

# Selecting the right rootstock for finger lime

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# Florida grown finger lime

- Relatively new to Florida
- Warm temperatures around the year along with ample rainfall
- High growth rate
- Poor soils, need good fertilizer program
- High soil pH and bicarbonate content
- HLB pressure!

# Citrus Tree

- Citrus trees— combination of scion and rootstock
  - Choose carefully!
- Purchase tree from a certified nursery to confirm the nursery is producing clean (diseasefree) plant material

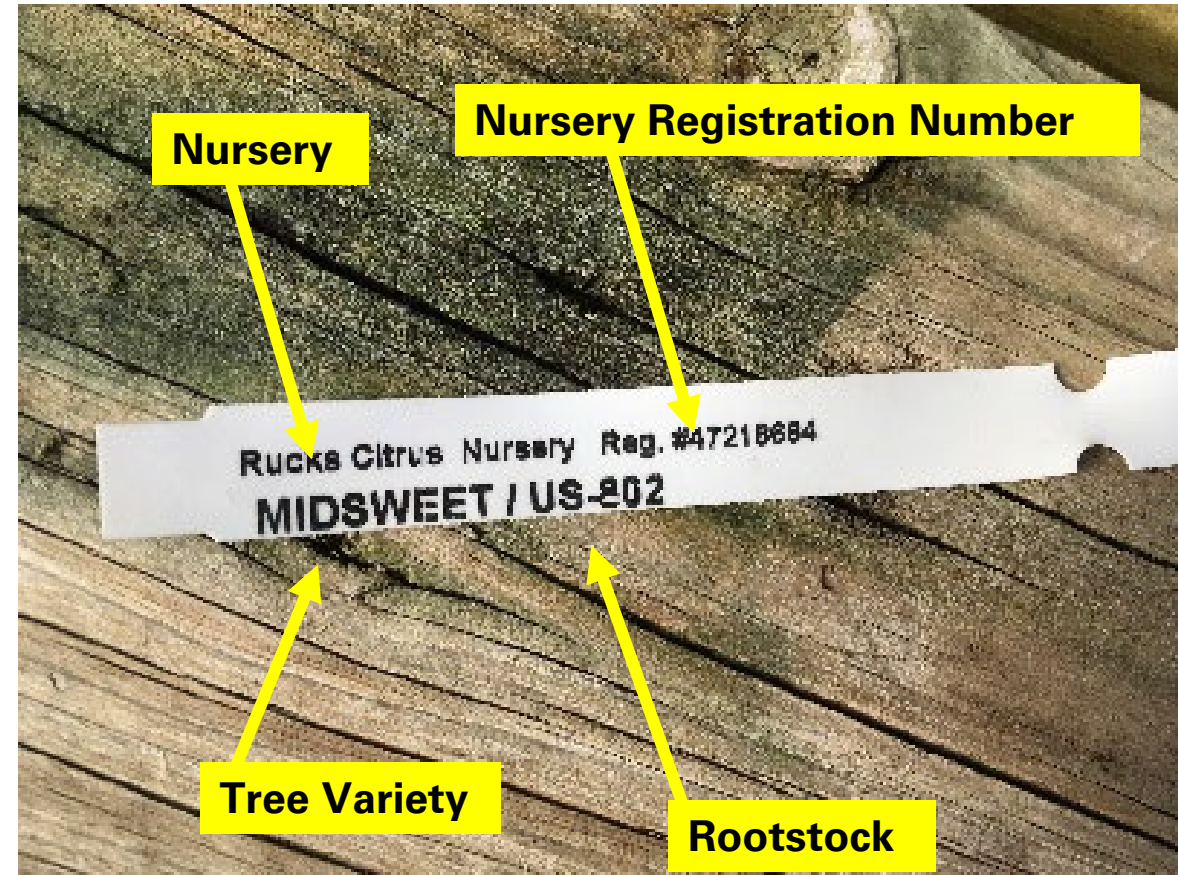


Photo Credit: Jamie D. Burrow, UF/IFAS

# Rootstocks

1. The rootstock, or stock, is the portion of the tree that consists of the lower trunk and the root system of the tree.
2. A specific cultivar for the rootstock can render a citrus tree tolerant to different stresses such as unfavorable soil conditions, soilborne pests and diseases, and cold
3. Rootstock also greatly influence the size, fruit quality, and yield of a citrus tree.

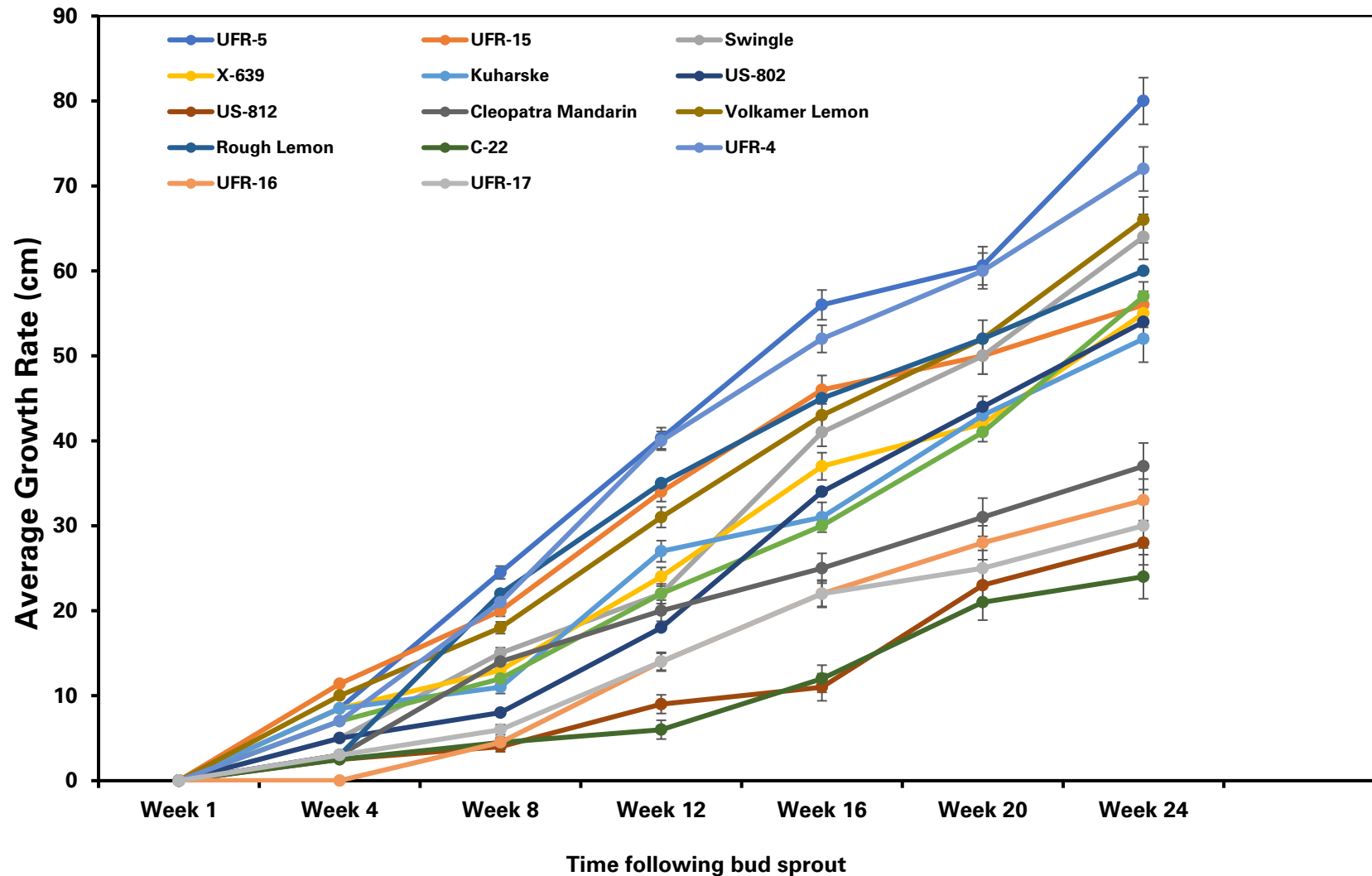
**Rootstock selection needs careful consideration**

# Rootstocks for Florida-grown finger lime

No.	Rootstock	Bud Take	Plant Growth rate
1	Swingle	good	fast
2	X-639	good	fast
3	Kuharske	good	fast
4	Sour Orange	good	fast
5	US-802	good	fast
6	US-812	good	slow
7	Cleopatra Mandarin	average	slow
8	Volkamer Lemon	good	fast
9	Rough Lemon	good	fast
10	C-22	poor	slow
11	UFR-4	good	fast
12	UFR 5	good	fast
13	UFR-15	good	fast
14	UFR-16	average	slow
15	UFR-17	poor	slow



# Growth rate of budded finger lime trees in the nursery



# Rootstock Trial

- Block planted in spring of 2017
- DPI 50-36 used as the scion of choice
- Trees began fruiting sporadically after two years in the ground
- Standard citrus management for first 4 years
- HLB has not been detected on any of these 4-year-old trees.
- Citrus Canker has not been detected so far.

Rootstocks	Traits
C-22	Popular in California
Carrizo	Commercial Standard
Cleopatra	
Mandarin	Commercial Standard
Kuharske	Currently popular
Sour Orange	Used for grapefruit
Swingle	Commercial Standard
UFR-15	Tolerant to HLB*
UFR-16	Tolerant to HLB*
UFR-17	Tolerant to HLB*
UFR-4	Tolerant to HLB*
UFR-5	Tolerant to HLB*
US-802	Tolerant to HLB
US-812	Tolerant to HLB
Volkamer Lemon	Vigorous
X-639	Vigorous





# Young spring flush on tree



# C-22 vs Volk at two years after planting



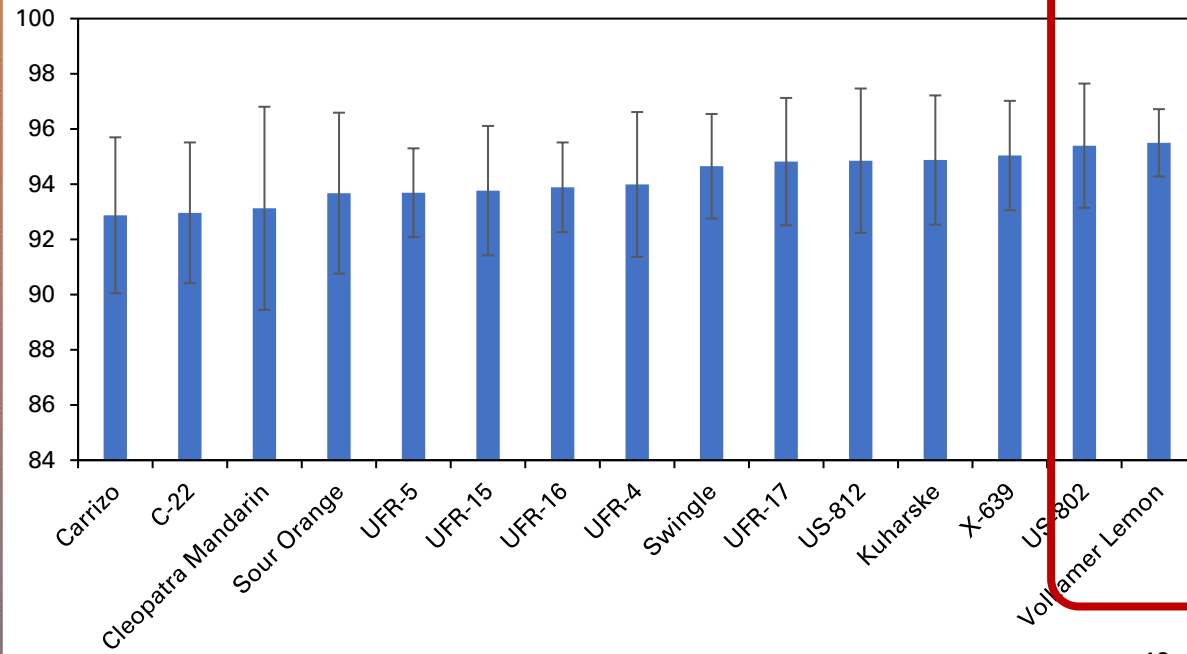
# Two year old trees



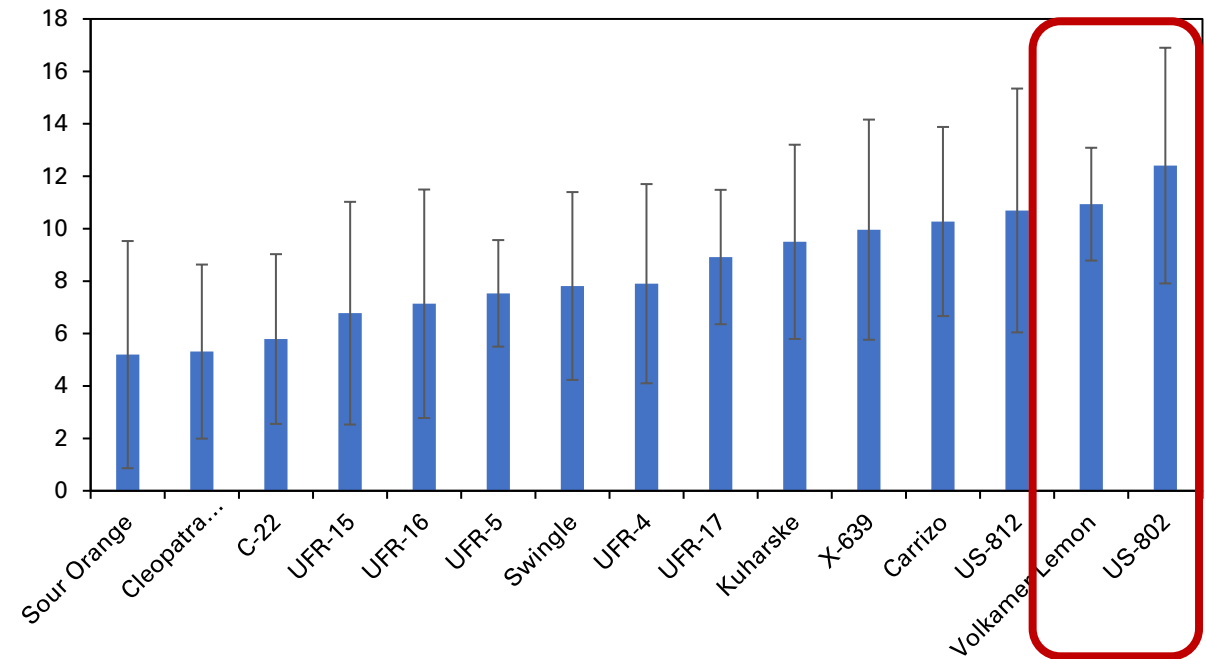
# Four year old trees



## Canopy Density

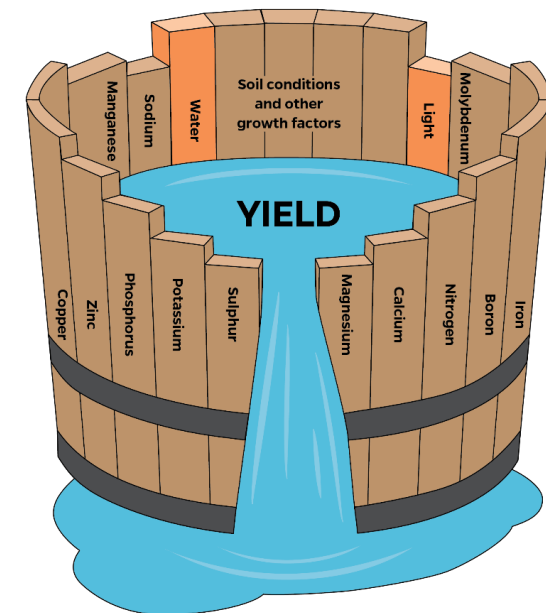


## Canopy Volume



# Fertilization Guidelines for Finger Lime

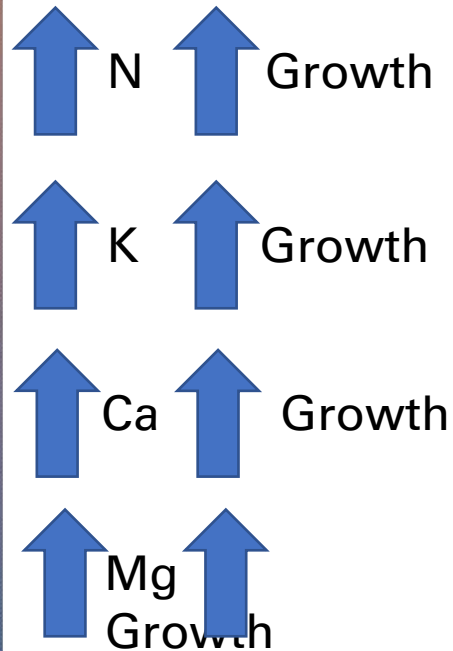
- High growth rate = high nutrition requirement
- 3-4 times fertilization
- Balanced and complete fertilizer
- Soil applied program is best
- Foliar sprays to influence fruit quality can be beneficial



# Fertilizer and Irrigation Guidelines

- Focus on nitrogen as growing trees need good amount of nitrogen
- Potassium sprays can help with improving fruit size
- Potassium and Calcium can improve peel integrity
- Excessive Nitrogen should be avoided as it can reduce fruit quality
- Good irrigation is critical for fruit size and improving fruit retention, drought stress should be avoided

# Leaf Nutrient Analysis



Rootstock	N %
UFR-16	1.4
UFR-4	1.4
Cleo	
Mandarin	1.5
Kuharske	1.5
C-22	1.5
Sour Orange	1.5
Volk Lemon	1.5
Carrizo	1.5
X-639	1.5
UFR-15	1.6
US-802	1.6
Swingle	1.6
UFR-5	1.7
UFR-17	1.7

Rootstock	Ca %
Carrizo	1.9
C-22	2.1
UFR-4	2.1
Kuharske	2.1
X-639	2.1
UFR-5	2.2
Swingle	2.2
Sour Orange	2.2
UFR-17	2.2
US-812	2.3
US-802	2.3
UFR-15	2.4
Cleo	
Mandarin	2.5
Volk Lemon	2.5

Rootstock	K %
UFR-16	1.0
Carrizo	1.0
US-812	1.0
UFR-4	1.0
Cleo	
Mandarin	1.0
Kuharske	1.1
C-22	1.1
X-639	1.1
US-802	1.1
Swingle	1.1
Sour Orange	1.1
UFR-15	1.1
UFR-5	1.1
UFR-17	1.3
Volk Lemon	1.3

Rootstock	Mg %
Carrizo	0.17
C-22	0.17
Sour Orange	0.17
Volk Lemon	0.18
Swingle	0.18
UFR-15	0.18
UFR-17	0.19
UFR-5	0.20
US-802	0.20
US-812	0.20
Cleo	
Mandarin	0.21
Kuharske	0.22
X-639	0.22
UFR-16	0.23

Rootstock	P %
Sour Orange	0.14
Volk Lemon	0.15
US-802	0.16
UFR-16	0.16
UFR-15	0.17
C-22	0.17
Cleo	
Mandarin	0.17
X-639	0.17
UFR-4	0.19
Swingle	0.19
UFR-17	0.19
US-812	0.19
Kuharske	0.19
Carrizo	0.20
UFR-5	0.21

Rootstock	S %
Cleo	
Mandarin	0.17
UFR-4	0.18
Swingle	0.19
C-22	0.19
X-639	0.19
Sour Orange	0.19
Carrizo	0.19
US-802	0.19
Kuharske	0.20
UFR-16	0.20
UFR-15	0.20
UFR-5	0.21
US-812	0.21
Volk Lemon	0.21
UFR-17	0.21

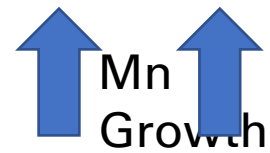


Rootstock	Zn ppm
Carrizo	38
UFR-16	54
X-639	54
US-812	54
UFR-17	54
Kuharske	55
Swingle	56
C-22	57
Sour Orange	58
Cleo	
Mandarin	58
UFR-5	62
US-802	64
UFR-4	64
UFR-15	65
Volk Lemon	68

Rootstock	B ppm
Carrizo	23
Sour Orange	23
UFR-16	25
C-22	26
X-639	26
UFR-4	29
UFR-15	31
Kuharske	31
US-802	32
Cleo	
Mandarin	33
UFR-17	34
Swingle	34
US-812	34
UFR-5	38
Volk Lemon	40

Rootstock	Mn ppm
Carrizo	24
US-812	36
Kuharske	36
UFR-16	37
X-639	37
C-22	38
Sour Orange	39
UFR-17	39
Swingle	39
US-802	40
UFR-4	42
Cleo	
Mandarin	42
UFR-15	44
UFR-5	47
Volk Lemon	48

Rootstock	Fe ppm
Swingle	51
X-639	57
UFR-4	58
Cleo	
Mandarin	58
UFR-16	58
Kuharske	58
Sour Orange	59
UFR-15	61
Carrizo	62
US-812	63
C-22	64
UFR-17	65
US-802	66
UFR-5	66
Volk Lemon	68



Micronutrients are known to improve performance of HLB-affected trees.

Even though Finger Lime are tolerant to HLB, a rootstock with high uptake is likely to grow better

# Ongoing Trial

- Two separate nutrition trials
- Trial 1 Identify the required nitrogen fertilization rate, evaluating 10 rootstocks
- Trials 2 Comparison of CRF versus regular fertilizer

# Conclusion

- Choice of rootstock is dependent on expected tree and fruit traits
- Volk Lemon, UFR5, and US 802 seems promising. A vigorous rootstock influences tree and fruit size
- Sour orange, G22, and Cleo produce small trees
- Swingle performance is average
- Good nutrition program is critical to sustain growth
- Specific nutrient requirement studies are underway.