Citrus Health Management Areas

Michael E. Rogers
Associate Professor of Entomology
University of Florida, IFAS, Citrus Research & Education Center

www.flchma.org
Past Experiences Managing Asian citrus psyllid

- Easy to kill…Hard to control !!!
Insecticide Use for Psylliid Control

- **Brazil**: varying success using 6 to 26 applications per season (Belasque et al. 2008)
- **Asia**: worst-case situations up to 52 applications per year (Beattie and Holford 2008)
- **Florida**: much variation; on average 6 to 10 applications per year
Primary reasons for repeated applications?

- **Short residual of pesticide control**
  - Foliar applied insecticides
- **Psyllid movement behavior**
ACP Caging Study
Daniela Okuma, Rosana Serikawa (UF, CREC 2010)

Residual Control of Adult ACP
Foliar Applied Insecticides

> 60% survival following exposure 12 DAT

- Untreated
- Spinetoram (Delegate)
- Spirotetramat (Movento)
- Fenpropatrin (Danitol)
- Imidacloprid (Provado)
- Chlorpyrifos (Lorsban)
Psyllid Movement


ACP movement between adjacent groves (3 days)

Protein marker 1

Protein marker 2

~ 100m
Psyllid Movement


ACP movement between adjacent groves (3 days)

Protein marker 1

~ 100m

Protein marker 2
Reasons for failed control?

- Collectively, these results explain how the lack of residual control combined with psyllid movement can result in the need for frequent repeated insecticide applications.
How to improve ACP control?

• **Implementation of area-wide ACP control programs**
  – Coordinated effort
  – Simultaneous treatment of groves in a “large” area
  – Delay psyllid recolonization of groves

• **Goals:**
  – Greater reduction in overall psyllid populations
  – Reduce the need for frequent reapplication of pesticides
Basic Principle of Total Population Control:

“Uniform suppressive pressure applied against the total population of the pest over a period of generations will achieve greater suppression than a higher level of control on most, but not all, of the population each generation”
Key Features

Grove-by-Grove Approach

• Targeting portion of population
• Refugia left for immigrants (reapplication of insecticides)
• Pests with limited mobility
• Low value crop with medium to high pest tolerance
• Reactive approach to pest presence
• Complicates pesticide resistance management

Area-Wide Approach

• Targeting entire population
• No refugia for immigrants (reduction in insecticide use)
• High pest mobility
• High value crop with low pest tolerance
• Proactive approach to pest presence
• Facilitates pesticide resistance management

(Summarized from: Hendrichs et al. 2007)
Creation of Citrus Health Management Areas

High Priority Recommendation (O-1):

• Creation of Citrus Health Management Areas (CHMAs)
  - Facilitate the coordination of psyllid control and other HLB management practices
Implementation of CHMAs (Florida)

• CHMA program is currently in the early stages of implementation

• Goals:
  – Define CHMA areas throughout Florida
  – Coordinate timing of pesticide applications
  – Coordinate MOAs of pesticide applications to manage pesticide resistance development
Implementation of CHMAs (Florida)

- Coordination provided by:
  - University of Florida (UF-IFAS) Extension
  - Florida Department of Agriculture & Consumer Services, Division of Plant Industries (FDACS-DPI)

- Grower participation will be necessary but is VOLUNTARY

- Grower acceptance and participation is crucial for success of Area-wide control programs (Heinrich et al. 2007).
Other CHMA Participants

• **UF-IFAS**
  – Serve as an information resource for developing plans of action
    • Extension specialists (entomology, horticulture, pathology, etc…), Extension agents
  – Provide infrastructure to facilitate grower communication of activities and results
    • Development of website for each CHMA
    • Email listserv notifications
    • County agent printed newsletters
Other CHMA Participants

- **FDACS – Division of Plant Industries**
  - Support provided by personnel from the regional CHRP offices
  - GIS mapping of defined CHMA’s
  - Routine psyllid monitoring of CHMA’s to prove effectiveness
Steps in CHMA Establishment

- **Growers request assistance**
  - Contact should be made with CHMA coordinator
    (Currently contact local IFAS Extension County Agents)

- **Planning meeting(s)**
  - Growers identify groves to participate in a CHMA
  - Geographic area of CHMA defined on map
  - Tentative psyllid control program decided upon for upcoming season *(for grower planning purposes)*
  - Follow-up meetings as needed to finalize plan or to motivate more participation
CHMA Meeting Goals

Topics for discussion

• Defining (mapping) the CHMA
  – Size of the CHMA is not the deciding factor in defining the area
  – Spatial distribution of groves in an area
  – Defining a psyllid “population” and targeting that population for control

“…large geographic areas are not a prerequisite for the area-wide approach…addressing the pest population…involves managing them at the population level…” (Hendrichs et al 2007)
CHMA Meeting Goals
Topics for discussion

• Defining (mapping) the CHMA
  – Must be practical!!!
  – Coordination of efforts across the defined area in a timely manner must be possible
  – Logistical Considerations
    • Growers with groves in different areas
    • Caretakers with groves across the state
    • Limitations of equipment and time
    • Harvesting schedules (fresh vs. processed fruit)
CHMA Meeting Goals

Topics for discussion

• Developing a plan of action
  – Timing and Frequency of applications
    • Coordinate as many sprays as feasible
  – Rotation of Pesticide Modes of Actions (MOAs)
  – Application methods
Table 1: Planning template for CHMAs where most fruit harvesting expected in the months of Jan, Feb, Mar, May or June

<table>
<thead>
<tr>
<th>Month</th>
<th>Timing</th>
<th>Product(^3)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>November/December</td>
<td>After last flush of the season</td>
<td>Organophosphate(^1)</td>
<td><em>Optimal time for coordinated spray</em>; first dormant spray; serves as a clean up spray to eliminate adult ACP going into the overwintering period.</td>
</tr>
<tr>
<td>January/February</td>
<td>Prior to first flush of season</td>
<td>Pyrethroid(^2)</td>
<td><em>Optimal time for coordinated spray</em>; second dormant spray; prior to first flush in spring control ACP that overwintered as adults or reproduced on unexpected winter flushes.</td>
</tr>
<tr>
<td>March (bloom period)</td>
<td>Depending on pest pressure</td>
<td>several options</td>
<td>Do not use pyrethroid since previously used. Do not use an organophosphate which is planned for the next application. Products that can be sprayed during bloom include Micromite and Portal but should only be applied when new flush is present since these products only control psyllid nymphs (not adults).</td>
</tr>
<tr>
<td>April</td>
<td>Immediately post bloom</td>
<td>Organophosphate</td>
<td><em>Possible time for coordinated spray using an OP</em>; this time is the first opportunity to control adult psyllids that developed on flush associated with bloom when most insecticides cannot be applied due to label restrictions preventing application during bloom. Growers in CHMAs not participating in a coordinated spray at this time may choose to use a product with a different mode of action.</td>
</tr>
<tr>
<td>May</td>
<td>Depending on pest pressure</td>
<td>Various options</td>
<td>Could use a pyrethroid since not previously used. Other options include Movento, Delegate (if leafminer present) or carbaryl.</td>
</tr>
<tr>
<td>June</td>
<td>1(^{st}) summer oil spray</td>
<td>Various options</td>
<td>Depending on the product used in the previous spray, numerous products (see Table 2) could be added to the summer oil sprays as well as tank mixed with other products depending on the life stages of psyllid controlled by each product and other pests requiring control such as leafminer or rust mites. During this time it may be difficult to coordinate sprays with the same mode of action, but coordination of the timing of summer oil sprays by growers within a CHMA could still be a feasible goal.</td>
</tr>
<tr>
<td>July</td>
<td>2(^{nd}) summer oil spray</td>
<td>Various options</td>
<td></td>
</tr>
<tr>
<td>August/September</td>
<td>Prior to fall flush</td>
<td>Pyrethroid(^2)</td>
<td><em>Possible time for coordinated spray using a pyrethroid</em>; Control psyllids that may have developed on sporadic summer flushes prior to the fall flush period when psyllid populations can rapidly increase. Growers in CHMAs not participating in a coordinated spray at this time may choose to use a product with a different mode of action.</td>
</tr>
<tr>
<td>October</td>
<td>Depending on pest pressure</td>
<td>Various options</td>
<td>Do not use pyrethroid since previously used. Do not use an organophosphate which is planned for next application. Options include Movento, Delegate, and carbaryl.</td>
</tr>
</tbody>
</table>

\(^1\) Organophosphate insecticides that can be used for psyllid control include Dimethoate, Imidan, Lorsban, Malathion and various generic formulations of these products.

\(^2\) Pyrethroid insecticides currently registered for use in Florida citrus include Danitol and Mustang.

\(^3\) Refer to Table 2 for information on product rates, application methods, psyllid life stages controlled and effective application methods.
Citrus Health Management Areas (CHMA’s): Guide to developing a psyllid management plan

Table 2: Pesticide use information for developing psyllid management programs.

<table>
<thead>
<tr>
<th>Chemical class</th>
<th>Active ingredient</th>
<th>Product</th>
<th>Rate/A</th>
<th>Application methods</th>
<th>REI</th>
<th>PHI</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbamates</td>
<td>aldicarb</td>
<td>Temik 15 G</td>
<td>33 lbs</td>
<td>Soil</td>
<td>48 hrs</td>
<td>0; 30 days (lemons)</td>
<td>Slow acting on adult psyllids; product scheduled to be cancelled Dec 31, 2011.</td>
</tr>
<tr>
<td></td>
<td>carbaryl</td>
<td>Sevin XLR</td>
<td>1.5 qts</td>
<td>Air, lv, ss</td>
<td>12 hrs</td>
<td>5 days</td>
<td>Short residual; fresh fruit for export should avoid use due to European MRL issues.</td>
</tr>
<tr>
<td></td>
<td>oxamyl</td>
<td>Vydate</td>
<td>2 qts</td>
<td>ss</td>
<td>48 hrs</td>
<td>7 days</td>
<td>Short residual; fresh fruit for export should avoid use due to European MRL issues.</td>
</tr>
<tr>
<td>Organophosphates</td>
<td>chlorpyrifos</td>
<td>Lorsban</td>
<td>5 pts</td>
<td>Air, lv, ss</td>
<td>5 days</td>
<td>21 days</td>
<td>Consult label for buffering instructions when pH is greater than 7.</td>
</tr>
<tr>
<td></td>
<td>dimethoate</td>
<td>Dimethoate 4E</td>
<td>1 pt</td>
<td>Air, lv, ss</td>
<td>10 days</td>
<td>15-45 days</td>
<td>Consult label for buffering instructions when pH is greater than 7.</td>
</tr>
<tr>
<td></td>
<td>malathion</td>
<td>Malathion 5</td>
<td>2 pts</td>
<td>Air, lv, ss</td>
<td>12 hrs</td>
<td>7 days</td>
<td>Consult label for buffering instructions when pH is greater than 7.</td>
</tr>
<tr>
<td></td>
<td>phosmet</td>
<td>Imidan</td>
<td>1.0 lb</td>
<td>Air, lv, ss</td>
<td>24 hrs</td>
<td>7 days</td>
<td>Consult label for buffering instructions when pH is greater than 7.</td>
</tr>
<tr>
<td>Pyrethroids</td>
<td>fenpropathrin</td>
<td>Danitol 2.4EC</td>
<td>1 pt</td>
<td>Air, lv, ss</td>
<td>24 hrs</td>
<td>1 day</td>
<td>Important to minimize use of foliar applications to prevent insecticide resistance development to maintain use for young tree care.</td>
</tr>
<tr>
<td></td>
<td>zeta-cypermethrin</td>
<td>Mustang</td>
<td>4.3 fl oz</td>
<td>Air, lv, ss</td>
<td>12 hrs</td>
<td>1 day</td>
<td></td>
</tr>
<tr>
<td>Neonicotinoids</td>
<td>imidacloprid</td>
<td>Admire Pro 4.6F</td>
<td>7-14 fl oz</td>
<td>Soil drench</td>
<td>12 hrs</td>
<td>0 day</td>
<td>Apply with 2% oil v/v. Also controls leafminer.</td>
</tr>
<tr>
<td></td>
<td>imidacloprid</td>
<td>Provado 1.6F</td>
<td>10-20 fl oz</td>
<td>ss</td>
<td>12 hrs</td>
<td>0 day</td>
<td>Important to minimize use of foliar applications to prevent insecticide resistance development to maintain use for young tree care.</td>
</tr>
<tr>
<td></td>
<td>thiamethoxam</td>
<td>Actara 25 WG</td>
<td>4.0-5.5 fl oz</td>
<td>ss</td>
<td>12 hrs</td>
<td>0 day</td>
<td>Important to minimize use of foliar applications to prevent insecticide resistance development to maintain use for young tree care.</td>
</tr>
<tr>
<td></td>
<td>thiamethoxam</td>
<td>Platinum 75 SG</td>
<td>1.83-3.67 fl oz</td>
<td>Soil drench</td>
<td>12 hrs</td>
<td>0 day</td>
<td>Important to minimize use of foliar applications to prevent insecticide resistance development to maintain use for young tree care.</td>
</tr>
<tr>
<td>Spinosyns</td>
<td>spinetoram</td>
<td>Delegate WG</td>
<td>4 oz</td>
<td>lv, ss</td>
<td>4 hrs</td>
<td>1 day</td>
<td>Apply with 2% oil v/v. Also controls leafminer.</td>
</tr>
</tbody>
</table>

Products that control psyllid immature stages only (eggs and/or nymphs)

<table>
<thead>
<tr>
<th>Product</th>
<th>Rate/A</th>
<th>Application methods</th>
<th>REI</th>
<th>PHI</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzyloyleas (growth regulator)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>diflubenzuron</td>
<td>6.25 oz</td>
<td>lv, ss</td>
<td>12 hrs</td>
<td>21 days</td>
<td>Apply with 2% oil v/v. Also provides control of leafminer and rustmites.</td>
</tr>
<tr>
<td>METI insecticides</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>fenpyroximate</td>
<td>4.0 pts</td>
<td>ss</td>
<td>12 hrs</td>
<td>14 days</td>
<td>Provides suppression of rustmites.</td>
</tr>
<tr>
<td>Petroleum distillates</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>petroleum oil</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>numerous</td>
<td>2% v/v</td>
<td>ss</td>
<td>12 hrs</td>
<td>0 days</td>
<td>Provides suppression of leafminer and rustmites.</td>
</tr>
<tr>
<td>Tetramic acid derivatives</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>spirotetramat</td>
<td>10 fl oz</td>
<td>ss</td>
<td>24 hrs</td>
<td>1 day</td>
<td>Systemic activity provides extended control of nymphal populations. Must use surfactant.</td>
</tr>
</tbody>
</table>

1 air=aerial application; lv=low volume application; ss=speed sprayer / traditional airblast application.
2 To obtain control of adult psyllids, these products may be combined with products listed above.
# Central Highlands 17/27 CHMA: 2010-11 Coordinated Psyllid Spray Plan

<table>
<thead>
<tr>
<th>Month</th>
<th>Application Window Targeted</th>
<th>Chemical Class</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>November / December</td>
<td>Nov 8-19</td>
<td>Organophosphate</td>
<td>Possible OP product options: chlorpyrifos (Lorsban), dimethoate, malathion, phosmet (Imidan)</td>
</tr>
<tr>
<td>January / February</td>
<td>Jan 31-Feb 14</td>
<td>Pyrethroid</td>
<td>Pyrethroid product options: fenpropathrin (Danitol), zeta-cypermethrin (Mustang)</td>
</tr>
<tr>
<td>March (bloom period)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>April</td>
<td>Immediately post bloom</td>
<td>Organophosphate</td>
<td>Possible OP product options: chlorpyrifos (Lorsban), dimethoate, malathion, phosmet (Imidan)</td>
</tr>
<tr>
<td></td>
<td>(DATES TBA)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>May</td>
<td>Depending on pest pressure</td>
<td>Various options</td>
<td>Growers are encouraged to add psyllid control products to their planned summer oil or nutritional spray programs. Make sure to not apply the same chemical class back-to-back keeping in mind the products planned to be used during the coordinated sprays in April and August/September windows.</td>
</tr>
<tr>
<td>June</td>
<td>1st summer oil spray</td>
<td>Various options</td>
<td></td>
</tr>
<tr>
<td>July</td>
<td>2nd summer oil spray</td>
<td>Various options</td>
<td></td>
</tr>
<tr>
<td>August / September</td>
<td>Prior to fall flush</td>
<td>Pyrethroid</td>
<td>Pyrethroid product options: fenpropathrin (Danitol), zeta-cypermethrin (Mustang)</td>
</tr>
<tr>
<td></td>
<td>(DATES TBA)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>October</td>
<td>Depending on pest pressure</td>
<td>Various options</td>
<td>Do not use pyrethroid since previously used. Do not use an organophosphate which is planned for next coordinated spray in Nov.</td>
</tr>
</tbody>
</table>

---

1 Four Coordinated sprays planned for 2010-2011 are highlighted in yellow. All growers in the Central Highlands 17/27 CHMA are encouraged to treat their groves in this 2 week window.

2 In order to prevent pesticide resistance, growers are encouraged to use a product from the specified chemical class.
• **Growers not limited to only one application method so long as...**
  
  – Product of choice is effective using the preferred application method

  – Application can be completed in the designated time frame

  – Some application methods can reduce overall costs, particularly when growers work cooperatively
Citrus Health Management Areas (CHMA's)

Creation of Citrus Health Management Areas (CHMAs) has been identified as a high priority for Florida citrus growers to slow the spread of citrus greening disease and preserve the current Florida commercial citrus acreage. The purpose of CHMAs is to encourage neighboring citrus growers to work together to combat citrus greening, particularly through the coordination of psyllid control efforts. The information found in the links below is provided to aid Florida citrus growers in establishing CHMAs in their areas.

CHMA overview

Contact information

CHMA toolkit

Active CHMA Websites

Related Sites

Citrus Research and Development Foundation, Inc.

Resources

Florida Citrus Pest Management Guide
Citrus Greening Disease
Citrus Black Spot
Citrus Health Management Areas (CHMA'S)
Citrus Canker
Asian Citrus Psyllid
Pesticide Information
Citrus Health Management Areas (CHMA's)

NE Desoto CHMA

Contacts

Jerry Nervin – DCLP
(863) 884-4999 ext. 201
jnervin@orangeco.ifas.edu

Shawna Weingarten – OCLP
(863) 381-9656
swweingarten@orangeco.ifas.edu

Rudy Strandsberg – DCLP
(863) 381-2076
bストansberg@orangeco.ifas.com

Steve H. Futon – UF-IFAS
Citrus Ext. Agent
(803) 906-1151 ext. 1202
sfuton@occe.ifas.ufl.edu

Latest News

9/29/16 Next coordinated application being planned for late Oct/early Nov.

9/23/16 NE Desoto CHMA program for next 12 months posted

(click to enlarge map)

- Planned pesticide applications
- Report of acres treated
- Psyllid scouting reports
- Grower forum - (online CHMA discussion board for registered growers)
- Join the CHMA – (to receive automated emails notices of new information updates)
Purpose of CHMA website (www.flchhma.org)

- Facilitate communication between growers
- Reference point for information of upcoming CHMA events
- Tool to convince non-participants to join the effort
  - Demonstration of benefit (psyllid scouting reports)
  - Educate growers (absentee growers)
More Information

Visit the Florida CHMA Website:
http://www.flchma.org

Additional Questions:
mrgrs@ufl.edu