

Citrus reticulata **Blanco**

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Figure 1 is the *Citrus reticulata*

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Introduction

Citrus reticulata is the most important mandarin orange. It is grown in China, India, and many other south Asian and southeast Asian countries. It is going to be discussed its Ecology which consists on its origin, affinities, the environmental factors and soil requirements, the elevation and climate, and the associated species in chapter two. Its Biology which consists of its chromosome complement, life cycle, phenology, reproductive biology, pollen, sexuality, fruit development and seed set is discussed in chapter three. Chapter four discusses the management and propagation of tangerines, (basically how to grow it) which consists of the chemical application of fertilizers, germination and propagation of seedlings, irrigation, managing pests and diseases, and how to harvest it. The last chapter discusses its markets and uses, and consists of the main importers, exporters and producers, and its edible and medical uses.

2.0 Ecology

2.1 Origin and affinities

2.1.1 Origin

Citrus reticulata is considered native of south - eastern Asia. It is most abundant in Japan, southern China, India, and the East Indies. It moved to the Western world in small steps. First two varieties from Canton were taken to England in 1805, they were cultivated in the mediterranean area and by 1850 they were well established in Italy. Sometime between 1840 and 1850 it was taken and planted at the consulate in New Orleans then it was carried to Florida and later to California. (Ladaniya, 2008). The current distribution of *Citrus reticulata* is given in figure 1 below.

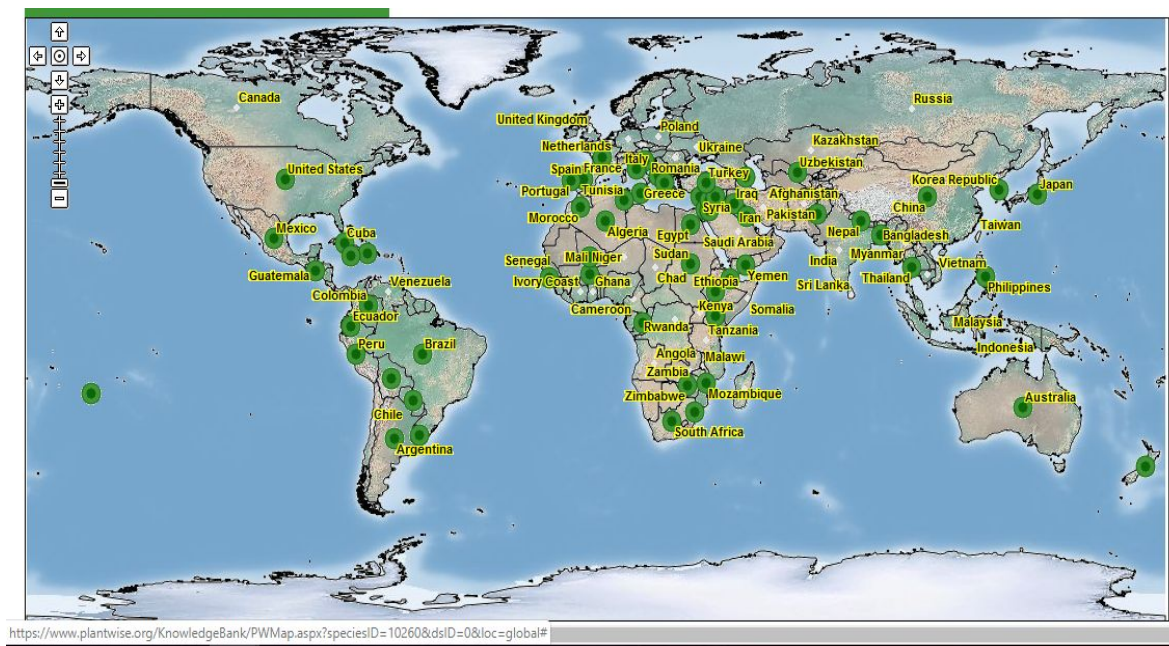


Figure 1: Current distribution of *Citrus reticulata*

2.1.1 Affinities

Taxonomic tree:

Domain: Eukaryota

Kingdom: Plantae

Phylum: Spermatophyta

Subphylum: Angiospermae

- Class: magnoliopsida
- Family: rutaceae
- Genus: citrus
- Species: citrus reticulata blanco
- Superorden: rosanae
- Order: sapindales
- División: tracheophyta (The Plant Data Team & Natural REsources Conservation Service, 2019)

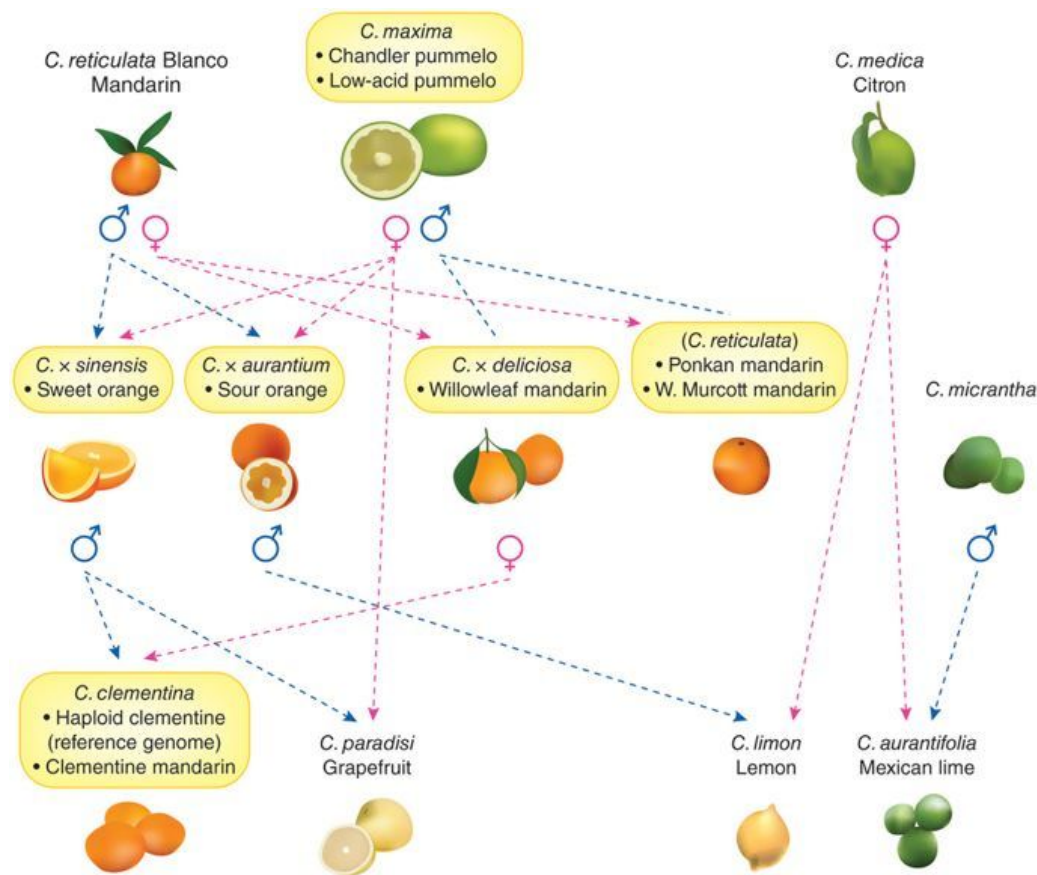


Figure 2: This is the *Citrus reticulata* family tree.

2.2 Environmental Factors

The fruit quality increases as the trees grow old and acidity decreases as fruit maturity advances on the tree or in storage. The quality varies considerably with soil type and climate as it is readily damaged by cold. (Ladaniya, 2008). It grows in tropical and subtropical areas.

2.2.1 Soil requirements

Citrus reticulata is easy to grow it is most important not to overwater them and to plant them in soil with good drainage. They rarely require pruning and are cold-hardy and drought-tolerant. They only need watering in Summer because they prefer well-drained soil. It should be planted in an area were it will get full sun or partial shade with a well-drained soil with a neutral pH level. In summer they should be watered 4 to 6 inches (per month) preferably they should be watered through the trip line of the tree branches where their feeder roots lie close to the surface. They should be fertilized three times

a year, apply 5 pounds of ammonium sulfate, 100 pounds of composted cow manure divided in 3 applications (Green, n.d.)

2.2.2 Elevation

In the tropics it mostly grows at elevations between 600-1300 m, while good quality fruit is obtained under subtropical lowland conditions. It can be grown within the latitudinal range 45°N-35°S. (Morton, 1987)

2.2.3 Climate

Cool temperatures during ripening improve the quality of the fruit and many cultivars need a pronounced dry season of up to 3-4 months to flower well. They are much more cold-hardy than the sweet orange, and the tree is more tolerant of drought. The fruits are tender and readily damaged by cold. (Morton, 1987)



Figure 3 is the *Citrus reticulata* tree.

2.3 Associated species

Many organisms inhabit the same ecological niche in which includes other trees, and animals, being more specific insects. Many types of insects inhabit, feed or are associated with the *Citrus reticulata* but because they are highly visible during harvest they are removed from the plant (with the exception of the honey- bee because it helps with pollination). Two types of significant fruit flies that are found with *Citrus reticulata* are the *Anastrepha fraterculus* and the *Ceratitis capitata*. (Morton, 1987)

3.0 Biology

3.1 Chromosome complement

The ploidy is diploid and the chromosome number is $2n=2x=18$ and that means that a single chromosome set consists of nine chromosomes. The size of the genome is 370Mb. (Cornélio, 2003)

3.2 Life cycle

Orange fruits start as flowers. The tree will have several blossoming between spring and fall although only a small proportion of flowers will produce fruit due to the fact that the tree drops lots of its flowers in order to be able to support the ones it does keep. This is because if the tree produces too much the energy will be spread too thinly and it won't be able to generate quality fruit if it needs to maintain too many. Because of this the tree uses the defense mechanism of dropping the small and sickly fruits in order to save energy. After this the oranges take between 5 and 18 months to develop. (Ibrahim et al., 2011)

3.3 Phenology

There are some problems associated with the production of Citrus. It bears a large number of flowers but they drop at early stages of development. Bloom and fruit drop are common on fruit setting, natural June drop and eventually fruit drop before attaining the commercial ripening is a common phenomenon. Citrus species usually produce a large number of flowers during flowering season. The floral load depends on the cultivar, tree age and environmental conditions. Besides flower drop in Citrus there are other natural fruit drops like initial drop and June drop which can be attributed to many causes, both physical and pathological. Sudden changes in temperature or humidity, poor nutrition management, hormonal imbalance, improper soil moisture, etc. A fungal infection leads to a pathological fruit drop because a fruit drop is also caused by damages caused by diseases and pests. (Ibrahim et al., 2011).

3.3 Reproductive biology

Citrus reticulata has an unusual mixture of reproductive characteristics including for example non-climacteric development. They exhibit a long juvenility phase and has apomixis. Apomixis is an asexual form of reproduction in which the seeds originated by the plant are genetically identical to the mothers. (Talon, 31 Octobre 2017)

3.3.1 Pollen

Its food development is linked to the presence of seeds so it depends on pollination and fertilization. Self-pollination usually takes place on the unopened or opening flower, often allowing pollination before anthesis. Cross pollination occurs between plants of different genetic background when insects transport of pollen. (Talon, 31 Octobre 2017).

3.3.2 Sexuality

Its sex structure contains both male and female sex organs. The anthers hold the pollen which contains the male sex cells while the female sex organ called the pistil, sits low on the center of the flower. And the ovary contains ovules that will become seeds if the flower is pollinated. (Talon, 31 Octobre 2017)

3.3.3 Fruit development and seed set

The activation of the genetic programs regulating the early growth and set depends mostly upon external stimuli of environmental nature, such as pollination, and hence of bloom quality. (Talon, 31 Octobre 2017)

4.0 Management and propagation

4.1 Chemical application of fertilizers

They should be fertilized three times a year, apply 5 pounds of ammonium sulfate, 100 pounds of composted cow manure divided in 3 applications , this is for five year old trees but for younger trees the amounts are reduced. A 2-year-old tree should receive a total of 1 1/4 pounds of ammonium sulfate or 25 pounds of composted cow manure the fertilizer should be spread evenly over the ground beneath the tree's drip line.(Green, n.d.)

4.2 Germination and propagation of seedlings.

To plant them first the seeds must be removed, the seeds should be rinsed under lukewarm tap water, rinse from any juice and removed of all fruit flesh from around the seeds. Any fruit left around the seeds will rot when planted in the soil and could result in mold or fungus that might destroy the seeds. When placed in a cup of lukewarm water they should be sit for 24 hours. Although soaking the seeds in water before planting is not necessary for germination, it does increase the chance of the seeds germinating successfully. Plant each seed into a 3 inch pot. Plant the seed 1/4 to 1/2 inch deep into a rich but well-drained potting soil with a neutral or slightly acidic pH balance. Water the soil of the pot until it is soaked and let it drain. Then cut one or two small holes into a small transparent bag. Place the bag over the top of the pot so that it acts as a barrier, keeping heat and moisture in over the surface of the pot. Secure the bag in place, if necessary, with an elastic band around the base of the bag and top rim of the pot. Place the pot where it will receive a few hours of direct sunlight each day. Remove the bag to water whenever the surface of the soil appears dry. Remove the plastic bag after the seedling emerges and outgrows the space provided within the bag. Water the seedling whenever the surface of the soil appears dry. Transplant the small tree after roots appear around the drainage holes of the pot. The seedling can be planted in a larger pot for patio or even indoor growing, or outside in an area of the yard where it will not be crowded or shaded from direct sunlight. (Kurtz, 2018).

4.3 Irrigation

Irrigation is a fundamental step in cultivating it as Citrus trees require more water than other fruit crops due to recurrent growth and development. It depends on factors like soil type, climatic conditions and the age of plants. It should be applied at every 5-8 days interval from March to June

and at every 9-12 days interval during November to February. Mandarin plants are sensitive to water stagnation, therefore water logging the tree trunk should be avoided. Irrigate the mandarin orchard after transplanting. A grown-up mandarin tree requires about 20-25 irrigations in a year, amounting about 1,400 mm of water. It is recommended to go for drip irrigation as it has many advantages such as: the amount of water can be controlled, it makes the water to be applied at the plant root system, as it is systematic it improves plant growth and quality, reduces the soil erosion and nutrients when compared to flood irrigation, it helps to reduce weeds, pests and diseases, and crops can be grown at any time. (McKenzie, 2018)

4.4 Managing pests and diseases

The main pests that are found in mandarin cultivations are: black fly, citrus psylla, citrus leaf miner, bark eating caterpillar, mealy bugs, citrus aphids, citrus thrips, fruit fly and mites. These pests cause to produce poor quality fruits and results in low crop yield. Spraying with insecticides like monocrotophos, phosalone, dimethoate, phosphamidon, and quinalphos depending upon the type of pest infestation has been found to be effective in most cases of these pests. (McKenzie, 2018)

The main diseases found in mandarin cultivations are: The main diseases found in mandarin cultivation are twig blight, gummosis, damping off, root and collar rot. The affected plants should be sprayed with Ridomil MZ 72, Bavistin, Benomyl, etc. It depends on the type of infection. (McKenzie, 2018)

4.5 Harvest

The mandarin crop yield starts from 4th to 5th year depending on many factors such as the cultivar being grown, soil type, climatic conditions and orchard management practices. When it comes to yield by individual tree, from fourth or fifth year, 40 to 45 fruits per tree can be expected and the crop stabilizes in the 8th year. Average yield for each tree is about 450 to 500 fruits after stabilization. The economic life orange tree can be from 20 to 25 years. There may be 2 or 3 crops in a year that are in summer, rainy season and in autumn. Usually the oranges start maturing in 9 to 12 months. The fruits should be harvested when they are fully ripe and attain proper size, attractive color and an acceptable sugar:acid ratio. The oranges may be treated with etherel for degreening and development of color. And the oranges should be washed, sorted, and graded based on sizes before being stored. (McKenzie, 2018)

5.0 Markets and uses

5.1 Markets

Citrus reticulata top 5 producers (2016):

Country	Production Volume
1. China	17.6M
2. Spain	2.94M
3. Turkey	1.34M
4. Morocco	1.08M
5. Egypt	1.02M

Tridge. (2019). Mandarin. Tridge.

Citrus reticulata top 10 exporters:

Country	Export value in 2016 (Usd)
1. Spain	\$1.55B
2. China	\$918.04M
3. Morocco	\$566.10M
4. Turkey	\$377.96M
5. South Africa	\$264.79M
6. Pakistan	\$222.51M
7. Chile	\$168.97M
8. Peru	\$166.44M

- | | |
|----------------|-----------|
| 9. Netherlands | \$135.55M |
| 10. Israel | \$131.97M |

Tridge. (2019). Mandarin. Tridge.

Citrus reticulata top 10 importers:

Country	Import value in 2016 (Usd)
1. Russia	\$625.83M
2. Germany	\$483.55M
3. France	\$483.30M
4. United Kingdom	\$389.67M
5. United States	\$380.03M
6. Thailand	\$284.19M
7. Netherlands	\$251.09M
8. Canada	\$215.03M
9. Malaysia	\$155.82M
10. Vietnam	\$135.28M

Tridge. (2019). Mandarin. Tridge.

5.2 Edible uses

Other than being eaten as a mandarin the essential oil from the peel is employed commercially in flavoring candy, gelatins, ice cream, chewing gum, bakery goods, and it is also used in perfume-manufacturing. Also it is use for food flavoring in foods such as cake. (Fern, 2019)

5.3 Medicinal Uses

Citrus species contain a wide range of active ingredients and research is still underway in finding uses for them. They are rich in vitamin C, flavonoids, acids and volatile oils. Some of the plants more recent applications are as sources of antioxidants and chemical exfoliants in specialized cosmetics. The fruit is antiemetic, aphrodisiac, astringent, laxative and tonic. The pericarp is analgesic, antiasthmatic, anticholesterolemic, anti-inflammatory, antiscorbutic, antiseptic, antitussive, carminative, expectorant, and stomachic. It is used in the treatment of dyspepsia, gastro-intestinal distension, cough with profuse phlegm, hiccup and vomiting. The endocarp is carminative and expectorant and is used in the treatment of dyspepsia, gastro-intestinal distension, coughs and profuse phlegm. The unripened green exocarp is carminative and stomachic. It is used in the treatment of pain in the chest and hypochondrium, gastro-intestinal distension, swelling of the liver and spleen and cirrhosis of the liver. The seed is analgesic and carminative and it is used in the treatment of hernia, lumbago, mastitis and pain or swellings of the testes. (Fern, 2019)

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