

Cyphomandra betacea

tamarillo

(Cav.) Sendtner

Solanaceae

LOCAL NAMES

English (Cape tomato, tomatillo, tree tomato); French (tomato de la Paz, arbre a tomates); German (Baumtomatenstrauch); Italian (pomodoro arboreo); Luganda (munyanya); Malay (pokok tomato); Portuguese (tomato de árvore); Spanish (tomate serrano, Palo de tomate, tomate silvestre, tomato de arbol); Swahili (mgogwe); Thai (makhua-thetton); Trade name (tamarillo)

BOTANIC DESCRIPTION

Cyphomandra betacea is a semi-woody shrub or small tree 2-3 m high, rarely 5 m. It is unarmed, pubescent, with a short trunk and stout lateral branches. The bark is grey.

Leaves alternate, simple, entire, usually grouped at the branch tips, with a robust petiole, 4-8 cm long. The limb is large, 15-30 x 10-20 cm, ovate, shortly acuminate, with a cordate base. Young leaves covered on both surfaces with a soft pubescence; with age, the upper surface becomes glabrous. Midrib and principal veins prominent on both surfaces.

Flowers fleshy pink, in groups of 3-10 in axillary cymes or racemes, near the ends of the branches. They are hermaphroditic, pentamerous, fragrant, pedicellate, 13-15 mm diameter. Calyx campanulate with broadly ovate, subacute lobes, which are thick and accrescent in fruit. Corolla rotate-campanulate, 12 mm long, with 5 long, narrow, lanceolate segments; reflexed at the apex. Stamens 5, yellow, inserted at the throat of the corolla.

Fruit an ovoid berry, measuring 4-6 (max. 10) cm long and 3-5 cm wide. It is suspended at the end of a long stalk, and surrounded at the base by the persistent green calyx. Skin is thin, glabrous, smooth, reddish-brown to violet changing to orange-red at maturity. Some varieties become deep purple at maturity. Pulp contains numerous small seeds that are circular, flat, thin and hard.

BIOLOGY

C. betacea is the only member of its genus known to be self-compatible. Flowers are self-pollinating; wind and insects assist in pollen transfer, resulting in better fruit set. Fruit ripens over a period of many months. Pruning may induce flowering; once it begins, maximum fruit production lasts only 4-5 years, for a period of 5 months per year. Fruit production begins 1-2 years after sowing and lasts for 8-12 years.



fruits (French B.)



Tamarillo plant (French B.)



Tamarillo mosaic potyvirus: Mosaic symptoms on tamarillo leaf. (Pearson MN)

Cyphomandra betacea

(Cav.) Sendtner

Solanaceae

tamarillo

ECOLOGY

A native of the forests of the Andes of Peru and Argentina, *C. betacea* has been successfully cultivated throughout the tropics. *C. betacea* thrives at elevations of 1000 m and more; it does well even above 2000 m if the mean monthly temperature remains above 10 deg. C and if frosts - which kill young plants - are exceptional. At low elevations, the trees do not flower; cool weather (probably cool nights in particular) promotes bloom. That is why the crop ripens in the winter in the subtropics. Flavour develops better under warm sunny days and cool nights of the dry season in the tropics than during the winter at higher latitudes.

It is presently found in hilly country throughout the tropics. With a shallow root system, it has little ability to withstand drought and is easily blown over. The shallow roots and large, soft leaves of *C. betacea* make it particularly susceptible to wind damage. They are apparently intolerant to constant high temperatures and often their fruits fail to mature in lowland tropical climates owing to excessive heat.

BIOPHYSICAL LIMITS

Altitude: 1 000-3 000 m, Mean annual temperature: 15-22 deg. C, Mean annual rainfall: 1300-1600 mm

Soil type: Grow best on well drained soils rich in organic matter and ample moisture. They cannot withstand waterlogging even for a period of a few days.

DOCUMENTED SPECIES DISTRIBUTION

Native: Argentina, Bolivia, Peru

Exotic: Antigua and Barbuda, Australia, Bahamas, Barbados, Brazil, Chile, China, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, Egypt, France, Germany, Grenada, Guadeloupe, Guatemala, Haiti, Honduras, Hong Kong, India, Indonesia, Jamaica, Japan, Kenya, Malaysia, Martinique, Mexico, Montserrat, Netherlands Antilles, New Zealand, Nicaragua, Panama, Papua New Guinea, Philippines, Portugal, Puerto Rico, South Africa, Spain, Sri Lanka, St Kitts and Nevis, St Lucia, St Vincent and the Grenadines, Tanzania, Trinidad and Tobago, Uganda, United Kingdom, United States of America, Venezuela, Virgin Islands (US)



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.

Cyphomandra betacea

tamarillo

(Cav.) Sendtner

Solanaceae

PRODUCTS

Food: Tamarillos are eaten by scooping out the entire fruit, discarding the exocarp and outer layer of the mesocarp. The refreshing, raw pulp is juicy, subacidic, pink, salmon or yellow. The unripe fruit can be used for chutney, curry and sambal (hot, chilli-based condiment). Only mature, tree-ripened fruits grown under favourable conditions develop the full flavour and aroma. The rather sharp, tart flavour typical of most red cultivars can be reduced by stewing. Properly ripened fruit is also essential for good quality stews, stuffings, jellies, jams, desserts and ice cream toppings. The red cultivars cannot be canned, as the redness signifies the presence of acidity that will corrode tin cans. The hard seeds may be strained out after boiling. Lime juice and sugar can be added to taste. Halves may be seasoned and baked or grilled.

The fruits of *C. betacea* are relatively nutritious because of their high vitamin content. They are rich in beta-carotene, making them good sources of pro-vitamin A, and they contain large amounts of ascorbic acid or vitamin C. Their high protein content makes them especially suitable for jam- and jelly-making. Levels of nitrogen and free amino acids are higher than those of most fruits except avocados and bananas; the values for potassium and phosphorus are also high among fruits, which are normally poor sources of these elements.

Tannin or dyestuff: The leaves of the tamarillo have been employed as a dye. The unripe fruits are used in the Colombian tanning industry to decolour hides.

Medicine: Warmed leaves are wrapped around the neck as a remedy for sore throat in Ecuador. The fruit pulp, after having been cooked in embers, is used as a poultice for inflamed tonsils in Colombia. The species was known as 'vegetable mercury' in Jamaica because of its presumed therapeutic value to the liver.

SERVICES

Ornamental: *C. betacea* is frequently grown as a curiosity in gardens in the temperate regions of North America. It is a common sight in homegardens of Latin America.

Intercropping: The species can be grown with crops such as coffee. Green manure or cover crops of grass and clover can be grown between rows. New Zealand growers often plant *C. betacea* as an intercrop in young citrus orchards.

TREE MANAGEMENT

Cyphomandra betacea is a fast-growing tree on good sites. Cuttings give low-branched bushy trees, which may need to be deblossomed to promote growth in the 1st year. Seedlings do not always come true to type. They grow vigorously and may reach a height of 1.5-1.8 m before laterals emerge. The plants grow continuously and easily shed old leaves. In New Zealand, trees are planted in single or double rows, e.g. at 2.5 x 2 m or 4.5 x 1.5 m against (3.5 + 1.5) m x 2 m or (4 + 2.5) m x 3 m, giving densities of 2000-1000 plants/ha. Much higher densities are reported from other countries.

Orchards need to be well drained; often the trees are planted on hills or ridges. Because of the shallow root system, deep cultivation should be avoided, but mulching is very beneficial. Young seedlings are cut back to a height of about 1 m to encourage branching, and each year the plants are pruned at the beginning of the crop cycle. This annual pruning consists of cutting back and thinning out the branches that have fruited to rejuvenate the bearing wood and to limit tree spread. Time of pruning influences harvest time. Coppicing can be practised. The brittle branches are prone to break when loaded with fruit; thus sheltered locations should be chosen or windbreaks must be provided. Plants respond well to nitrogen fertilizer, particularly after the 1st fruit has set. In the tropics, using a generous amount of organic matter and manure when making hills for planting minimizes the need for additional fertilizer. Irrigation during the dry season is important to sustain growth and to improve fruit size and yield. Yields per tree average around 20 kg of fruit/year, and commercial yields are about 15-17 t/ha. Trees are short-lived; 12 years is the highest recorded lifespan of an orchard.

GERMPLASM MANAGEMENT

Orthodox storage behaviour; no loss in viability after 42 months of hermetic storage at -20 deg. C with 5.5% mc. Reduction in viability occurs after 8-10 months of storage at room temperature. There are about 100 000 seeds/kg.

PESTS AND DISEASES

A major insect pest is the tree tomato worm, the larva of the pyraustid moth *Neoleucinodes elegantalis*. The larvae bore into the fruit, causing it to spoil prematurely and bringing on fruit losses of 40-80%. Chemical and possibly biological controls may be helpful in controlling or eliminating this pest.

Aphids are one of the more common pests; they transmit cucumber mosaic virus and potato virus 'Y'. Cucumber mosaic virus causes stunting and mottling of leaves. Potato virus 'Y' causes mottling of leaves and dark spots on the fruit; yield is also reduced. *Phytophthora* blights (*P. palmivora* and *P. infestans*) also affect plants, particularly during the rainy season. These blights can be prevented by applying copper, daconil, or maneb sprays.

Principle fungal diseases include anthracnose, which hardens and deforms the skin of the fruit, and powdery mildew (*Oidium* spp.), an ashy-white fungus found on the upper and lower leaf surfaces of plants in Colombia and New Zealand. *C. betacea* may also be susceptible to verticillium wilt, a soil-borne fungus that infects tomato, potato and eggplant.

FURTHER READING

- Anon. 1986. The useful plants of India. Publications & Information Directorate, CSIR, New Delhi, India.
- Bohs L. 1989. Ethnobotany of the Genus *Cyphomandra* (Solanaceae). *Economic Botany*. 43(2): 143-163.
- Coates-Palgrave K. 1988. Trees of southern Africa. C.S. Struik Publishers Cape Town.
- FAO. 1982. Fruit-bearing forest trees: technical notes. FAO-Forestry-Paper. No. 34. 177 pp.
- Hong TD, Linington S, Ellis RH. 1996. Seed storage behaviour: a compendium. Handbooks for Genebanks: No. 4. IPGRI.
- ICRAF. 1992. A selection of useful trees and shrubs for Kenya: Notes on their identification, propagation and management for use by farming and pastoral communities. ICRAF.
- Jackson D. 1986. Temperate and subtropical fruit production. Butterworth Horticultural Books.
- 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).
- 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).
- Popenoe W. 1974. Manual of the tropical and subtropical fruits. The Macmillann Company.
- Rice RP, Rice LW, Tindall HD. 1987. Fruit and vegetable production in warm climates. Macmillan Press, London.
- Verheij EWM, Coronel RE (eds.). 1991. Plant Resources of South East Asia No 2. Edible fruits and nuts. Backhuys Publishers, Leiden.

SUGGESTED CITATION

Orwa C, A Mutua, Kindt R, Jamnadass R, S Anthony. 2009 Agroforestry Database: a tree reference and selection guide version 4.0 (<http://www.worldagroforestry.org/sites/treedbs/treedatabases.asp>)