

**LOCAL NAMES**

English (bergamot orange); French (bergamotier); Indonesian (bergamet)

**BOTANIC DESCRIPTION**

*Citrus bergamia* is an erect, unarmed, much branched tree up to 12 m tall, with trunk up to 25 cm in diameter; in cultivation trees are pruned up to 4-5 m in height with crown diameter of about 5 m.

Leaves alternate, simple, glandular, aromatic when bruised; petiole about 13 mm long, moderately winged, articulated near the blade; blade lanceolate, up to 12 cm x 6 cm, in upper third part weakly indented.

Inflorescence terminal, racemose, many-flowered; pedicel up to 8 mm long; flowers bisexual, 4-5(-10)-merous, fragrant; calyx cup-shaped with short lobes, yellow-green; corolla 3.8 cm in diameter, most often with 5, narrow-elongate, pure-white petals without any purple tinge; stamens (13-)21(-28), in (2-)4(-6) groups, sometimes petaloid; disk nectariferous; pistil with subglobose ovary, short and thick style, distinct to indistinct stigma.

Fruit a slightly flattened subglobose to pyriform berry (hesperidium), 6.5-7 cm x 6-7.5 cm, often with a small navel and a persistent style; peel 6-7 mm thick, with numerous glands, tough, smooth to rough, sometimes ridged, adherent, shiny green turning yellow when ripe; flesh yellowish, firm, very acid and bitter, divided into 8-14 segments.

Seed (0-)3(-13) per fruit, flattened, 11 mm x 6 mm x 4.4 mm, pale yellow, usually monoembryonic.

*C. bergamia* is most probably of hybrid origin. It has been suggested that it is a hybrid between sour orange (*C. aurantium* L.) and lemon (*C. limon* (L.) Burm.f.), or a mutation of the latter. Others hold it as a hybrid between sour orange and lime (*C. auratifolia* (Christm. & Panzer) Swingle). Bergamot is only known from cultivation and consists of a limited and well defined number of cultivars. Four cultivar groups are recognized in bergamot: Common Bergamot, Melarosa (fruit rather flattened), Torulosa (fruit ridged) and Piccola (dwarf cultivars). Only Common Bergamot is commercially cultivated for the essential oil and 3 cultivars are grown: 'Castagnaro', 'Femminello' and 'Inserto'. Formerly, 'Femminello' and 'Castagnaro' constituted virtually all commercial plantings in the world, but they have largely been replaced by 'Inserto' ('Fantastico'), a hybrid of 'Femminello' and 'Castagnaro'. 'Femminello' is somewhat less vigorous and smaller than 'Castagnaro', but is earlier and more regular in bearing. Its fruit is spherical or nearly so, the rind smooth and more aromatic and hence it is preferred. 'Castagnaro' is more upright and vigorous, attaining a larger size than 'Femminello', but is less fruitful. Its fruit is roundish but frequently exhibits a short neck and obovate outline and is sometimes slightly ribbed; the rind is usually rougher and the oil usually less aromatic than in 'Femminello'. 'Inserto' is a fairly vigorous tree, that yields well and has only a slight tendency to alternate-bearing; its fruit is medium in size, averaging about 130 g with a rough rind texture.

**BIOLOGY**

In Italy flowering is in March-April, fruits are harvestable in December-February.



Fruits and foliage (TopTropicals.com)



Trees (TopTropicals.com)

**ECOLOGY**

In Calabria bergamot is grown in coastal areas protected from cold northerly winds by the nearby mountain range. The area has the highest average annual temperature and the highest number of sunshine hours in Italy and is further characterized by mild winters, a small difference between day and night temperatures and the absence of frost. The monthly average daily temperature varies between 26 deg. C in August to 12 deg. C in January. The average number of sunshine hours reaches a maximum of 10 h per day in July and is lowest in December and January with 3 hours per day. Average annual rainfall is about 550 mm with a maximum in December-January and a minimum in July. Although it was long thought that bergamot was adapted to a narrowly defined climate, it has proven to grow well in tropical conditions too, such as in Ivory Coast. Oils obtained from fruits harvested in the interior of Calabria, where bergamot is not traditionally grown, show a high linalyl acetate and linalool content, but poor olfactive qualities.

**BIOPHYSICAL LIMITS**

Mean annual rainfall: 550 mm.

Soil types: The soils are mainly alluvial.

**DOCUMENTED SPECIES DISTRIBUTION**

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.

**PRODUCTS**

**Food:** The juice of the fruit was formerly used to prepare calcium citrate and citric acid, while nowadays it is a component of citrus soft drinks.

**Fodder:** The pulp is used as animal feed or for the extraction of pectins.

**Essential oils:** Bergamot is mainly grown for the essential oil present in the peel of its fruit (bergamot oil). Bergamot oil is an important component of toilet water 'eau-de-Cologne', which was first developed around 1675 in Cologne (Germany) by the Italian immigrant Gian Paolo Feminis. His relatives further developed the industry and brought it to several other cities. As a result several formulae of eau-de-Cologne were developed, all characterized by bergamot oil. Later, bergamot oil became a constituent of high quality perfumes and of men's perfumes, such as aftershaves.

**Lipids:** The oil is further used in skin care products (bronzers), soaps, lotions and creams. A different oil is obtained from the leaves (bergamot petitgrain oil), but is only produced to order.

**Other products:** Bergamot oil is also a characteristic additive of Earl Grey tea and of tobacco flavourings. In the Castelli area south of Rome it is customary to put a bergamot fruit in a cask of Frascati wine to impart its characteristic aroma.

**SERVICES**

**TREE MANAGEMENT**

Plantation: Planting distances range from 4 m x 4 m in the oldest groves in Italy to 5 m x 5 m or 6 m x 4 m in younger ones. Plantations are generally intercropped initially, to reduce establishment costs.

Husbandry: Young trees of bergamot are trained from 90-120 cm above ground level to produce a vase with 3-4 branches. Pruning is usually done every 2-3 years, only occasionally annually. In Calabria it is done in February after harvesting. The operation requires skilled labour to maintain each tree in a good shape. Weed control is usually done manually, though the use of herbicides is becoming more frequent. In older plantations on sloping land a grass cover is often maintained to control erosion. Ring weeding is then often practised, to reduce damage by diseases and pests. Irrigation is mostly by overhead sprinklers, but in the oldest groves basin irrigation is still practised. The amount of irrigation water applied annually in Italy is about 600 mm/ha. The amount of fertilizer applied and its timing varies from place to place and from farmer to farmer.

**GERMPLASM MANAGEMENT****PESTS AND DISEASES**

Little is known about diseases and pests affecting bergamot. Apart from diseases and pests attacking citrus in general, it is particularly sensitive to styler end rot, a physiological disease affecting the fruit.

**FURTHER READING**

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**SUGGESTED CITATION**

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