

SUBTROPICAL FRUIT

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Summary

In this chapter the major fruits grown in the subtropics are discussed. The subtropics are situated between the two tropics and about 40° latitude. Here the summer is hotter and winter cooler than in the tropics.

Humidity is generally lower and the difference in daylight is greater. A better definition in environmental terms is that the subtropics are bounded by the 10 °C isotherms of average temperature for the coldest month.

General and up to date information is presented on citrus fruits, dates, olives, pomegranate, grapes, figs, kiwi fruit, and persimmon, including their use and production methods. There is also some discussion of production of stone fruit—peaches, nectarines, apricots, and plums.

1. Citrus fruit and types

Lemons and limes are mainly used as flavoring in drinks and food preparation. All the others are grown principally for fresh consumption, but they are also used in the preparation of fresh juices, soft drinks, jams, jellies, and marmalades the peel of lemons and oranges may be candied or used to flavor pastries.

Citrus fruits are grown throughout Southeast Asia, Mediterranean countries, southern USA, Australia, and, on a more limited scale, in Africa. The cultivated species are believed to be native to the tropical and subtropical regions of Southern Asia.

They are generally evergreen shrub or small trees, often spiny, with very hard wood.

Botanically the citrus trees are all members of the family *Rutaceae*. The genus *Citrus* contains 16 species (see Figure 1 and table 1).

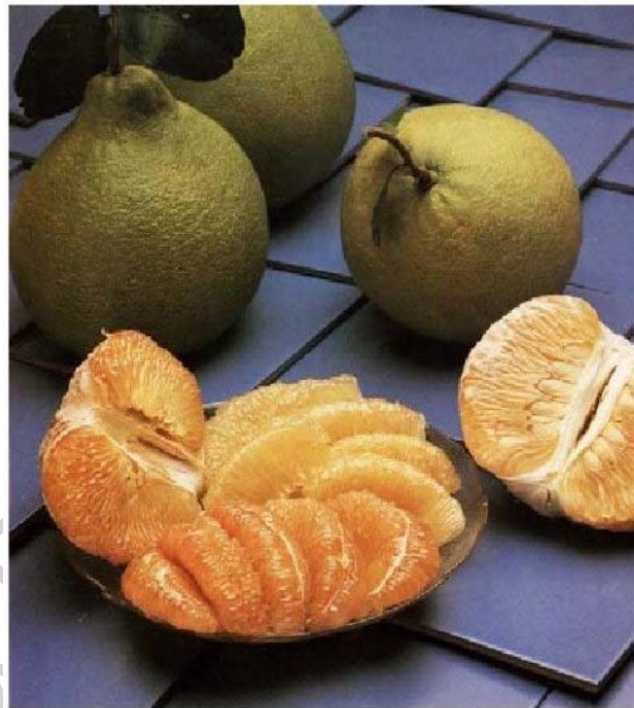


Figure 1. Pummelo fruit

<i>C. aurantifolia</i> (Chriatm) Swingle	Lime
<i>C. aurantium</i> (L) Burm	Sour/Bitter Orange
<i>C. limonum</i> L.	Lemon
<i>C. grandis</i> L	Pummelo (or shaddock)
<i>C. medica</i> L	Citron
<i>C. paradisi</i> Macfad	Grapefruit
<i>C. reticulata</i> Blanco	Mandarin or Tangerine
<i>C. sinensis</i> (L) Osbeck	Sweet Orange

Table 1. The cultivated species of *Citrus*.

The flowers of citrus trees are carried singly or small groups; they are sweet-smelling with white petals, usually five in number. Spines arise in the leaf axils alongside the buds. The leaves are simple.

1.1. Relation to soils

Citrus trees can be grown on a wide range of soil types. Deep, well-drained, light or medium textured loamy soils of good fertility are best. They can tolerate a pH range of 5 to 8, but 5.5 to 7.0 is ideal. They are sensitive to certain salts such as boron, sodium carbonate, and sodium chloride.

1.2. Methods of cultivation

General propagation is usually by budding onto rootstocks, which are grown from seed. Ideally, the seeds should be planted 5 to 6 months before the rains, or 6 to 8 months for rough lemon. They are planted at a depth of 2.5 cm and a spacing of 15 to 23 cm in well-drained, shaded, mulched beds. About 0.5 kg of seed is adequate for about 100 m². Optimum temperature for germination is 26 to 32 °C. When the rain begins, the seedlings should be about 20 cm high. Strong plants with good roots are transplanted from the seedbed to the nursery at a spacing of 1 m x 30 cm, or into plastic bags. Budding takes place about 6 months later.

Seedlings are ready for planting out 12 to 15 months after budding, depending on the area. Branches may be cut back to 1 cm before planting out, or a third of the remaining leaves removed. Planting holes should be 0.5 to 0.6 m in depth. Fertilizer may or may not be incorporated into the soil. Mulching is beneficial for weed control, and the planting distance depends on the nature and form of the soil, the topography, and type of rootstock. In most countries, commercial producers prefer the trees to be spaced at about 200 trees/ha, but in East Africa spacing can vary from 170 to 620 trees/ha.

1.3. Fertilizing

Citrus species respond well to fertilizers. Recommendations vary considerably from country to country. Nitrogen is the most important fertilizer in both the developmental and bearing stages of the tree. Excessive K should be avoided. On newly cleared and burnt land, K may be omitted for the first few years. The trench is filled with poultry manure and allowed to decompose in the rains.

1.4. Irrigation

For high yields of good quality fruit in arid and semi-arid regions where rainfall is less than 800 mm, irrigation is essential, especially during drought periods. Where soil moisture is irregular, flowering is seasonal, thus producing a glut of fruit on the market from May to August in eastern Africa. With judicious irrigation, flowering and fruiting can be achieved throughout the year, and a better price obtained at market.

Citrus reach full bearing in ten years, but should start producing some fruits 3 to 5 years after planting in the field. Generally flowering is followed by fruit maturity in 7 to 9

months. Under regular irrigation, some trees will fruit throughout the year, but in semi-arid and arid areas with distinct dry seasons, fruiting is seasonal. Four main citrus species are cultivated in Africa: lime, lemon, mandarin and sweet orange.

1.5. Cultivated citrus

Lime, *Citrus aurantifolia*

A branched, spiny shrub or small bushy tree up to 5 m. The leaves are small, and the petioles narrowly winged. Flowers and fruits are small.

The main producers are shown in Table 2. They can be grown from sea level to an altitude of 1200m in Kenya. They prefer rocky soils and are very sensitive to cold and different diseases. The Tahiti or Persian lime is larger fruited than Mexican limes and is seedless. They prefer deep sandy soils.

It is used in jams, jellies, marmalades, in alcoholic drinks, and as a garnish for fish and meat.

Lemon, *Citrus limon*

A straggling bush or small tree, up to 6 in height, with stiff spines. The leaves are ovate and serrate. The fruit is oblong, usually with a nipple-shaped tip, and bright yellow. The rind is thick, and the pulp pale yellow and very acid.

Varieties include Nepali Round and Eureka, which are seedless, and the Italian varieties Messina and Panderosa are nearly seedless. Villafranca, Lisboa and Eureka are grown in Kenya up to 2100 m.

The fruits are used for flavoring and garnishes, in the preparation of curries, squashes, lemonade, home-made sherbet, puddings, ices, and preserves, but are usually not eaten fresh.

	1989-91	1997	1998	1999
Mexico	746	1126	1186	1215
Argentina	497	970	1021	1050
India	747	1000F	1000F	1000F
Iran	460	940	891	891F
USA	718	885	831	840F

F = FAO estimate

Source: *FAO Production Yearbooks 1999*.

Table 2. Leading lemon and lime growing countries of the world (annual production x 1000 MT)

Source: *FAO Production Yearbooks 1999*

Mandarin, *Citrus reticulata*

This small bushy tree, 2 to 8 m high, is sometimes spiny. The leaves are small, and ovate to lanceolate. The fruits are subround, flattened, with thin loose rind which is easily separated from the segments, which are green, yellow or bright orange. The pulp is sweet to sub-acid, and orange colored. In general terms, mandarins are yellow-fruited cultivars (Figure 2.).

The main producers are shown in Table 3.

Tangerines are orange-fruited cultivars. Emperor is grown at low altitudes in Kenya. Satsuma is very hardy and cold resistant; Kalimpong, Sylhet, and Coorg, which are small, deeply colored and intensely flavored, are grown in India. Mandarin pulp is eaten fresh as a dessert. Segments are also canned and used in the production of mandarin juice.



Figure 2. Mandarin fruits

	1989-91	1997	1998	1999
China	3767	6885	5878	5941
Spain	1456	1998	1762	2014
Japan	1749	1555	1194	1360
Iran	423	684	727	727
Brazil	649	680	680	680

F = FAO estimate

(FAO Production Yearbooks 1999)

Table 3. Leading mandarin -growing countries in the world (annual production x 1000 MT).

Source: FAO Production Yearbook 1999

Sweet orange, *Citrus sinensis*

Sweet orange is a popular citrus fruit enjoyed by people throughout the world. Oranges are valued for their delicious juice and high vitamin content. They are an excellent source of vitamin C and also contain vitamin A and several B vitamins (see Figure 3.).

The tree is 6-12 m high at maturity, often with blunt spines. They leaves 7.5 are 10 cm

long, and are not strongly scented. The fruits are round and 4 to 12 cm in diameter. The peel thick and usually ripens to an orange color, though often remaining green in the subtropics and tropics.

Growers around the world raise more sweet oranges than any other type (see Table 4). The most important varieties are: Valencia, Washington naval, Hemline, Parson, Brown, Pineapple, Jaffa, Maltese and Ruby.

Its pulp is a popular dessert fruit. Whole fruits are used extensively for flavoring pastry products. The fruits are sliced, dried until brittle and then ground to powder: this is added to cakes, biscuits, etc. Oranges are also very commonly made into marmalade. Peel is used in distilleries for making spices and liqueurs and is also candied.



Figure 3. Sweet orange fruits

	1989-91	1997	1998	1999
Brazil	18061	22961	20732	22772
USA	7421	11514	12401	8968
China	1468	2640	2255	2989
Mexico	2321	3944	3331	2903
Spain	2653	2845	2443	2685

F = FAO estimate

Source: FAO Production Yearbooks 1999.

Table 4. Leading orange -growing countries in the world (annual production x1000MT

Source: FAO Production Yearbook 1999

2. Dates, *Phoenix dactylifera* L.

The fruits of the date palm contain a very high percentage of sugar, giving them high calorific value, but also a high fibre content, which is important in human health. Lower grades are fed to cattle and camels.

Date palms produce an important food in North Africa, and the Middle East. A great deal of research and development effort is being devoted to ecology, production methods and gene bank preservation on dates, mainly in Kuwait, Tunisia, Jordan and Saudi Arabia. While the date needs large quantities of water, it also requires long periods of hot dry weather. An Arabian proverb says that dates must have their head in the fire and their feet in the water.

The date palm has very specific requirement regarding climates. It needs a subtropical climate without rainfall during the period from flowering to ripening (extending over 120 to 200 days), but with abundant sunshine, low relative air humidity and average daily temperatures of at least 30 °C, particularly during the ripening stage. During the vegetative stage dates are tolerant to short periods of frost.

Dates have a high water requirement, over 2000 mm annually. For this, they depend on groundwater or irrigation. Dates can tolerate five successive days as hot as 50 °C. Soils: Date palms are not very particular about soil conditions, though they prefer sandy soils. Without irrigation the groundwater table should be less than 3m deep. Although dates are fairly salt tolerant, they prefer non-saline soils.

Date palms start producing after 4 to 8 years. Full production is attained after 15 to 20 years, after which the yield diminishes gradually. The economic life of a date garden is 40 to 50 years, if replacements are not made. If about 3% of the trees are replaced annually, a date garden will survive indefinitely.

Date palms are often inter-cropped with food crops (e.g. wheat, barley), fodder crops (alfalfa, oats), or fruit crops (citrus, bananas). Where they are inter-planted with fruit trees, adequate spacing of both date palms and fruit tree must be maintained.

Planting is done vegetatively with 5 to 6 year old offshoots that are removed from selected female trees that produce well. Since the palm is dioecious, a certain number of male trees should be maintained—about one in every 50 female trees.

Pollination is done artificially by placing parts of the male inflorescence in the female inflorescence. The seed is used for breeding purposes only.

The optimum plant population is about 150 palms/ha.

As regards fertilizer requirements, smallholders generally apply farm manure only. Usually, date palms show no response to phosphate and potassium applications.

Noxious weeds do not effect growth of the crop in date gardens, with their high temperatures and closed canopy.

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