

# Rough lemon

## Origin

Rough lemon (*Citrus jambhiri* Lush) is presumed to be indigenous to north-east India, where it still grows wild. Four distinct rough lemon types are recognised in India. Initially the principal rootstock and the best known of all rootstocks in South Africa and widely used in other citrus-producing countries of the world, there is an abundance of general information available on the performance of rough lemon rootstock.

A wide range of selections of rough lemon were initially used in southern Africa. The selection which the CIS has focused on is Cairn rough lemon. However, it should be noted that research carried out during the 1980s and 1990s showed that various selections performed differently in different regions. It is not possible in practice to produce and maintain commercial levels of seed supplies of all the rough lemon selections. For practical reasons therefore, a selection with good overall performance was selected, i.e. Cairn.

## Ownership

Open.

## General Description

Rough lemon is one of the most vigorous rootstocks used in the citrus industry in South Africa, developing large tree size, as well as medium to large fruit size and good crop load. The internal quality of the fruit is moderate with lower Brix, juice and acid levels than quality-inducing rootstocks. Eureka lemon in combination with rough lemon performs very well and still remains the primary choice, except on replant and heavy soil types.

## Tree Characteristics

Trees on rough lemon rank at or near the top in terms of growth vigour and tree size in comparison with trees on other rootstocks, provided that soils are disease free, specifically of nematodes and *Phytophthora*. Trees on rough lemon are more sensitive to cold and frost damage. However, young trees on rough lemon damaged by cold recover more rapidly than trees on less vigorous rootstocks which are severely damaged.

## Soil Type

Rough lemon can be planted in a wide range of soils, but it is particularly well adapted to deep, coarse sands on which some other rootstocks do not perform well.

Rough lemon is not sufficiently tolerant to root rot and should not be used on wet, poorly-drained soils, even though it is more tolerant to flooding than most rootstocks. Rough lemon tolerates calcareous soils with pH above 7.5, but is sensitive to very saline soil conditions.

## Fruit Characteristics

Fruit from trees on rough lemon have a relatively thick rind, and juice quantity and quality is among the poorest compared to other rootstocks. Fruit from trees on rough lemon do not hang as well as on certain other rootstocks, and the flesh tends to dry out and become granulated.

## Production

Trees on rough lemon yield amongst the highest for any rootstock, and fruit size is generally large.

## Cultivar Options

Rough lemon is not a good rootstock for mandarins as fruit tend to dry out (granulate), reducing the already naturally short harvest season of most mandarin cultivars. Also, the alternate bearing tendency of mandarin cultivars may be enhanced by the use of rough lemon. However, rough lemon is an excellent rootstock for oranges, particularly when they are grown for processing, as high yields lead to a good per hectare production of kg soluble solids, unsurpassed by trees on most other rootstocks. Also, some cultivars such as Valencias have an inherently high juice quality and propagating them on rough lemon does not greatly reduce their quality. These cultivars usually yield best on rough lemon, though Brix will be lower.



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## General

Trees on rough lemon are tolerant to *Citrus tristeza virus* (CTV) and citrus viroids (CVd). They are susceptible to citrus nematodes and are severely affected by *Phytophthora* root rot/gummosis, but are not as susceptible as sweet orange when used as a rootstock. High susceptibility to citrus blight is one of the other major weaknesses of rough lemon and this has affected the extent of its use in South Africa. Rough lemon is regarded as a poor replant rootstock, but with the currently available chemicals it can possibly perform adequately in a replant situation where irrigation is carefully controlled. Rough lemon was widely used in South Africa until the 1990s, but is now less favoured.

## Summary

The main advantages of rough lemon are: resistance to higher pH and deep sandy soils, earlier colour compared to Swingle citrumelo, medium to large fruit size, compatibility with Eureka lemon and rapid recovery after cold damage to the trees.

## General Comments

- Trees on rough lemon produce very good to excellent crops with generally large fruit size.
- Juice levels of the fruit tend to be on the lower side with average internal quality and fruit granulate easier.
- Trees on rough lemon are severely affected by *Phytophthora*, as well as being susceptible to nematodes and citrus blight.
- Rough lemon trees are tolerant to CTV and exocortis.
- It is not advisable to use rough lemon as a rootstock option on replant soils due to poor performance.
- Will perform well and tolerate high pH (above 7,5) and coarse, sandy soils.
- Trees on rough lemon will be sensitive to cold, but recover rapidly due to rootstock vigour.



Bahianinha Navel planted on rough lemon in 1997 with an average tree height of 3.5 to 4m.