

Male plants develop caprifigs of low quality

Female plants grow figs with tasty flesh and plenty of petite seeds

Up to 3 generation of inflorescences per year

Quality of pollination and multiple fruits is affected by *Blastophagus pseudes* which lives only in natural habitat of fig tree

Propagation:

Vegetative: Wood and Root cuttings, layering



Fresh fruits contain:

Carbohydrates 25 %

Protein 1.4 %

Fats 0.26 %

Vitamin C, provitamin A

Dried fruits contain:

Carbohydrates 65 %

Protein 3.4 %

Fats 1.2 %

Fibre 7 %

Minerals 2.3 %

Water 18 %

Eaten fresh as a dietetic fruit

Dried figs

Magiun, jams, juice, wine, roasted figs substitute coffee

MANGOSTEEN

Garcinia mangostana

Native to Malaysia and Indonesia

One of the most popular tropical fruit

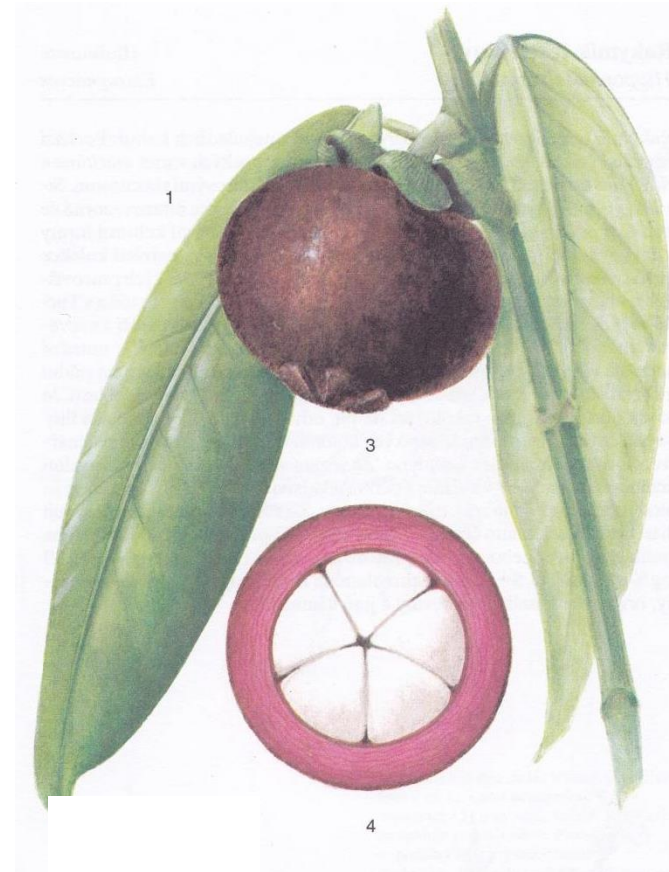
Typical wood plant of humid tropical regions, one of the most heat- and moisture-demanding plant, highly susceptible to cold; drop below 5 °C is critical

Today: Grown in south-east and south Asia, Central America, and elsewhere

Large plantations: Panama and Honduras

Evergreen tree, grows in tropical Equator climate, 10-25 m tall, dense pyramid-like crown

Clusiaceae Family



Requires even distribution of precipitation throughout the year; necessary irrigation in dry regions

Deep and permeable soil

Protection against wind (breaks fruits)

Propagation is very difficult

Seedlings grow slowly and replanting is difficult; productiveness onset starts after 10 years

Seeds rapidly lose germinating ability

Vegetative: Budding, poor results

Fruit

Rounded berry with persistent calyx, pericarp: thick, dark purple to brown purple, leaks yellow latex

4-8 segments inside the fruit with oval-elongated seeds, white to pink fleshy and juicy aril around them, very tasty



Aril contains:

Protein 0.5 %

Fats 0.1 %

Carbohydrates 13.4 %

Minerals 0.2 %

Excellent smell and taste

Eaten fresh

Canning, freezing

Damaged tree bark leeks gum-resins which stiffen on air and form cheaper types of a colourant and raw material for production of varnishes and paints

Pericarp is used a colourant and for tannin and seeds in folk medicine



Mangosteen

LYCHEE

Litchi chinensis

Native to China, spread to Indochina, southern Japan and northern regions of India

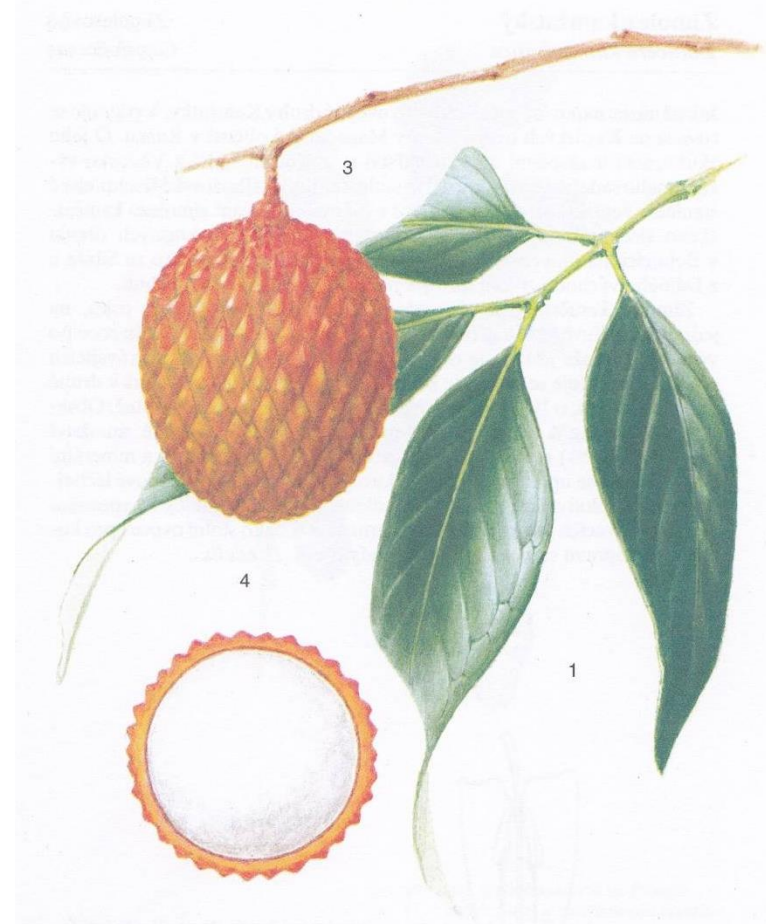
Limited cultivation in north-east Australia, southern Africa, Brazil and Florida

Requires tropical, humid summer and sub-tropical frost-free winter which stimulates blooming in the upcoming year

Trees reach 10-15 m

No specific requirements on soil (moist, acidic)

Sapindaceae Family



Fruit: Stone, oval to ellipsoid, 25-50 mm,
15-35 g

Pericarp: Thin, warty, light to dark red

Propagation:

Mostly vegetative: Aerial layering, cutting,
grafting using lychee seedlings

Fruits

Excellent table fruits, eaten fresh

Drying

Crystallization

Salads (fully ripe fruits, aril is separated from seeds)

Harvest: Unripe fruits are picked together with twigs, transport and storage (3 days at 20 °C)



Aril takes 70 % of the fruit weight:

Protein 0.7-1.1 %

Carbohydrates 12-21 %

Organic acids 1.16 %

Fibre 2.25 %

Minerals 0.7 % (P, Ca, Fe)

Trace amounts of vit. C

provit. A 0.1 mg/kg

Niacin (PP) 2 mg / kg



MANGO

Mangifera indica

Native to monsoon regions of Burma and Indian foothills of Himalaya

The most widespread tropical fruit

Second highest world production (first: bananas)

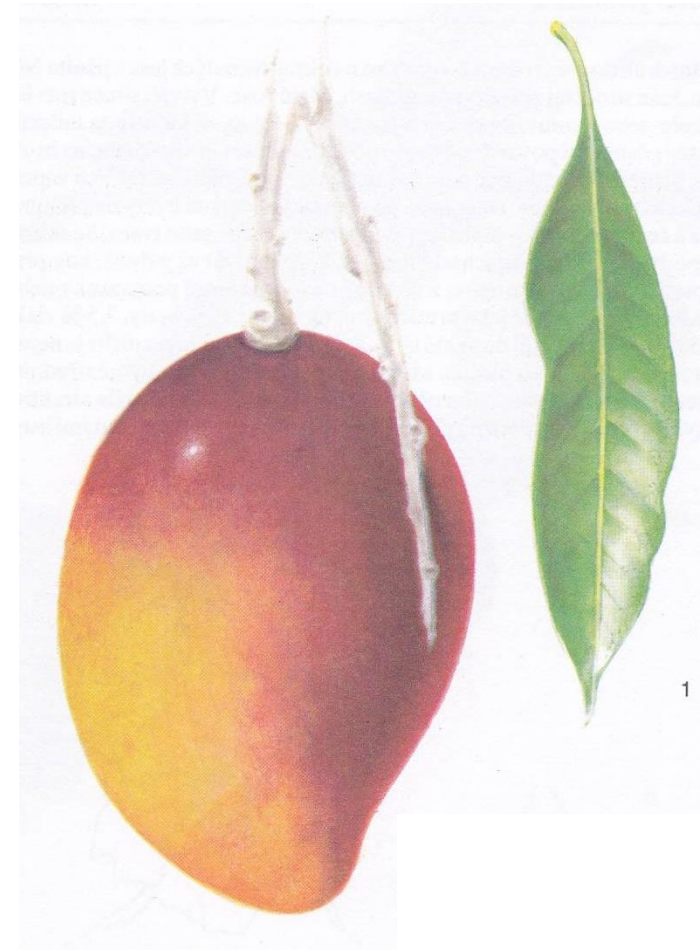
India: Plantations occupy 65 % of land for fruit growing

Available on the market all year round in developed countries

"King of tropical fruits"

Evergreen tree, reaches 10-30 m and more, dense oval to rounded crown

Anacardiaceae Family



Fruit:

Egg-shape, rounded to kidney-shaped stone, flattened and bended, 200-2,000 g

Pericarp: Green, yellow, orange to red, hard

Flesh: Juicy, sweet to spicy, may be rather fibrous or terpene-like

Flat, oval to kidney-shaped seed inside the flesh



Propagation:

Mostly vegetative: Aerial layering, cutting, grafting using lychee seedlings



Fruit flesh:
Carbohydrates 11-20 %
provit. A 31 mg/kg



Mango tree

Ripe fruits are eaten fresh (combined with pineapple, citrus fruits, papaya, etc.)

Juices, marmalades, jelly-type candy

Cocktails, salads, purees, wine, spirits

Crystallization, freezing, drying

Unripe fruits are marinated, production of chutney (sweet as well as spicy sauces)

Production of Amchyr: mixed with other seasonings (curcuma) – added into soups, sauces, etc.

Seeds without the peel taste like almonds, production of flour

Leaves are fed to livestock

Banana tree

Musa x sapientum

Native to south-east Asia, expanded to other tropical regions

Foodstuff for billion people – eaten fresh and cooked

Some species are fed to livestock and pigs, other species are used in textile fabric and tannin production, leaves are used in construction and food packaging

Typical ornamental plant in tropical and subtropical regions

Herbaceous perennial plant, reaches 10 m

0.3-0.6 m tall false stem grows from an underground root stalk; stem comprises broadened leaf sheaths forming a spiral

Spike-like inflorescence grows through the centre of the false stem

Musaceae Family



High requirements on air and soil temperatures, benefits from permeable soil, rich with nutrients and moisture, acidic to neutral

Propagation:

Vegetative: offshoots growing around the false stem



Fruit

Berries of various sizes and shapes

Fruits are eaten fresh and processed – salads, crystallized bananas, dried bananas, purees, etc.

Coffee substitute, alcoholic beverages

Bananas fried on oil and butter until the sugar caramelizes

Apical part of inflorescence: Undeveloped part of male flowers is used for salads, side dishes, etc.

Starch for production of pasta is extracted from root stalks

Ripe fruits:

Water 64-75 %

Protein 0.8-1.5 %

Fats 0.25-0.5 %

Carbohydrates 19-25 % (sucrose, fructose,
glucose)

Fibre 0.2 %

Minerals 0.8 %

provit. A 0.4 mg/kg

Vitamin B1 0.4 mg/kg

Vitamin B2 0.7 mg/kg

Vitamin B12 0.6 mg/kg

Vitamin C 100 mg/kg



RAMBUTAN

Nephelium lappaceum

Native to Malaysia, grown mostly in south-east Asia

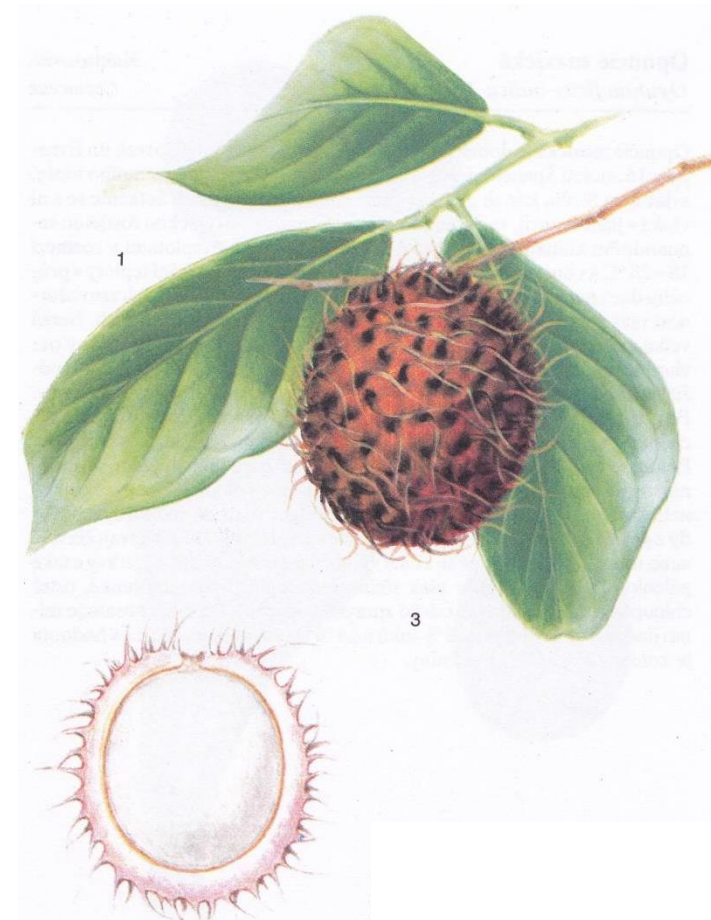
Low to medium-sized tree, grows in Equator regions, young branches are red to brown, densely tomentose

Requires a lot of heat all year round, grown mostly in lowlands or low hills of Equator regions

Requires lots of precipitation, evenly distributed throughout the year

Low requirements on soil, needs sufficient amount of nutrients

Sapindaceae Family



Rounded to egg-shaped fruit, 50-80 mm, yellow to red
Pericarp: Thick, firm, covered with soft spikes
Large seed is covered with white to pinkish, translucent aril with refreshing, sour taste and pleasant smell



Aril is eaten fresh, eaten in salads with sour-sweet covering liquid; syrup, jam and wine production

Seeds contain 37 % of oil – used in food industry

Folk medicine

Propagation:

Vegetative: Budding in wet seasons

Propagation using seeds is not recommended, very variable quality

PRICKLY PEAR

Opuntia ficus-indica

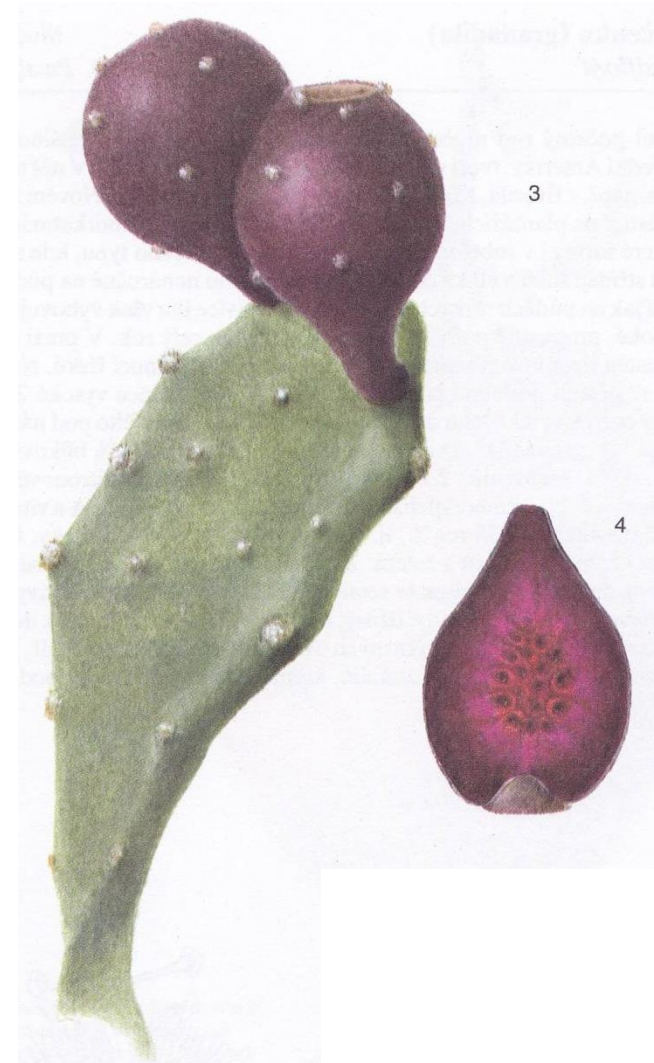
Native to Mexico, imported to Europe by Spaniards in 16th century, expanded in Mediterranean region (Sicily, France, Spain)

Robust, branched, 1-5 m tall sub-tropical cactus with thickened stalk with flattened leaf pads

Bundles of spikes on the plant surface

Large, yellow androgynous flowers grow in upper leaf pads

Cactaceae Family



Flourishes in locations with 18-28 °C temperatures, enough sun-light, tolerates temperature fluctuations during day and night

Tolerates -5 °C in winter

Low requirements on soil, grown on soil otherwise not fit for other fruit species, sufficient amount of Ca

Blossom and fruits development must be controlled; high temperatures and lack of moisture results in small and dry fruits

Propagation:

Division of stem parts: Cut area must dry after the cutting, base must be thoroughly dry and the plant had begun to callous; replant in light substrate with bottom heating, shading, higher air humidity

From seeds

Fruits: Smooth, egg-shaped, elongated, pear-like berry, 70-300 g, whitish, yellow, red to purple violet

Flesh: White, soft, juicy and sweet, may be filled with petite, black seeds

Certain fruits have calcium oxalate crystals in flesh, cultivated varieties have none



Fully mature fruits are eaten fresh, cooked or dried

Marmalades, syrups, juices, spirits

Minutely, sharp hairs must be wiped off before eating (no hairs in cultivated varieties)

Flesh contains:

Protein 0.5 %

Fats 2 %

Carbohydrates 14 %



PASSION FLOWER (MARACUJA)

Passiflora

Native to South and Central America, vine with edible fruits

May be grown in plantations (Brazil, Columbia, Venezuela, Hawaii, New Zealand)

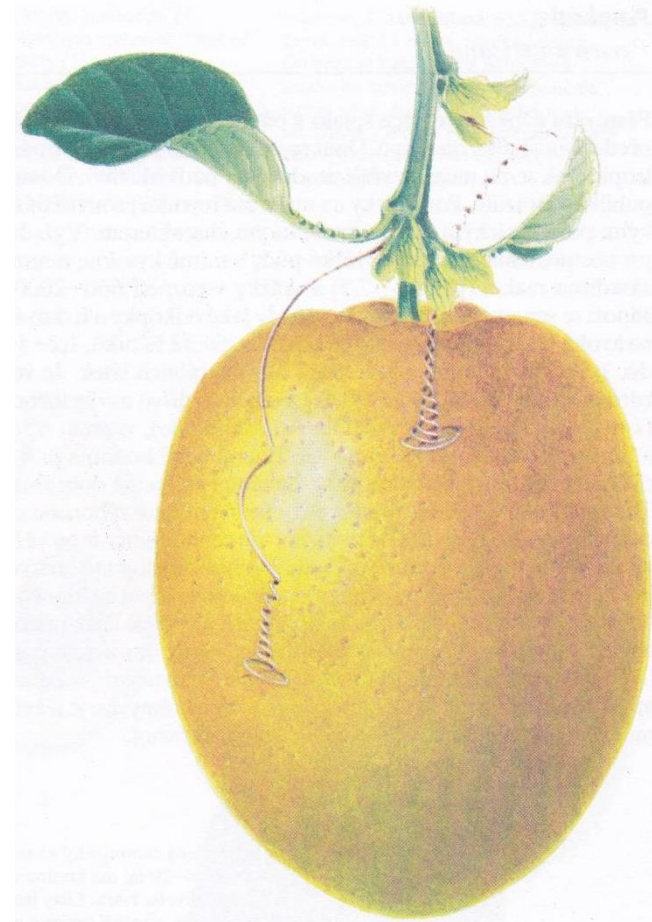
Tropical to sub-tropical vine with very long lignifying stems with tendrils

Attractive flowers, up to 80 mm large

Fruits: Berries of various sizes, shapes and colours, up to 2.5 kg

Contain plenty of flattened seeds covered with juicy aril

Passifloraceae Family



Passionfruit *Passiflora edulis* very common
Giant Granadilla *P. quadrangularis*, 2.5 kg
fruits
Winged-stem Passion Flower *P. alata* less
common
Sweet Granadilla *Passiflora ligularis* high-
quality fruits, sold in Europe



Grown in lowlands and low hills of tropical regions; several forms grow in sub-tropical, monsoon-type climate with dry and wet seasons fluctuations

Low requirements on soil, benefits from both heavy and light soils, flourishes on fertile, deep, permeable soil with enough moisture throughout the year

Growing on plantations resembles growing of grape vine - 2-2.5 m tall wire support

Propagation:

From seeds: Most common

Easy propagation using cuttings

Fruits, also called Maracuja and Granadilla, are one of the most delicious table fruits

Mature fruits are cut longitudinally, and granules (aril with seeds) are scooped with a spoon

Beverages (lemonades, juices, nectars) are produced from the passion flower juice; juice is further used for production of other juices with less distinct flavour (papaya, mango)

Ice-creams, fruits salads, etc.



Passion Flower

Flesh contains:

Protein 2.4 %

Fats 2.5 %

Carbohydrates 17 %

Acids 2.2-3.9 % (citric acid)

Fibre 3.7 %

Minerals 1.2 % (P, Ca, Fe)

- vit C 330 mg/kg (similar to tangerines)

- provit. A

AVOCADO

Persea americana

Native to Central America, linked with Mayan culture

Today, avocado grows in most of tropical and subtropical regions

Biggest producers: Mexico, Dominican Republic, Brazil

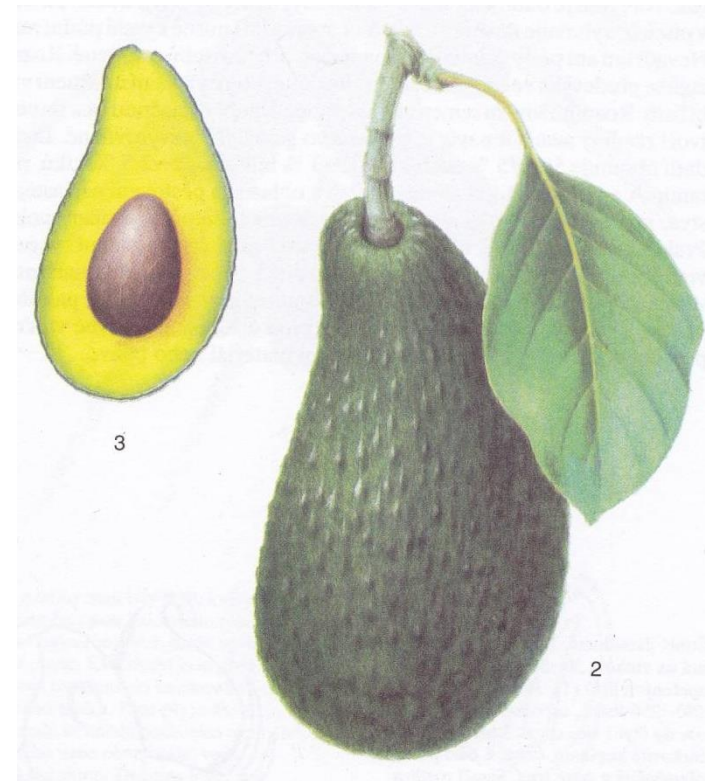
Evergreen, sub-tropical to tropical tree, reaches 6-20 m

Fruit set equals only 0.1 %

Fruit: Rounded, egg-shaped or pear-shaped fleshy berry

Peel: Green, yellowish green, brown to purple black, shiny as well as matte, smooth as well as rough

Lauraceae Family



Flesh: Whitish yellow to yellow, buttery consistency, slightly sweet, mild smell
One large, conical seed in positioned inside the fruit freely, or is fixed to the flesh



Fruits are eaten fresh, cut alongside, seed is scooped out, flesh is sprinkled with lemon juice or Worcester sauce, salt, pepper and eaten with a spoon, or spread on bread

Salads with tomatoes, peppers, onions

In combination with pineapple, citrus fruits

Mayonnaise, purees, creams

Dried, crushed to powder

Frozen

Fat is odour-free, has excellent taste and rarely gets rancid; used in pharmaceuticals and cosmetic industry



Avocado

Flesh contains:

Protein 0.8-4.4 %

Fats 5-32 %

Carbohydrates 1.2-10 %

Fibre 1.5-2 %

Minerals 0.8 %

Vitamin B2 1.5 mg/kg

Vitamin B1 0.7 mg/kg

•Niacin (PP) 10 mg / kg

•provit. A 0.3 mg/kg

Vitamin C 150 mg/kg

Energy value is 2.5 times higher than in
bananas, digestibility is the same

Various requirements on heat in relation to tropical, semi-tropical and sub-tropical nature of particular avocado

Soil: Deep, permeable, light to medium heavy, slightly acidic, neutral to mildly alkali (pH 5.5-7.5), annual precipitation: 600-2,000 mm

Propagation:

Seeds, grafting; occasionally: root layering and cuttings

DATE PALM

Phoenix dactylifera

Native to Mesopotamia and south-western Iran

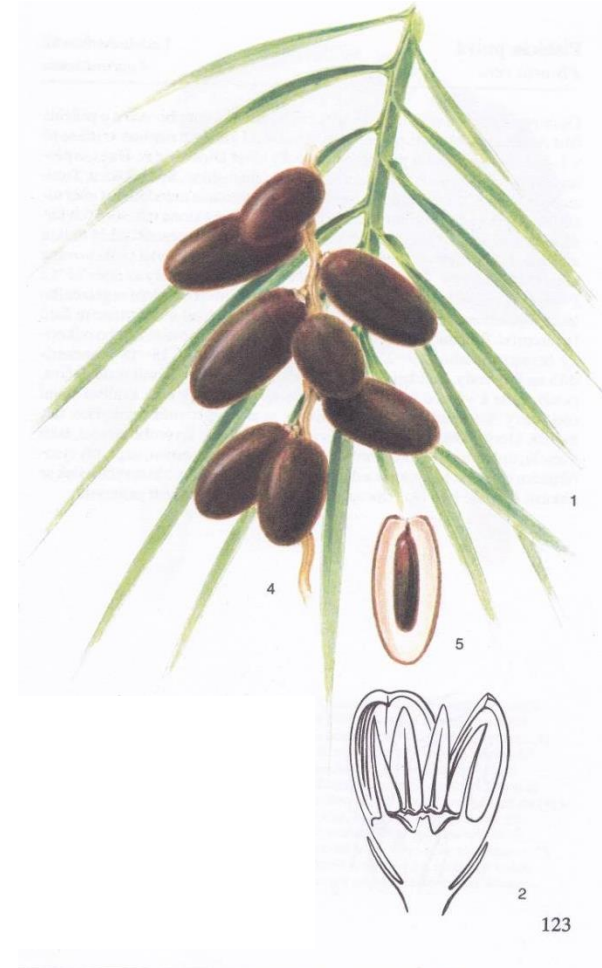
Biggest producers: Iraq, Egypt, Iran, Saudi Arabia, Algeria

Slender, dioecious palm reaches 10-30 m, 30-80 leaves at the top

Fruit: Yellow, reddish to brown stone, oval to egg-shaped, sweet flesh

Flesh: Juicy, semi-dry, or dry; contains one spindle-like seed with a distinctive longitudinal furrow

Arecaceae Family



Flesh contains:
Protein 2-3 %
Fats 1-2.5 %
Carbohydrates 50-75 %
Vitamin B1
provitamin A

Fruits:

Dates are commonly eaten fresh in the growing regions

Dried for export production

Various dishes using dates

Other plant parts are also important:

Vegetation tops with leaves are eaten as vegetable

Sweet juice, leaking from cut stalk of male inflorescence or from a trunk, is used for production of palm wine

Various products are woven from the leaves

Firm fibre for ropes is derived from date palm petioles

Wood: Construction material and fuel

Optimum conditions: Arid regions with sub-tropical continental climate, extremely high temperatures and low air humidity in summer, sufficient soil moisture all-year round

Basically no requirements on soil; grows in sandy, slightly acidic/neutral/slightly alkali soil; tolerates salinized/shortly flooded soil

Propagation:

Mostly vegetative: offshoots, formed on the trunk in leaf axils

From seeds (not so common) Male plants are dominant; uneven offspring

PISTACHIO

Pistacia vera

Very old crop plant, Native to warm regions of the Mediterranean Sea and close areas in Asia where it grows wild

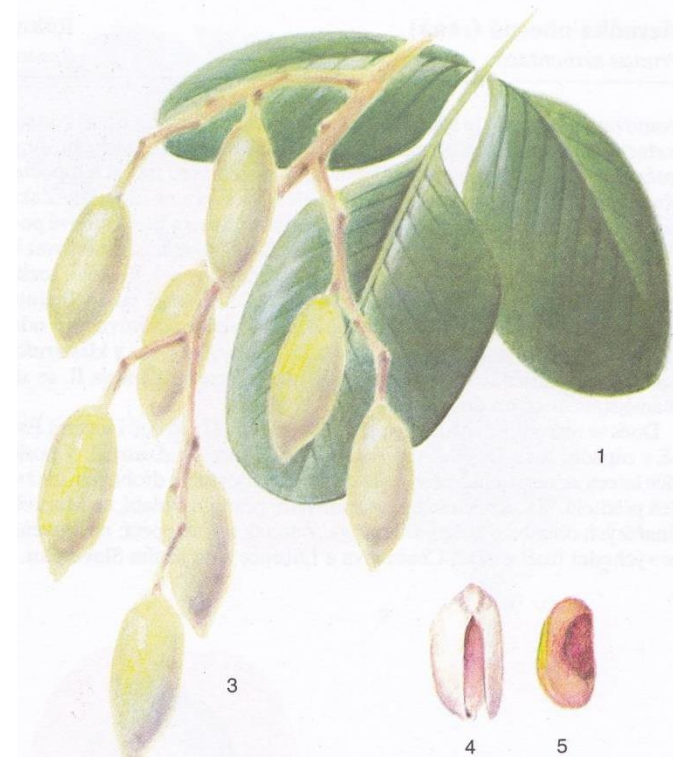
Today: Turkey, Iran, Sicily, Afghanistan, Syria, Greece, Tunisia, and southern France

Dioecious shrub/tree, reaches 5-7 m

Sprouts around the main trunk develop naturally and replace dying trunk later, plant may live up to 160 years

Ellipsoid fruit, up to 20 mm long, pointed at the top

Anacardiaceae Family



Fleshy pericarp dries when approaching maturity, and turns yellow to red
Shell of the fruit is hard, smooth and relatively thin
Shell often cracks alongside when the fruits mature
Seed is brown, cotyledons are green



Seeds contain:
Protein 19-23 %
Fats 43-62 %
Carbohydrates 15-18 %
Water 8 %

Eaten dried, roasted, salted

Added into pastry

Ice-cream, creams

Pharmaceutical and food industry: Spirits production

High-quality table oil, becomes rancid easily

Resin called mastic is acquired from a wounded bark – production of glues, paintings and sealants

Red colourant is obtained from the leaves

Wood is used in furniture production

The most drought-resilient plant of all
fruiting trees

Pistachio tree grows naturally on sunny,
dry and rocky slopes

Low requirements on soil, intolerant to wet
and acidic soil

Frost-resistant varieties tolerate -10 to -12
°C, wild trees may sustain -25 °C

Successful growth requires the
temperatures to drop below zero during
dormancy period

Otherwise, leaves and inflorescences are
deformed

Propagation:

Vegetative: Grafting and root layering

From seeds

PSIDIUM

Psidium

Psidium Genus includes roughly 150 sub-tropical to tropical species coming from South and Central Americas; 2 most significant ones: Common guava and Cattley guava

Come from Brazil, grown in many warm regions throughout the world today
Myrtaceae Family



Common guava *Psidium guajava*

Higher requirements on temperature – tropical plant, in high demand on the market

3-10 m high shrub/tree

Typical separable strips of bark

Fruit: Rounded, oval or pear-shaped berry with greenish to straw yellow skin, bumpy to smooth, shiny coating

Flesh: Juicy, yellowish white, pink to dark red, plenty of soft seeds



Cattley guava *Psidium cattleianum*

Tolerates short-term drop of temperatures below $-5\text{ }^{\circ}\text{C}$ - sub-tropical plant

Shrub or 3-5 m tall tree

Fruit: Egg-shaped to rounded, thin red to purple peel

Flesh: White, juicy, aromatic, slightly acidic, plenty of hard seeds



Fruits contain:

Protein 0.9 %

Fats 0.3 %

Carbohydrates 15 %

Fibre 5.2 %

Minerals 0.5 %

Traces of provit. A

Vitamin B1 0.3 mg/kg

Vitamin B2 0.3 mg/kg

Niacin (PP) 2 mg / kg

Vitamin C: 300-3,000 mg/kg

Fruits of both species are eaten fresh
Freshly picked fruits may be stored for 3 weeks at 8-10 °C and 90 % air humidity
Juices, jelly-type candy, syrups, wine
Preserved in sugary covering liquid
Salads, puddings, ice-cream, children nutrition
Thanks to high amount of vit. C, psidium juice is added into other juices with lower amounts of vit. C and uninteresting flavours

Soil: Light, permeable, acidic, rich in nutrients

Propagation:

Common guava: From seeds only

Cattley guava: vegetative

Grafting

Cutting

Aerial layering

POMEGRANATE

Punica granatum

Pomegranate is one of the oldest fruits

Grows wild in the Middle East, Caucasia, Central Asia and the Anatolian region, Iran and Afghanistan

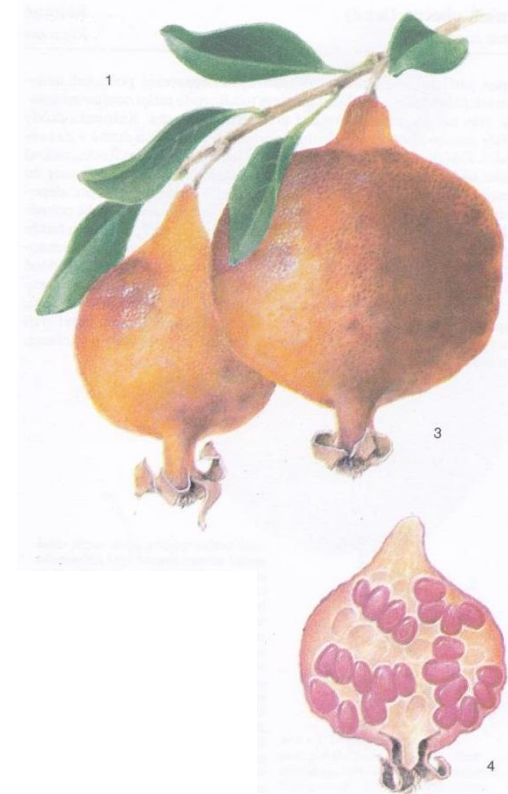
Commonly grown on the Crimea, Black Sea coast of Georgia, Central Asia, and the Mediterranean region and America

Deciduous shrub/tree, reaches 5 m

Fruit: Red, yellow, pale, rounded berry with persistent calyx

Pericarp: Leather-like, hard, 6-12 lobes inside the fruit contain plenty of seeds wrapped with juicy aril

Punicaceae Family



Seeds are white

Aril: Red, pink or whitish

Sweet, sour-sweet or sour juice is coloured accordingly



Fruits contain:

Water 77 %

Protein 1.5 %

Fats 3 %

Carbohydrates 14-21 %

Citric acid 3-4 %

Eaten fresh

Juice: "Grenadina"

Syrups, wine

Tannins extracted from the roots are used
in medicine



Benefits from sub-tropical continental type of climate: Long, hot summer, no major precipitation, and cold, wet winter

Soil: Rather demanding, flourishes in fertile, light, neutral to slightly alkali soils

Propagation:

Vegetative: Grafting using seedlings; wood cuttings

From seeds

CASHEW

Anacardium occidentale

Native to tropical regions of Brazil and Amazonia. Cultivation expanded to other tropical regions of America, south-east and south Asia, Africa and the Oceania

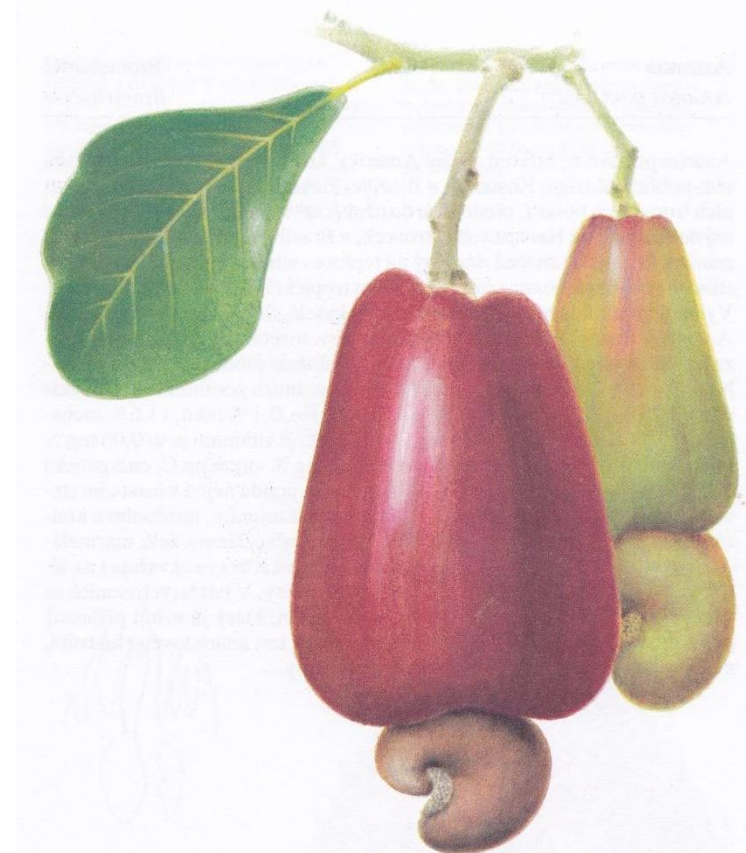
Biggest growers: India, Mozambique, Tanzania, Brazil, Kenya

Evergreen tree, reaches 7-18 m, greyish trunk and branches

Fruit: Kidney-shaped nut with thick, leathery, brown-green shell

Along with growth of the fruit, peduncle and receptacle thicken and produce false drupe, a pear-shaped cashew apple

Anacardiaceae Family



Fruits: Tasty, whitish seeds, cashew seeds:
Protein 20 %
Fats 46 %
Carbohydrates 26 %
Fibre 1 %
Minerals 2.7 %
Eaten roasted, salted (good with wine),
added into chocolates and candy
Oil is extracted from the seeds
Nut shell contains 30-35 % of oil – urushiol:
Excellent disinfection qualities

Apple cashew is light yellow to red orange,
has a very fine peel and a pleasant smell

Flesh: Juicy, fine, light yellow, refreshing
sweet and sour taste, pleasant smell,
contains:

Protein 0.8 %

Fats 0.6 %

Carbohydrates 11.2 %

Fibre 0.8 %

Minerals 0.4 %

Vitamin C 1,900-2,400 mg/kg

Vitamin B2: 3 to 4 times more than in
orange

Flesh: Production of juices, syrups,
alcoholic beverages, marmalades

Extract from unripe apples together with copperas produces indelible black colour
Highly praised hard wood, resistant to termites
Yellowish natural gums leaking from tree bark has similar use as gum arabic
Leaf extract: toothpaste

ANONA

Annona

Tropical regions of America, Asia and Africa: 120 species of this genus; some of them are cultivated as fruits, others for wood and alkaloid production

Requirements of particular species on environment (heat and soil) depend on area of origin

Evergreen or deciduous tree/shrubs, low-branched crown

After the blossom loss, thickened, juicy one-seeded follicle develops from each ovary which grows together with other follicles into a multiple fruits resembling a strawberry

Flesh contains many flat, oval to elongated brown or black seeds

Annonaceae Family



Least demanding: sub-tropical chirimuya, other species from tropical regions are more demanding

Low requirements on soil: lighter, even rocky, dry, slightly acidic to neutral

Propagation:

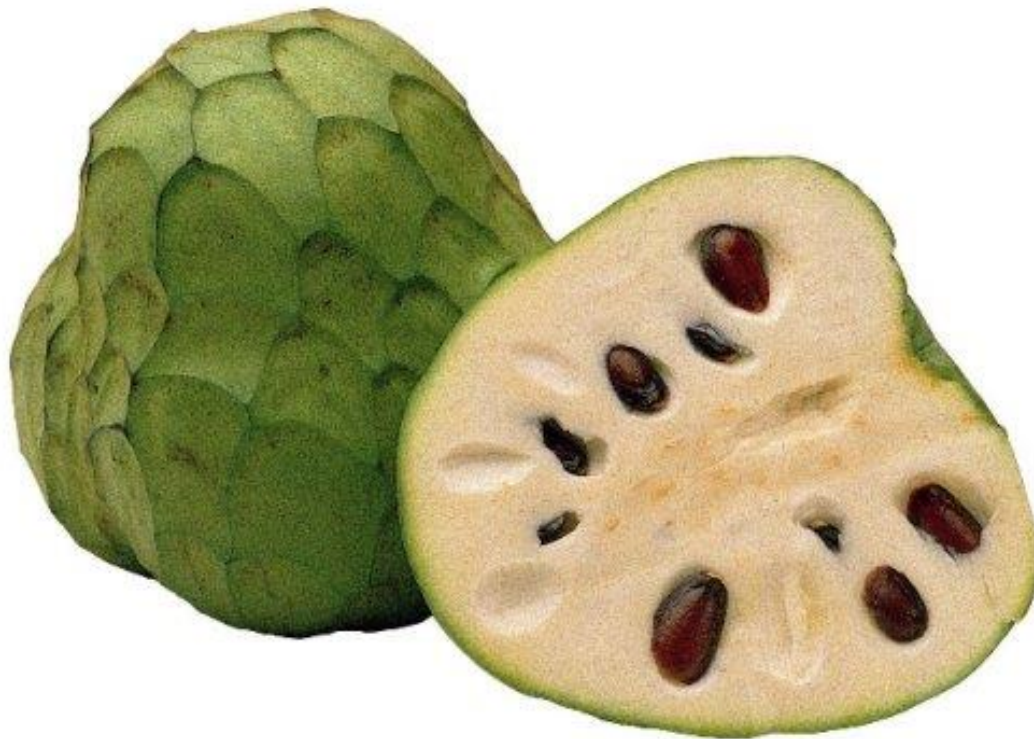
Vegetative: Grafting, cutting, aerial layering

From seeds: Uneven quality of all features, productiveness onset after 5 years

ANONA CHIRIMUYA *Annona cherimola*

Native to the Andes and northern parts of South America

Commonly cultivated in many mountainous regions in tropical and sub-tropical regions



SOURSOP *Annona muricata*

Native to the Antilles, now common in the whole tropics



SUGAR APPLE *Annona squamosa*
Sugar apple grows in the whole tropics



Photo: Ian Maguire

CUSTARD APPLE *Annona reticulata*



MOUNTAIN SOURSOP *Annona montana*
Less significant variety



Multiple annona fruits are a delicious fruit:

Protein 1.7-1.9 %

Fats 0.5-0.8 %

Carbohydrates 14-22 %

Fibre 2-3.4 %

Organic acids 1 %

Minerals 0.7-2.1 %

Vitamin C 200 mg/kg

Traces of provit. A

Eaten fresh, rots quickly

From flesh: beverages, ice-cream, jelly-type candy, juices, alcoholic beverages

Extracted juice is mixed with wine, milk or ice-cream

CAROB TREE

Ceratonia siliqua

Native to Syria – the so called St John's-bread, John the Baptist ate the fruits in the desert

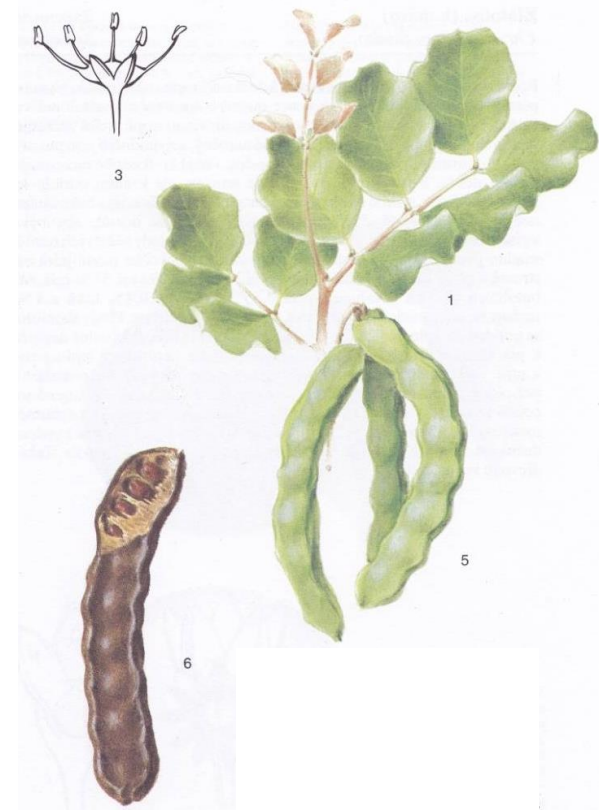
Spread to the Mediterranean Sea regions: Greece, Turkey, Egypt, Palestine, Cyprus, Crete, Sicily, Spain, Portugal, Morocco, Algeria

Evergreen tree, reaches up to 12 m, erect trunk, wide-branched crown

Fruit: Thick-walled, non-dehiscent pod, up to 300 mm long, thickened on the edge, dark brown, straight or slightly curved

Inside, there is a sweet, brown, hard flesh and 3-10 hard, flat, shiny seeds with constant weight of 0.2 g (used as weights in jewellery and chemist's in past – one carat)

Caesalpiaceae Family



Pods are harvested unripe and are dried; drying also causes fermentation and improves flesh quality:

Protein 2 %

Carbohydrates: up to 50 %

Starch 35 %

Fibre 9 %

Water 10-12 %

Butyric acid: 1% (typical taste and smell)

Pods are eaten fresh

Extraction: Syrup for sweetening,
sweetening of other foods

Excellent wines and spirits (Palo, a
Spanish bitter liquor for good digestion)

Roasted and ground pods, free of seeds, resemble cocoa powder:
beverages, cocktails, candy and pastry products

Ground seeds provide “locust gum”, also called the "carob gum" - for
production of glues in textile, leather, and paper industry, and for gelation
products and thickeners used in dishes



High temperatures in summer; sustains short mild periods of frost only for a while, max. -5 °C

Tolerates drought and dry, rocky soil

Propagation:

Vegetative: Grafting and wood cuttings

From seed: Easy, seedlings start to fruit late and the fruits are of various quality

