

Citrus sinensis

sweet orange

(L.) Osbeck

Rutaceae

LOCAL NAMES

Amharic (birtukan); Arabic (bortugan,burtukal); Bengali (musambi,kamala nambu,narangi); Burmese (tung-chin-thi); Creole (zoranj dous,orange dous); English (batavian,Mozambique orange,orange,Valencia orange,tight-skinned orange,sweet orange); Filipino (kahel); French (oranger commun,orange douce,orangier); German (orange,apfelsine); Hindi (kamala nambu,musambi,narangi); Indonesian (jeruk manis); Italian (arancio dolce); Khmer (krôôch pôôsat'); Lao (Sino-Tibetan) (kiêngz); Luganda (muchungwa); Malay (choreng,limau manis,chula); Mandinka (nemuno,lemuno,larincho); Pidgin English (sava orens); Spanish (naranja de China,naranja dulce,naranja); Swahili (mchungwa); Tamil (sathagudi,chini); Thai (somkliang,somtra,makhun); Tigrigna (aranshi); Trade name (sweet orange); Vietnamese (cam)

BOTANIC DESCRIPTION

Citrus sinensis is a small, shallow-rooted evergreen shrub or tree about 6-13 m high with an enclosed conical top and mostly spiny branches. Twigs angled when young, often with thick spines

Leaves smooth, oval, 5-15 x 2-8 cm, dark green above, glossy, with a distinctive smell often similar to the fruit, petiole winged

Flowers small, waxy greenish-white, fragrant; calyx broad saucer-shaped, petals 5, white elliptic, 1.3-2.2 cm long

Fruits orange, reddish-green to yellowish-green, round, 4-12 cm, consist of a leathery peel 6 mm thick, tightly adherent, protecting the juicy inner pulp, which is divided into segments that may not contain seeds, depending on the cultivar

The specific epithet (*sinensis*) refers to its Chinese origin

BIOLOGY

C. sinensis starts flowering and bearing fruit after 3-5 years. In Haiti, trees flower between March and May and fruits mature between November and April. Fruit maturation takes 9-12 months. Trees are hermaphroditic, and insect pollinated. Flower initiation occurs in mid-summer, before the late spring flush.



Orange bacterial canker lesions on leaves caused by *Xanthomonas axonopodis* pv. *Citri* (FAO in collaboration with CABI)



McClain (1976) reported that the first navel oranges were not produced on the trees at the Tibbets home, but rather from that of the neighbors McCoy and Cover who had budded existing seedling trees with budwood from the Tibbets' trees when they had first arrived. Commercial exposure came with the areas first citrus fair in 1879 where the seedless navel oranges won first prize over all competition. This created a demand for budwood and a fence had to be erected around the trees to prevent theft. It is said that \$1.00 a bud was paid by people anxious to get buds. (R. Ubeda, J.S. Aznar and L. F. C. O'Connor)



Gummosis lesions will ultimately girdle the tree. Sweet orange is highly susceptible and the fungus attacks both roots and trunk of the sweet orange. Ultimately the tree will die. (Roistacher CN)

Citrus sinensis

(L.) Osbeck

Rutaceae

sweet orange

ECOLOGY

C. sinensis is a subtropical rather than a tropical species. It prefers a prominent change of seasons. Whereas most cultivars can be grown throughout the ecological range described for the genus, the requirements of commercial production are much more exacting, confining each cultivar to environments compatible with high yield and good fruit quality. Few cultivars do well in the humid tropical lowlands; the choice is much wider for areas with a monsoon climate and intermediate elevation. High constant humidity makes *C. sinensis* susceptible to pests and diseases, but it can tolerate a small amount of frost. Trees are intolerant of waterlogging.

BIOPHYSICAL LIMITS

Altitude: 0-2 000 m, Mean annual temperature: 5-40 deg. C, Mean annual rainfall: 900-2500 mm

Soil type: Trees will grow in almost any soil type if well aerated. The optimum conditions for citrus orchards are fertile, light to medium, well-drained, deep, loose loams; soils with a high water table should be avoided. The species is sensitive to excess salts; pH range of 5-8 is preferred.

DOCUMENTED SPECIES DISTRIBUTION

Native: China, Vietnam

Exotic: Australia, Brazil, Cambodia, Cote d'Ivoire, Eritrea, Ethiopia, Gambia, Ghana, Guinea-Bissau, Haiti, India, Indonesia, Israel, Italy, Kenya, Malaysia, Mexico, Myanmar, New Zealand, Papua New Guinea, Philippines, South Africa, Spain, Sudan, Tanzania, Thailand, Uganda, United Kingdom, US, Zanzibar



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.

Citrus sinensis

(L.) Osbeck

sweet orange

Rutaceae

PRODUCTS

Food: Fruits are a good source of vitamin C. They can be eaten fresh or made into juice, marmalade or jelly. In Brazil and Florida, juice the world's largest producers, 90% of the production is converted to. Pectin, a setting agent, is made from the peel.

Fodder: Pulp, molasses and residues from juice production are used as cattle feed.

Apiculture: Trees are valued honey plants.

Fuel: *C. sinensis* is a potential source of firewood.

Timber: Wood can be used for boards and panelling.

Essential oil: Peels, leaves and flowers contain fine essences of oils that may be used in manufacture of cosmetics and medicinal applications.

Medicine: Leaf decoction with salt is taken orally for digestive tract ailments, nerve disorders, fever, asthma, blood pressure, general fatigue and vomiting. Crushed leaves or fruit juice is massaged into the skin to relieve itching. Macerated root, leaf or fruit mesoderm is taken orally for urethritis; macerated fruit mesoderm or bark decoction is taken orally for liver ailments. Fruit juice or leaf decoction with sugar is taken orally for cold and loss of appetite, while crushed leaf decoction as a bath relieves headache and rheumatism. Broken bones are massaged with roasted fruit. Leaf oil exhibits carminative properties and light antispasmodic and sedative properties.

SERVICES

Shade or shelter: *C. sinensis* is sometimes planted to provide shade.

Ornamental: The species has the potential of being grown as an amenity tree in gardens.

TREE MANAGEMENT

Seedlings should never be planted out deeper than they were in the nursery. Seedlings should be spaced about 5-6 cm apart; trees are planted at a spacing of 3-5 m squares, but a spacing of up to 1.3 m can be used, depending on the climate. Irrigation is necessary if rainfall is not adequate. If soil lacks nutrients, fertilizer containing nitrogen, phosphorus potash, magnesium, calcium, zinc, manganese and iron should be added. Pruning is practised to encourage branching and keep the tree low for easy harvesting of the fruit. Any growth below where budding took place should be removed. Pruning, sanitation, use of resistant varieties and spraying are used to control pests and diseases. Weeds are controlled using chemicals such as Diuron, Bromacil, Terbacil Simazine, Paraquat, Diquat, 2,2-DPA, Armitrol, MSMA and DSMA.

A windbreak should be provided to protect trees. Trees aged 3-4 years produce 2.5-5 t/ha of fruit and 8-12 year old trees produce 20-40 t/ha of fruit. Single trees may live up to 100 years, but the economic life of an orchard seldom exceeds 30 years.

GERMPLASM MANAGEMENT

After removal from the fruit, seeds are cleaned and slowly dried to 7.2% mc then stored in a refrigerator. Desiccation from 45% to 20% reduces viability from 71% to 9%. Seeds tolerate desiccation to 10.6% at 70% r.h., but further desiccation reduces viability; only 10% of seeds survive desiccation to 4% mc at of 20% r.h. Storage behaviour is intermediate and seeds lose viability from 81% to 20% after 6 months storage. There are about 3500 seeds/kg.

PESTS AND DISEASES

Pests include termites and nematodes of several species: *Semipenetrans*, *Tylenchulus*, *Trichodirus* and *Xiphimena* species. Other pests known to attack *C. sinensis* are *Aleuroplatus samoanus*, *Aonidiella aurantii*, *Ceratitis capitata*, *Cryptoblastes plagiocleuca*, *Dacus dorsalis*, *D. melanotus*, *D. tyroni*, *Othreis fullonia*, *Parlatoria cinerea*, *P. pergandii*, *Phyllocoptruta oleivora* and *Toxoptera airantii*.

Disease causing organisms include *Alternaria* spp., *Botrytis* spp., *Capnodium cotri*, *Colletotrichum* spp., *Diaporthe citri*, *Diplodia* spp., *Elsinoe fawcetti*, *Fusarium* spp., *Glomerella cingulata*, *Penicillium digitatum*, *P. italicum*, *Phytophthora parasitica*, *Psorosis* spp., *Sclerotinia* and *Xanthomonas citri*. Tristeza is a viral disease that triggers yellowing and wilting of leaves, twig die-back and subsequent death of tree. Another die-back attacks citrus in India. Other important diseases include leaf mottle yellows in the Philippines and citrus vascular degeneration in Indonesia.

FURTHER READING

- Abbiw D. 1990. Useful plants of Ghana. Intermediate Technology Publications and the Royal Botanical Gardens, Kew.
- Anon. 1986. The useful plants of India. Publications & Information Directorate, CSIR, New Delhi, India.
- Bein E. 1996. Useful trees and shrubs in Eritrea. Regional Soil Conservation Unit (RSCU), Nairobi, Kenya.
- Bekele-Tesemma A, Birnie A, Tengnas B. 1993. Useful trees and shrubs for Ethiopia. Regional Soil Conservation Unit (RSCU), Swedish International Development Authority (SIDA).
- Cobley L.S & Steele W.M. 1976. An Introduction to the Botany of Tropical Crops. Longman Group Limited.
- Hong TD, Linington S, Ellis RH. 1996. Seed storage behaviour: a compendium. Handbooks for Genebanks: No. 4. IPGRI.
- Katende AB et al. 1995. Useful trees and shrubs for Uganda. Identification, Propagation and Management for Agricultural and Pastoral Communities. Regional Soil Conservation Unit (RSCU), Swedish International Development Authority (SIDA).
- Lanzara P. and Pizzetti M. 1978. Simon & Schuster's Guide to Trees. New York: Simon and Schuster
- Mbuya LP et al. 1994. Useful trees and shrubs for Tanzania: Identification, Propagation and Management for Agricultural and Pastoral Communities. Regional Soil Conservation Unit (RSCU), Swedish International Development Authority (SIDA).
- Michael L. 1976. Citrus production in the South Pacific. South Pacific Commission Publications Bureau. Handbook No. 14.
- Nicholson B.E, Harrison S.G, Masefield G.B & Wallis M. 1969. The Oxford Book of Food Plants. Oxford University Press
- Simmons AF. 1972. Growing unusual fruit. David and Charles Limited. Newton Abbot Devon.
- Smith JHN et. al. 1992. Tropical forests and their crops. Cornell University Press.
- Szolnoki TW. 1985. Food and fruit trees of Gambia. Hamburg. Federal Republic of Germany.
- Timyan J. 1996. Bwa Yo: important trees of Haiti. South-East Consortium for International Development. Washington D.C.
- Udawela UAKS, Pushpakumara DKNG, Samita S, Dissanayake UB. 2008. Evaluation of sweet orange Citrus sinensis L. Osbeck varieties in low country intermediate zone of Sri Lanka: Sri Lankan Journal of Agricultural Science. 45:32-45.
- Verheij EWM, Coronel RE (eds.). 1991. Plant Resources of South East Asia No 2. Edible fruits and nuts. Backhuys Publishers, Leiden.
- Vogt K. 1995. A field guide to the identification, propagation and uses of common trees and shrubs of dryland Sudan. SOS Sahel International (UK).
- Williams R.O & OBE. 1949. The useful and ornamental plants in Zanzibar and Pemba. Zanzibar Protectorate.

SUGGESTED CITATION

Orwa C, Mutua A , Kindt R , Jamnadass R, Simons A. 2009. Agroforestry Database:a tree reference and selection guide version 4.0 (<http://www.worldagroforestry.org/af/treedb/>)