

Rootstocks for Valencia Oranges & Lisbon Lemons in Arizona

by D. R. Rodney, R. M. Allen & R. H. Hilgeman*

The selection of rootstocks for citrus trees is complicated because of the many factors involved. Some of these factors are: physical characteristics of

soil and calcium content; types of salts in the irrigation water; adaptation of the rootstock to the above situations and the characteristic growth and fruiting responses induced in the trees under these conditions; and the tolerance of the rootstock to common viral and fungal diseases.

Figure 1. Two experimental rootstocks are shown in photo at left, from left, a one year old sour orange and a nine month old rough lemon.

*Horticulturist at the Yuma Station, Plant Pathologist at the Plant Pathology Department in Tucson, and Horticulturist at the Salt River Valley Citrus Farm, near Phoenix, respectively.

The tolerance or susceptibility of citrus rootstocks to the disease caused by the fungus, *Phytophthora*, which is commonly known as foot rot or brown rot gummosis, is of major importance,

Table 1. Comparative Performance of Rootstocks with Valencia Orange and Lisbon Lemon Scions in Arizona.

	Tree and Fruit, Growth & Yield ^a					
	Sandy Soil ^a		Loam Soil ^a		Fruit Size ^b	Total Soluble Solids ^c
	Orange	Lemon	Orange	Lemon		
Rough Lemon	1	1	1	1	L	L
Rangpur Lime	1	1	1	1	M	L
Citrus Macrophylls	1	1	1	1	M	L
Sour Orange	3	2	2	1	M	H
Cleopatra Mandarin	3	2	3	—	S	H
Willowleaf Mandarin	—	—	1	—	M	H
Sacaton Citrumelo	2	3	2	1	L	M
Troyer Citrange	2	2	3	2	M	M
Sweet Orange	3	3	3	2	M	H
Grapefruit	—	—	—	—	—	H

^a Sandy soil-Yuma Mesa and Wellton Mesa; sandy loam-Salt River Valley and Yuma Valley; 1 = large tree or yield, 4 = small tree or yield.

^b L = Large M = Medium S = Small

^c H = High M = Medium L = Low

^d R = Resistant; MR = Moderately Resistant; S = Susceptible

^e Uptake from high calcium soils 1 = adequate; 2 = intermediate; 3 = inadequate

^f Uptake under high concentrations 1 = low; 2 = intermediate; 3 = high
Insufficient evidence on which to base judgment is indicated by —.



since it is the major cause of tree deaths in Arizona.

At present there appears to be very few trees in this state affected by the virus causing tristeza (California quick decline) and although we have seasonal populations of the aphids (*Aphis gossypii*) capable of transferring the virus, there has been no known spread of the disease under field conditions.

The accompanying chart was prepared as an easy reference guide to the advantages and disadvantages of each of 10 common rootstocks for Valencia oranges and Lisbon lemons.

In columns 1 to 4, vigor and yield are indicated by numbers 1 to 4 with "1" being the most vigorous. The first 3 rootstocks are rate "1" on both soil types, while on loam soil, Sour orange, Willowleaf mandarin and Sacton citrumelo are also rate "1."

Small fruit size is not a major problem in Arizona and only Cleopatra mandarin is rated as inducing small fruit size (col. 5).

The 3 vigorous rootstocks, Rough lemon, Rangpur lime and Citrus macrophylla, produce fruit with low total solids in the juice (col. 6). This is a disadvantage if these rootstocks are used for oranges but not if used as rootstocks for lemons. Young trees on Rough lemon rootstock frequently produce elongated fruit with thick, coarse peel and because of the lower solids, Valencia oranges freeze at temperatures about 1 degree (F.) higher than fruit of trees on Sour orange rootstock.

Columns 7 to 10, indicate the relative resistance or susceptibility of the rootstocks to the most common diseases affecting citrus trees in Arizona. Susceptibility to a disease means that

the susceptible rootstock should be budded only with buds that are known to be free of the disease (if it is a virus disease as tristeza, xyloporosis, or exocortis) or that the risk should be recognized as in the case of the disease caused by the fungus, *Phytophthora*.

The expected responses of the rootstocks to borderline deficiencies of iron and zinc are indicated in columns 11 and 12, and expected responses to excesses of chlorine and boron are indicated in columns 13 and 14. If using a rootstock having an intermediate or low ability to pick up a micro-nutrient, that nutrient should be supplied when the leaves show deficiency symptoms. Excesses are not easily corrected; so if citrus is to be planted in an area where an excess is known or suspected to exist, one should avoid rootstocks which will pick up a high amount of the excess element.

Table 2. Comparative Performance of Rootstocks with Valencia Orange and Lisbon Lemon Scions in Arizona.

<i>Disease Tolerance^d</i>				<i>Nutrition</i>			
<i>Tristeza</i>	<i>Xyloporosis</i>	<i>Exocortis</i>	<i>Phytophthora</i>	<i>Deficiency^e</i>		<i>Excess^f</i>	
<i>(Quick Decline)</i>	<i>(Cachexia)</i>	<i>(Scaly Butt)</i>	<i>(Foot Rot)</i>	<i>Iron</i>	<i>Zinc</i>	<i>Chlorine</i>	<i>Boron</i>
R	MR	R	S	2	1	2	2
R	S	S	S	2	1	1	2
S	S	R	MR	1	2	2	1
S	R	R	R	1	2	2	2
R	MR	R	MR	2	1	1	3
R	R	R	MR	2	1	1	3
R	R	S	R	2	2	2	2
S	R	S	MR	2	3	3	2
R	R	R	S	3	—	2	2
S	R	R	MR	3	—	3	2

^a Sandy soil-Yuma Mesa and Wellton Mesa; sandy loam-Salt River Valley and Yuma Valley:

1 = large tree or yield, 4 = small tree or yield.

^b L = Large M = Medium S = Small

^c H = High M = Medium L = Low

^d R = Resistant; MR = Moderately Resistant; S = Susceptible

^e Uptake from high calcium soils 1 = adequate; 2 = intermediate; 3 = inadequate

^f Uptake under high concentrations 1 = low; 2 = intermediate; 3 = high
Insufficient evidence on which to base judgment is indicated by —.