

# Carrizo citrange

## Origin

Hybrids of sweet orange and trifoliate orange are known as citranges (*Citrus sinensis* x *Poncirus trifoliata*). Carrizo and Troyer are hybrids of Washington Navel orange and *Poncirus trifoliata*.

## Ownership

Open.

## General Description

Carrizo and Troyer citranges are visually indistinguishable and are of considerable interest throughout the world as rootstocks because of their tolerance to *Citrus tristeza virus* (CTV) and *Phytophthora* root rot. The main difference between Troyer and Carrizo is that the latter is also burrowing-nematode resistant, a nematode not present in southern Africa.

## Tree Characteristics

An advantage of Carrizo and Troyer is the excellent performance of young trees on these rootstocks.

## Soil Type

Carrizo has performed well in replant orchards in the Sundays River Valley, where its performance has been far better than rough lemon.

Carrizo and Troyer are sensitive to alkaline-induced chlorosis and in some cases trees have severely declined as a result of iron and other trace element deficiencies on saline, calcareous and especially high pH soils. Carrizo and Troyer have a less-developed feeder root system than rough lemon and are therefore not as tolerant to low soil moisture levels compared with rough lemon. Irrigation regimes which are suitable for good tree performance where rough lemon is the rootstock have proved inadequate for trees on Carrizo and Troyer.

## Fruit Characteristics

Fruit size is usually medium to large and internal fruit quality is excellent. Their major disadvantage is the tendency to induce a higher incidence of creasing. This is a serious problem in the Sundays River Valley and some other areas. Carrizo and Troyer also induce higher acid levels than rough lemon, but while this has occasionally created problems with Valencias, Minneola tangelos and grapefruit in the cooler production areas, it is advantageous in the warm/hot areas.

Colour development of fruit on trees budded to Carrizo or Troyer is usually 5 to 10 days ahead of that on rough lemon.

## Production

Carrizo and Troyer are vigorous and produce excellent crops of high quality fruit in their early years (precocious).

## Cultivar Options

Carrizo and Troyer are excellent rootstocks for sweet orange and grapefruit cultivars and most mandarin hybrids. However, there has occasionally been some tree decline accompanied by a bud union crease with certain mandarin cultivars on Troyer, e.g. Owari Satsuma as seen in California after 15 to 20 years. This phenomenon has not been a problem in South Africa, most probably due to higher budding practices.

## General

Carrizo has been a leading rootstock in Florida whereas Troyer was widely used in California until C-35 citrange became popular. In the past, Troyer was widely used in South Africa, but the popularity of Carrizo has subsequently exceeded that of Troyer. Carrizo and Troyer inherited their susceptibility to citrus viroids (CVd) from the trifoliate orange parentage. Severe CVd variants will cause infected trees on these rootstocks to decline and be unproductive. Milder variants are less injurious and were studied as possible dwarfing agents. Carrizo and Troyer are ranked as tolerant to *Phytophthora* gummosis/root rot and CTV.



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Commercially, growers experience only occasional problems. Trees on Carrizo and Troyer appear somewhat susceptible to *Fusarium* dry rot decline, which is prevalent in certain Eastern Cape orchards. These rootstocks are tolerant to citrus nematodes. There is some evidence that the citranges may impart a higher degree of greening susceptibility to the scions than rough lemon and the mandarin rootstocks.

Citrus Blight affects trees on Carrizo and Troyer. Since the 1960s, Carrizo has gradually replaced rough lemon in Florida because of severe losses from blight occurring in plantings on the latter rootstock. Trees on Carrizo were heavily planted and some of these orchards are now also experiencing considerable tree loss from citrus blight. The incidence of citrus blight, nevertheless, is highly variable.

### Summary

The main advantages of Carrizo citrange are: Phytophthora root rot/gummosis intermediate resistance, nematode and CTV tolerance, good internal quality, earlier external colour compared to Swingle citrumelo, and medium tree size.

### General Comments

- Large tree, but smaller than Swingle citrumelo.
- Vigorous growth of young trees.
- Excellent crop and high internal quality on young trees.
- Sensitive to high pH soils.
- External fruit colour 1 to 2 weeks before Swingle citrumelo or rough lemon.
- Intermediate resistance to Phytophthora root rot.
- Tolerant to CTV and nematodes on replant soils.
- High incidence of creasing in combination with sensitive scion cultivars.
- Not compatible with Eureka lemon.
- Midnight Valencia in combination with Carrizo citrange is a very good combination.



Fukumoto Navel on Carrizo citrange planted in 2001 (3 m tree height) indicating a healthy bud-union with this scion-rootstock combination.



Nova on Carrizo citrange planted in 1991 (3 m tree height).