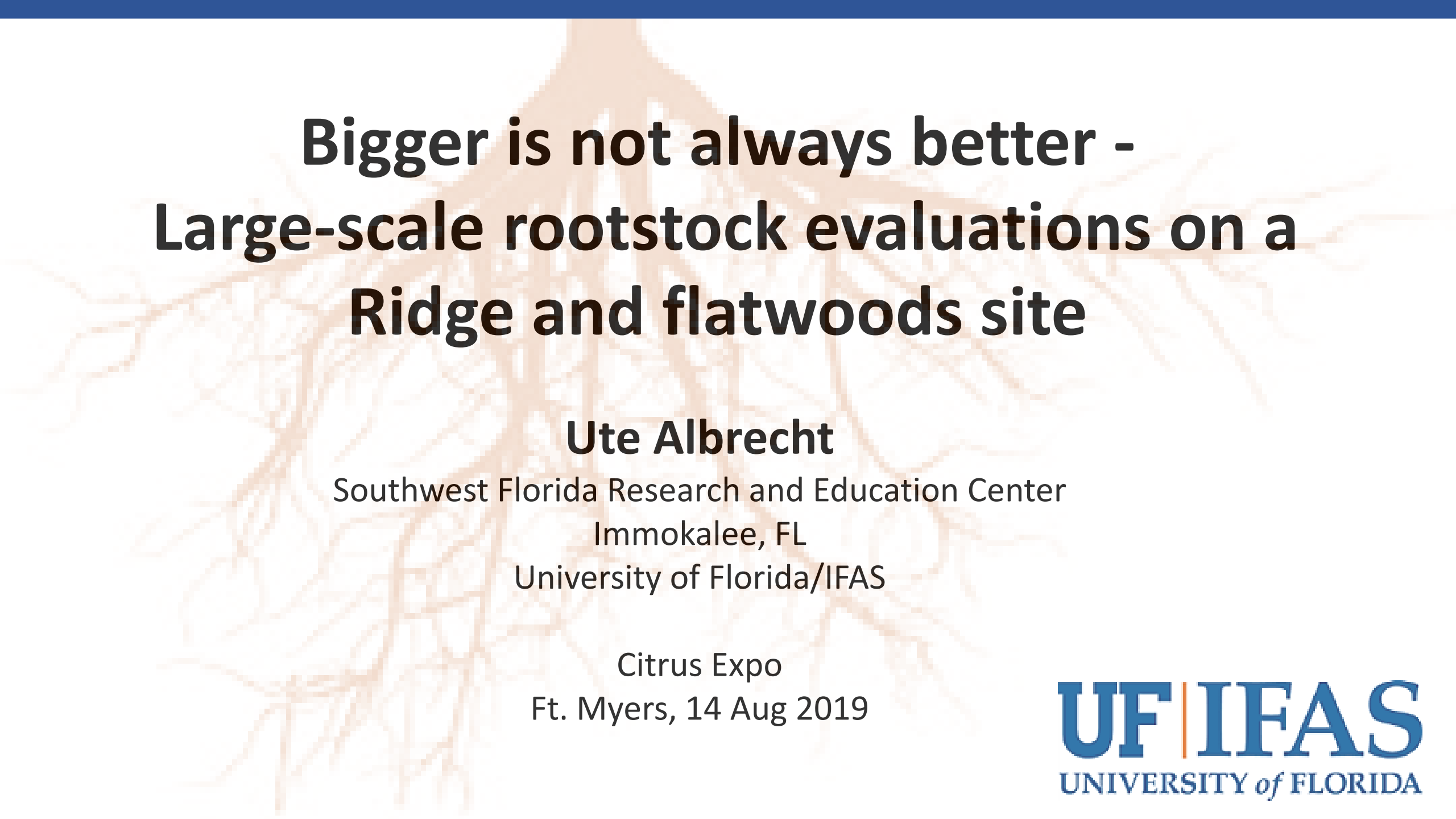




Bigger is not always better - Large-scale rootstock evaluations on a Ridge and flatwoods site

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Citrus Expo

Ft. Myers, 14 Aug 2019

CRDF Project No. 18-029C

Evaluation of citrus rootstock response to HLB
in large-scale existing field trials



UF | IFAS
UNIVERSITY of FLORIDA

Objective

Investigate rootstock effects on the performance of Valencia and Hamlin trees grown on a typical Ridge and flatwoods site under HLB-endemic conditions



Trials

- Planting date: October 2015
(Drs. Jude Grosser, Fred Gmitter, Bill Castle)
- Collaborator: Lykes Bros.
- Locations:
 - ❖ Basinger (Highlands County)
 - ❖ Lake Wales (Polk County)
- Scion varieties:
 - ❖ Hamlin
 - ❖ Valencia
- Rootstock varieties: 30-50 (UF, CA, Spain, few USDA)



UF Rootstocks



Rootstock name	Parentage	Origin
6058 + 2071-02-2	SO+Rangpur x Cleopatra+Trifol. Or.	Florida (UF)
Amb + Benton	Amblycarpa + Benton citrange	Florida (UF)
Amb + Czo	Amblycarpa + Carrizo citrange	Florida (UF)
Changsha + 50-7 (UFR-6)	Changsha + Trifol. Or. 50-7	Florida (UF)
Changsha + Benton	Changsha + Benton citrange	Florida (UF)
Green 2 (UFR-17)	Nova+HBPummelo x SO+Carrizo	Florida (UF)
Green 3	Nova+HBPummelo x SO+Carrizo	Florida (UF)
Green 7	Nova+HBPummelo x SO+Carrizo	Florida (UF)
Orange 13	Nova+HBP x Cleo+Arg. Trifol. Or.	Florida (UF)
Orange 14	Nova+HBP x Cleo+Arg. Trifol. Or.	Florida (UF)
Orange 15 (UFR-3)	Nova+HBP x Cleo+Arg. Trifol. Or.	Florida (UF)
Orange 19 (UFR-4)	Nova+HBP x Cleo+Arg. Trifol. Or.	Florida (UF)
Orange 3 (UFR-1)	Nova+HBP x Cleo+Arg. Trifol. Or.	Florida (UF)
Orange 4 (UFR-2)	Nova+HBP x Cleo+Arg. Trifol. Or.	Florida (UF)
Sorp + Sh-991	SO+Rangpur x Cleo+Trifol. Or.	Florida (UF)
Wgft + 50-7	White grapefruit + Trifol. Or. 50-7	Florida (UF)
White 1	Nova+HBP x Succari+Arg. Trifol.	Florida (UF)
White 3	Nova+HBP x Succari+Arg. Trifol.	Florida (UF)
White 4 (UFR-5)	Nova+HBP x Succari+Arg. Trifol.	Florida (UF)
B11R4T22	Flying Dragon x C. obovoidea	Florida (UF)

Other Rootstocks

Rootstock name	Parentage	Origin
C-146	Sunki Mandarin x Swingle Trifol. Or.	California (UCR)
C-22	Bitters Sunki x Swingle Trifol. Or.	California (UCR)
C-54	Carpenter Sunki x Swingle Trifol. Or.	California (UCR)
C-57	Furr Sunki x Swingle Trifol. Or.	California (UCR)
SP-1	Cleopatra x Trifol. Or.	Spain (IVIA)
SP-2	Troyer x Cleopatra	Spain (IVIA)
SP-3	Cleopatra x Trifol. Or.	Spain (IVIA)
SP-4	King Mandarin x Trifol. Or.	Spain (IVIA)
SP-5	King Mandarin x Trifol. Or.	Spain (IVIA)
SP-6	King Mandarin x Trifol. Or.	Spain (IVIA)
SP-7	Cleopatra x Trifol. Or.	Spain (IVIA)
SP-8	Cleopatra x Trifol. Or.	Spain (IVIA)
V-17	Volkamer lemon x Trifol. Or.	Spain (IVIA)
Swingle	Duncan Grapefruit x Trifol. Or.	Florida USDA
US-897	Cleopatra x Flying Dragon Trifol. Or.	Florida USDA
X-639	Cleopatra x Rubidoux Trifol. Or.	California (UCR)

'Bitters' (C-22)

- Produces a small tree, with high yield relative to canopy volume.
- Good tolerance to freezing.
- Very tolerant of calcareous soil.

'Carpenter' (C-54)

- Produces medium to large trees, with good yield.
- Very tolerant of citrus nematode

'Furr' (C-57)

- Produces medium to large trees, with good yield.
- Good tolerance to freezing.
- Very tolerant to *Phytophthora parasitica*
- Very tolerant of citrus nematode.

<http://plantbiology.ucr.edu/faculty/new%20citrus%20rootstocks%202009.pdf>



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Basinger Trials – Flatwoods type site



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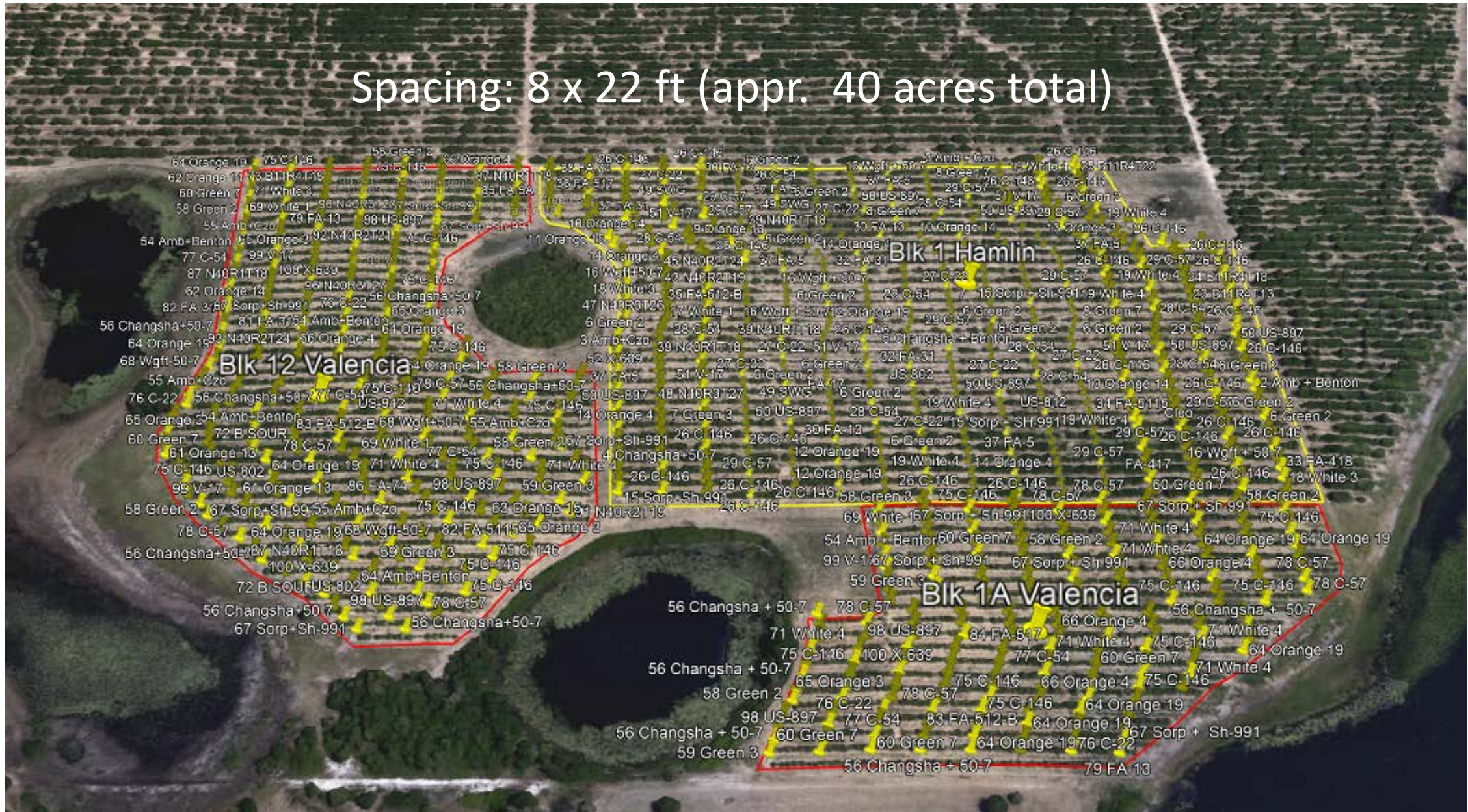


Lake Wales Trials – Ridge site

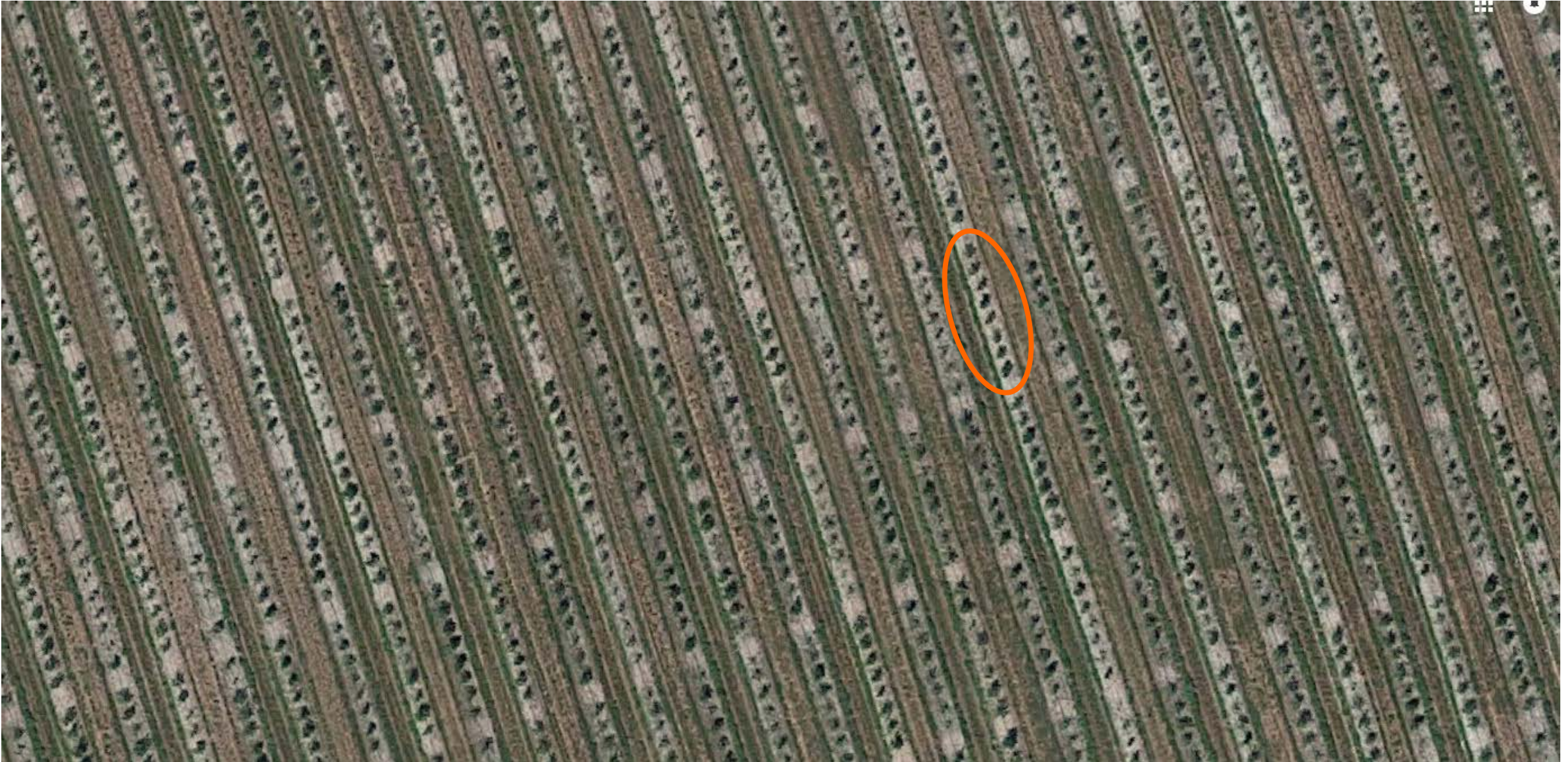


Lake Wales Trials – Ridge site

Spacing: 8 x 22 ft (appr. 40 acres total)



Eight Tree Replicates



Valencia – Basinger July 2019

Large



Valencia – Basinger July 2019

Medium



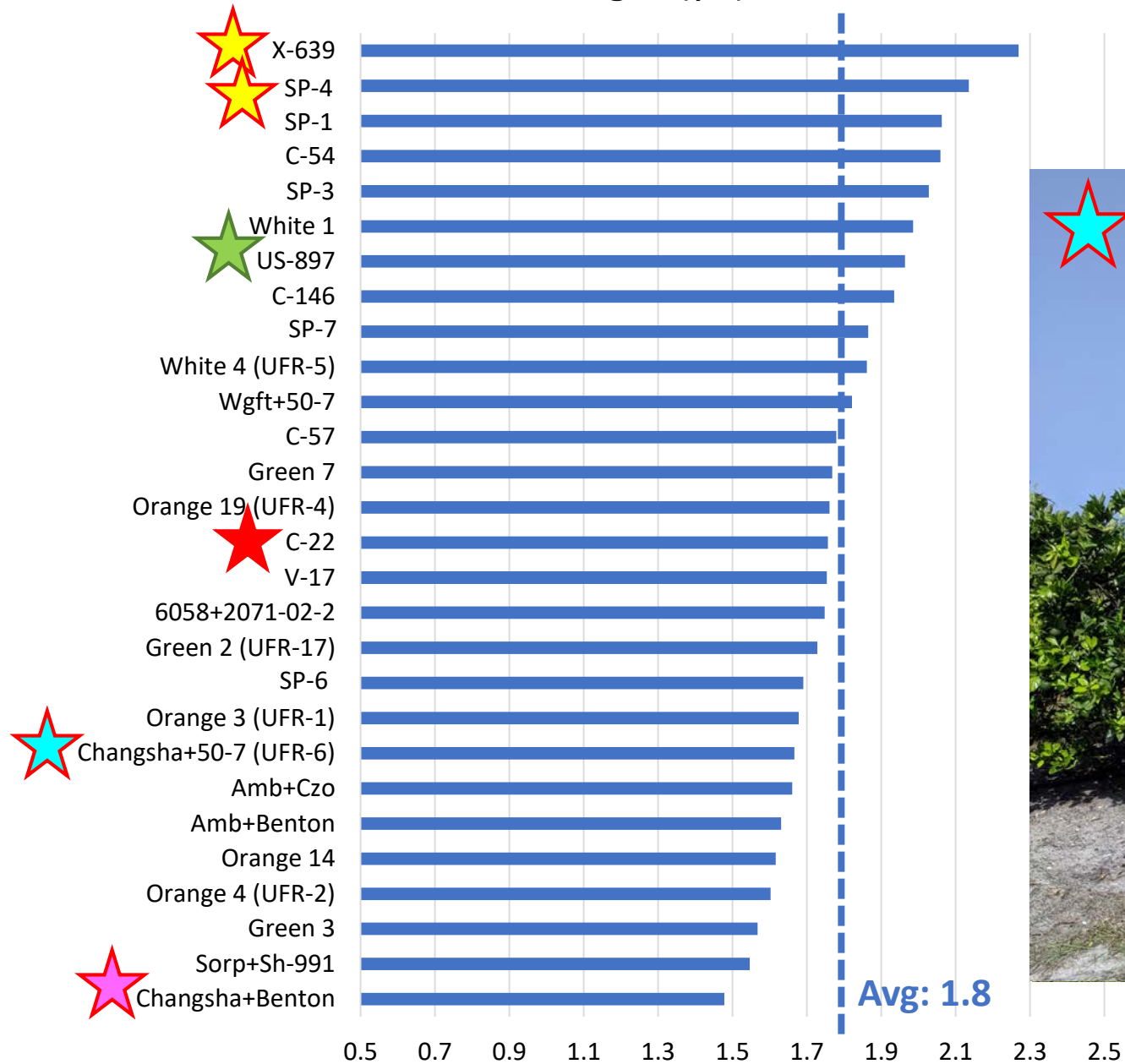
Valencia – Basinger July 2019

Small

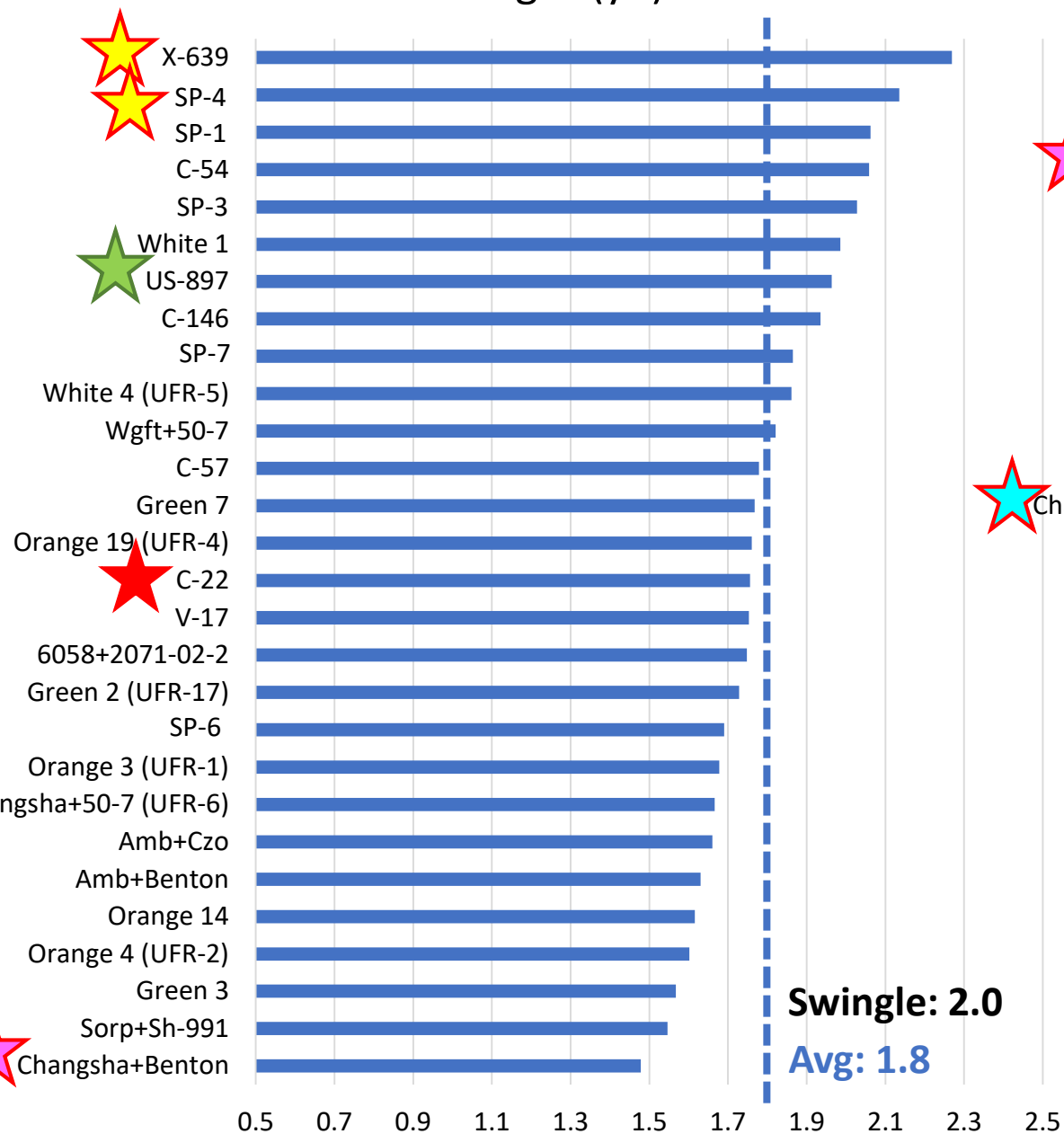


Tree height (yd)

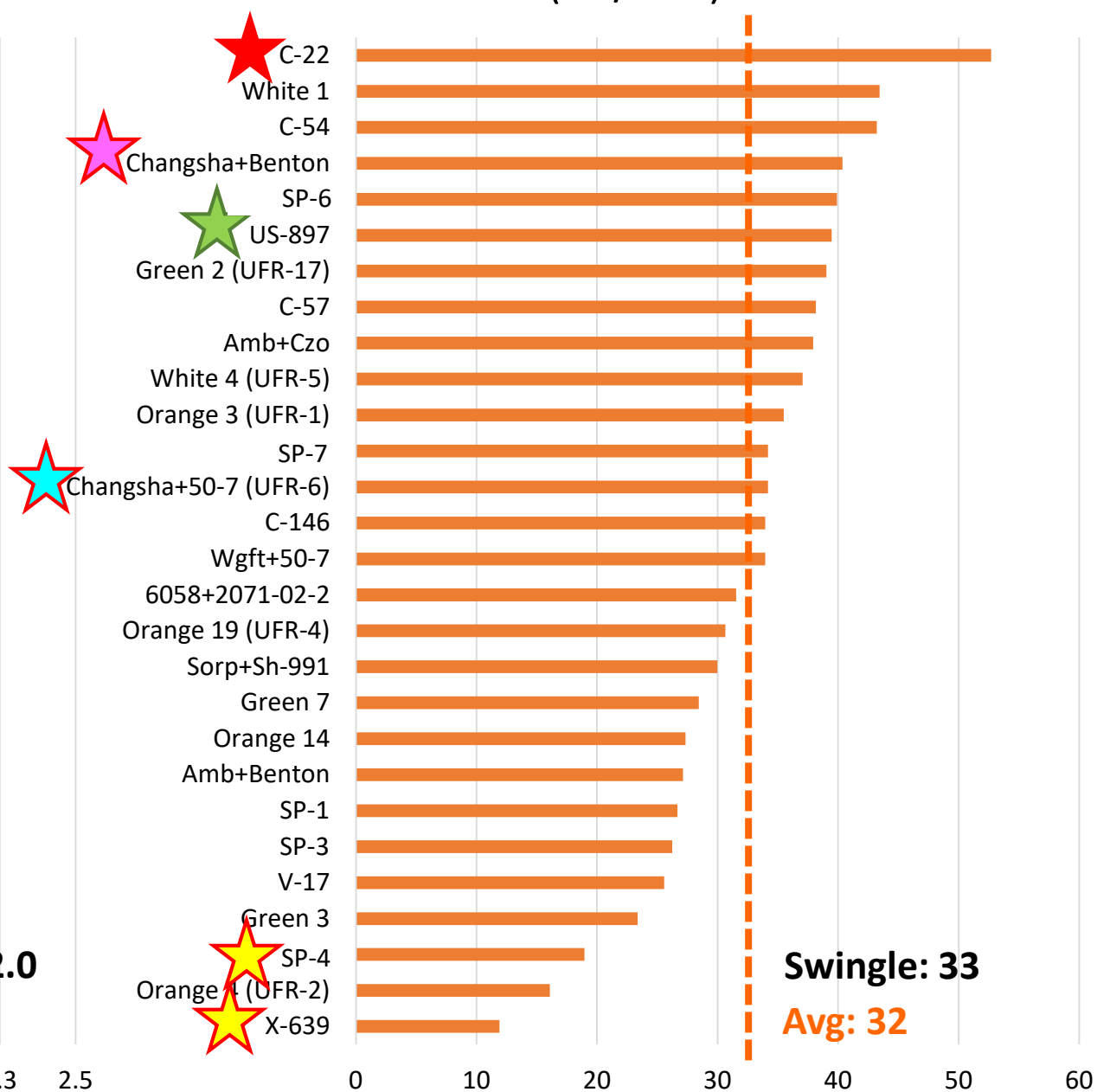
Valencia - Basinger



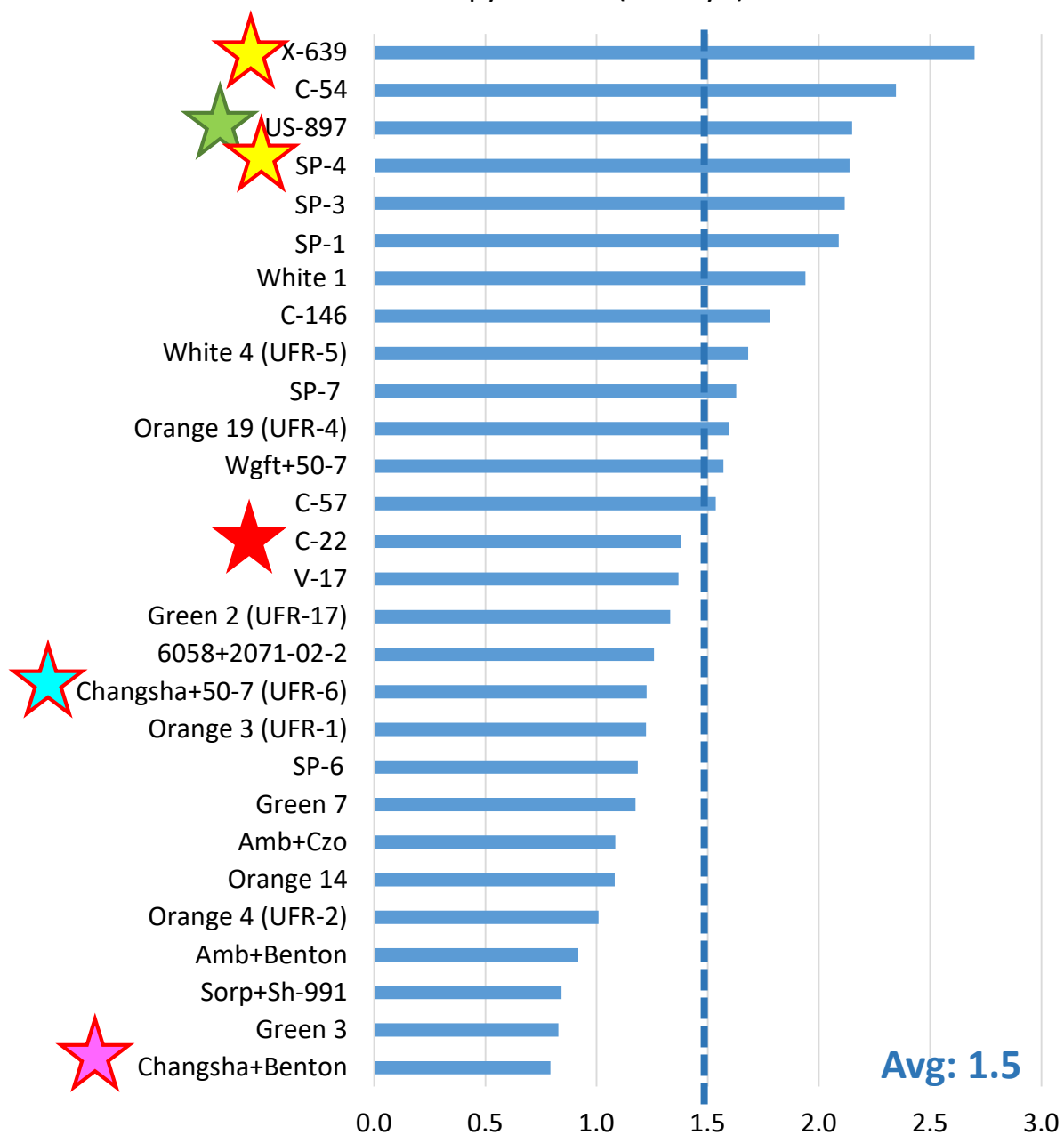
Tree height (yd)



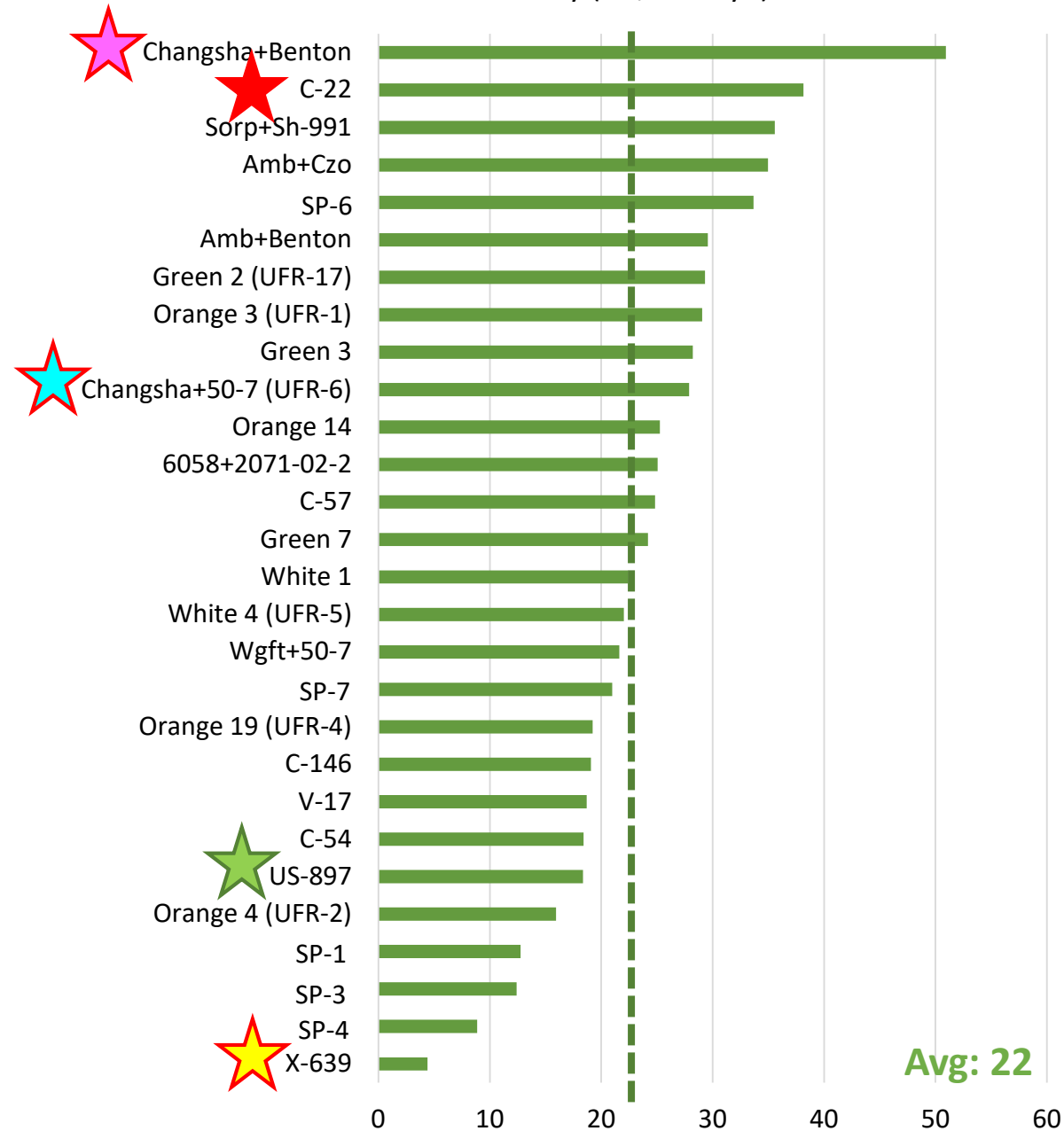
Yield (lbs/tree)



Canopy volume (cubic yd)



Yield efficiency (lbs/cubic yd)



Tree health



Large, low yield efficiency



Small, higher yield efficiency

Fruit quality – Valencia Basinger & Lake Wales

		Fruit wt. (oz)	Juice (%)	TSS(%)	Acid (%)	Ratio	Juice color (CN)
★	Changsha+Benton	6.7	59.7	10.9	0.75	14.5	37.1
	SP-6	6.5	58.5	10.8	0.70	16.0	37.2
	White 4 (UFR-5)	6.9	57.8	10.6	0.77	13.8	36.8
★	White 1	6.9	57.7	10.5	0.73	14.4	36.6
	Changsha+50-7 (UFR-6)	6.8	58.9	10.5	0.74	14.2	36.8
	Sorp+Sh-991	6.6	58.6	10.2	0.70	14.7	36.8
	Green 3	7.5	57.2	10.1	0.67	15.0	36.7
	Amb+Benton	6.8	58.5	10.0	0.70	14.2	36.9
	Orange 3 (UFR-1)	7.1	56.9	9.8	0.69	14.3	36.8
	V-17	6.5	55.9	9.8	0.63	15.7	36.5
★	C-57	6.9	57.6	9.7	0.67	14.5	36.9
	C-22	6.9	57.7	9.7	0.64	15.2	36.7
	C-146	7.1	56.7	9.6	0.63	15.2	36.6
	Orange 19 (UFR-4)	6.6	58.0	9.6	0.66	14.6	36.6
	Green 7	7.5	56.6	9.5	0.66	14.4	35.9
	Green 2 (UFR-17)	7.0	56.5	9.5	0.69	13.9	36.4
	Orange 14	6.8	57.0	9.5	0.69	13.9	36.6
★	C-54	7.1	57.3	9.4	0.66	14.4	36.6
	US-897	7.1	58.4	9.4	0.65	14.4	36.8
	SP-7	7.3	57.3	9.2	0.64	14.6	36.7
	Orange 4 (UFR-2)	6.9	55.9	9.2	0.62	15.0	36.7
★	SP-5	7.6	55.0	8.7	0.54	16.7	36.7
	SP-4	7.5	52.7	8.5	0.57	14.9	36.0
	SP-3	7.3	50.7	8.4	0.57	14.9	36.0
★	SP-1	7.2	54.5	8.4	0.60	14.1	36.6
	X-639	7.2	52.8	8.4	0.62	13.7	36.5

Note

- Data vary between the different trial locations and between scions, but the general trend is similar.
- Hamlins suffered more fruit drop from citrus canker due to the aftermath of hurricane Irma.



Rootstock performance across all 4 trials

	Rootstock	Yield (lbs/tree)	Height (yd)	Canopy volume (yd ³)	Yield efficiency (lbs/yd ³)
★	C-22	33.34	1.82	1.75	19.0
	SP-6	31.82	1.79	1.40	22.7
★	C-146	29.99	2.02	1.98	15.2
	US-897	29.30	1.97	2.07	14.2
	White 4 (UFR-5)	29.02	1.85	1.58	18.3
	C-54	28.67	2.10	2.42	11.8
	C-57	28.38	1.95	2.00	14.2
	SP-7	26.83	1.95	1.88	14.2
★	Changsha+Benton	24.48	1.50	0.84	29.2
	V-17	24.26	1.83	1.49	16.3
★	Changsha+50-7 (UFR-6)	23.75	1.67	1.19	20.0
	Green 2 (UFR-17)	22.54	1.70	1.24	18.1
	Orange 19 (UFR-4)	22.36	1.84	1.73	12.9
	SP-1	21.54	1.99	2.03	10.6
	Orange 14	21.48	1.76	1.37	15.6
	Orange 3 (UFR-1)	21.23	1.71	1.27	16.7
★	SP-4	20.70	2.08	2.07	10.0
	SP-3	20.26	2.00	2.08	9.7
★	X-639	19.16	2.23	2.71	7.1
	Amb+Benton	17.13	1.48	0.78	21.8
	Orange 4 (UFR-2)	16.43	1.70	1.22	13.5
	Sorp+Sh-991	15.59	1.55	0.86	18.1

Take Home Message

- Tree size can be considerably influenced by rootstock.
- Large trees are not always productive trees (at least not during the early production years).
- Several small tree size inducing rootstocks are very productive, yield efficient, and therefore suitable for higher density planting.



Rootstock propagation



Seed



Cutting



Tissue culture

Commercial field trials

Hendry County



Polk County



Start: April 2018

Polk County Trial (1 Year)

Effect	Height (yd)	Canopy spread (in)	Root trunk diam. (in)	Scion trunk diam. (in)
ROOTSTOCK				
<i>US-802</i>	Significant differences among trees on different rootstocks independent of the propagation method			
<i>US-812</i>				
<i>US-942</i>				
<i>US-897</i>				
<i>Swingle</i>				
	**	**	***	***
PROPAGATION METHOD				
<i>Tissue culture 1</i>	No significant differences among trees on rootstocks that were propagated by seed, cuttings, or tissue culture			
<i>Tissue culture 2</i>				
<i>Cuttings</i>				
<i>Seed</i>				
	NS	NS	NS	NS

Polk County Trial (July 2019)



Take Home Message

- Tissue culture propagation is expected to become more and more relevant for providing large numbers of new and desired rootstocks.
- Using yield-efficient trees with high-quality fruit at higher density can generate higher profits especially during the early production years.







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<https://swfrec.ifas.ufl.edu/>