

The main lemon varieties



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'Eureka' (American origin)

A variety bred in 1858 in Los Angeles, California, from a population of lemons grown from seed. The seeds were from lemons imported from Italy and were probably of the 'Lunario' variety. The tree is vigorous and not very thorny. The medium-sized fruits vary in shape from elliptic to oblong (elongated). They generally possess a short neck at the stalk base and a short apical nipple surrounded by a depression. The nipple is sometimes larger. The pulp is yellow at maturity, fine, juicy, acid and aromatic. The fruit contains few pips. The tree is everbearing, with three or four flowerings a year. Local climatic conditions strongly affect the intensity of the flowerings and hence the size of the different harvests. Although 'Eureka' trees bear fruit all the year round, production is mainly at the end of the winter and in early spring.



'Lisbon' (American origin)

A variety thought to have selected from sown plants of the Portuguese variety 'Gallego' and grown in California from the mid-nineteenth century onwards. The trees are very vigorous and thorny and more resistant to unfavourable conditions (heat, cold, wind and lack of care) than the other lemon trees. Buried in the vegetation, the fruits are well protected from adverse conditions such as sun, wind, etc. The fruits are of average size and vary in shape from elliptical to oblong (elongated). They have a small neck at the stalk end and a base nipple surrounded by a slight irregular depression that is more marked on one side. The pulp is very juicy, very acid and yellow at maturity. The fruits have medium seed content. The rind is of average thickness and clinging. The surface has fine markings, is slightly rough with very little ridging. The depression and nipple are often larger than in 'Eureka' and the epidermis is smoother and less ridged. 'Lisbon' trees have an erect habit and are very productive with only a slight everbearing character (a dominant main flowering). Harvesting is generally carried out from mid-autumn to mid-winter.

'Feminello' (Italian origin)

'Feminello' lemons form most of Italian production. The fruits are medium-sized, elliptical to oblong with a neck and a nipple varying in size. The rind is medium thick and very clinging. The peel is finely marked and moderately smooth with depressed oil glands. It is yellow when the fruit is ripe. The yellowish pulp is very juicy and strongly acid. Trees display average vigour, are only very slightly thorny and bear very heavily with harvesting staggered throughout the year. This group of lemon trees with a very marked everbearing character is well suited to the forcing technique. The lemons picked are called *primofiori* in the autumn, *limoni* in the winter and *verdelli* in the summer.



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'Interdonato' (Italian origin)

This Italian cultivar is a natural lemon x citron hybrid identified in 1875 at Nizza in Sicily. It possesses advantageous resistance to mal secco and is an early variety. The trees display average vigour and production and are practically thorn less. The variety is not suitable for forcing. Although similar to the other lemon varieties, 'Interdonato' differs in that the fruit is larger, with smoother, finer rind and fewer segments and seeds. The internal qualities differ too as the fruit is less juicy and less acid. It is little grown in Italy, where it originated, but it has a special position in Turkey where its earliness and resistance to mal secco are appreciated. The fruits are sold rapidly after picking for reasons of the under-supply of the market in September and October.



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'Kütdiken' (Turkish origin)

This Turkish lemon is probably of Italian origin. It is close to the 'Feminello' and 'Eureka' type everbearing lemon trees and the fruits are similar. The main variety grown in Turkey, it is an autumn variety picked from November onwards after 'Interdonato'. It is suitable for storage for up to nine months. Its main handicap is its susceptibility to mal secco.



'Verna' (Spanish origin)

This Spanish variety of unknown origin forms most of the lemon plantations in Spain but is little grown in other countries. The trees are vigorous and hardly or not at all thorny. They possess the everbearing character. Distinction is made between two harvest periods with fruits of different characteristics: cosecha for the harvest period from the end of February to early July and rodrejos or verdelli for those of the second period covering the whole summer. The fruits given by the second flowering are not quite as good. However, this potential second harvest makes it possible to release fruits when the market is under-supplied. The fruits have a more or less marked neck at the stalk end and prominent nipple at the base. The peel is slightly rough with tiny deformations. The juice content is good and the fruits have few seeds or none at all. The fruits keep well on the trees. Fruiting is marked by a few problems of alternate bearing.



Fino (Spanish origin)

(synonyms: 'Mesero', 'Blanco', 'Primofiori')

This variety is said to have originated from a seed of Limón Común de la Vega del río Segura. The tree is vigorous and tends to display thorny shoots. The fruits are slightly smaller than those of 'Verna', with no neck, a small nipple and smoother finer peel. The pulp is very juicy and acid and contains a moderate quantity of seeds. The variety is very productive but with little or no reflowering. The main harvest starts in early October and finishes at the end of February.



Rootstocks

Until the nineteenth century, the main purpose of using rootstocks was to prevent attacks of *Phytophthora* that damaged the bark on the root systems or the base of the trunks.

Awareness of the interactions (susceptibility, tolerance, resistance) between the various rootstocks and certain degenerative diseases that can spread to Citrus and the spread of cultivation zones in agriculturally less favourable places (limier and even slightly saline soils, very heavy poorly drained soils, etc.) have broadened the range of constraints and stimulated a search for new rootstocks capable of providing a more or less satisfactory response. The choice of a rootstock is the result of a compromise in the face of these biotic or abiotic constraints. It also takes into account

the specific effect of each type of rootstocks on the agronomic behaviour of the trees: earliness of the start of production of a plantation, the size and regulation of production and the quality of the fruits (size, peel colour, juice content, sugar and acid contents, etc.).

Features of rootstocks

'Eureka' lemon trees are totally incompatible with *Poncirus trifoliata* and a number of hybrids of this such as citrange, citrumelo, citremon, citrandarin, etc. However, there are a few rare exceptions. This incompatibility does not concern the other lemon varieties.

The very good productivity achieved in southern Spain with rootstock *Citrus macrophylla* has had to be seen in a new light as the lemons keep less well. However, trials have shown that in comparison with sour orange, this rootstock increases yield by about 50% over a seven-year period.

Staggered marketing

The staggering of production used to be based essentially on the growing of everbearing varieties in a suitable climatic environment. Several strategies were then developed:

- the forcing technique consisting of enhancing summer flowering intensity to produce lemons outside the peak production period, that is to say after the period running from the end of November to April;
- choice of cultivar, consisting of combining varieties whose natural production peaks are sufficiently staggered;
- mastery of postharvest storage (see 'Storage' above).

This approach has been developed for several decades in the United States and enables steady supplying of the market all the year round.

Rootstocks have a marked effect on certain fruit quality parameters and in particular the peel colour and the soluble dry matter content and acid content of the pulp. Sour orange enhances all these aspects, with fruits being distinctly better coloured at harvesting (less greenish) and with dry matter and acid contents 10 to 12% higher.

Agricultural trials in Argentina have demonstrated the possibility of using rootstocks with low vigour to design high density plantations with trees whose vegetative growth is smaller. The *Poncirus trifoliata* cultivar 'Flying dragon' makes this possible but the practice is limited by two types of constraint: the variety 'Eureka' cannot be used as it is incompatible with *Poncirus* cultivars and limestone or slightly saline soils that are frequent in lemon-growing zones and that do not suit this rootstock.

