

diarrhea and urine retention. Water-diluted juice is used as a gargle for sore throat and as a lotion for ringworm of the scalp.

The seeds, marketed in  $\frac{1}{4}$  inch (7 mm) lengths, and the bark are much used in tropical medicine and are shipped from India, Malaya and Polynesia, and, to a small extent, from the West Indies, to pharmaceutical supply houses in Europe and England. Extracts of both, but especially the seeds, in liquid or powdered form, are freely given orally, 2 to 3 times a day, to patients with diabetes mellitus or glycosuria. In many cases, the blood sugar level reportedly is quickly reduced and there are no ill effects. However, in some quarters, the hypoglycemic value of jambolan extracts is disclaimed. Mercier, in 1940, found that the aqueous extract of the seeds, injected into dogs, lowered the blood sugar for long periods, but did not do so when given orally. Reduction of blood sugar was obtained in alloxan diabetes in rabbits. In experiments at the Central Drug Research Institute, Lucknow, the dried alcoholic extract of jambolan seeds, given orally, reduced blood sugar and glycosuria in patients.

The seeds are claimed by some to contain an alkaloid, jambosine, and a glycoside, jambolin or antimellin, which halts the diastatic conversion of starch into sugar. The seed extract has lowered blood pressure by 34.6% and this action is attributed to the ellagic acid content. This

and 34 other polyphenols in the seeds and bark have been isolated and identified by Bhatia and Bajaj.

Other reported constituents of the seeds are: protein, 6.3–8.5%; fat, 1.18%; crude fiber, 16.9%; ash, 21.72%; calcium, 0.41%; phosphorus, 0.17%; fatty acids (palmitic, stearic, oleic and linoleic); starch, 41%; dextrin, 6.1%; a trace of phytosterol; and 6 to 19% tannin.

The leaves, steeped in alcohol, are prescribed in diabetes. The leaf juice is effective in the treatment of dysentery, either alone or in combination with the juice of mango or emblic leaves. Jambolan leaves may be helpful as poultices on skin diseases. They yield 12 to 13% tannin (by dry weight).

The leaves, stems, flowerbuds, opened blossoms, and bark have some antibiotic activity. A decoction of the bark is taken internally for dyspepsia, dysentery, and diarrhea and also serves as an enema. The root bark is similarly employed. Bark decoctions are taken in cases of asthma and bronchitis and are gargled or used as mouth-wash for the astringent effect on mouth ulcerations, spongy gums, and stomatitis. Ashes of the bark, mixed with water, are spread over local inflammations, or, blended with oil, applied to burns. In modern therapy, tannin is no longer approved on burned tissue because it is absorbed and can cause cancer. Excessive oral intake of tannin-rich plant products can also be dangerous to health.

Source: Morton, Julia F. *Fruits of Warm Climates*. 1987.

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## Malay Apple *aka Mountain Apple.*

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A delight to the eye in every respect, the Malay apple is much admired for the beauty of the tree, its flowers and its colorful, glistening fruits, without parallel in the family Myrtaceae. Botanically identified as *Syzygium malaccense* Merr. & Perry (syns. *Eugenia malaccensis* L., *Jambos malaccensis* DC.), this species has earned a few alternate English names including Malay rose-apple, mountain apple, water apple, and, unfortunately, Otaheite apple, which is better limited to the ambarella, *Spondias dulcis* Park., and cashew, or French cashew (Guyana) or Otaheite cashew (India) because of its resemblance to the cashew apple, the pseudofruit or swollen fruit-stalk of the cashew nut.

In Malaya there are many local names including *jambu merah*, *jambu bar*, *jambu bol*, *jambu melaka*, *jambu kling* and *jambu kapal*. In Thailand, it is *chom-phu-sa-raek* or *chom-phu-daeng*; in Cambodia, *chompuk kraham*; in Vietnam, *man hurong tau*; in Indonesia, *darsana*, *jambu tersana*, or *djamboo bol*; in the Philippines, *makopang-kalabau* or *tersana*; in Guam, *makupa*; in Tahiti, *ahia*; in Hawaii, *ohia*. In the French language it is *jambosier rouge*, *poire de Malaque*, *pomme Malac* (corrupted to *pomerac*), *pomme de Malaisie*, and *pomme de*

*Tahiti*. Among Spanish names are: *pomarosa*, or *pomarrosa*, *Malaya* (Puerto Rico); *manzana* (Costa Rica), *marañon japonés* (El Salvador), *pomarosa de Malaca* (Colombia); *pera de agua* or *pomagás* (Venezuela); and *marañon de Curacao* (Panama), though the somewhat similar plant in Curacao is *S. samarangense* Merr. & Perry, locally called *cashu di Surinam*, in Papiamentu, *Curacaose appel*, in Dutch. The latter species has yellowish-white flowers and light-red, greenish-white or cream-colored fruits. (See Java apple pp. 381-2.)

### Description

The Malay apple tree is rather fast-growing, reaching 40 to 60 ft (12–18 m) in height, and has an erect trunk to 15 ft (4.5 m) in circumference and a pyramidal or cylindrical crown. Its evergreen leaves are opposite, short-petioled, elliptic-lanceolate or oblanceolate; soft-leathery, dark-green and fairly glossy on the upper surface, paler beneath; 6 to 18 in (15–45 cm) long,  $3\frac{1}{2}$  to 8 in (9–20 cm) wide. The veins are indistinct above, but they and the pale midrib are prominent on the underside. New growth is wine-red at first, changing to pink-buff. The abundant flowers, only mildly fragrant, and borne on the upper

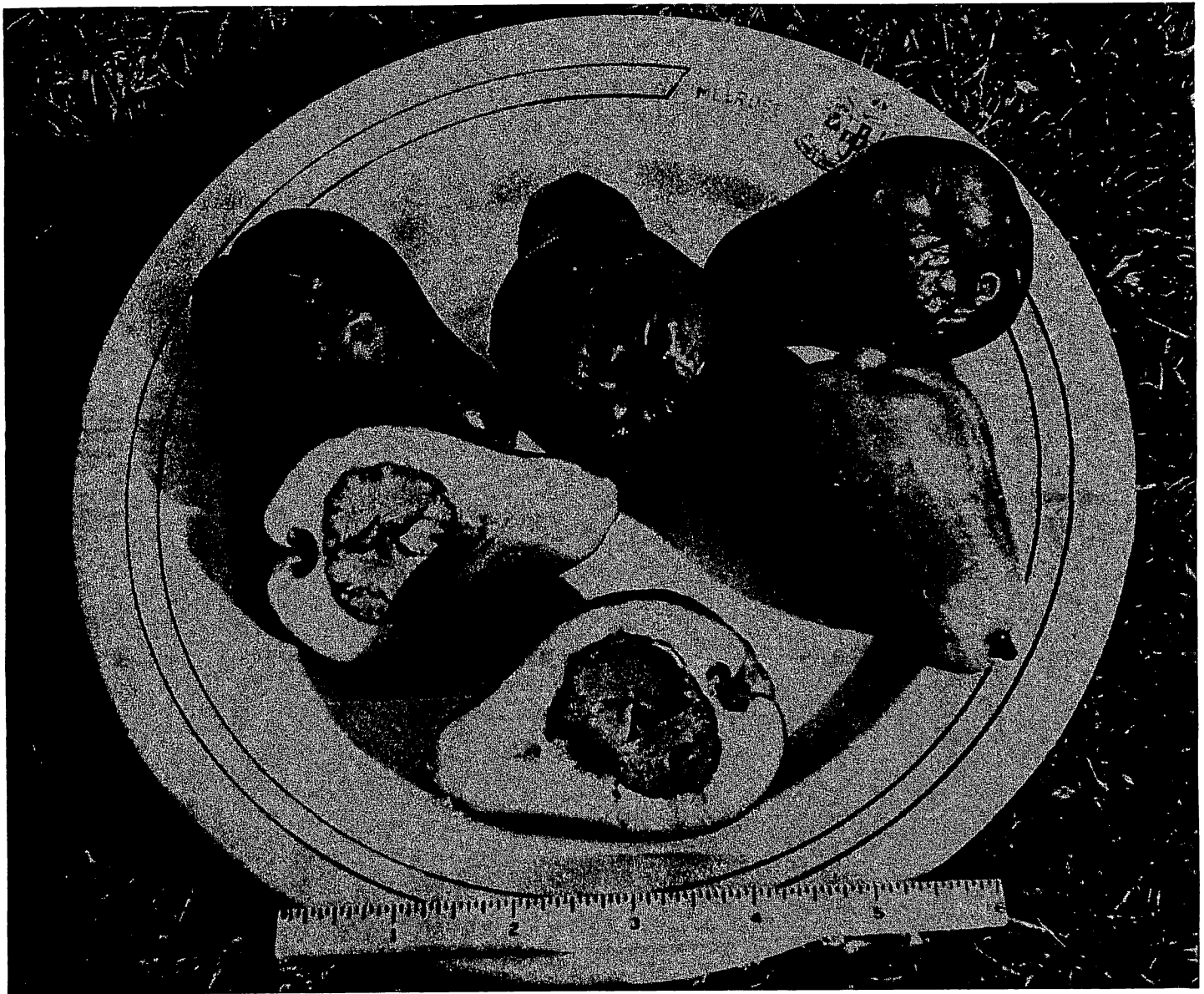


Fig. 102: Glossy, red, juicy, Malay apples (*Syzygium malaccense*) are sold in markets and along streets in warm areas of the Old and New World.

trunk and along leafless portions of mature branches in short-stalked clusters of 2 to 8, are 2 to 3 in (5–7.5 cm) wide, and composed of a funnel-like base topped by 5 thick, green sepals, 4 usually pinkish-purple to dark-red (sometimes white, yellow or orange) petals, and numerous concolorous stamens to  $1\frac{1}{2}$  in (4 cm) long tipped with yellow anthers. Though showy, the flowers are hidden by the foliage until they fall and form a lovely carpet on the ground. The fruit, oblong, obovoid, or bell-shaped, 2 to 4 in (5–10 cm) long, 1 to 3 in (2.5–7.5 cm) wide at the apex, has thin, smooth, waxy skin, rose-red or crimson or sometimes white with streaks of red or pink, and white, crisp or spongy, juicy flesh of very mild, sweetish flavor. There may be a single oblate or nearly round seed or 2 hemispherical seeds,  $\frac{5}{8}$  to  $\frac{3}{4}$  in (1.6–2 cm) in width, light-brown externally, green internally and somewhat meaty in texture. The fruits of some trees are entirely seedless.

### Origin and Distribution

The Malay apple is presumed to be a native of Malaysia. It is commonly cultivated from Java to the Philippines and Vietnam, also in Bengal and South India. Portuguese voyagers carried it from Malacca to Goa and from there it was introduced into East Africa. It must have spread throughout the Pacific Islands in very early times for it is featured in Fijian mythology and the wood was used by ancient Hawaiians to make idols. Indeed, it has been recorded that, before the arrival of missionaries in Hawaii, there were no fruits except bananas, coconuts and the Malay apple. The flowers are considered sacred to Pele, the fiery volcano goddess. Captain Bligh conveyed small trees of 3 varieties from the islands of Timor and Tahiti to Jamaica in 1793. The tree was growing under glass in Cambridge, Massachusetts, in 1839, and specimens were fruiting in Bermuda in 1878.

Eggers, who studied the flora of St. Croix, reported seeing naturalized trees in shaded valleys during his stay on the island from 1870 to 1876. The Malay apple was unknown in Puerto Rico in 1903 but must have arrived soon after. Britton and Wilson observed 2 trees 43 ft (13 m) high at Happy Hollow in 1924. Thereafter, the tree was rather frequently planted as an ornamental or wind-break. Perhaps the Portuguese were responsible for its introduction into Brazil, for it is cultivated there, as it is also in Surinam and Panama. Dr. David Fairchild sent seeds from Panama to the United States Department of Agriculture in 1921. In 1929, young trees from the Canal Zone were transported to the Lancetilla Experimental Gardens at Tela, Honduras, where they flourished and fruited. The Malay apple is sometimes seen in other parts of Central America, including Belize, El Salvador and Costa Rica, much more frequently in parks and gardens in Venezuela. The fruits are sold in local markets and along the streets wherever the tree is grown.

### Varieties

Ochse mentions an oblong to pear-shaped, white form called *djamboo pootih*, *djamboo bodas*, or *djamboo kemang*, which, in Java, is less flavorful than the red type. He says that there are many forms because of seedling variation. A large, especially sweet and juicy clone was introduced into the Philippines from Hawaii in 1922.

### Climate

The Malay apple is strictly tropical, too tender for Florida and California except under very unusual conditions. It is naturalized and cultivated from sea-level to 9,000 ft (2,740 m) in valleys and on mountain slopes of the lowest forest zone of the Hawaiian Islands, and is grown up to 2,000 ft (610 m) in Ceylon and Puerto Rico. The tree needs a humid climate, with an annual rainfall of 60 in (152 cm) or more.

### Soil

The tree grows vigorously on a range of soil types from sand to heavy clay. It tolerates moderately acid soil, reacts unfavorably to highly alkaline situations. In India, it grows best on the banks of ponds, lakes and streams where there is good drainage and no standing water. It is reported to be one of the first trees to spring up in new lava flows in Hawaii.

### Propagation

Malay apple seeds germinate readily. Many sprout on the ground under the tree. While seed propagation is common, superior types are multiplied by budding onto their own seedlings. Air-layering has been successful and cuttings have been rooted in sand in Hawaii. Seeds are planted no more than 1½ in (4 cm) deep in nurseries or directly in the field. They will germinate in 2 to 4 weeks and, if in nurseries, the seedlings are transplanted to the field when 8 months old. Cuttings are ready for transplanting in 6 weeks after rooting.

### Culture

In India, Malay apple trees are spaced 26 to 32 feet (8–10 m) apart in fields prepared and enriched as for any other crop, and thereafter they require little care except for elimination of weeds and periodic fertilization and plentiful irrigation in very dry weather.

### Pests and Diseases

Young Malay apple trees are frequently attacked by termites in India. It is reported that sap-feeders, defoliators, miners and borers have been found on the foliage and on dead stems.

### Season

In Java, the tree flowers in May and June and the fruits ripen in August and September. The fruiting season is about the same around Castleton Gardens in Jamaica but at the lower level of Kingston it is earlier and ends during the first week of June. In India, the main crop occurs from May to July and there is often a second crop in November and December. In Puerto Rico, the tree may flower 2 or 3 times a year, in spring, summer and fall, the blooming season covering 40 to 60 days. The spring and fall flowering seasons produce the biggest crops. Fruits mature in 60 days from the full opening of the flowers and they fall quickly after they become fully ripe and deteriorate rapidly. For marketing, they must be hand-picked to avoid damage and to have longer shelf-life.

### Yield

The yield varies from 48 to 188 lbs (21–85 kg) per tree.

### Food Uses

The ripe fruit is eaten raw though many people consider it insipid. It is best stewed with cloves or other flavoring and served with cream as dessert. Asiatic people in Guyana stew the peeled fruit, cooking the skin separately to make a sirup which they add to the cooked fruit. Malayan people may add the petals of the red-flowered hibiscus (*Hibiscus rosa-sinensis* L.) to make the product more colorful. Malay apples are often cooked with acid fruits to the benefit of both. They are sometimes made into sauce or preserves. The slightly unripe fruits are used for making jelly and pickles.

In Puerto Rico, both red and white table wines are made from the Malay apple. The fruits are picked as soon as they are fully colored (not allowed to fall) and immediately dipped in boiling water for one minute to destroy surface bacteria and fungi. The seeds are removed and, for red wine, the fruits are passed through a meat grinder and the resulting juice and pulp weighed. To this material, they add twice the amount of water and 1½ lbs (680 g) of white sugar per gallon, and pour into sterilized barrels with the mouth covered soon with cheesecloth. Yeast is added and a coil inserted to maintain circulation of the water. The barrels are kept in the coolest place possible for 6 months to 1 year, then the wine is filtered. It will be of a pale-rose color so artificial color is added to give it a rich-red hue. In making white wine, the fruits are peeled,

the only liquid is the fruit juice, and less sugar is used, only 1¼ lbs (565 g) per gallon, so as to limit alcohol formation over a fermenting period of 3 to 6 months.

In Indonesia, the flowers are eaten in salads or are preserved in sirup. Young leaves and shoots, before turning green, are consumed raw with rice or are cooked and eaten as greens.

Food Value Per 100 g of Edible Portion*	
Moisture	90.3–91.6 g
Protein	0.5–0.7 g
Fat	0.1–0.2 g
Fiber	0.6–0.8 g
Ash	0.26–0.39 g
Calcium	5.6–5.9 mg
Phosphorus	11.6–17.9 mg
Iron	0.2–0.82 mg
Carotene	0.003–0.008 mg
(Vitamin A)	3–10 I.U.
Thiamine	15–39 mcg
Riboflavin	20–39 mcg
Niacin	0.21–0.40 mg
Ascorbic Acid	6.5–17.0 mg
*According to analyses made in Hawaii, El Salvador and Ghana.	

## Other Uses

**Wood:** The timber is reddish, soft to hard, tough and heavy, but inclined to warp. It is difficult to work, but is employed for construction, railway ties, and for fashioning bowls and poi boards in Hawaii.

**Medicinal Uses:** According to Akana's translation of *Hawaiian Herbs of Medicinal Value*, the astringent bark has been much used in local remedies. It is pounded together with salt, the crushed material is strained through coconut husk fiber, and the juice poured into a deep cut. "The patient must exercise absolute self-control as the liquid burns its way into the flesh and nerves."

In the Molucca, or Spice, Islands, a decoction of the bark is used to treat thrush. Malaysians apply a powder of the dried leaves on a cracked tongue. A preparation of the root is a remedy for itching. The root acts as a diuretic and is given to alleviate edema. The root bark is useful against dysentery, also serves as an emmenagogue and abortifacient. Cambodians take a decoction of the fruit, leaves or seeds as a febrifuge. The juice of crushed leaves is applied as a skin lotion and is added to baths. In Brazil, various parts of the plant are used as remedies for constipation, diabetes, coughs, pulmonary catarrh, headache and other ailments. Seeded fruits, seeds, bark and leaves have shown antibiotic activity and have some effect on blood pressure and respiration.

## Java Apple (Plate LIII)

Much less known than the Malay Apple, this member of the Myrtaceae is botanically identified as *Syzygium samarangense* Merr. & Perry (syns. *S. javanicum* Miq.; *Eugenia javanica* Lam. in part; *E. alba* Roxb.). Among its various vernacular names are: samarang rose apple, *djamboe semarang* (Indonesia); *jambu ayer rhio* (Malaya); *pini jambu* (Ceylon); *jumrool*, *jamrul*, or *amrool* (India); *chom pu kao*, or *chom pu kio* (Thailand); *makopa* (Philippines); *cashu di Surinam*, or *Curacaoe appel* (Curacao); wax apple, wax jambu and water apple, generally.

### Description

The tree, 16 to 50 ft (5–15 m) tall, has a short trunk 10 to 12 in (25–30 cm) thick, and open, widespreading crown, and pinkish-gray, flaking bark. The opposite leaves are nearly sessile, elliptic-oblong, rounded or slightly cordate at the base; yellowish to dark bluish-green; 4 to 10 in (10–25 cm) long and 2 to 4¾ in (5–12 cm) wide; very aromatic when crushed. Flowers, borne in drooping panicles of 3 to 30 at the branch tips or in smaller clusters in the axils of fallen leaves, are fragrant, yellowish-white, ¾ to 1½ in (2–4 cm) broad, 4-petalled, with numerous stamens

¾ to 1 in (1.5–2.5 cm) long. The waxy fruit, usually light-red, sometimes greenish-white or cream-colored, is pear-shaped, narrow at the base, very broad, flattened, indented and adorned with the 4 fleshy calyx lobes at the apex; 1½ to 2 in (3.4–5 cm) long, 1¾ to 2½ in (4.5–5.4 cm) wide. The skin is very thin, the flesh white, spongy, dry to juicy, subacid and very bland in flavor. There may be 1 or 2 somewhat rounded seeds ¾ to 5/16 in (0.5–0.8 cm) wide, or none.

### Origin and Distribution

The tree is indigenous from Malaya to the Andaman and Nicobar Islands where there are wild trees in the coastal forests. It was introduced into the Philippines in prehistoric times and is widely grown throughout those islands. It is common in Thailand, Cambodia, Laos, Vietnam and Taiwan, frequently cultivated in India and in Zanzibar and Pemba, but primarily as an ornamental, seldom for its fruits which are little valued. It was introduced into Jamaica before 1903 and also into Surinam and the islands of Curacao, Aruba and Bonaire. A few trees have been grown in Israel but have borne sparsely.