

Psidium guajava

L.

Myrtaceae

LOCAL NAMES

Amharic (zeituna); Arabic (juafa,juava,guwâfah); Bengali (goachhi,piyara,peyara); Burmese (malakapen); Creole Patois (gwayav); Dutch (goejaba); English (common guava,guava); Filipino (bayabas,guyabas); French (goyava,goyavier); German (Guavenbaum,guava); Hawaian (kuawa); Hindi (goachhi,jamba,amrud,amarood,sapari,safed safari); Indonesian (jambu biji); Japanese (banjiro); Javanese (jambu klutuk); Khmer (trapaek sruck); Lao (Sino-Tibetan) (si da); Luganda (mupeera); Malay (jambu berase,jambu biji,jambu kampuchia,jambu batu); Mandinka (biabo); Portuguese (goiaba); Sanskrit (mansala); Sinhala (koiya,pera); Spanish (araza-puita,gauyaba blanca,perulera,guaiaba dulce,guayaba,Guayaba agria,guayaba común,guayabillo,agria); Swahili (mpera); Tamil (koyya); Thai (ma-man,barang,ma-kuai); Tigrigna (zeitun); Urdu (amrud); Vietnamese (oi)

BOTANIC DESCRIPTION

Psidium guajava is a large dicotyledonous shrub, or small evergreen tree, generally 3-10 m high, many branches; stems crooked, bark light to reddish brown, thin, smooth, continuously flaking; root system generally superficial and very extensive, frequently extending well beyond the canopy, there are some deep roots but no distinct taproot.

Leaves opposite, simple; stipules absent, petiole short, 3-10 mm long; blade oblong to elliptic, 5-15 x 4-6 cm, apex obtuse to bluntly acuminate, base rounded to subcuneate, margins entire, somewhat thick and leathery, dull grey to yellow-green above, slightly downy below, veins prominent, gland dotted.

Inflorescence, axillary, 1- to 3-flowered, pedicles about 2 cm long, bracts 2, linear. Calyx splitting irregularly into 2-4 lobes, whitish and sparsely hairy within; petals 4-5, white, linear-ovate c. 2 cm long, delicate; stamens numerous, filaments pale white, about 12 mm long, erect or spreading, anther straw coloured; ovary inferior, ovules numerous, style about 10 cm long, stigma green, capitate.

Fruit an ovoid or pear-shaped berry, 4-12 cm long, weighing up to 500 g; skin yellow when ripe, sometimes flushed with red; pulp juicy, creamy-white or creamy-yellow to pink or red; mesocarp thick, edible, the soft pulp enveloping numerous, cream to brown, kidney-shaped or flattened seeds. The exterior of the fruit is fleshy, and the centre consists of a seedy pulp.

From the Greek *psidion* (pomegranate), due to a fancied resemblance between the two fruits.

BIOLOGY

The pollen is viable for up to 42 hours and the stigmas are receptive for about 2 days. Bees are the principal pollinators. There is some self- and cross-incompatibility but several cultivars have set fair crops of seedless or few-seeded fruit. Levels of 60-75% selfing have been found in natural populations; this has been used to produce homozygotic varieties that can be propagated from seed. It is not known to what extent erratic flowering through the year affects pollination intensity. One of the most critical botanical characteristics of guava is that flowers are borne on newly emerging lateral shoots, irrespective of the time of year. The floral structure, which makes emasculation difficult and with a juvenile period of 3-5 years limit conventional breeding.

Seedlings may flower within 2 years; clonally propagated trees often begin to bear during the first year after planting. Trees reach full bearing after 5-8 years, depending on growing conditions and spacing. The guava is not a long-lived tree (about 40 years), but the plants may bear heavily for 15-25 years. Bats are the main fruit dispersal agents.



Fruits green at Wahinepee, Maui, Hawaii (Forest and Kim Starr)



Fruit at Makawao, Maui, Hawaii (Forest and Kim Starr)



Flower at Makawao, Maui, Hawaii (Forest and Kim Starr)

ECOLOGY

P. guajava appears to have evolved in relatively open areas, such as savannah/shrub transitional zones, or in frequently disturbed areas where it is a strong competitor in early secondary growth. In some areas it is found in large thickets with as many as 100 plants in an area of less than half a hectare, although it is more often found in densities of 1-5 plants/ha. *P. guajava* is considered a noxious weed in many tropical pasture lands (when chemical control is not available, guava proliferation may result in the abandonment of a pasture).

The guava is a hardy tree that adapts to a wide range of growing conditions. It can stand a wide range of temperatures; the highest yields are recorded at mean temperatures of 23-28 deg. C. In the subtropics quiescent trees withstand light frost and 3.5-6 months (depending on the cultivar) of mean temperatures above 16 deg. C suffice for flowering and fruiting. It fruits at altitudes up to 1 500 m and survives up to 2 000 m. Guava is more drought-resistant than most tropical fruit crops. For maximum production in the tropics, however it requires rainfall distributed over the year. If fruit ripens during a very wet period it loses flavour and may split.

BIOPHYSICAL LIMITS

Altitude: 0-2 000 m, Mean annual temperature: 15-45 deg. C, Mean annual rainfall: 1 000-2 000 mm

Soil type: Soils vary widely, including slightly to strongly acid. As expected from a secondary colonizer, it grows well on poor soils with reasonably good drainage, however growth and production are better on rich clay loams.

DOCUMENTED SPECIES DISTRIBUTION

Native: Colombia, Mexico, Peru, United States of America

Exotic: Australia, Bangladesh, Brunei, Cambodia, Cameroon, China, Costa Rica, Cote d'Ivoire, Cuba, Dominican Republic, Ecuador, Eritrea, Ethiopia, Fiji, Gabon, Gambia, Greece, Guyana, Haiti, India, Indonesia, Israel, Kenya, Laos, Malawi, Malaysia, Myanmar, Nigeria, Pakistan, Panama, Philippines, Puerto Rico, Samoa, Senegal, South Africa, Sri Lanka, Sudan, Tanzania, Thailand, Togo, Uganda, Venezuela, 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: The whole fruit is edible; flavour varies from very acid to sweet with the best fruit being both sweet and mildly acid. It has a pleasant aroma, is very high in vitamin C (10-2 000 mg/100 g of fruit), and a rich source of vitamin A and pectin (0.1-1.8%). Pectin content increases during ripening and declines rapidly in over-ripe fruit.

Table varieties with good taste, large size and high pulp to seed ratio, have been developed for the fresh fruit market in many countries. Other varieties have been developed for the industrial purposes and the following wide variety of products are available: canned fruit or mesocarps in sweet syrup, puree, goiabada (a type of thick, sweet jam), jams and jellies, juices and nectars, ice cream and yoghurts. Guava paste, or guava cheese as known in the West Indies, is made by evaporating the pulp with sugar; it is eaten as a sweetmeat. A firm in the Philippines dehydrates slices of the outer, non-seeded part of the fruit to make a similar product. In some Asian countries such as Indonesia, the leaves are used in cooking.

Apiculture: White fragrant flowers secrete nectar in excess all day attracting bees, which also collect juice from the damaged fruits. In India for instance, the blossoms occur in May and June.

Fuel: Wood makes excellent firewood and charcoal because of its abundance, natural propagation, and classification as an undesirable weed.

Timber: Sapwood light brown, heartwood brown or reddish; hard, moderately strong and durable. It is used for tool handle, fence posts and in carpentry and turnery.

Tannin or dyestuff: The leaves and bark may be used for dyeing and tanning.

Essential oil: Plant contains an essential oil. The volatile oil with methylchavicol, persein and d-pinene (a paraffin) is found in the leaf.

Alcohol: Winemaking from the fruit has been commercialized in southern Africa.

Poison: *P. guajava* has insecticidal properties.

Medicine: All parts of the young fruit are astringent. Guava exhibits antibacterial action against intestinal pathogens such as *Staphylococcus*. The dried ripe fruits are recommended as a remedy for dysentery, while the leaves and fruits are used as a cure for diarrhoea. Oil contains bisabolene and flavinoides that exhibit anti-inflammatory properties. A decoction of the leaves or bark is taken externally as a lotion for skin complaints, ringworm, wounds, and ulcers. Water from soaking the fruit is good to treat diabetes. The leaves are made into a cataplasm; cooked, they are given to horses with strangle.

Some suggested treatments are digestive tract ailments, cold, and high blood pressure: leaf decoction or fruit juice with salt or sugar taken orally. Trauma, pain, headache, and rheumatism: hot leaf decoction compress. Sore throat, hoarse throat: leaf decoction, gargle. Varix, ulcer: leaf decoction, treated with warm water, bath. Hepatitis, gonorrhoea, and diarrhoea: clear fruit juice.

SERVICES

Ornamental: Widely cultivated as an ornamental fruit tree.

Boundary or barrier or support: *P. guajava* has been used to stake yams (*Dioscorea* spp.); the small tree is cut back and used to support them. Yield increases of 33-85% have been recorded in Nigeria.

Intercropping: Performed very well when intercropped with fodder crops such as maize, sorghum and cowpeas. Tree growth reduction is very small.

Pollution control: Identified as useful for bio-indication and as a bio-accumulator in India. It is sensitive to sulphur dioxide; sensitivity to injury based on chlorophyll destruction.

TREE MANAGEMENT

For intensively managed orchards in Thailand trees are spaced only 4-6 m apart but seedlings for fruit processing may be spaced up to 10 x 8 m apart. Irrigation during the dry season and frequent light pruning to promote the emergence of flowering shoots are employed for continuity of production throughout the year. When the crop is cycled most fertilizer is applied as a basal dressing at the end of the harvest, if necessary supplemented by a top dressing; if trees are cropped continuously, fertilizers are applied in several small doses. Growth rate is excellent and the plants coppice readily. Branching is extensive and pruning is necessary to form good orchard trees. Firewood cuttings cause excessive propagation by formation of sprouts and suckers.

Best time of day to harvest is early morning because by noon fruit is warmer and deteriorates more rapidly. During harvesting, great care is necessary to avoid fruit damage, as when collected almost ripe, they will only store for about 2-3 days at room temperature. Fruit for industrial purposes do not need such care but greater speed is still essential. Average yields are between 30-40 kg/plant in 5 year-old plants and will reach a maximum production of 50-70 kg at about 7 years if well managed.

GERMPLASM MANAGEMENT

Seed storage behaviour is orthodox; seeds at 6% mc survive 24 hours in liquid nitrogen; no loss in viability following 66 months hermetic storage at -20 deg. C with 5.5% mc.

PESTS AND DISEASES

Insect pests are numerous and in some cases severe. Fruit fly maggots such as *Anastrepha striata*, *Dacus* spp. and *Ceratitis* spp. are especially troublesome. Aphids (*Aphis* spp.) feed on young growth, causing the curling of leaves. *Selenothrips rubrocinctus*, the red-banded thrip; adult and larval forms puncture leaves of the infested tree and brownish stains appear. Heavily infested trees are sometimes completely defoliated.

In Brazil yellow rust (*Puccinia psidii*) is an extremely serious fungal pest, as are leaf spot (*Phyllosticta guajayae*) and anthracnose (*Colletotrichum gloeosporioides*). The green scale (*Coccus viridis*) occurs on branches. Fruit rot (*Glomerella cingulata*) shrivels green fruit and rots ripe fruit. Mushroom root rot (*Clitocybe tabescens*) can eventually kill the tree.

FURTHER READING

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SUGGESTED CITATION

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