CHOOSING FRESH CITRUS VARIETIES FOR A CUPS PRODUCTION SYSTEM

Arnold Schumann
University of Florida, Lake Alfred, FL, USA
CUPS facility at the CREC
1.3 acres (58,000 sq. feet)
CUPS has excluded ACP and prevented HLB for five years at the CREC, despite being adjacent to HLB+ and ACP-infested trees
2018-2019 CUPS highlights

About 250 acres of commercial CUPS in Florida, and expanding

Commercial CUPS W. Murcott @ 1 year
‘W murcott’ in commercial CUPS @ 2.5 years (August 2019) KLM Farms, where the 2018 CUPS field day was held
• ‘W murcott’ in commercial CUPS @ 2.5 years (August 2019)
• Trees are planted in the ground
• ‘W murcott’ fruit is **seedless** in CUPS
INTRODUCTION & OBJECTIVES

• Grapefruit production in Florida has been drastically reduced by HLB: 40.8 million boxes in 2003/04 to 5.4 million boxes in 2018/19 (87% reduction) www.nass.usda.gov

• ‘Honey’ murcott, ‘Dancy’ and other favorite Florida varieties are also very susceptible to HLB

• Grow Citrus Under Protective Screen (CUPS) to exclude the Asian Citrus Psyllid and completely block CLas transmission

• Produce asymptomatic, low-seeded, premium grade fresh fruit in HLB-endemic Florida by using CUPS

• CUPS is an integrated system with a high establishment cost – citrus grown must be high yielding, high quality, with potential to generate high fruit revenue
CREC CUPS 2018/19 season for two main varieties:

4th year highlights

- ‘Ray Ruby’ grapefruit: December 5, 2018, average 892 boxes/acre, 100% pack-out
- ‘Honey’ murcott: January 23, 2019 average 529 boxes/acre, 100% pack-out

‘Ray Ruby’ grapefruit
426 cartons packed
70% US #1
$25.89 /box net fruit revenue
($23,094 /acre /year)

‘Honey’ murcott
326 cartons packed
90% US #1
$42.48 /box net fruit revenue
($22,472 /acre /year)
RESULTS

‘Ray Ruby’ grapefruit @ 2.5 years, 35 L pots, 871 trees /acre:
January 2018: ‘Ray Ruby’ grapefruit @ 3.5 years
October 2018: ‘Ray Ruby’ grapefruit @ 4.1 years
‘Ray Ruby’ grapefruit @ 4.25 years, 20 L pots, 871 trees /acre:
UF711 in CUPS
‘Honey’ murcott @ 3.5 years, large fruit = best price
‘Honey’ murcott from CUPS
Sugarbelle
Early pride
‘Ray Ruby’ grapefruit
Other grapefruit varieties and hybrids also perform well in CUPS:

**UF914** – seedless, sweet “grapefruit”

UF914 yields: >800 boxes/acre in year 4
<table>
<thead>
<tr>
<th>Variety</th>
<th>Color break</th>
<th>Maturity</th>
<th>GA response</th>
<th>Seed</th>
<th>Other</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ray Ruby, Ruby Red</td>
<td>good</td>
<td>Dec - Jan</td>
<td></td>
<td>low</td>
<td>No alternate bearing, low pruning req.</td>
<td>******</td>
</tr>
<tr>
<td>Honey murcott</td>
<td>good</td>
<td>Jan - Feb</td>
<td>yes</td>
<td>high</td>
<td>Alternate bearing high pruning req.</td>
<td>******</td>
</tr>
<tr>
<td>W. murcott</td>
<td>bad</td>
<td>Dec - Jan</td>
<td>yes</td>
<td>none</td>
<td>Alternate bearing high pruning req.</td>
<td>******</td>
</tr>
<tr>
<td>Dancy</td>
<td>excellent</td>
<td>Dec - Jan</td>
<td>yes*</td>
<td>low</td>
<td>high pruning req.</td>
<td>***</td>
</tr>
<tr>
<td>Sugarbelle</td>
<td>bad</td>
<td>Nov-Dec</td>
<td>yes*</td>
<td>none</td>
<td>high pruning req.</td>
<td>***</td>
</tr>
<tr>
<td>Kinnow mandarin</td>
<td>good</td>
<td></td>
<td></td>
<td>high</td>
<td>high pruning req.</td>
<td>**</td>
</tr>
<tr>
<td>Early Pride</td>
<td>excellent</td>
<td>Oct-Nov</td>
<td>yes*</td>
<td>none</td>
<td>Alternate bearing high pruning req.</td>
<td>**</td>
</tr>
<tr>
<td>Clementine</td>
<td>yes*</td>
<td></td>
<td></td>
<td>none</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>Temple</td>
<td></td>
<td></td>
<td></td>
<td>low</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>Bingo</td>
<td>good</td>
<td>Oct-Nov</td>
<td></td>
<td>none</td>
<td>Severe dieback</td>
<td>*</td>
</tr>
<tr>
<td>BB4</td>
<td>good</td>
<td>Oct-Nov</td>
<td></td>
<td>none</td>
<td>Alternate bearing Preharvest drop</td>
<td>*</td>
</tr>
<tr>
<td>UF914</td>
<td>good</td>
<td>Nov-Jan</td>
<td></td>
<td>none</td>
<td>No alternate bearing, low pruning req.</td>
<td>***</td>
</tr>
</tbody>
</table>

*GA appears to be essential for these varieties in CUPS

Fruit issues yrs 1-3
### Other varieties trialed in CUPS: 2014 to 2019

<table>
<thead>
<tr>
<th>Variety</th>
<th>General observations</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sanguinelli blood orange</td>
<td>Poor color break &amp; granulation</td>
<td>*</td>
</tr>
<tr>
<td>Page tangelo</td>
<td>Good color break; Over-maturing fruit: granulation</td>
<td>**</td>
</tr>
<tr>
<td>Satsuma</td>
<td>Over-maturing fruit: granulation</td>
<td>*</td>
</tr>
<tr>
<td>Hamlin</td>
<td>Poor color break &amp; granulation</td>
<td>**</td>
</tr>
<tr>
<td>Valencia</td>
<td>Poor color break &amp; granulation</td>
<td>**</td>
</tr>
<tr>
<td>Glen navel</td>
<td>Over-maturing fruit: granulation</td>
<td>*</td>
</tr>
<tr>
<td>Cara cara navel</td>
<td>Over-maturing fruit: granulation</td>
<td>*</td>
</tr>
<tr>
<td>Persian lime</td>
<td>Excellent quality; moderate yield</td>
<td>*****</td>
</tr>
<tr>
<td>Eureka lemon</td>
<td>Vigorous; moderate yield; rust mite</td>
<td>***</td>
</tr>
<tr>
<td>Meyer lemon</td>
<td>Very high yield; rust mite</td>
<td>*****</td>
</tr>
</tbody>
</table>
‘Persian’ lime - seedless

‘Meyer’ lemon - seedless

‘Ray Ruby’ grapefruit – low seed
‘Honey Murcott’ mandarin
  some seeds

‘W. Murcott Afourer’ mandarin
  seedless

‘Page’ tangelo = seedless
‘Sugar belle’ – seedless
‘UF BB4’ – seedless
CURRENT (August 2019) observations: Kinnow mandarin ~2.5 years
CURRENT (August 2019) observations:
Dancy tangerine ~2.5 years
10 ppm GA applied at bloom; no alternate bearing yet
CURRENT (August 2019) observations:
Dancy tangerine ~2.5 years
No GA applied at bloom:
CURRENT (August 2019) observations:
Sugar Belle ~ 2.5 years
10 ppm GA applied at bloom:
CURRENT (August 2019) observations: Ray Ruby grapefruit~5 years
CURRENT (August 2019) observations: Honey murcott~5 years
CURRENT (August 2019) observations:  
W murcott ~5 years
TWO VARIETIES WITH KNOWN, RELIABLE PERFORMANCE IN THE CREC CUPS

• **Ray Ruby** grapefruit thrives in the CUPS, and started production in year 1; seems to love heat

• Both fruit quantity and quality are high, resulting in high net fruit revenue

• Greasy spot disease pressure is high for CUPS grapefruit

• CUPS allows growing a very HLB-susceptible variety (grapefruit) in HLB-endemic conditions, while retaining non-GMO status

• Demand for CUPS-grown Florida grapefruit can be high due to the great taste of “fresh-from-Florida” fruit and the 87% reduction in supply from traditional field-grown sources
TWO VARIETIES WITH KNOWN, RELIABLE PERFORMANCE IN THE CREC CUPS

• **Honey murcott** thrives in the CUPS heat, and started production in year 2. Some fruit splitting occurs in September. Good color break

• Both fruit quantity and quality are high, resulting in high net fruit revenue; alternate bearing is a disadvantage

• CUPS allows growing yet another favorite, very HLB-susceptible variety (Honey) in HLB-endemic conditions, while retaining non-GMO status

• Demand for CUPS-grown Florida Honey murcott fruit of premium size (80s, 100s) and great taste is high, despite the presence of seeds
CONCLUSIONS

• CUPS is an attractive non-GMO fresh fruit solution to HLB

• Economic viability of CUPS technology can be maximized by early high yields of premium grade fruit & high pack-out, 100%

• Emphasis is on producing larger, clean fruit with good color; red grapefruit varieties and Honey murcott are good choices

• W. murcott is an attractive variety for CUPS, but the poor color break is an unsolved issue; unresponsive to ethylene degreening? Experimenting with restricting nitrogen from phase II fruit development onwards

• Early Pride, Dancy, Kinnow, Sugar Belle, UF914, and others need more data to build knowledge base for CUPS production
Thank you for your support

Grower stakeholders & cooperators
UF/IFAS Extension Agents
Laboratory and Support Staff
Funding: CREF 2014
FDACS SCBG 2014-17
UF/IFAS Citrus Initiative 2013-18

This material is based upon work that is supported by the National Institute of Food and Agriculture, U.S. Department of Agriculture, under award number 2018-70016-27387

Contact: schumaw@ufl.edu