Citrus Undercover Production Systems: Grapefruit Trial

Barrett Gruber & Brian Boman
IRREC, Fort Pierce, UF-IFAS

Arnold Schumann, Fred Gmitter, & Jude Grosser
CREC, Lake Alfred, UF-IFAS
Acknowledgments

• Gruber & Boman lab personnel

• HLB Diagnostic Lab – UF/IFAS/SWFREC
  – Pamela Roberts & staff

• St. Lucie County Extension
  – Parker Platts

• Funding & Support
  – Treasure Coast Agricultural Research Foundation
  – UF-IFAS Citrus Initiative Fund
  – USDA-FDACS SCBG
Huanglongbing (HLB, “greening”)

Asian citrus psyllid

Candidatus Liberibacter asiaticus (pathogen)

Project Goal:

Develop grapefruit/fresh fruit production systems that prevent the development of HLB
Huanglongbing (HLB, “greening”)

Asian citrus psyllid

*Candidatus Liberibacter asiaticus* (pathogen)

Citrus Undercover Production Systems (CUPS)

Covered production – nursery grade insect screen (50 mesh)

Planting density = 5’ × 10’ (871 trees/acre, in-ground vs. potted)

‘Ray Ruby’ grapefruit

Low volume, drip irrigation/fertigation (all trees)

Eventually add fresh varieties from Drs. Gmitter & Grosser (CREC)
High – density, containerized citrus

Southern California, 2012

Mandarins, about 1,900 trees/acre

First harvest in about 18 months

About ½ box/tree yield (~1,000 boxes/acre)

Take home point: Rapid, high yields
Weather stations in the screen houses provide parameters daily, which are communicated to the irrigation software in the lab.

Tree growth responses to irrigation/fertigation events are used to optimize future watering events.

Each grapefruit tree is connected to drip emitters to provide precisely controlled irrigation/fertigation.

Customized irrigation-runtimes are generated by the irrigation software and sent to the irrigation/fertigation manifold back in the field.
CUPS: Advantages

Excludes the Asian citrus psyllid (nurseries set the precedent)

Prevents citrus leafminer damage

Reduced threat to bees & other pollinators

Less water is wasted *INSIDE* screen houses

*Can be started TODAY!!!*
Each structure = 100’ wide & 120’ long (0.28 acre)
Poles = 14’ tall (above ground)
4’ in ground

Anchors attached to each pole

Anchor = 5’ long
Trees potted/planted week of Thanksgiving-2013
PRELIMINARY RESULTS:

Pest & Pathogen:
  • # of adult Asian Citrus Psyllids / sticky trap
  • Proportion of CLas positive trees
  • Proportion of leaves with visible leafminer damage
OUTSIDE !!!

![Graph showing the number of Asian Citrus Psyllid per trap over months.

- Open Air-US897, In ground
- Open Air-US897, Pots
- Open Air-Sour Orange, In ground
- Open Air-Sour Orange, Pots

Statistical significance:
- \( P_{\text{Media \^ Root \^ Date}} = 0.61 \)
- \( P_{\text{Media \^ Date}} < 0.01 \)
OUTSIDE !!!

October 2014

\[ P_{\text{Media} \times \text{Rootstock}} = 0.70 \]
\[ P_{\text{Media}} = 0.44 \]
\[ P_{\text{Rootstock}} = 0.71 \]
December 2014

Visible Leafminer Damage (Proportion)

IngroundSO  IngroundUS897  PotsSO  PotsUS897

$P_{\text{Media} \times \text{Rootstock}} = 0.76$
$P_{\text{Media}} = 0.07$
$P_{\text{Rootstock}} = 0.30$
INSIDE !!!

2014:
• **NO** Asian Citrus Psyllids
• **NO** CLas positive trees
• **NO** Visible leafminer damage
PRELIMINARY RESULTS:

Meteorology Data:
- Air Temperature (°C)
- Wind Gust (kph)
- Monthly Rainfall (mm)
- Monthly Reference Evapotranspiration-ETo (mm)
The graph shows the monthly wind gusts measured in kilometers per hour for the year 2014 at two different locations: "Open Air" and "Screen Houses".

Key points:
- The wind gusts for "Open Air" generally range from 20 to 40 km/h, with a slight increase in October and November.
- The wind gusts for "Screen Houses" are lower, generally ranging from 5 to 15 km/h, with a slight increase in November.

Statistical significance:
- The cover date effect is not significant at the 0.01 level.
- The cover effect is significant at the 0.04 level.
- The date effect is significant at the 0.01 level.

Note: "Cover" likely refers to the type of measurement setting (open or screened).
Tree Growth Inside CUPS Screen House Structures

November 2013
Tree Growth Inside CUPS Screen House Structures

June 2014
Tree Growth Inside CUPS Screen House Structures

October 2014
Thanks!
Questions?