Growing a Young Citrus Tree in the Greening Era
Citrus Management Strategies in a New Disease Era

Presented by:

• Ryan Atwood, Multi-County Citrus Extension Agent, Lake County

• Tim Hurner, Multi-County Citrus Extension Agent, Highlands County
Contributing to this presentation:

- Dr. Michael Rogers, Entomologist, CREC, Lake Alfred
- Dr. Arnold Schuman, Agronomist, CREC, Lake Alfred
- Ron Murraro, Economist, CREC, Lake Alfred
- Seven Citrus Growers in Central Florida
The Question

• Can we successfully grow a young citrus tree in the greening era?
Successful Management Strategy

Key Elements of a Successful Management Strategy

1. Grow Trees to a Productive Unit in a short time.


Successful Management Strategy

Today’s presentation will cover

1. Key Components of **Grower New Planting Programs**
   a. Nutrition
   b. Pest management

2. Key Components of **Current Research Programs** on New Plantings
   a. Irrigation
   b. Nutrition
   c. Pest Management
• The following information was obtained from Seven Citrus Growers in Central Florida that had made solid plantings in the past 3 – 4 years were surveyed.
• Tree Spacing used ranged from 140 – 284 trees per acre
  
  25’ X 12.5’ to 18’ X 8.5’
• Nutrition Program
  • Soil applications
Grower Program-Nutrition

- 5 Agriform tablets (20-10-5) in planting hole
  (3 growers)
Grower Program - Nutrition

- **Dry Fert.**
  
  2X / year  
  Feb/March and Sept./Oct.

- **Liquid Fert.**
  
  2X per month  
  Mar./April to Aug./Sept.
Grower Program-Nutrition

- **Year 1**
  Total N 0.27# to 0.70# N / tree / year

- **Year 2**
  Total N 0.54# to 1.20# N / tree / year

- **Year 3**
  Total N 0.90# to 1.60# N / tree / year
Table 8.1. Recommended N rates and minimum number of annual applications for non-bearing citrus trees.

<table>
<thead>
<tr>
<th>Year in grove</th>
<th>lbs N/tree/year (range)</th>
<th>Lower limit of annual application frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Controlled-release fertilizer</td>
</tr>
<tr>
<td>1</td>
<td>0.15 – 0.30</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>0.30 – 0.60</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>0.45 – 0.90</td>
<td>1</td>
</tr>
</tbody>
</table>
Grower Program - Pest Mgt.

- Chemical selections based on controlling psyllids, and other pest throughout the year.

- 8-10 sprays per year, 4-6 weeks apart with alternating MOA.

- Foliar (NPK) Nutritional Product was added to each spray application.
Grower Program - Pest Mgt.

- Copper used monthly
  - March/April through Sept./October
- to manage **Citrus Canker**.
Grower Program - Pest Mgt.

- **Admire Pro and Platinum**
- Were used at the Maximum rate
  - Applied in several applications each year.
<table>
<thead>
<tr>
<th>Month</th>
<th>Pesticides Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan/Feb</td>
<td>Danitol</td>
</tr>
<tr>
<td>March</td>
<td>Carbaryl, Delegate, Imidan, Agri-Mek, Oil</td>
</tr>
<tr>
<td>April</td>
<td>Mustang, Orthene, Agri-Mek, Oil</td>
</tr>
<tr>
<td>May</td>
<td>Danitol, Oil</td>
</tr>
<tr>
<td>Month</td>
<td>Pesticides Used</td>
</tr>
<tr>
<td>------------</td>
<td>------------------------------------------------------</td>
</tr>
<tr>
<td>June</td>
<td>Orthene, Agri-Mek, Oil</td>
</tr>
<tr>
<td>July</td>
<td>Carbaryl, Delegate, Movento, Oil</td>
</tr>
<tr>
<td>August</td>
<td>Carbaryl, or Delegate, Imidan Agri-Mek, Oil</td>
</tr>
<tr>
<td>September</td>
<td>Orthene, Agri-Mek, Carbaryl, Delegate, Oil</td>
</tr>
<tr>
<td>Month</td>
<td>Pesticides Used</td>
</tr>
<tr>
<td>-----------</td>
<td>--------------------------------------</td>
</tr>
<tr>
<td>October</td>
<td>Carbaryl, Delegate</td>
</tr>
<tr>
<td>November</td>
<td>Orthene, Agri-Mek, Mustang, Envidor</td>
</tr>
</tbody>
</table>
Grower Program - Pest Mgt.

- **Results**
  - **Greening Positives**
    - 3-4 years
    - Ranged from 0 to 1.5 %
IFAS Research Programs

• CREC

  • Dr. Arnold Schuman
ACPS PROGRAM

Advanced Citrus Production System
Goal #1

To bring a grove into production earlier recognizing that potential threats may require replanting at an earlier age.
Goal # 2

- To maximize tree growth:
  a. recover investment cost early
  b. mitigate negative impacts of future issues such as
     - Freezes
     - Greening
     - Blight
ACPS PROGRAM

• Components of an ACPS Program
  1. High Density Planting
  2. Adapted Rootstocks
  3. Pulse Irrigation
  4. Intensive Fertigation
  5. Balanced Complete Nutrition
1. High Density Plantings

- More trees per acre:
  - Up to 300 trees per acre accommodate traditional production equipment.
  - $18' \times 8' = 303$ trees per acre
1. High Density Plantings

- More trees per acre:
  - Over 300 trees per acre may require modification of production equipment or smaller equipment.
    - Tractors, Sprayers, Fertilizer Spreaders, Mowers, etc.

- $12 \times 10 = 363$ trees per acre
2. Adapted Rootstocks

- **Dwarfing**
  - U S 897
  - Flying Dragon

- **Semi-Dwarfing**
  - C-35
  - U S 802
3. Pulse Irrigation

• Irrigation Strategy for Immature trees-
  • Drip Irrigation
  • Pulse Irrigate to keep top 0-6 inches of soil at field capacity.
• Monitor moisture at 18 inch depth to avoid excess water use and leaching.
Issue

• Cold Protection
  • Drip Irrigation will not provide Cold Protection.
  • May need a second micro-sprinkler system where cold protection is needed.
Issue

• Cold Protection
  • Drip Irrigation will not provide Cold Protection.
  • May need a second micro-sprinkler system where cold protection is needed.
• May still be cost effective.
4. Intense Fertigation

- **Fertigation Strategy for immature Trees**
  - Fertigate daily
    - 100 to 150 ppm N concentration in final delivered water volume
4. Intense Fertigation

- Fertigation Strategy for immature Trees

- Inject Fertilizer as a pulse and water to follow to flush lines.
4. Intense Fertigation

- **Fertigation Strategy for Immature Trees**
  - Fertigate in morning after sunrise when photosynthesis and transpiration are at their peak.
## 5. Balanced Complete Nutrition

### Immature trees (Feb to Nov)

<table>
<thead>
<tr>
<th>Nutrient Element</th>
<th>Concentration (%, w/v)</th>
</tr>
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<tbody>
<tr>
<td>N</td>
<td>4.50</td>
</tr>
<tr>
<td>P</td>
<td>0.90</td>
</tr>
<tr>
<td>K</td>
<td>3.75</td>
</tr>
<tr>
<td>Ca</td>
<td>3.75</td>
</tr>
<tr>
<td>Mg</td>
<td>0.75</td>
</tr>
<tr>
<td>S</td>
<td>1.08</td>
</tr>
<tr>
<td>Zn</td>
<td>0.015</td>
</tr>
<tr>
<td>Cl</td>
<td>3.26</td>
</tr>
<tr>
<td>Mn</td>
<td>0.045</td>
</tr>
<tr>
<td>Fe</td>
<td>0.09</td>
</tr>
<tr>
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<tr>
<td>Cu</td>
<td>0.0015</td>
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Recent ACPS Study

• Dr. Arnold Schuman
  • UF / IFAS / Citrus Research and Education Center, Lake Alfred

• Study
  – 363 Trees per acre
  – 19 month old Trees

• Result To Date
Immature ‘Hamlin’ with ACPS – August 2010
age 19 months  
Est. ½ box per tree
Growth curves at the young tree Ridge site

- **Height (inches)**
- **Date (mm/dd/yy)**

Key:
- **Drip fertigation, Swingle (10x20)**
- **Drip fertigation+OM, Swingle (10x20)**
- **MS+gran. fert (grower), Swingle (10x20)**
- **MS fertigation, Swingle (10x20)**
- **Drip fertigation, Swingle (8x18)**
- **Drip fertigation, C-35 (8x18)**
- **Drip fertigation, C-35 (8x15)**
Table 1. Water and fertilizer N applied and tree canopy growth in year

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<tr>
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<th>Conventional (218 tpa)</th>
<th>Microsprinkler OH § (218 tpa)</th>
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<td>Irrigation water (gal/acre)</td>
<td>49,177 (1x)</td>
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<td>2,507 (1x)</td>
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* Conventional = granular fertilizer in six split applications
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IFAS Research Programs

• CREC

• Dr. Michael Rogers
Resets / Young Tree Care:
Insect Control Options
Pest Control on Young Trees

• Asian Citrus Psyllid
  – Year-round risk,
  – Young trees flush more often,
  – Increased chance of young trees becoming infected with HLB.

**Must** keep young trees free of psyllids
Psyllid Control on Young Trees

- **Psyllid Control**
  - Soil-applied systemic insecticides
    - **Imidacloprid**: controls psyllid and leafminer
    - **Aldicarb**: controls psyllid
      (Aldicarb no longer registered for use after 12/31/11)
Solid Plantings of Young Trees

● soil-drench applications

1. **Imidacloprid**
   a. Primary control for psyllid on young trees
   b. Expect about 8 weeks control from one drench application
   c. Increasing the rate does not appear to increase residual control in Florida sandy soils
   e. Leaching potential high from Irrigation & Rainfall
Solid Plantings of Young Trees

- soil-drench applications

5. **Thiamethoxam** (Platinum)
   a. Slightly faster uptake
   b. More water soluble
   c. More prone to leaching following heavy rainfall
   d. Best to use during the dry season
## Solid Plantings of Young Trees

<table>
<thead>
<tr>
<th>Tree Size</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
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<tbody>
<tr>
<td>Month</td>
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</tr>
<tr>
<td>2’-4’</td>
<td></td>
<td></td>
<td>Thiamethoxam</td>
<td></td>
<td></td>
<td>Imidacloprid</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4’-6’</td>
<td></td>
<td></td>
<td>Thiamethoxam</td>
<td></td>
<td></td>
<td>Imidacloprid</td>
<td></td>
<td></td>
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Example of how to space out soil applications to get the most benefit.
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<th></th>
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</thead>
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<td>4’-6’</td>
</tr>
<tr>
<td>Jan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feb</td>
<td>Thiamethoxam</td>
<td>Foliar</td>
</tr>
<tr>
<td>Mar</td>
<td>Foliar</td>
<td>Thiamethoxam</td>
</tr>
<tr>
<td>Apr</td>
<td>Imidacloprid</td>
<td>Foliar</td>
</tr>
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<td></td>
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<td>Dec</td>
<td>Imidacloprid</td>
<td></td>
</tr>
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</table>

**Use a foliar spray with a different mode of action between soil-drench applications:**

- to prevent resistance development
Resets in Bearing Groves

• soil-drench applications
  – Make soil-drench applications to resets in addition to ongoing psyllid control program.
  – Additional imidacloprid and Thiamethoxam drench applications can be made to resets (provided you observe the rate per acre limit).
  – Foliar sprays of imidacloprid and Thiamethoxam to mature trees in same block count towards amount applied per acre per year.
The Question

• Can we successfully grow a young citrus tree in the greening era?
Questions?