

Best Horticultural Practices 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!

For successful planting....

- What is goal of planting?
- Identify the right rootstock and scion
- Good nutrition program
- Pest control
- Canopy management

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

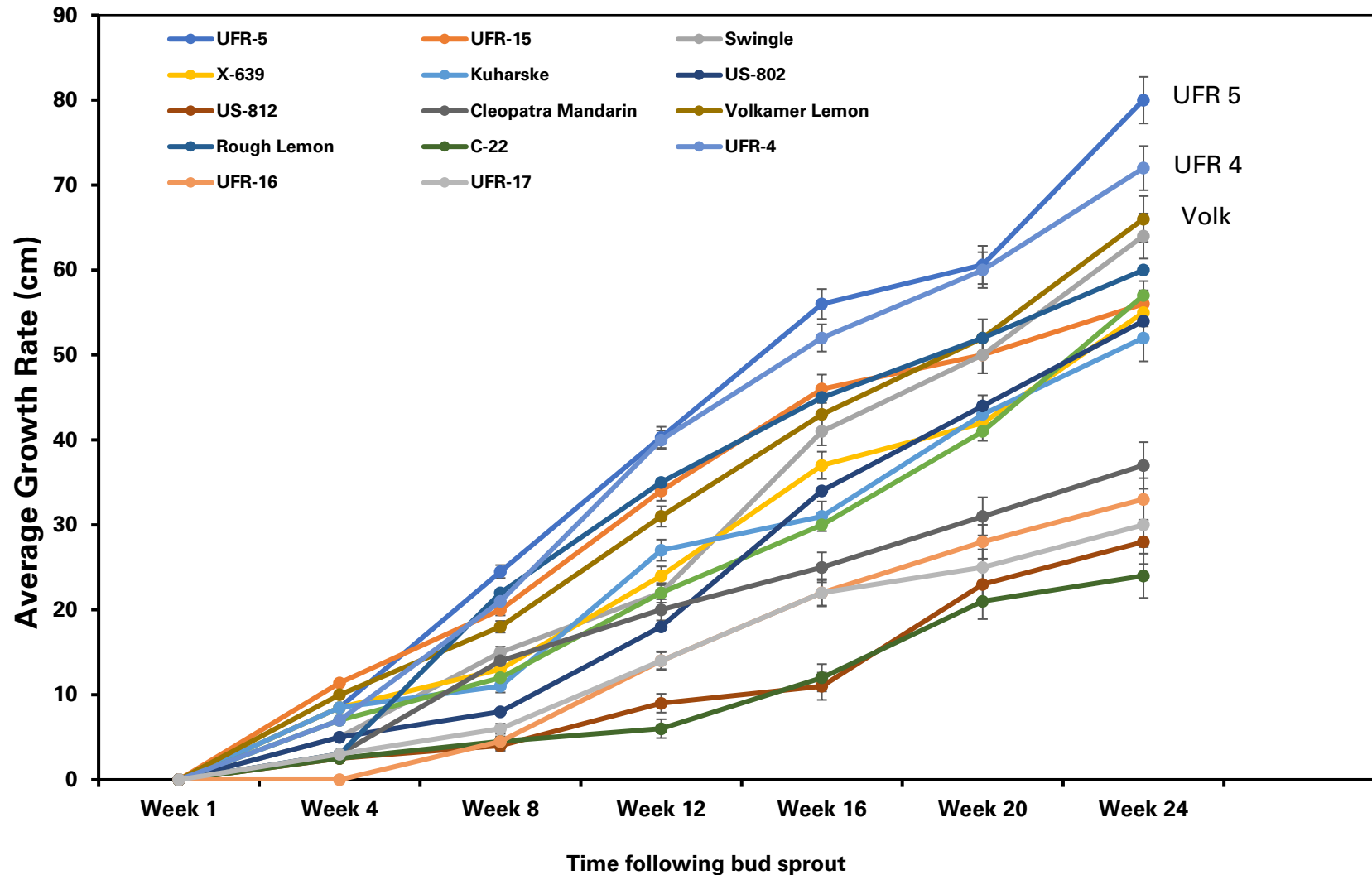
Rootstocks selection needs careful consideration

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.

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



Fertilizer-Rootstock Trial

Goal:

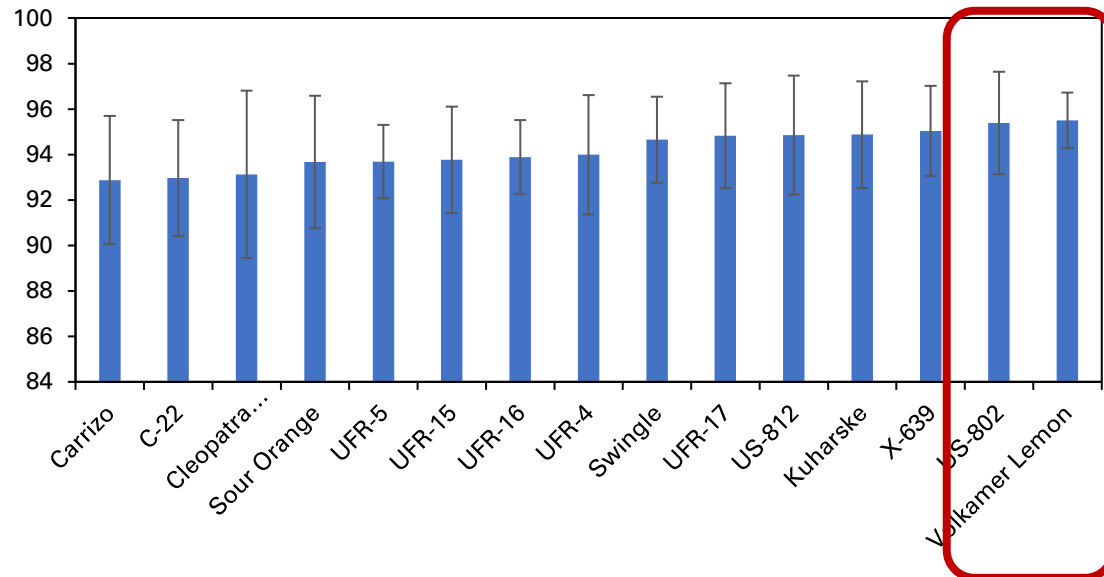
1. Identify the required rate of nitrogen, potassium and phosphorus fertilization and its interaction with rootstocks
 2. Is CRF better than conventional fertilizer for Finger Lime?
- Block planted in spring of 2017
 - DPI 50-36
 - Standard citrus management for first 4 years
 - Nutrition treatment began in 2021

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

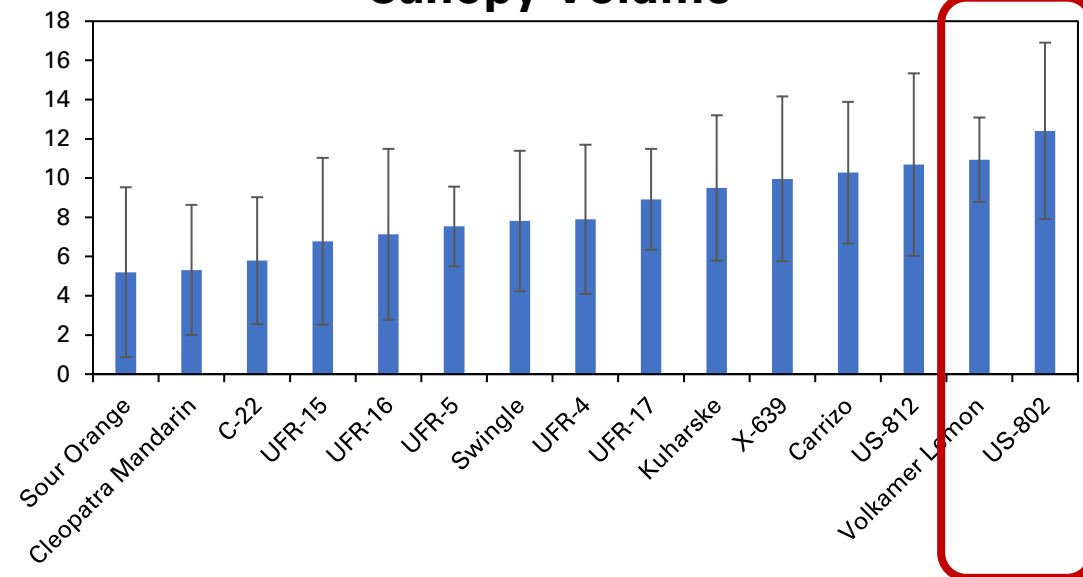
Nutrition-Rootstock

- Finger lime trees on any rootstock are very vigorous
- At the beginning of nutrition trial Volk lemon and US 802 had largest trees

Canopy Density



Canopy Volume



At the end of two years

	Rootstock	INT %	Volume m ³
→	C-22	93.0	5.8
	Carrizo	92.9	10.3
	Cleopatra Mandarin	93.1	5.3
	Kuharske	94.9	9.5
→	Sour Orange	93.7	5.2
	Swingle	94.7	7.8
	UFR-15	93.8	6.8
	UFR-16	93.9	7.1
	UFR-17	94.8	8.9
	UFR-4	94.0	7.9
	UFR-5	93.7	7.5
→	US-802	95.4	12.4
→	US-812	94.9	10.7
→	Volkamer Lemon	95.5	10.9
→	X-639	95.0	10.0

Nitrogen trial

- Three rates compared
 - 100lb N/year
 - 150 lb N/year
 - 200 lb N/year
- Hand fertilization 4 times a year

10		3.35		11.72		Minors		Slow Release Units	
Nitrogen		Phosphorous		Potash					
AMMN NITRATE 34.4	8.690%	DIAMMONIUM PHOS	3.350%	KMAG STD	3.840%	CALCIUM (CA)	6.700%	0	N from AMMN NITRATE 34.4
DIAMMONIUM PHOS	1.310%			WHITE MOP GR	7.880%	MAGNESIUM (MG)	2.000%	0	N from DIAMMONIUM PHOS
						.000% Soluble Magnesium (MG)		0	P from DIAMMONIUM PHOS
						.000% Chelated Magnesium (MG)		0	K from KMAG STD
						SULFUR (S)	9.440%	0	K from WHITE MOP GR
						.920% Sulfur (Free)			
						BORON (B)	.010%		
						IRON (FE)	.030%		
						.000% Soluble Iron (FE)			
						.030% Chelated Iron (FE)			
						MANGANESE (MN)	.070%		
						.070% Soluble Manganese (MN)			
						.000% Chelated Manganese (MN)			
						ZINC (ZN)	.070%		
						.070% Soluble Zinc (ZN)			
						.000% Chelated Zinc (ZN)			
									Other Materials (lbs)

Results

- Overall, rate of N did not affect the growth rate
 - A fast-growing tree grew fast
- X-639 and Volk showed direct response to high rate of N , however 150 lb and 100 lb yielded similar canopy growth
- UFR -15 and swingle showed decline in canopy growth with higher N

N treatment	Canopy density	Canopy Volume
	%	m ³
100lbs	94.4	8.3
150lbs	94.1	8.3
200lbs	95.0	8.5

Rootstock	Treatment	INT	Volume
X-639	200lbs	96.0	12.7
X-639	150lbs	94.7	8.9
X-639	100lbs	94.7	9.0

Rootstock	Treatment	INT	Volume
Volk	200lbs	96.4	12.1
Volk	150lbs	94.6	11.4
Volk	100lbs	95.5	9.3

Swingle	200lbs	94.0	6.2
Swingle	150lbs	95.8	8.2
Swingle	100lbs	94.0	8.7

UFR-15	200lbs	94.6	5.6
UFR-15	150lbs	91.5	4.4
UFR-15	100lbs	95.2	10.3

Nutrient analysis

- Nutrient scoring places UFR5 with the highest amount of nutrients and x639 with the lowest whereas Volk is second highest in nutrient scoring.
- X639 is seeing dilution effect of nutrients as this rootstock is vigorous and highest in growth
- Volk is amongst rootstocks with (significant) high growth but also has high nutrient score.
 - Volk is better at nutrient uptake during periods of high growth rate?

Conventional versus CRF

- Finger Lime is highly vigorous on any rootstock
- Consistent fertilization is key for growth
- Rootstock interaction
 - US-802, only rootstock to show higher growth with CRF
 - C-22, only rootstock to higher growth with Conventional
- Overall, conventional fertilizer improved canopy growth over CRF

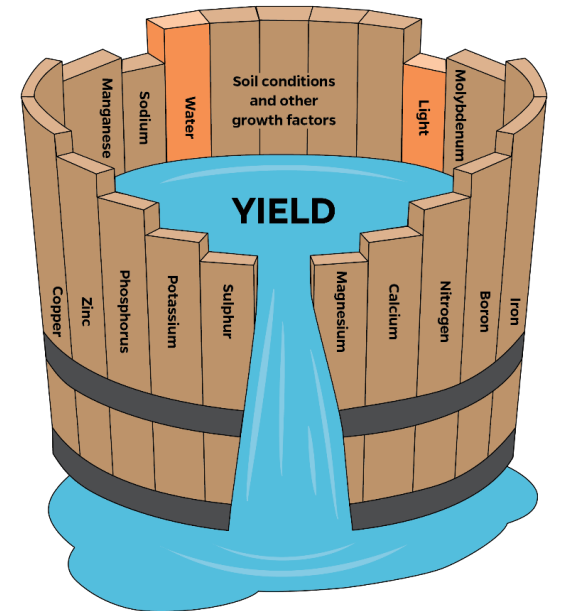
Treatment	Canopy Density	Canopy Volume
CNV	94.4	9.5
CRF	93.5	7.8

So what does this all mean?

- Volk lemon, X639, and US 812 seems promising
- Swingle has average performance
- 150-200 lb N/acre/year is ideal to promote canopy growth
- No obvious benefit of using CRF.
 - Conventional fertilizer is better for Finger lime

General guidelines for fertilization and irrigation

- High growth rate = high nutrition requirement
- 3-4 times fertilization
- Balanced and complete fertilizer
- Foliar sprays to influence fruit quality can be beneficial
- For fruiting trees, potassium sprays can help with improving fruit size
- Potassium and Calcium can improve peel integrity
- Good irrigation is critical for fruit size and improving fruit retention, drought stress should be avoided



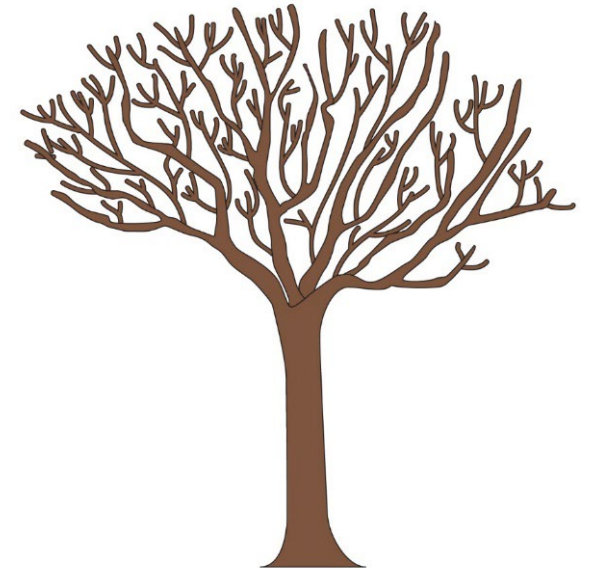
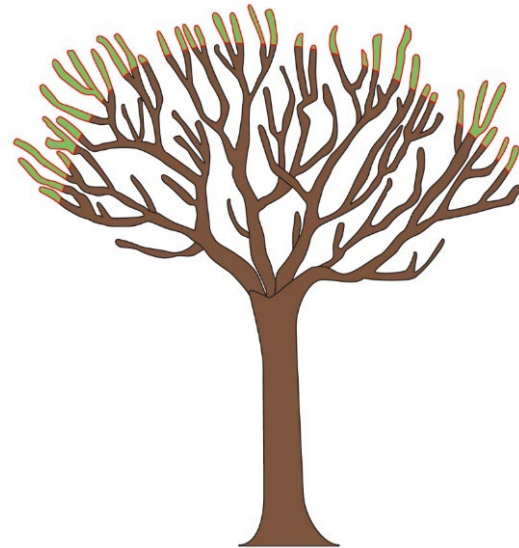
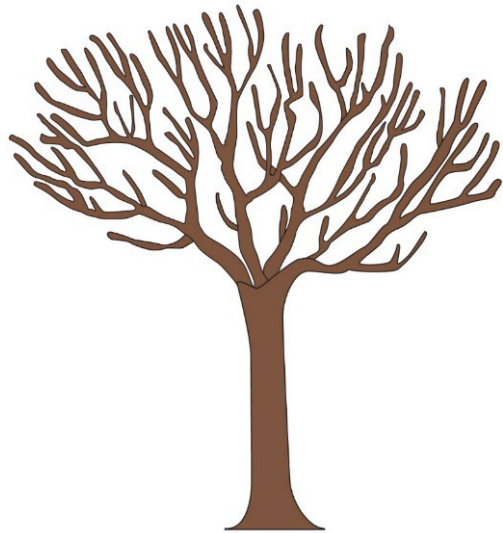
Canopy Management

- Finger Lime is vigorous and can grow big shrub
- Some finger lime varieties can be thorny
- Canopy management is essential for ease of fruit harvest, better air flow, sun light interception, better fruit quality



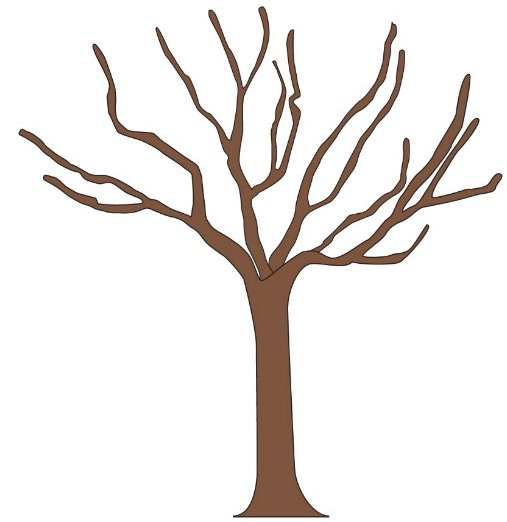
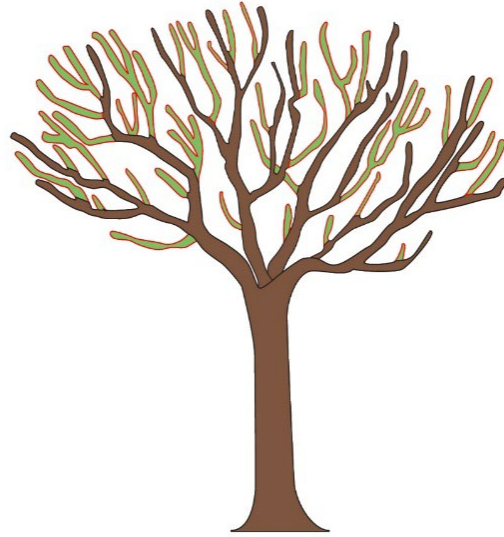
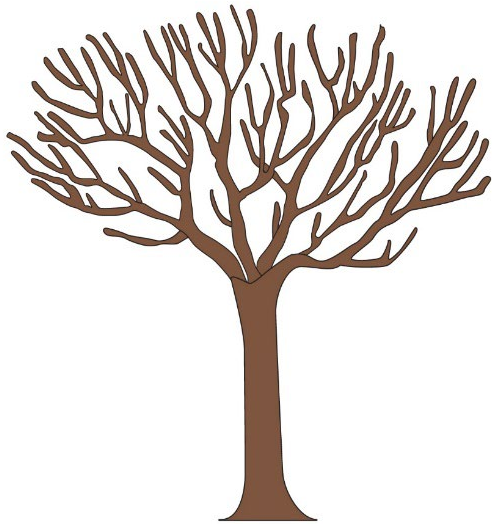
Pruning Cuts

- Heading back



Pruning Cuts

- Thinning



Take home message

- Most rootstocks do well with finger lime, Volk and X-639 creates most vigorous trees
- Good nutrition is essential for good canopy growth
- 150-200 lbs N, conventional fertilizer
- Scion is more important for fruiting characteristics
- Manual pruning to open canopy is essential once trees are 5+ year old