest, as are many fruit borers in the orders Coleoptera, Diptera and Lepidoptera. Mousebirds also attack the tree. In the Caribbean region *A. muricata* is attacked heavily by the fungus *Colletotrichum gloeosporioides* and, in the Manaus, Brazil, region by *Pellicularia* spp.

**FURTHER READNG**

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**SUGGESTED CITATION**

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