

Purple mangosteen

"Mangosteen" redirects here. This may also refer to the entire genus *Garcinia*.

Purple mangosteen



Illustration from *Fleurs, Fruits et Feuillages Choisis de l'Ile de Java* 1863-1864 by Berthe Hoola van Nooten (Pieter De Pannemaeker lithographer)

Scientific classification

Kingdom:	Plantae
(unranked):	Angiosperms
(unranked):	Eudicots
(unranked):	Rosids
Order:	Malpighiales
Family:	Clusiaceae
Genus:	<i>Garcinia</i>
Species:	<i>G. mangostana</i>

Binomial name

Garcinia mangostana

L.

The **purple mangosteen** (*Garcinia mangostana*), colloquially known simply as **mangosteen**, is a tropical evergreen tree believed to have originated in the Sunda Islands and the Moluccas of Indonesia. It grows mainly in Southeast Asia, and also in tropical South American countries such as Colombia, in the state of Kerala in India and in Puerto Rico, where the tree has been introduced. The tree grows from 6 to 25 m (20–82 ft) tall. The fruit of the mangosteen is sweet and tangy, juicy, and somewhat fibrous, with an inedible, deep reddish-purple colored rind (exocarp) when ripe. In each fruit, the fragrant edible flesh that surrounds each seed is botanically endocarp, i.e., the inner layer of the ovary.^[1]

The purple mangosteen belongs to the same genus as the other, less widely known, mangosteens, such as the button mangosteen (*G. prainiana*) or the *charichuelo* (*G. madruno*).

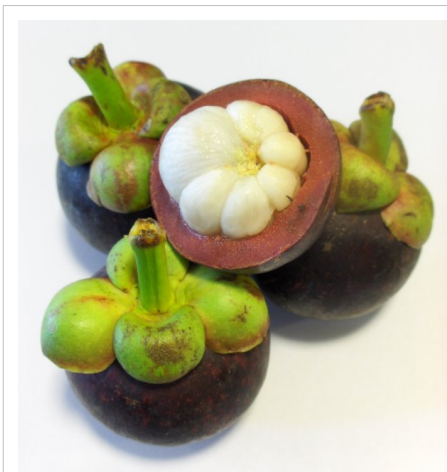
A description of mangosteen was included in the *Species Plantarum* by Linnaeus in 1753.

Tree and fruit



Mangosteen tree

A tropical tree, the mangosteen must be grown in consistently warm conditions, as exposure to temperatures below 0 °C (32 °F) for prolonged periods will generally kill a mature plant. They are known to recover from brief cold spells rather well, often with damage only to young growth. Experienced horticulturists have grown this species outdoors, and brought them to fruit in extreme south Florida.



Only the white flesh of the purple mangosteen is edible

The juvenile mangosteen fruit, which does not require fertilisation to form (see agamospermy), first appears as pale green or almost white in the shade of the canopy. As the fruit enlarges over the next two to three months, the exocarp colour deepens to darker green. During this period, the fruit increases in size until its exocarp is 6–8 centimetres (2.4–3.1 in) in outside diameter, remaining hard until a final, abrupt ripening stage.

The subsurface chemistry of the mangosteen exocarp comprises an array of polyphenols, including xanthenes and tannins that assure astringency which discourages infestation by insects, fungi, plant viruses, bacteria and animal predation while the fruit is immature. Colour changes and softening of the exocarp are natural processes of ripening that indicates the fruit can be eaten and the seeds have finished developing.^[2]

Mangosteen produces a recalcitrant seed and must be kept moist to remain viable until germination. Mangosteen seeds are nucellar in origin and not the result of fertilisation; they germinate as soon as they are removed from the fruit and die quickly if allowed to dry.^[3]

Once the developing mangosteen fruit has stopped expanding, chlorophyll synthesis slows as the next colour phase begins. Initially streaked with red, the exocarp pigmentation transitions from green to red to dark purple, indicating a final ripening stage. This entire process takes place over a period of ten days as the edible quality of the fruit peaks.

Over the days following the removal from the tree, the exocarp hardens to an extent depending upon postharvest handling and ambient storage conditions, especially relative humidity levels. If the ambient humidity is high, exocarp hardening may take a week or longer when the aril quality is peaking and excellent for consumption. However, after several additional days of storage, especially if unrefrigerated, the arils inside the fruit might spoil without any obvious external indications. Using the hardness of the rind as an indicator of freshness for the first two weeks following harvest is therefore unreliable because the rind does not accurately reveal the interior condition of the arils. If the exocarp is soft and yielding as it is when ripe and fresh from the tree, the fruit is usually good.

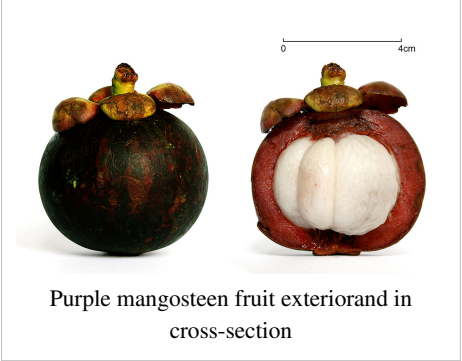
The edible endocarp of the mangosteen is botanically defined as an aril with the same shape and size as a tangerine 4–6 centimetres in diameter, but is white. The circle of wedge-shaped arils contains 4–8, rarely 9 segments, the larger ones harbouring apomictic seeds that are unpalatable unless roasted.

Often described as a subtle delicacy, the arils bear an exceptionally mild aroma, quantitatively having about 1/400th of the chemical constituents of fragrant fruits, explaining its relative mildness.^[4] The main volatile components having caramel, grass and butter notes as part of the mangosteen fragrance are hexyl acetate, hexenol and α -copaene.

On the bottom of the exocarp, raised ridges (remnants of the stigma), arranged like spokes of a wheel, correspond to the number of aril sections.^[5] Mangosteens reach fruit-bearing in as little as 5–6 years, but more typically require 8–10 years.^[6]

Nutritional content

Mangosteen, canned, syrup pack

 <p>Purple mangosteen fruit exterior and in cross-section</p>	
Nutritional value per 100 g (3.5 oz)	
Energy	305 kJ (73 kcal)
Carbohydrates	17.91 g
- Dietary fiber	1.8 g
Fat	0.58 g
Protein	0.41 g
Thiamine (vit. B ₁)	0.054 mg (5%)
Riboflavin (vit. B ₂)	0.054 mg (5%)
Niacin (vit. B ₃)	0.286 mg (2%)
Pantothenic acid (B ₅)	0.032 mg (1%)
Vitamin B ₆	0.018 mg (1%)
Folate (vit. B ₉)	31 µg (8%)
Vitamin C	2.9 mg (3%)
Calcium	12 mg (1%)
Iron	0.3 mg (2%)
Magnesium	13 mg (4%)
Manganese	0.102 mg (5%)
Phosphorus	8 mg (1%)
Potassium	48 mg (1%)
Sodium	7 mg (0%)
Zinc	0.21 mg (2%)

Link to USDA Database entry ^[7]
Percentages are roughly approximated
using US recommendations for adults.
Source: USDA Nutrient Database ^[8]

The aril is the white part of the fruit containing a mild flavor that makes the fruit popular for eating.^[9] When analyzed specifically for its content of essential nutrients, however, mangosteen nutrition is modest, as all nutrients analyzed are a low percentage of the Dietary Reference Intake.

Peel phytochemicals

Mangosteen peel contains xanthonoids, such as mangostin, and other phytochemicals having antioxidant properties *in vitro*. Some studies demonstrated that juice containing mangosteen peel extracts may reduce blood levels of C-reactive protein, a biomarker of inflammation.^[citation needed] Research on the phytochemistry of the plant without human clinical study is inadequate to assure the safety or efficacy of its use as a supplement.

Some mangosteen juice products contain whole fruit purée or polyphenols extracted from the inedible exocarp (rind). The resulting juice has purple colour and astringency derived from exocarp pigments.

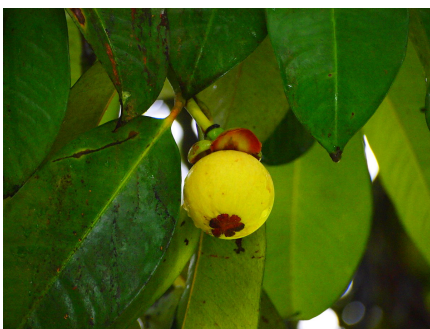
Uses

Culinary

Due to restrictions on imports, mangosteen is not readily available in certain countries. Although available in Australia, for example, they are still rare in the produce sections of grocery stores in North America and Europe. Following export from its natural growing regions in Southeast Asia, the fresh fruit may be available seasonally in some local markets like those of Chinatowns.

Mangosteens are available canned and frozen in Western countries. Without fumigation or irradiation to kill the Asian fruit fly fresh mangosteens had been illegal to import into the United States until 2007. Freeze-dried and dehydrated mangosteen arils can also be found.

Upon arrival in the US in 2007, fresh mangosteens sold up to \$45 per pound in speciality produce stores in New York City, but wider availability and somewhat lower prices have become common in the United States and Canada within two or three years. Fresh mangosteens sell for around \$8 a pound in the US. Despite efforts described above to grow mangosteen in the Western Hemisphere, nearly the entire supply is imported from Thailand. Canned mangosteens are also available in the United States for a much lower price, but much of the fruit's unique flavor is lost in the canning process.



Young fruit

Before ripening, the mangosteen shell is fibrous and firm, but becomes soft and easy to pry open when the fruit ripens. To open a mangosteen, the shell is usually scored first with a knife; one holds the fruit in both hands, prying gently along the score with the thumbs until the rind cracks. It is then easy to pull the halves apart along the crack and remove the fruit. Occasionally, during peeling of ripe fruits, the purple exocarp juice may stain skin or fabric.

There is a legend about Queen Victoria offering a reward of 100 pounds sterling to anyone who could deliver to her the fresh fruit. Although this legend can be traced to a 1930 publication by the fruit explorer, David Fairchild, it is not substantiated by any known

historical document, yet is probably responsible for the uncommon designation of mangosteen as the "Queen of Fruit".

In his publication, "*Hortus Veitchii*", James Herbert Veitch says he visited Java in 1892, "to eat the Mangosteen. It is necessary to eat the Mangosteen grown within three or four degrees of latitude of the equator to realize at all the attractive and curious properties of this fruit."

The journalist and gourmand R. W. Apple, Jr. once said of the fruit, "No other fruit, for me, is so thrillingly, intoxicatingly luscious...I'd rather eat one than a hot fudge sundae, which for a big Ohio boy is saying a lot." Since 2006, private small volume orders for fruits grown in Puerto Rico were sold to American gourmet restaurants who serve the aril pieces as a delicacy dessert.

Traditional medicine and research

Various parts of the plant have a history of use in traditional medicine, mostly in Southeast Asia; it may have been used to treat skin infections, wounds, dysentery, and urinary tract infections.

According to the American Cancer Society, "there is no reliable evidence that mangosteen juice, puree, or bark is effective as a treatment for cancer in humans".

Other uses

Mangosteen twigs have been used as chew sticks in Ghana, and the wood has been used to make spears and carpentry in Thailand. The rind of the mangosteen fruit has also been used to tan leather in China.

Marketing

Mangosteen is marketed for only a short period of six to ten weeks due to its seasonal nature. It is mainly grown by smallholders and sold at fruit stalls by roadsides. Its irregular, short supply leads to wide price fluctuations throughout its season. The price of mangosteen has also been subject to great fluctuations over the years. Additionally, there is no standard product quality assessment or grading system, making international trade of the fruits difficult. The mangosteen still remains rare in Western markets, though its popularity is increasing; however, it is often sold at a high price.

References

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- [2] Plant Pigments for Colour and Nutrition (<http://www.hort.wisc.edu/usdavr/simon/publications/97hort0012.html>)
- [3] Mangosteen seed information (<http://mangosteen.com/Sciencenonscienceandnonsense.htm>)
- [4] MacLeod AJ, Pieris NM. Volatile flavour components of mangosteen, *Garcinia mangostana*" *Phytochemistry* 21:117–9, 1982
- [5] Mangosteen photographs showing external characteristics (mangosteen.com) (<http://mangosteen.com/FruitPicturesPageone.htm>)
- [6] Mangosteen growing characteristics (<http://mangosteen.com/Sciencenonscienceandnonsense.htm>)
- [7] <http://ndb.nal.usda.gov/ndb/search/list?qlookup=09177&format=Full>
- [8] <http://ndb.nal.usda.gov/ndb/search/list>
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