

Update on Rootstock Trials on Florida Central Ridge and Flatwood-Type Sites

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Funding

Citrus Research and Development Foundation

CRDF Project No. 18-029C



Field trials

Planting date: October 2015

Trial establishment: Drs. Grosser, Castle, and Gmitter (CREC)

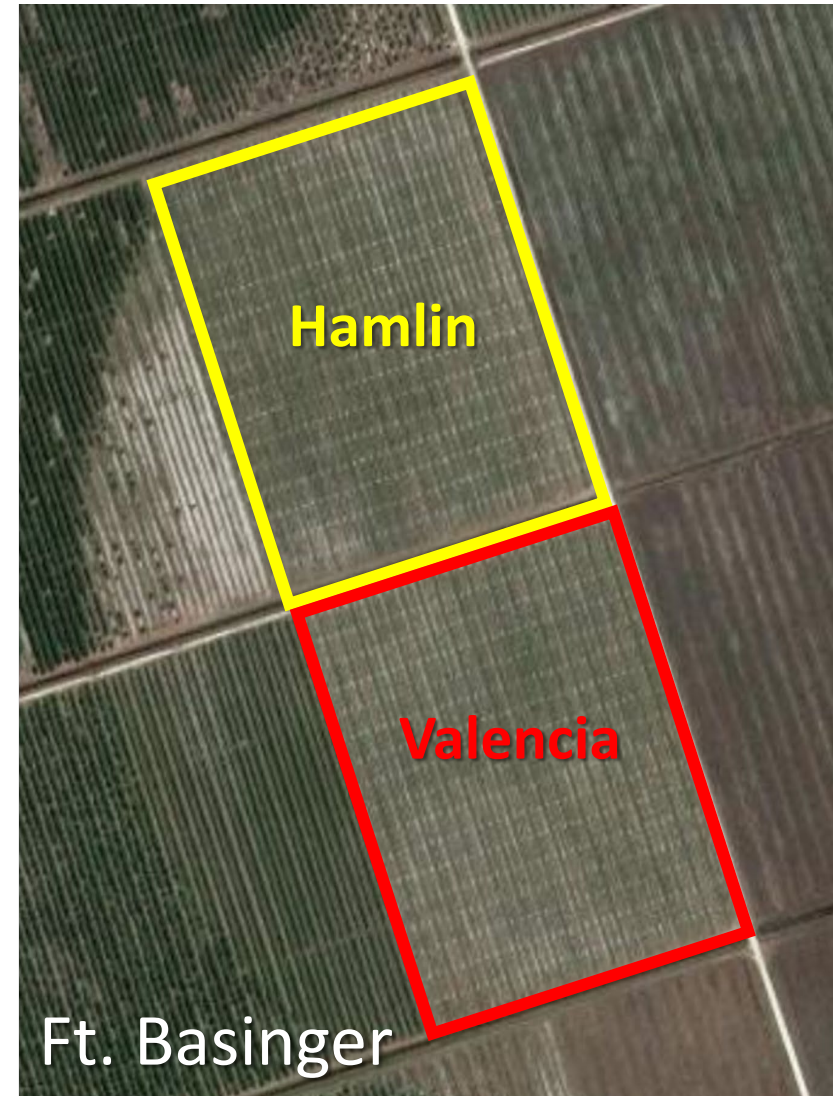
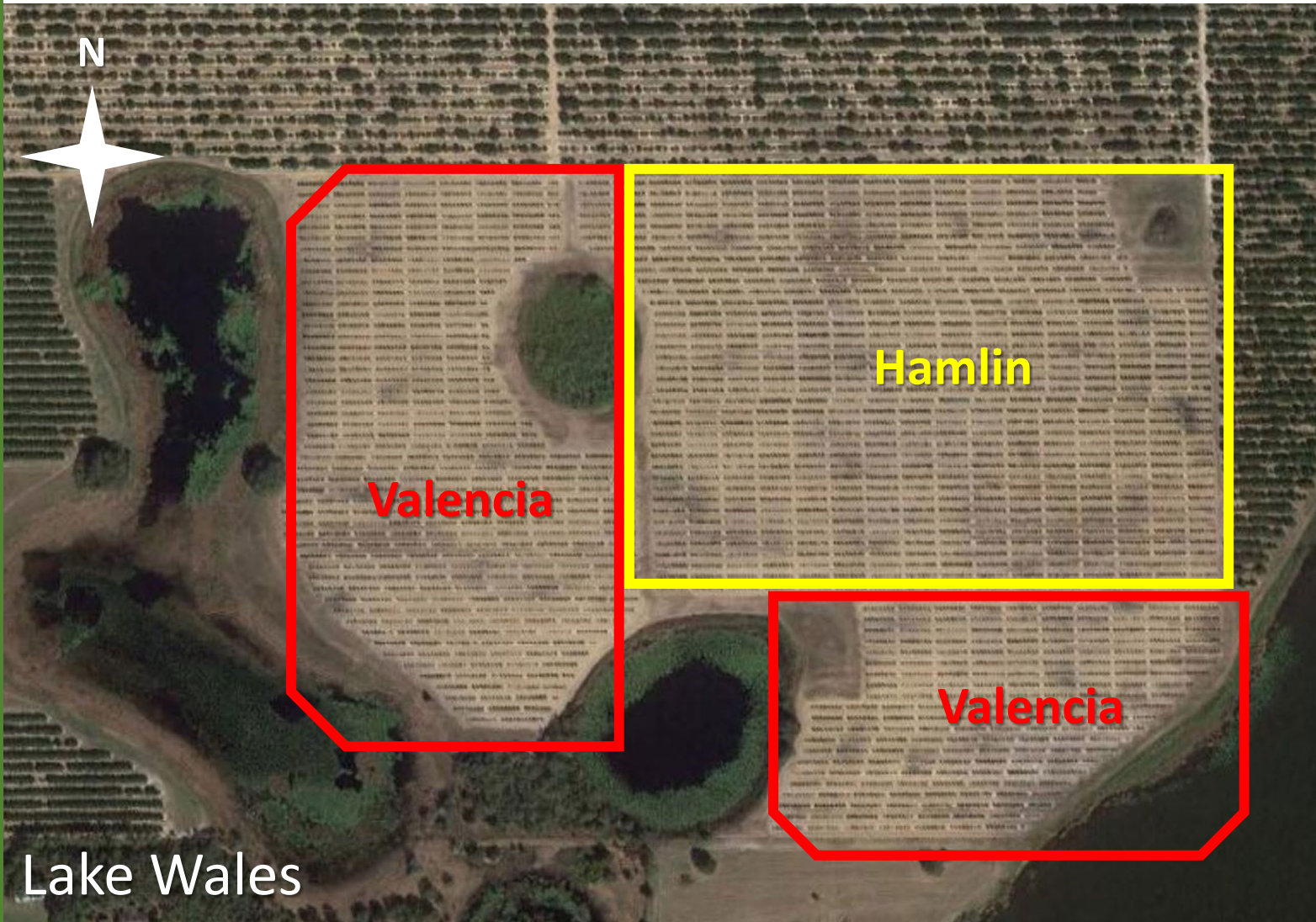
Collaborator: Lykes Bros.

Locations: Highlands County (near Fort Basinger) and Polk County (near Lake Wales)

Scions: Valencia and Hamlin

Rootstocks: 30+ (UF, CA, Spain, few USDA)

Aerial view



Trial Sites

Experimental units



Ft. Basinger (Highlands County) *Flatwoods-type*

8 x 25 ft



Lake Wales (Polk County)

Central FL Ridge

8 x 22 ft



Soil properties

	Basinger (Flatwoods)	Lake Wales (Ridge)
Sand	95.2%	99.2%
Clay	4%	0.0%
Silt	0.8%	0.8%
Organic matter content	0.72%	0.34%
CEC	4.5 meq/100 g	3.2 meq/100 g
pH	5.7	5.5

UF rootstocks - Tetraploids

Rootstock name	Parentage	Origin
UFR-1	Nova+HBP x Cleo+Arg. Trifol. Or.	Florida (UF)
UFR-2	Nova+HBP x Cleo+Arg. Trifol. Or.	Florida (UF)
UFR-3	Nova+HBP x Cleo+Arg. Trifol. Or.	Florida (UF)
UFR-4	Nova+HBP x Cleo+Arg. Trifol. Or.	Florida (UF)
UFR-5	Nova+HBP x Succari+Arg. Trifol. Or.	Florida (UF)
UFR-6	Changsha + Trifol. Or. 50-7	Florida (UF)
UFR-17	Nova+HBPummelo x SO+Carrizo	Florida (UF)
6058 + 2071-02-2	SO+Rangpur x Cleopatra+Trifol. Or.	Florida (UF)
Amb + Czo	Amblycarpa + Carrizo citrange	Florida (UF)
Changsha + Benton	Changsha + Benton citrange	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)
Wgft + 50-7	White grapefruit + Trifol. Or. 50-7	Florida (UF)
White 1	Nova+HBP x Succari+Arg. Trifol. Or.	Florida (UF)
White 3	Nova+HBP x Succari+Arg. Trifol. Or.	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	Cleopatra x Trifol. Or.	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	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.	Developed in South Africa
B Sour	Sour orange	

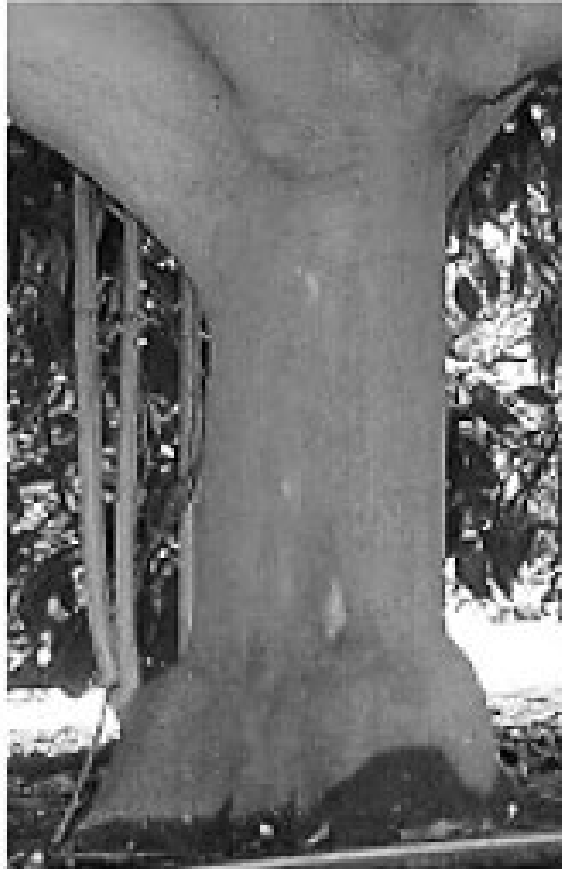
'Bitters', 'Carpenter' and 'Furr' trifoliolate hybrids

C.T. Federici, R.S. Kupper, and M.L. Roose, University of California Riverside, CA

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



Bitters (C-22)



Carpenter (C-54)



Furr (C-57)

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Overview and general observations

Tree survival

- 99.2% at Basinger (Flatwoods)
- 99.7% at Lake Wales (Ridge)
- No significant rootstock effects

HLB disease symptoms and canopy health

- All trees are expressing HLB symptoms (depending on the season: moderate to more severe) → **extensive fruit drop**
- PCR analysis confirmed all trees as infected with CLas
- Some rootstock effects for foliar HLB symptoms and canopy density, but none for CLas titers

Overview and general observations

Leaf nutrients

- Leaf nutrient concentrations were mostly in the adequate range (except for Cu)
- Rootstock effects were found each year for most macro and micronutrients, but there was no clear trend

Tree size and productivity

- Significant rootstock effects, especially between diploid and tetraploid rootstocks

Large-sized trees

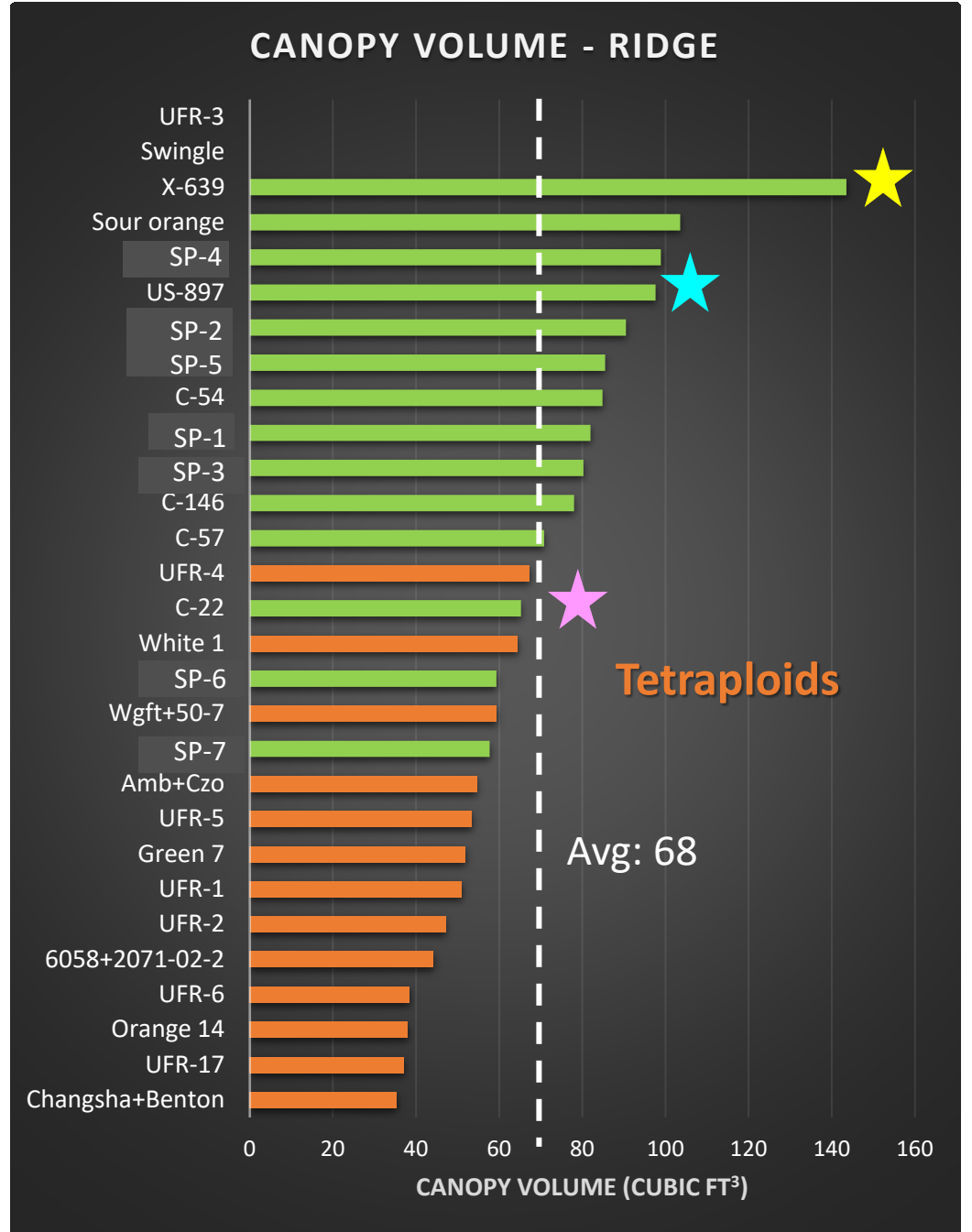
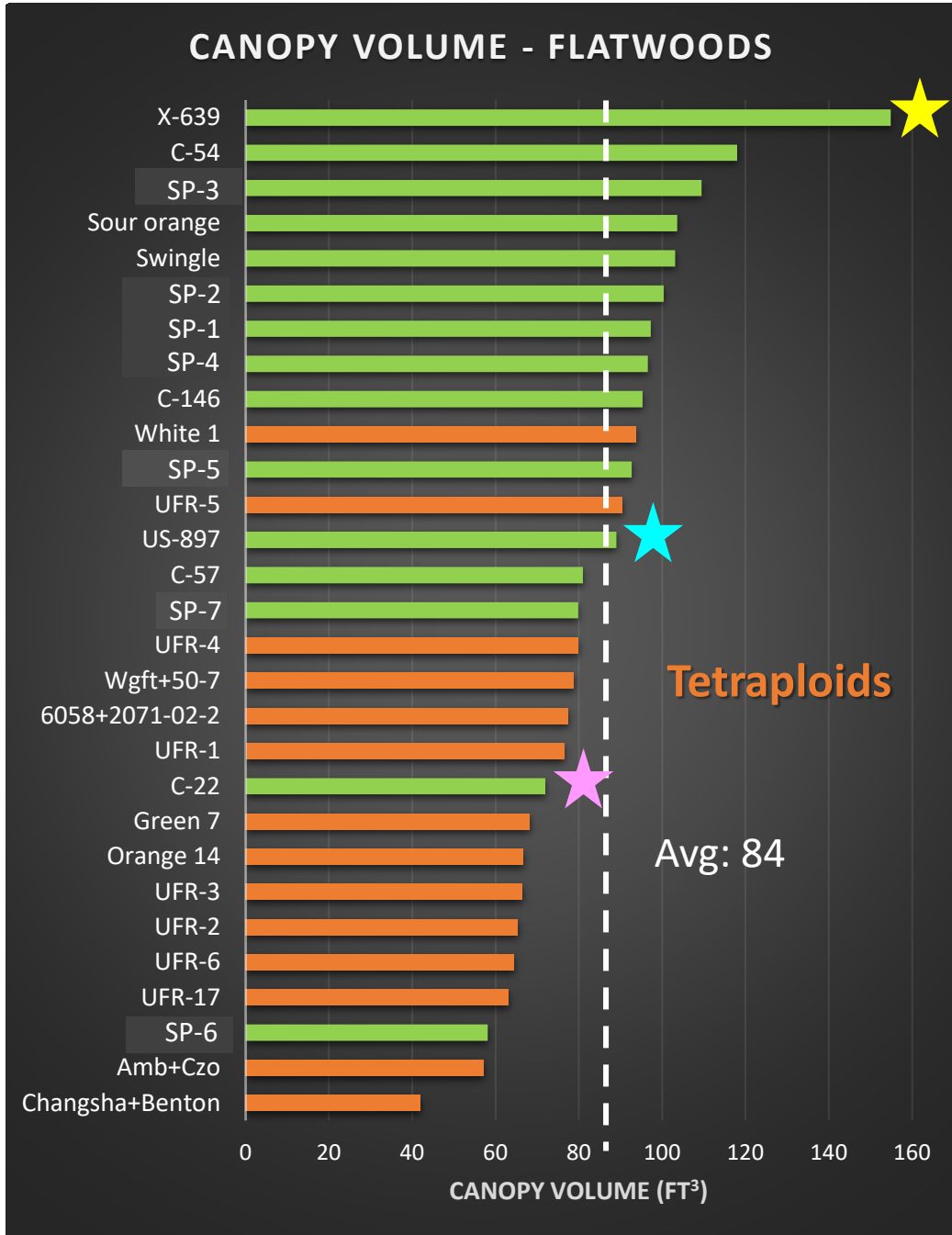


Medium-sized trees



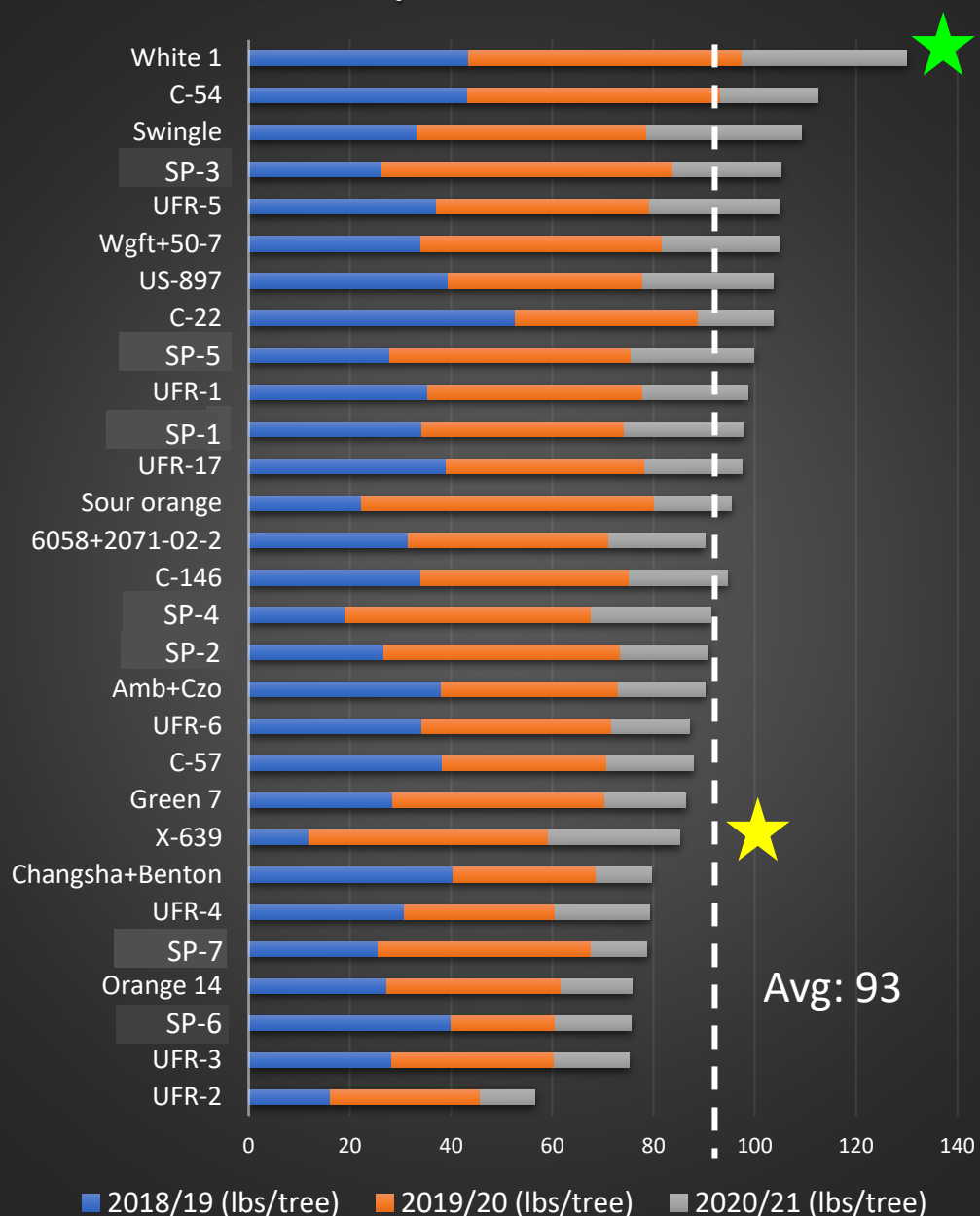
Small-sized trees



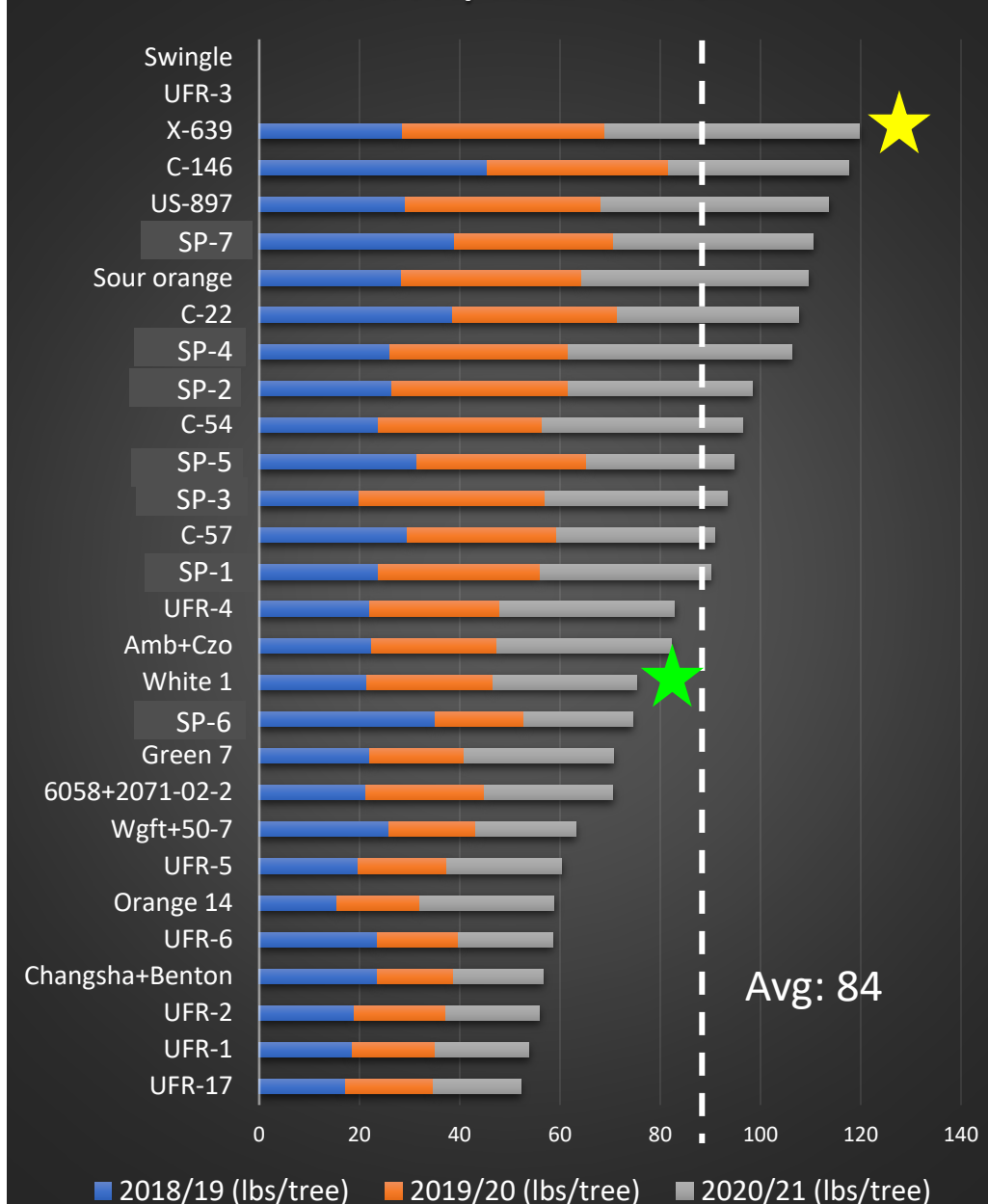


Yield (2018/19-2020/21)

LBS FRUIT/TREE - FLATWOODS



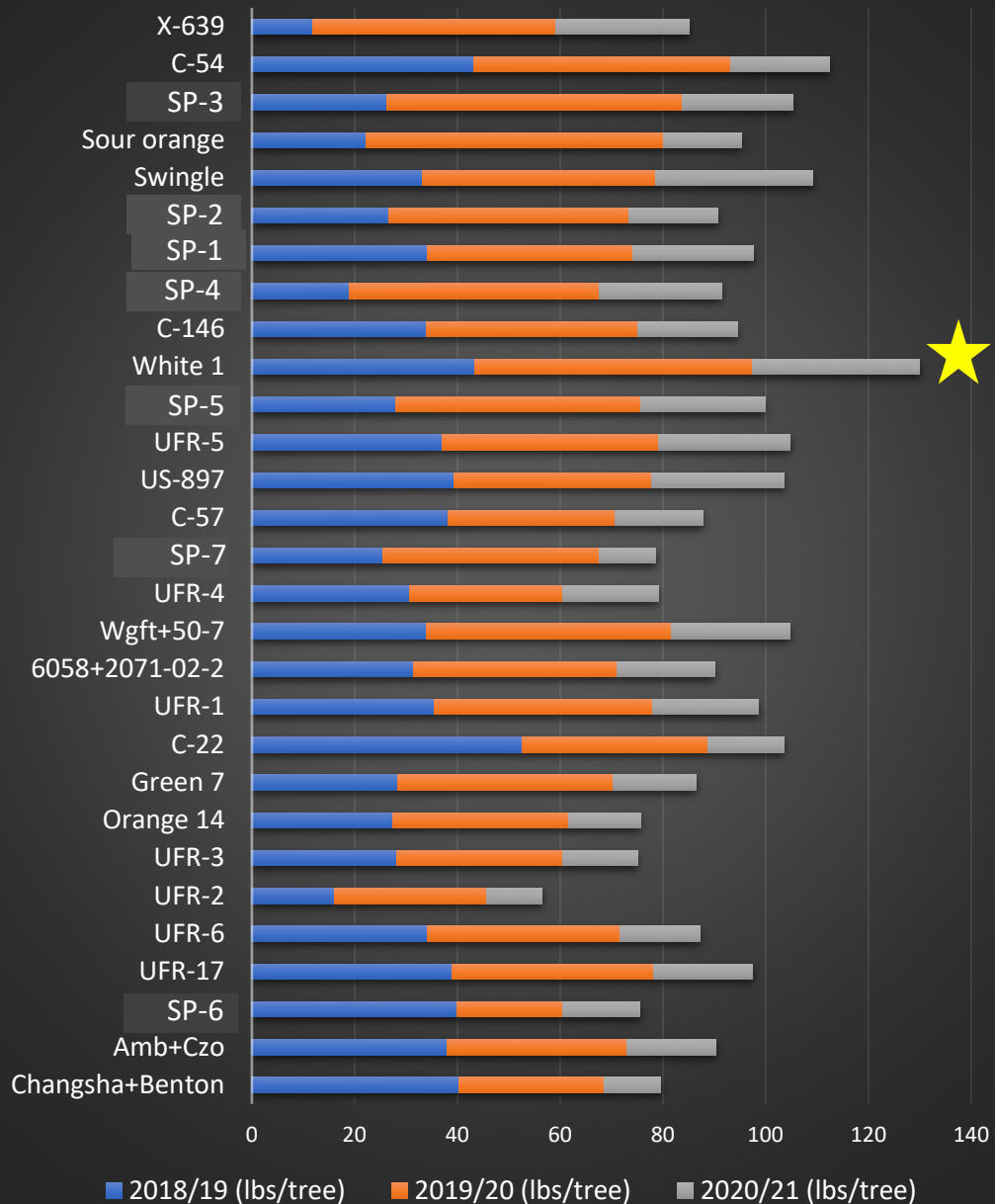
LBS FRUIT/TREE - RIDGE



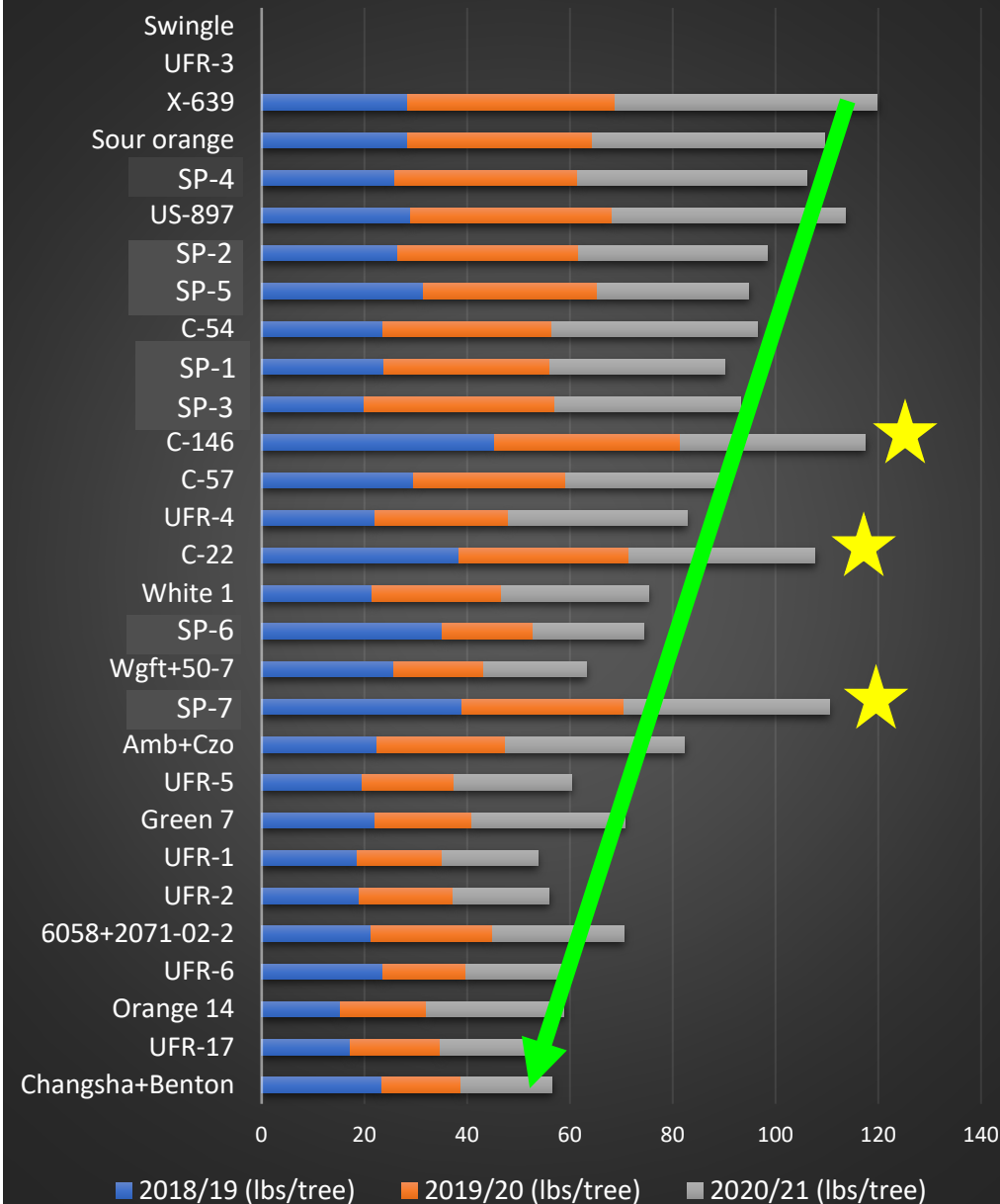
Yield (2018/19-2020/21)

Tree size

LBS FRUIT/TREE - FLATWOODS



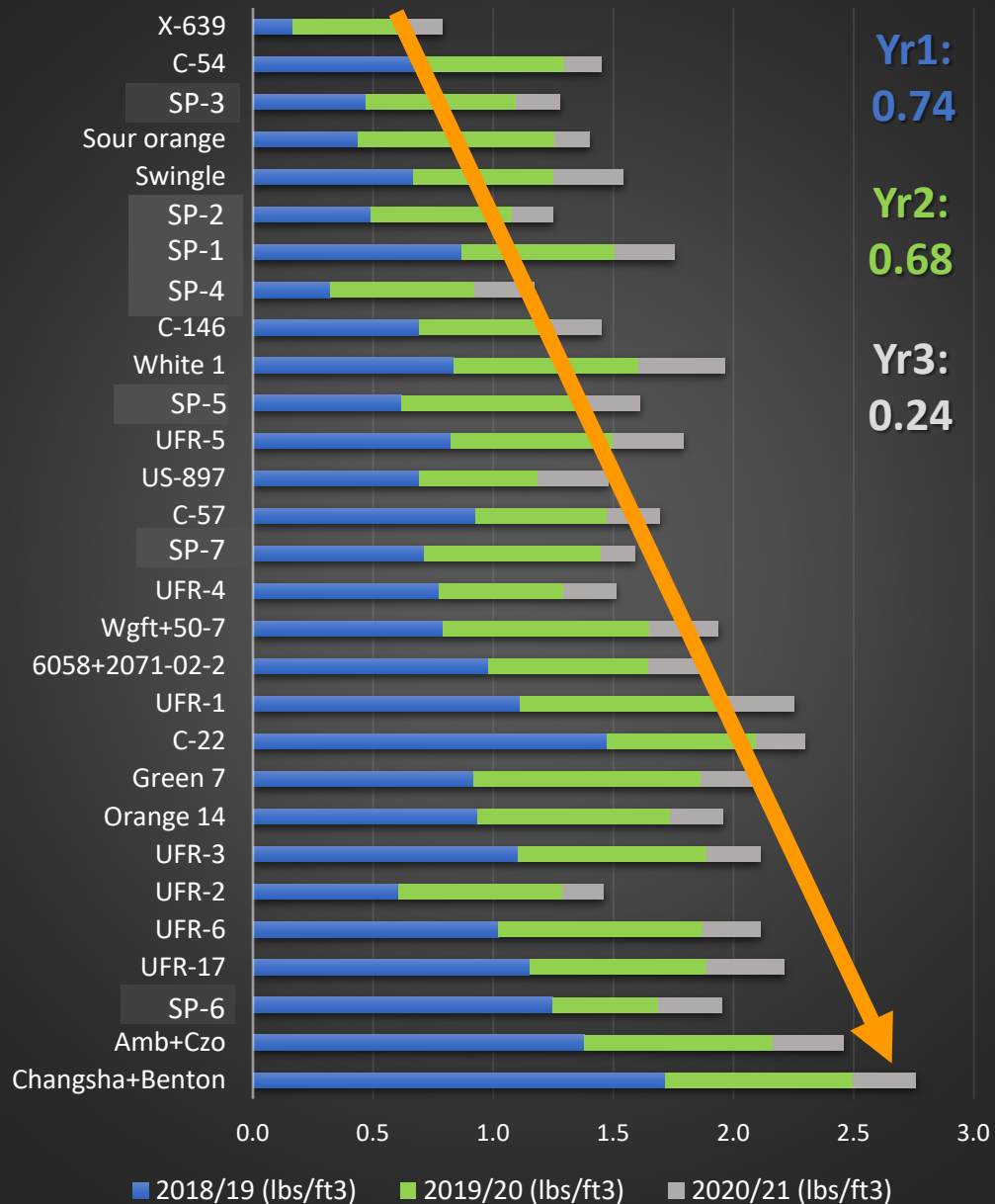
LBS FRUIT/TREE - RIDGE



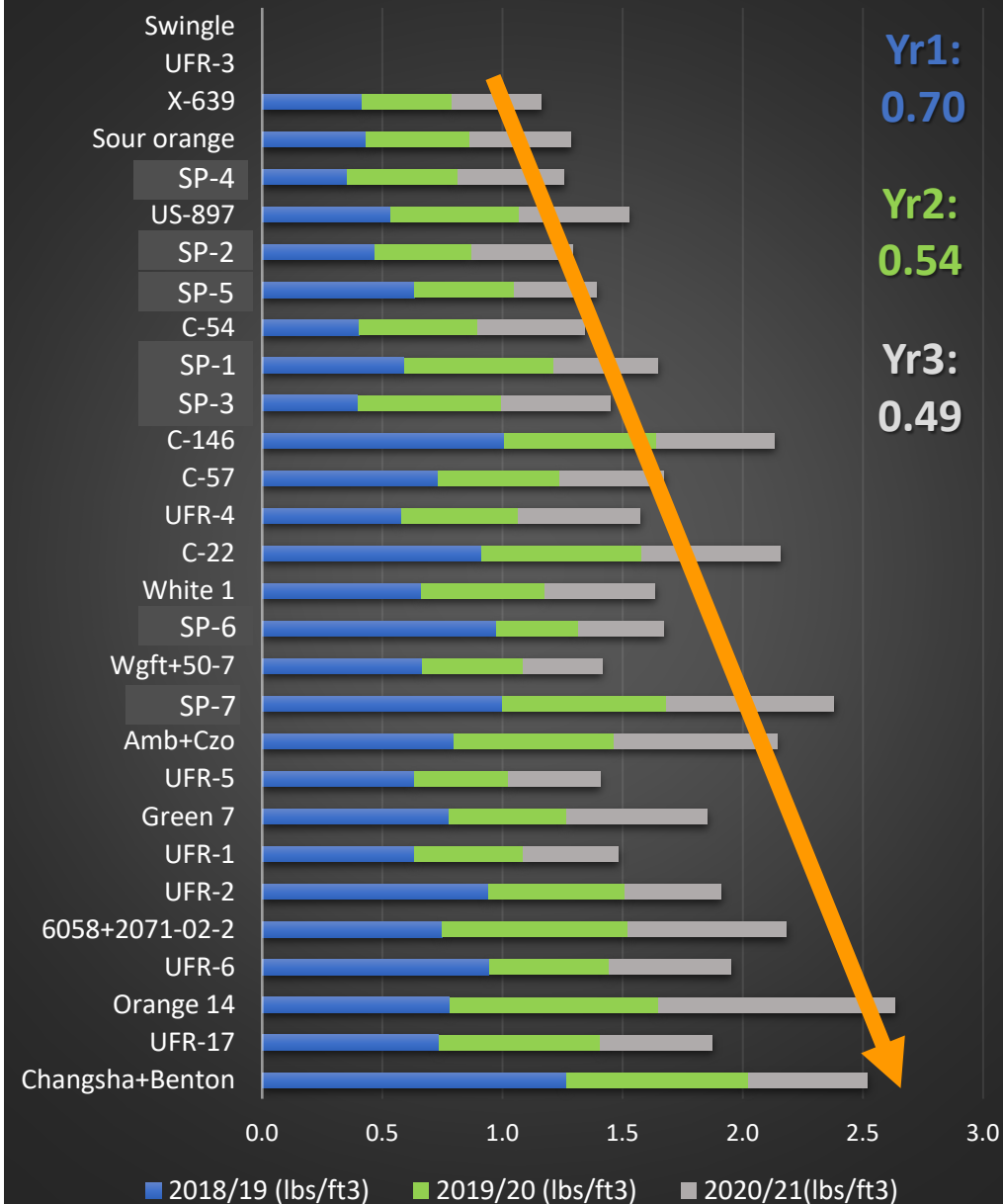
Yield efficiency

Tree size

YIELD EFFICIENCY - FLATWOODS



YIELD EFFICIENCY - RIDGE



High yield efficiency



Lower yield efficiency

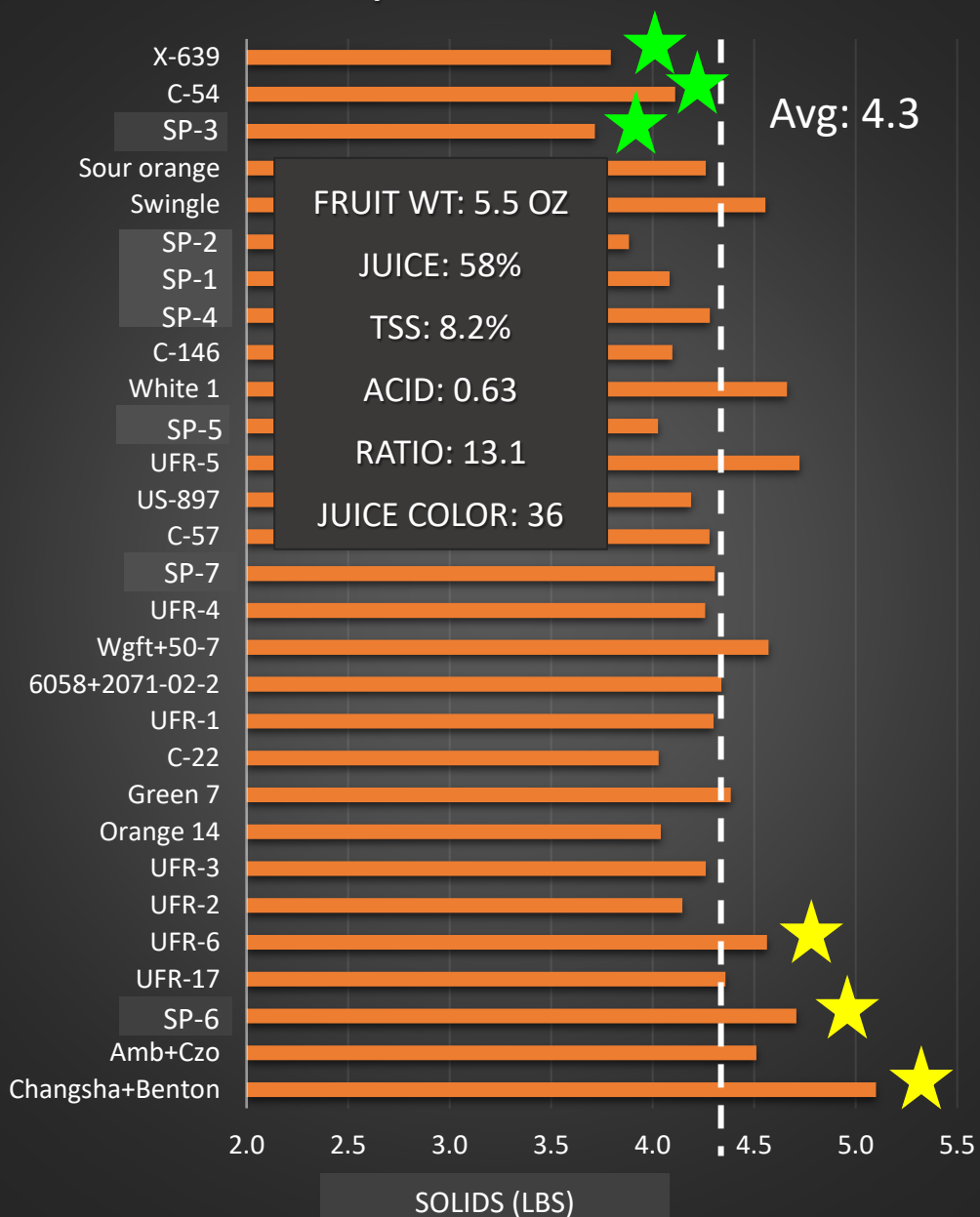


BUT: Trees on several of the small yield-efficient rootstock have now been removed by the grower

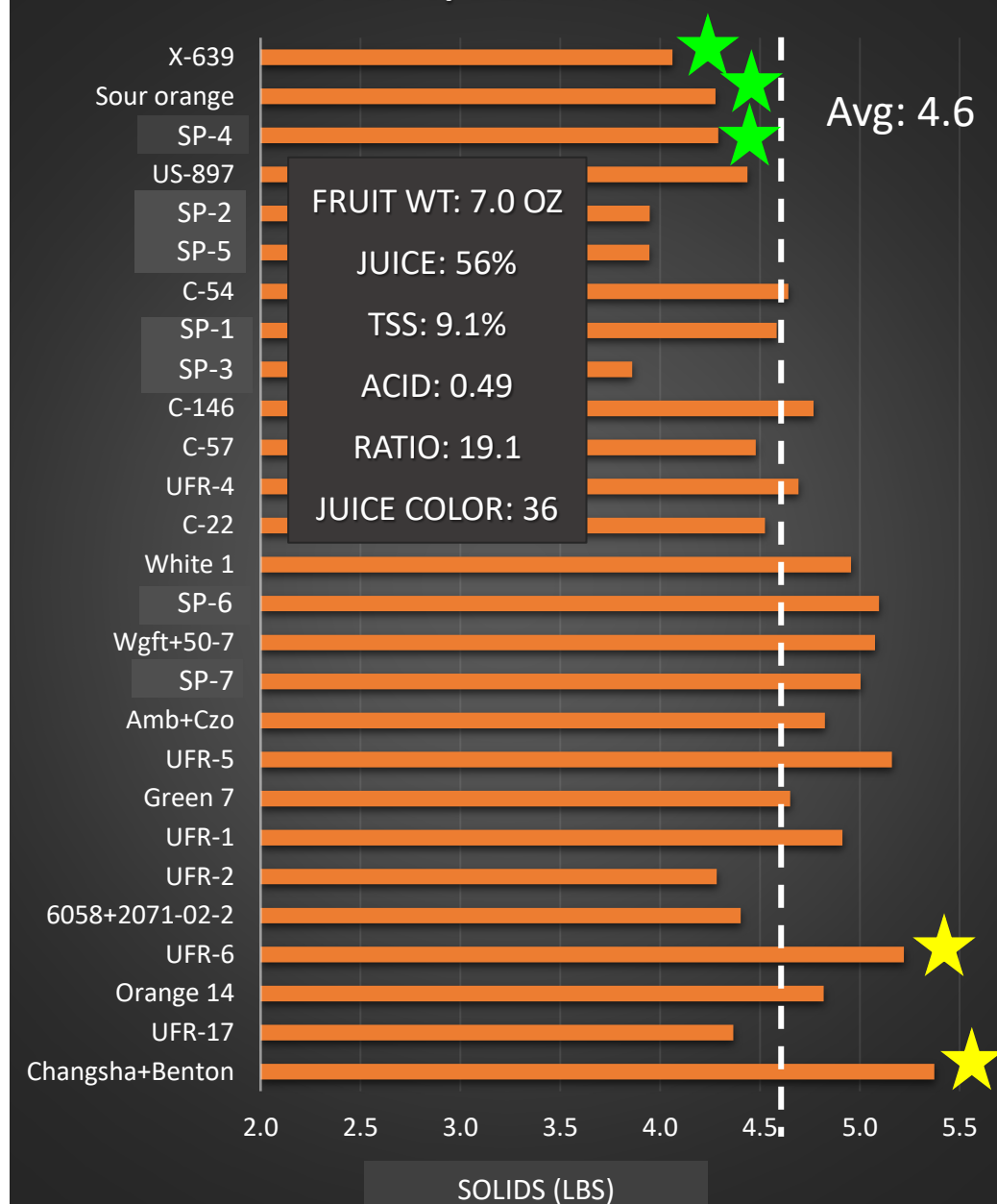
Fruit quality

Tree size

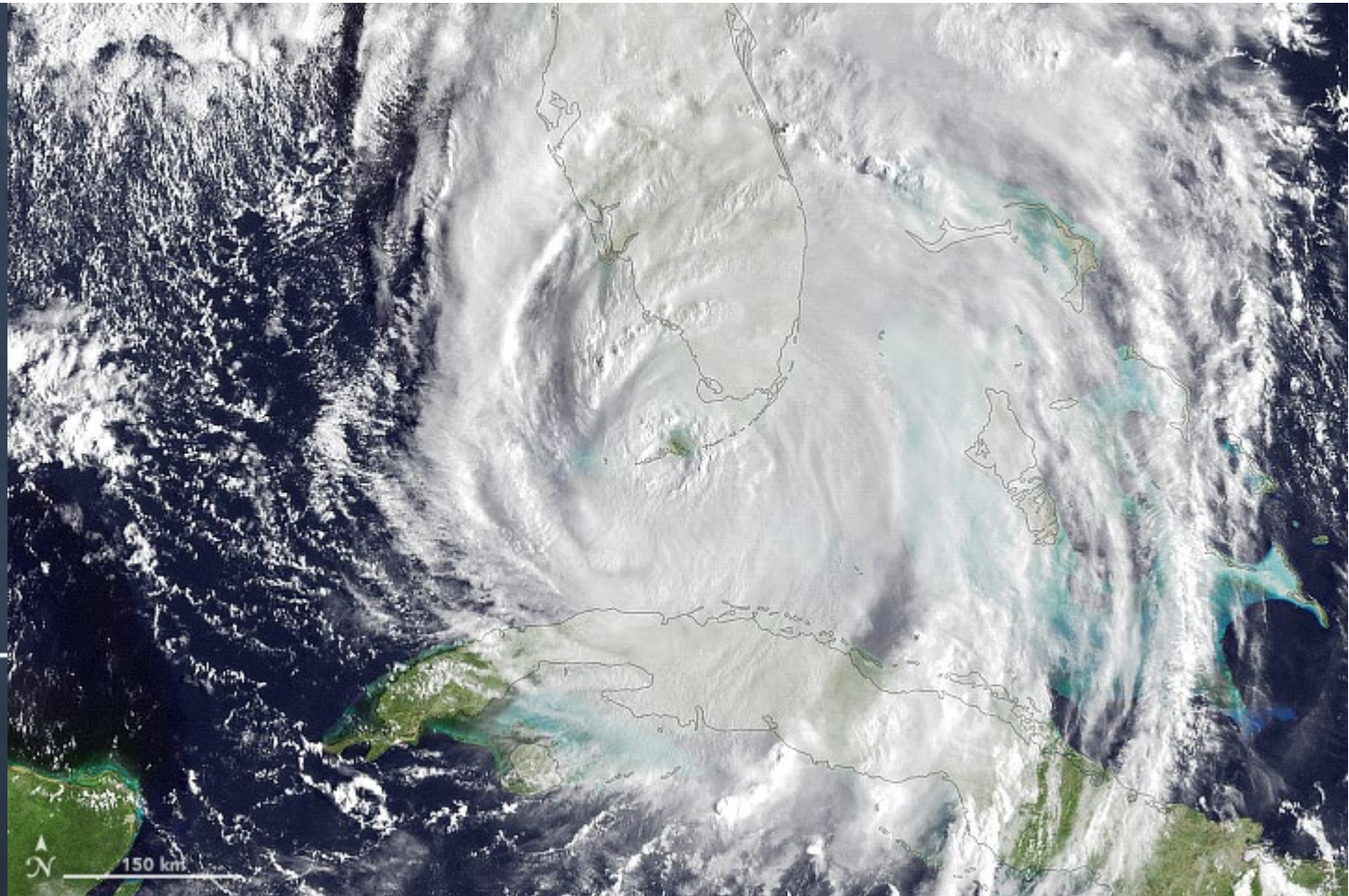
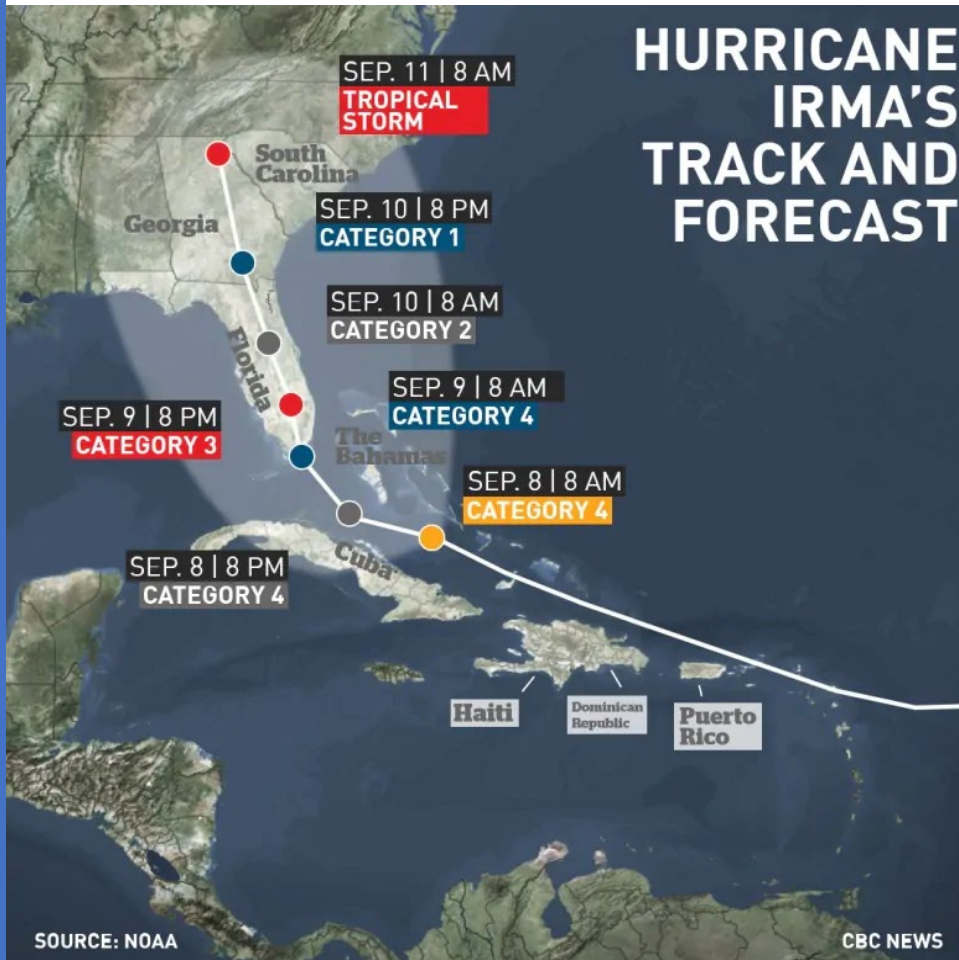
SOLIDS/BOX - FLATWOODS



SOLIDS/BOX - RIDGE



Hurricane Irma 2017



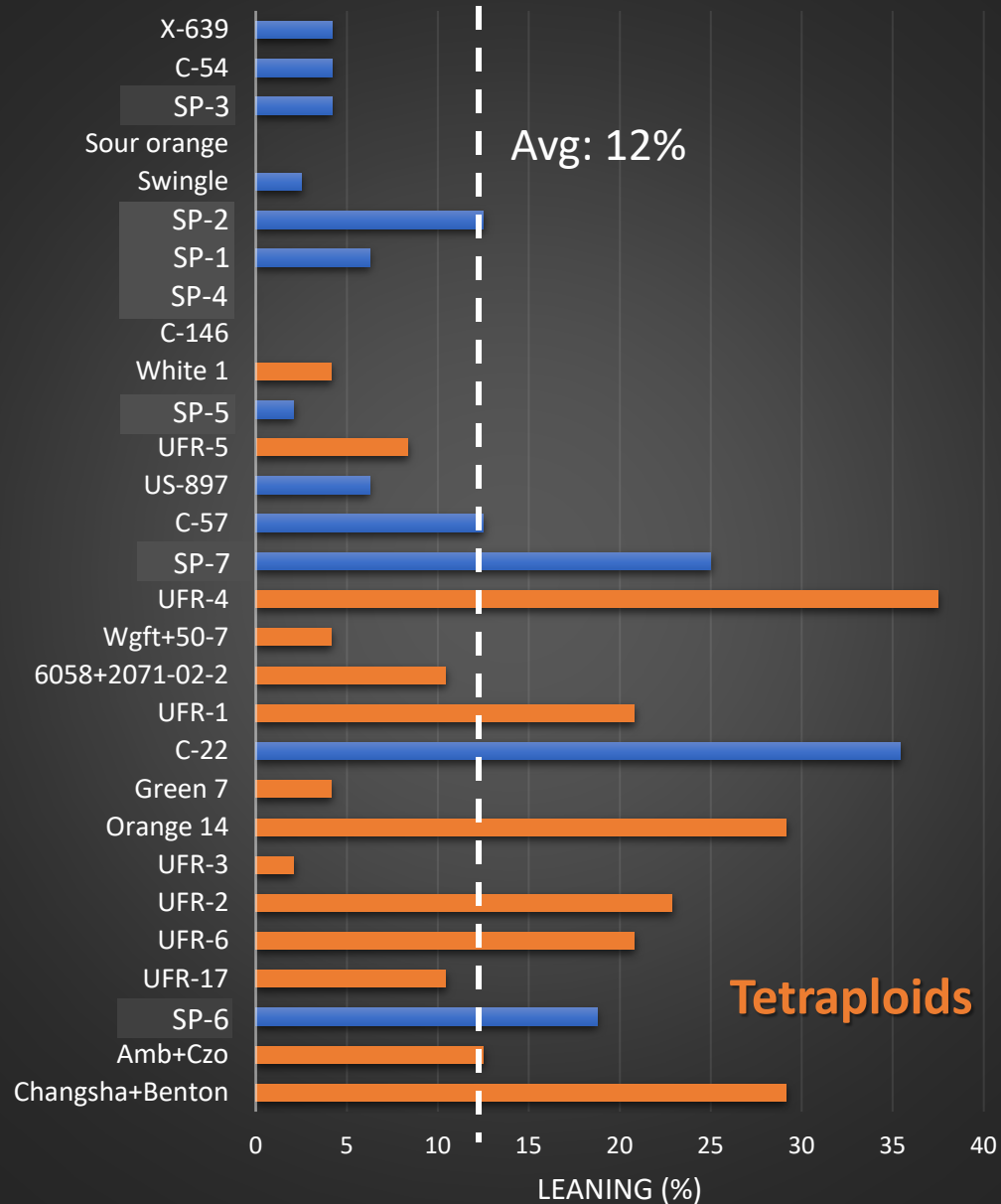
<https://www.cbc.ca/news/canada/montreal/quebec-florida-hurricane-irma-1.4282385>

<https://earthobservatory.nasa.gov/images/90948/hurricane-irma-strikes-florida>

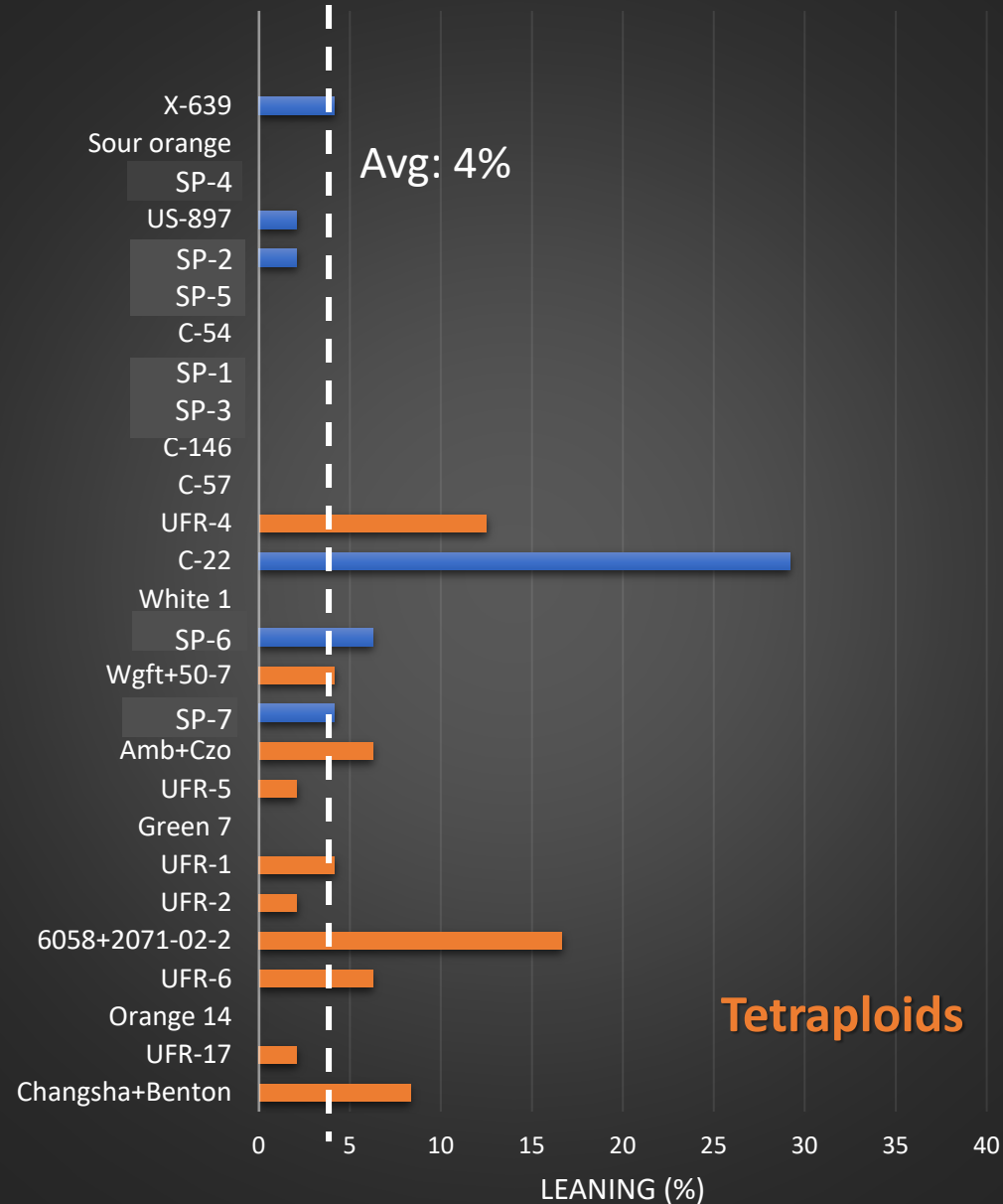
Wind resistance

Tree size

LEANING TREES - FLATWOODS



LEANING TREES - RIDGE



Wind-induced leaning did not seem to affect productivity
(e.g. C-22)



Summary

- ❖ Most of the tetraploid rootstock induced a smaller tree size than diploid rootstocks
- ❖ Larger tree size (canopy volume) was generally related to higher productivity per tree
- ❖ But extensive fruit drop in 2020/21 especially at the Basinger site
- ❖ Small tree were more yield efficient than large trees

Summary

- ❖ Rootstocks that induce small yield-efficient trees can be planted at higher-density and may be more profitable during the early production years
- ❖ Trees on some of the small-size inducing rootstocks were vulnerable to tropical force winds, but this did not seem to affect productivity
- ❖ *Long-term evaluation of rootstocks is necessary to assess economic benefits*

