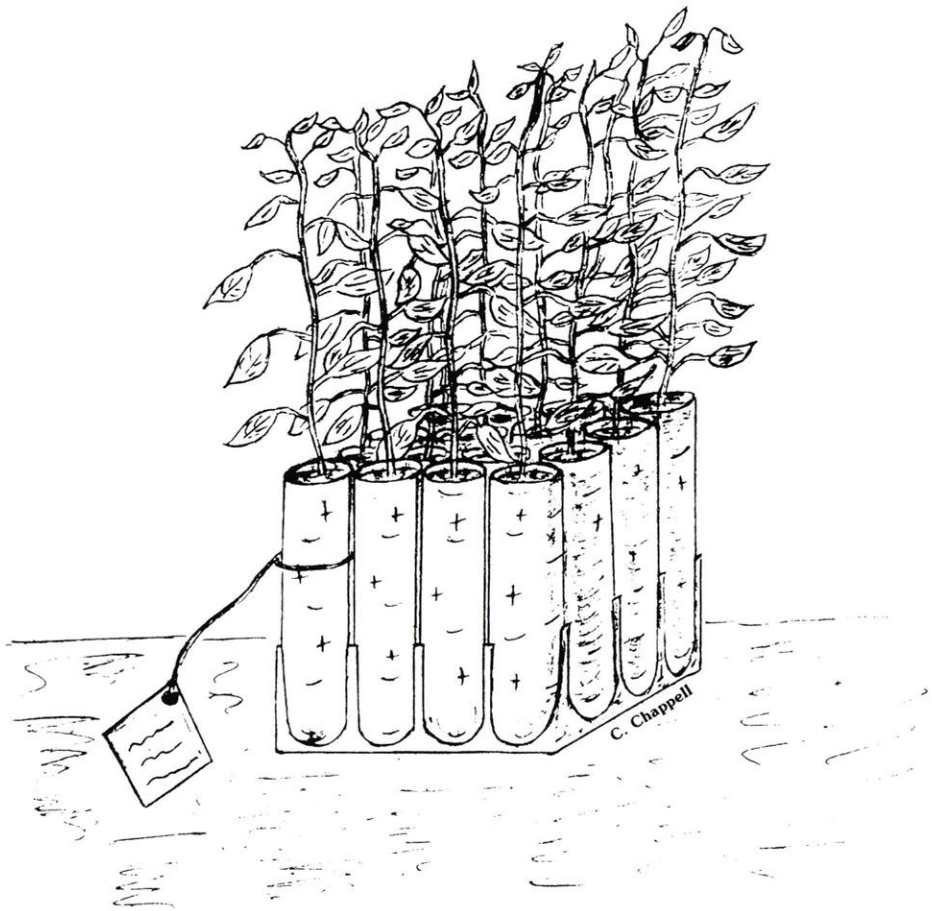
WHICH ROOTSTOCK TO CHOOSE

FOR LEMONS



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WHICH ROOTSTOCK TO CHOOSE

Which lemon rootstock to choose is a critical and difficult decision you must make, and it should be approached in several different ways. This publication is just one of them.

Here are some steps to follow in choosing the right rootstock for you. First, research the literature. See what has already been written. You will probably find some conflicting statements, so the more you read, the better. Second, talk with people. See what your local nurseryman says; check with other growers in your area. See what has worked for them. Draw on your own experience, too.

After you have done some reading and have talked with people, you now need to have some knowledge of your own specific planting site. This is just as important as knowing the rootstocks, themselves. Questions like . . . what kind of soil do I have? . . . what's the climate like? . . . and, what kind of diseases are in my area? . . . all need to be answered.

After you have answered these questions and have become an "expert" on rootstocks, you're now ready to start the process of elimination. Discard the rootstocks that obviously would not be compatible with your planting site. For example, if you have a clay soil infested with *Phytophthora species*, you probably won't want to plant Sweet Orange rootstock. If your soil is highly calcareous, you won't want to plant Trifoliate. After going through this process of elimination, you will probably end up with 1-3 rootstocks as possibilities for your specific site. To narrow it down any further, you may need to toss a coin. In fact you may consider planting two rootstocks instead of relying on just one.

As mentioned earlier, choosing the correct rootstock is a difficult task. One reason for this is the rootstock performance ambiguities that occur. Different test plots conducted with the same rootstock can produce varying results. Rootstocks will react differently in different areas, and no two test plots can ever be exactly the same; soils and climates differ; irrigation systems differ; numerous variables are involved. Also, researchers can differ in their interpretation of field test data. All may agree that a particular rootstock is sensitive to salts, but to what degree does one rate it, sensitive or sensitive +.

The point is, when dealing with rootstocks, we are not always dealing with absolutes. So, get as much information as possible; know your area, eliminate the obvious, and then -- good luck.

Troyer and Carrizo Citrange

In Moorpark, 22 year old Monroe and Dr. Strong on Troyer appear more vigorous and healthy looking than the same scions on Macrophylla. Eurekas, however, are incompatible. In a large Valencia test plot, Carrizo performed just slightly better than Troyer in production and tree size. Fruit size on both was smaller than average. Excellent fruit quality, tolerant to *Phytophthora* and better than average as a replant. Resistant to certain biotypes of the citrus nematode.

Rootstocks In Minor Use Or Experimental

The Citremon

Is a cross between lemon and Trifoliate Orange. Eureka lemons are incompatible on these rootstocks. With Lisbons, a phloem necrosis appears in the rootstock in about 15 years. However, at 19 years old, Limoneira 8A Lisbon trees on Citremon CRC 1449 look very good.

Citrumelos

Are hybrids between grapefruit and Trifoliate Orange. There are several - including CRC 1452, CPB 4475, Swingle, and Sacaton. Trees on Citrumelo show excellent growth, good fruit quality and yields approaching that of trees on Macrophylla. Caution must be exercised with using Citrumelo in lime soils.

Citrumelos show good to excellent resistance to *Phytophthora*. We do not know for sure the compatibility of Eurekas on these rootstocks. Indications are that Eureka is not compatible.

Citrumelo CRC 1452 - Twenty-three year old Rosenburger and Limoneira 8A Lisbons on CRC 1452 near Santa Paula were tested and showed degeneration of the phloem tissue in the rootstock. This may be a rootstock disorder.

CPB 4475 - The original 4475 parent tree was bred in Florida. Seed from this tree was taken to Texas, propagated, and subsequently, seed from the Texas trees was then taken to California (USDA Indio Station). It was in the early 60's that the name Swingle was bestowed upon CPB 4475 (after W.T. Swingle). Although the name Swingle is given to CPB 4475, characteristic diferences have been observed between trees coming from the Florida parent tree and those from the California trees. The oldest 4475's we have are 15 years old and show no phloem necrosis. 4475 is one of the most *Phytophthora* resistant rootstocks we have; it is also nematode resistant but susceptible to lime-induced iron chlorosis.

Sacaton - After 30 years in Arizona, the Sacaton is showing no phloem necrosis. Sacaton has been a good rootstock on lime soils in Terra Bella and in Phoenix.

LEMON ROOTSTOCK SUMMARY

Common Rootstocks in Commercial Use Today

Macrophylla

Young trees especially show good vigor and production - excellent overall production. It is Phytophthora resistant but susceptible to nematodes. Trees can be brittle and subject to wind damage. Slightly more sensitive to cold than most other rootstocks. Macrophylla is Tristeza susceptible and is used primarily for lemons. The major drawback to this rootstock is Macrophylla Rootstock Necrosis (MRN), a degeneration of the sieve tubes just below the budunion. So far as we know, all lemon scions placed on Macrophylla rootstock eventually decline. See Citrograph Mar. 84 for details on MRN.

Rough Lemon

Is the name given to numerous rootstock clones or strains grouped under *Citrus jambhiri.* They are susceptible to *Phytophthora,* and poor drainage is a problem. The Schaub Rough Lemon is more *Phytophthora* resistant than other selections tried in Ventura County and does best in sandy soils. Rough Lemon types are sensitive to salt and boron. Trees on Rough Lemon usually produce well in the first 15 to 20 years. Fruit quality is moderate-low. Trees on these rootstocks are tender towards frost.

The Sweet Orange

Rootstock induces good yield and high fruit quality in the scion. This rootstock, along with Volkameriana and Rough Lemon is compatible with Eureka, although lemon sieve-tube necrosis in the Eureka scions may sufficiently limit translocation at 8 to 15 years to cause tree decline. Lisbons and oranges show good compatibility on Sweet Orange. The major problem with Sweet Orange is its susceptibility to *Phytophthora.* It is not recommended for heavy clay soils, very sandy soils, calcareous soils, or soil with a history of *Phytophthora* infestation. However, in well drained loam and sandy loam soils, with high budding and planting, proper water management and, with the use of the new anti-*Phytophthora* fungicides this can be an excellent rootstock.

Citrus Taiwanica

Is a variable rootstock. Many off-type seedlings may occur, and careful roguing at the nursery is needed. This rootstock has shown some promise as a nematode and *Phytophthora* tolerant type.

The Trifoliate Orange

Rootstocks (notably Rubidoux, Pomeroy, and a few others) have always been reported as doing poorly in a coastal environment. However, some good 20-30 year old lemon and orange trees on Trifoliate have been observed from Ventura to Fillmore. Trifoliate rootstocks are often tolerant to *Phytophthora*, nematodes, and *Armillaria*. These rootstocks may be good candidates to try as replants where no fumigation has been done. They are not recommended for lime soils, as they are susceptible to lime-induced iron chlorosis. On the Limoneira Ranch, with 19 year old Lisbons on various Trifoliate rootstocks the phloem tissue in the rootstock was rated good to excellent; the trees were vigorous and in excellent condition. Fruit quality on Trifoliate rootstocks is excellent. These rootstocks are very susceptible to exocortis.

Yuma Ponderosa

Is a rootstock closely related to Cuban Shaddock - if it is not actually the same - as shown by physical similarities and the high degree of polyembryony. It is a vigorous rootstock and in the first few years of a field trial at the Lindcove Field Station (Tulare, CA), has consistently been among the leaders in yield. It is compatible with both Lisbons and Eurekas. Yuma Ponderosa shows tolerance to *Phytophthora*, and indications are that it is tolerant to *Tristeza*.

Volkameriana

May be a Rough Lemon hybrid. However, it is much more resistant to *Phytophthora* than the Rough Lemon and Sweet Orange rootstocks. In fact, it had been planted in Argentina in areas where the Rangpur Lime rootstock had died due to *Gummosis*. Lemon trees on this rootstock are excellent producers and after 25 years Limoneira 8A Lisbon on Volkamariana show no phloem necrosis. The bud union is smooth and fruit quality is about equal to that of trees on Rough Lemon.

LEMON ROOTSTOCKS

A Summary of Characteristics

	Citrumelo 4475	Rangpur Lime	C. Macrophylla	Rough Lemon	Sweet Orange	Troyer & Carrizo Citranges	Volkameriana	Trifoliate
Growth	Mod.	Vig.	Vig.	Vig.	Mod.	Mod.	Vig.	Mod.
Eventual Tree Size	Med.	Lrg.	Med.	Lrg.	Med.	Med. +	Lrg. –	Lrg. (4)
Fruit Production	Good	Very Good	Very Good	Very Good	Good	Good	Very Good	Good
Salt Tolerance (5)	Avg.	Avg. +	Avg. +	Avg. –	Avg. –	Avg. –	Avg.	Avg. –
Resistance to Gummosis	Resist. +	Susc.	Resist.	Susc.	Susc.	Resist.	Resist. (3)	Resist.
Compatibility: Lisbon Compatibility: Eureka	Good Incomp.	Good Good	See Foot Note (1)	Good Good	Good Good	Good Incomp.	Good Good	Good Incomp.
Poor Soil Drainage	Susc.	Susc.	Susc. +	Susc.	Susc.	Susc. +	Susc.	Susc. +
Susceptibility to Citrus Nematode	Tolerant	Susc.	Susc.	Susc.	Susc.	Tolerant/ Susc. (2)	Susc.	Tolerant
Tenderness to Frost	Hardy	Tender	Tender	Tender	Hardy	Hardy	Tender	Hardy
Tree Longevity	Avg.	Avg. +	Short (1)	Avg. –	Long	Avg.	Avg.	Avg.

In general the above characteristics are true. However, it is recognized that ratings may vary to some small degree.

1. Susceptible to Macrophylla Rootstock Necrosis.
2. Depending upon the bio-type of the nematode, Troyer & Carrizo will be tolerant or susceptible.
3. Majority of tests show Volkameriana to be phytophthora resistant.
4. Will depend upon scion and rootstock combination.
5. Refers to concentration of soluable salt in the soil, and does not imply any specific ion damage.

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