

Orange



Orange



Orange blossoms and oranges on tree

Scientific classification

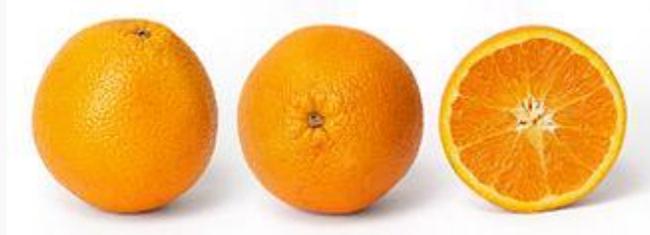
Kingdom:	Plantae
(unranked):	Angiosperms
(unranked):	Eudicots
(unranked):	Rosids
Order:	Sapindales
Family:	Rutaceae
Genus:	Citrus

Species: C. × sinensis

Binomial name

Orange trees have been the most cultivated tree fruit in the world since 1987.^[6] Orange trees are widely grown in tropical and subtropical climates for their sweet fruit. The fruit of the orange tree can be eaten fresh, or processed for its juice or fragrant peel.^[4] Sweet oranges currently account for approximately 70% of citrus production.^[7] In 2010, 68.3 million metric tons of oranges were grown worldwide, production being particularly prevalent in Brazil and the US states of California^[8] and Florida.

Botanical information and terminology



Orange fruit and cross section

All citrus trees belong to the single genus *Citrus* and remain almost entirely interfertile. This means that there is only one superspecies that includes grapefruits, lemons, limes, oranges, and various other types and hybrids.^[10] As the interfertility of oranges and other citrus has produced numerous hybrids, bud unions, and cultivars, their taxonomy is fairly controversial, confusing or inconsistent.^{[3][7]} The fruit of any citrus tree is considered a hesperidium (a kind of modified berry) because it has numerous seeds, is fleshy and soft, derives from a single ovary and is covered by a rind originated by a rugged thickening of the ovary wall.^{[11][12]}

Different names have been given to the many varieties of the genus. Orange applies primarily to the sweet orange – *Citrus sinensis* (L.) Osbeck. The orange tree is an evergreen, flowering tree, with an average height of 9 to 10 m (30 to 33 ft), although some very old specimens can reach 15 m (49 ft). Its oval leaves, alternately arranged, are 4 to 10 cm (1.6 to 3.9 in) long and have crenulate margins.^[14] Although the sweet orange presents different sizes and

shapes varying from spherical to oblong, it generally has ten segments (carpels) inside, and contains up to six seeds (or pips)^[15] and a porous white tissue – called pith or, more properly, mesocarp or albedo^[16]— lines its rind. When unripe, the fruit is green. The grainy irregular rind of the ripe fruit can range from bright orange to yellow-orange, but frequently retains green patches or, under warm climate conditions, remains entirely green. Like all other citrus fruits, the sweet orange is non-climacteric. The *Citrus sinensis* is subdivided into four classes with distinct characteristics: common oranges, blood or pigmented oranges, navel oranges, and acidless oranges.

Like most citrus plants, oranges do well under moderate temperatures—between 15.5 and 29 °C (59.9 and 84.2 °F)—and require considerable amounts of sunshine and water. It has been suggested that the use of water resources by the citrus industry in the Middle East is a contributing factor to the desiccation of the region.^[citation needed] Another significant element in the full development of the fruit is the temperature variation between summer and winter and, between day and night. In cooler climates, oranges can be grown indoors.

As oranges are sensitive to frost, there are different methods to prevent frost damage to crops and trees when subfreezing temperatures are expected. A common process is to spray the trees with water so as to cover them with a thin layer of ice that will stay just at the freezing point, insulating them even if air temperatures drop far lower. This is because water continues to lose heat as long as the environment is colder than it is, and so the water turning to ice in the environment cannot damage the trees. This practice, however, offers protection only for a very short time.^[54] Another procedure is burning fuel oil in smudge pots put between the trees. These devices burn with a great deal of particulate emission, so condensation of water vapour on the particulate soot prevents condensation on plants and raises the air temperature very slightly. Smudge pots were developed for the first time after a disastrous freeze in Southern California in January 1913 destroyed a whole crop.^[55]

Propagation

See also: Fruit tree propagation

It is possible to grow orange trees directly from seeds, but they may be infertile or produce fruit that may be different from its parent. For the seed of a commercial orange to grow, it must be kept moist at all times. One approach is placing the seeds between two sheets of damp paper towel until they germinate and then planting them, although many cultivators just set the seeds straight into the soil.

Commercially grown orange trees are propagated asexually by grafting a mature cultivar onto a suitable seedling rootstock to ensure the same yield, identical fruit characteristics, and resistance to diseases throughout the years. Propagation involves two stages: first, a rootstock is grown from seed. Then, when it is approximately one year old, the leafy top is cut off and a bud taken from a specific scion variety, is grafted into its bark. The scion is what determines the variety of orange, while the rootstock makes the tree resistant to pests and diseases and adaptable to specific soil and climatic conditions. Thus, rootstocks influence the rate of growth and have an effect on fruit yield and quality.



Orange trees generally are grafted. The bottom of the tree, including the roots and trunk, is called rootstock, while the fruit-bearing top has two different names: budwood (when referring to the process of grafting) and scion (when mentioning the variety of orange).



Orange tree



Oranges

Canopy-shaking mechanical harvesters are being used increasingly in Florida to harvest oranges. Current canopy shaker machines use a series of six-to-seven-foot long tines to shake the tree canopy at a relatively constant stroke and frequency.

Degreening

Oranges must be mature when harvested.^[citation needed] In the United States, laws forbid harvesting immature fruit for human consumption in Texas, Arizona, California and Florida.^[66] Ripe oranges, however, often have some green or yellow-green color in the skin. Ethylene gas is used to turn green skin to orange. This process is known as "degreening", also called "gassing", "sweating", or "curing".^[66] Oranges are non-climacteric fruits and cannot post-harvest ripen internally in response to ethylene gas, though they will de-green externally.

Storage

Commercially, oranges can be stored by refrigeration in controlled-atmosphere chambers for up to 12 weeks after harvest. Storage life ultimately depends on cultivar, maturity, pre-harvest conditions, and handling. In stores and markets, however, oranges should be displayed on non-refrigerated shelves.

At home, oranges have a shelf life of about one month. In either case, optimally, they are stored loosely in an open or perforated plastic bag.

Pests and diseases

See also: List of citrus diseases

Cottony cushion scale

The first major pest that attacked orange trees in the United States was the cottony cushion scale (*Icerya purchasi*), imported from Australia to California in 1868. Within 20 years, it wiped out the citrus orchards around Los Angeles, and limited orange growth throughout California. In 1888, the USDA sent Alfred Koebele to Australia to study this scale insect in its native habitat. He brought back with him specimens of *Novius cardinalis*, an Australian ladybird beetle, and within a decade the pest was controlled.

Production

Main article: Citrus production

Orange juice is traded internationally in the form of frozen, concentrated orange juice to reduce the volume used so that storage and transportation costs are lower.

Juice and other products

Oranges, whose flavor may vary from sweet to sour, are commonly peeled and eaten fresh or squeezed for juice. The thick bitter rind is usually discarded, but can be processed into animal feed by desiccation, using pressure and heat. It also is used in certain recipes as a food flavoring or garnish. The outermost layer of the rind can be thinly grated with a zester to produce orange zest. Zest is popular in cooking because it contains the oil glands and has a strong flavor similar to that of the orange pulp. The white part of the rind, including the pith, is a source of pectin and has nearly the same amount of vitamin C as the flesh and other nutrients.

Although not so juicy or tasty as the flesh, orange peel is edible and has higher contents of vitamin C and more fibre. It also contains citral, an aldehyde that antagonizes the action of vitamin A. Particularly in environments where resources are scarce and therefore maximum nutritional value must be obtained with the minimum generation of waste, for example, on a submarine, orange peels have

been consumed routinely. Since large concentrations of pesticides have been found in orange peels,^[80] some organizations^[which?] recommend consumption of the peel of only organically grown and processed oranges, where chemical pesticides or herbicides would not have been used.^[81]

Products made from oranges

Although once thought to cause renal cancer in rats, limonene is now considered a natural chemopreventive agent in humans,^{[85][86]} since there is no evidence for its carcinogenicity or genotoxicity. The Carcinogenic Potency Project estimates that D-limonene causes human cancer on a level roughly equivalent to that caused by exposure to caffeic acid via dietary coffee intake,^[87] whereas the International Agency for Research on Cancer (IARC) classifies it under Class 3, which means it is not classifiable as to its carcinogenicity to humans.^[88]

Orange blossoms are used in several different ways, as are fruit peels and the leaves and wood of the tree.