Learn the important strategies used to implement an effective IPM program. There is much more to IPM than oils and soaps!

Rafael Andy Vega and Norman C. Leppla, Ph.D.
UF, IFAS, IPM Florida
Tuesday October 26, 2010
Session D-6: 2:30 - 3:30
About me

- CT → MA
- B.S. In Engineering at Northeastern University
- Tropical Horticulturist at Zoo New England
- Plant Medicine Program, University of Florida
- Information Specialist, IPM Florida
Outline of objectives

- What is IPM and why should we incorporate these strategies?
- How do we identify problems before they get out of hand?
- Specific examples of IPM in practice.
- Resources available for you to use.
What is IPM

- IPM is a **sustainable** approach to managing pests through **biological, cultural, physical** and **chemical** tools in a way that **minimizes** risks to the community.

- IPM Actions
  - Scouting
  - Diagnosis
  - Thresholds
  - Management
  - Evaluation
What is IPM

- To control pests
- Enhance sustainable practices
- Reduce use of dangerous chemicals
- Increase efficiency of crop production
- Minimize environmental impacts
What is IPM

DECREASE…
• Pest outbreaks & disease epidemics
• Environmental contamination
• Human health hazard
• Pest mgmt. costs
• REDUCE RISK…

INCREASE…
• Reliability
• Sustainability

Chem

Biological Control

Cultural Methods
What is IPM

- Biological knowledge
- Monitoring and inspection
- Act to control pests when necessary
- Choose least-risk options
- Long-term, preventative practices
- Evaluation and records
- Pesticide management
- Continual improvement
Identifying problems

- What part(s) of the plant are being attacked?
- What is attacking the plant?
  - Insects, mites
  - Disease
- Where does the pest feed/hide?
- How can pest be managed?
Identifying problems

- Look for damage
- Undersides of leaves
- Try to identify your bad guy
- Establish a threshold for damage
Identifying problems
Applying IPM
http://ipm.ifas.ufl.edu/
• Mechanical control includes field preparation by plowing or disking, cultivation, mowing, hoeing and hand pulling of weeds.

• Physical removal of insects

• Mechanical control practices are among the oldest of weed management techniques.

• Warning: Seedbed preparation by plowing or disking exposes many weed seeds to variations in light, temperature, and moisture. For some weeds, this process breaks weed-seed dormancy.
Cultural Methods

- **Crop-Free Periods**
  - **Cover Crops**
    - Sunn hemp, cowpea,
  - **Help reduce initial pest populations**
    - Nematodes, viruses,
    - Think non susceptible hosts
- **Crop Rotation**
  - Manages populations of pests and pathogens

- **Companion Crops**
  - Provide nectar & pollen for beneficial insects
- **Resistant Plants**
  - Denies pests and pathogens a host to reproduce on
- **Sanitation**
  - Minimizes pressure from pathogens
Natural Enemies and Pesticides - Thrips Species

Florida flower thrips
*Frankliniella bispinosa*

Melon thrips
*Thrips palmi*

Tobacco thrips
*Frankliniella fusca*
Example of IPM

- Invasive Pest
- Vulnerable Crop
- Resistant Crop
  - Competitors
  - Natural enemies
  - Resistant varieties

Pesticide program
- New insecticides
- New formulations
- Application methods
- Resistance management

Integrated pest management program
- Cultural practices
- Scouting, ID of pests & NEs
- Conservation of NEs
- Augmentation of NEs
- Reduced-risk insecticides
- Resistance management
Pepper

Western flower thrips

thrips larvae

Orius

Thrips per flower

Pirate bugs per flower

fenpropathrin

spinosad

untreated

May & June 1996

Funderburk, Stavisky & Olson 2000
Amblyseius swirskii
**Amblyseius swirskii Effectiveness**

- Very high numerical response to availability of food
- Highly efficacious against western flower thrips, greenhouse whiteflies and tobacco whiteflies
- In combination with:
  - *Orius spp.* against western flower thrips
  - Whitefly parasites against whiteflies
  - *P. persimilis* or *A. californicus* against two-spotted spider mites
- Good establishment on pollen
- Whiteflies can substitute for pollen in peppers
- Good results in North and South Europe
- May replace *A. cucumeris*, depending on release permits
**Bemesia tabaci**

Control on Hibiscus

- **Weeks 0 to 20**: Mean number of alive pupae of *B. tabaci* per plant.
- **Weeks 1 to 22**: Release dates and mean number of *A. swirskii* per plant.

Release dates:
1. Week 13
2. Week 16
3. Week 19

Comparisons:
- *A. swirskii* per plant
- *B. tabaci* with *A. swirskii*
- *B. tabaci* without *A. swirskii*
Description of U.S Companies Serving the Southeast

- Number = 49 producers and suppliers
- Size = 10 employees average
- Revenue = $20-25 million, 3 > $1.5 million
- Species = 56 (+ 21 microbials), 5/20 producers >3 species, ca 50% produce one, few new species.
Markets for Natural Enemies

- Entomopathogenic nematodes- *Heterorhabditis*, *Steinernema*
- Predatory mites- *Amblyseius*, *Galendromus*, *Neoseiulus*, *Phytoseiulus*, *Hypoaspis*
- Predatory insects- *Chrysoperla*, *Cryptolaemus*, *Hippodamia*, *Orius*, *Dalotia*, *Coccinella*, *Delphastus*, *Feltiella*, *Podisus*, *Rhyzobius*, *Stethorus*
- Parasitoids- *Aphelinus*, *Aphytis*, *Encarsia*, *Eretmocerus*, *Aphidius*, *Pediobius*, *Trichogramma*
- Fly parasites- *Muscidifurax*, *Splangia*, *Nasonia*
- Biopesticides- *Bacillus*, *Beauveria*, *Trichoderma*
Major Commercial Natural Enemies
Major Commercial Natural Enemies
Guidelines for Purchasing and Using Commercial Natural Enemies and Biopesticides in Florida and Other States

- Guide on how to go about purchasing natural enemies (insects, mites, nematodes) and biopesticides

- What do I need to know?
  - What plant/habitat is being attacked?
  - What is causing the problem?
  - What kind of natural enemy do I want to use?
More than 49 biological control companies provide nematodes, mites, insects, and bioinsecticides for pest management in Florida and the Southeast.

- Nematodes are sold by 28 companies (5 species).
- Predators are sold by 31 companies, 26 supply mites (10 species) and 31 supply insects (15 species).
- Parasitic wasps are sold by 31 companies (23 spp.).
How to Use this Guide

Table 1
Pest Habitat
- Identify your pest habitat
- Identify your insect or mite pest
- Select a type of natural enemy
- Select a specific natural enemy

Table 2
Parasitic Nematodes

Table 3
Predatory Mites

Table 4
Predatory Insects

Table 5
Parasitic Wasps

Table 6
Bio-pesticides

Table 7
Commercial Biological Control Companies
- Obtain guidance from supplier
- Purchase appropriate natural enemy
### Habitats, Pests and Natural Enemies

#### Table 1

<table>
<thead>
<tr>
<th>Habitats of Plant or Animal Pests</th>
<th>Identified Pest</th>
<th>Commercial Natural Enemies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Citrus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>aphids</td>
<td>predatory insects</td>
<td>19, 22-24, 28, 33</td>
</tr>
<tr>
<td>beetles (grubs)</td>
<td>parasitic nematodes</td>
<td>3</td>
</tr>
<tr>
<td>caterpillars</td>
<td>predatory insects</td>
<td>20, 22-24</td>
</tr>
<tr>
<td></td>
<td>parasitic wasps</td>
<td>55, 56</td>
</tr>
<tr>
<td>mealybugs</td>
<td>predatory insects</td>
<td>25, 29</td>
</tr>
<tr>
<td></td>
<td>parasitic wasps</td>
<td>45</td>
</tr>
<tr>
<td>mites</td>
<td>predatory mites</td>
<td>11, 13</td>
</tr>
<tr>
<td>scales</td>
<td>predatory insects</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>parasitic wasps</td>
<td>36, 46</td>
</tr>
<tr>
<td>thrips</td>
<td>predatory mites</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>predatory insects</td>
<td>19</td>
</tr>
<tr>
<td>whiteflies</td>
<td>predatory insects</td>
<td>19, 22-24, 27</td>
</tr>
</tbody>
</table>
## Predatory Insects

Guidelines for Purchasing and Using Commercial Natural Enemies and Biopesticides In...

### Table 4. Predatory insects. Numbered biological control products (family, genus and species), some target pests and source companies.

<table>
<thead>
<tr>
<th>PREDATORY INSECTS</th>
<th>ARBICO • BCP Certis • BioBest • EcoSolutions • The Green Spot • Hydro-Gardens • International Technology • IPM Labs • Koppert • Natural Insect Control • Rincon-Vitova • Syngenta Bioline</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>27. Feltiella acarisuga</strong>&lt;br&gt;(spider mites in ornamentals and vegetables, and in greenhouses and interiorscapes)</td>
<td></td>
</tr>
<tr>
<td><strong>Anthocoridae</strong></td>
<td></td>
</tr>
<tr>
<td><strong>28. Orius insidiosus</strong>&lt;br&gt;Minute pirate bug&lt;br&gt;(thrips, aphids and whiteflies on ornamentals, vegetables and citrus, and in greenhouses and interiorscapes)</td>
<td>ARBICO • Biocontrol Network • The Green Spot • IPM Labs • Natural Insect Control • Planet Natural • Rincon-Vitova</td>
</tr>
<tr>
<td><strong>Pentatomidae</strong></td>
<td></td>
</tr>
<tr>
<td><strong>29. Podisus maculiventris</strong>&lt;br&gt;Spined soldier bug&lt;br&gt;(Colorado potato beetles and caterpillars on ornamentals, vegetables and citrus)</td>
<td>ARBICO • EcoSolutions • Evergreen • The Green Spot • IPM Labs • Koppert • M &amp; R Durango • Natural Insect Control • Plant Products • Rincon-Vitova • Syngenta Bioline</td>
</tr>
<tr>
<td><strong>Neuroptera</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Chrysopidae</strong></td>
<td></td>
</tr>
<tr>
<td><strong>30. Chrysoperla carnea</strong>&lt;br&gt;Lacewing&lt;br&gt;(aphids and any other small soft bodied insects on ornamentals, vegetables and citrus)</td>
<td>A-1 Unique • American Insectaries • BCP Certis • BioBest • Bugiological Control • Harmony Farm Supply • Hydro-Gardens • International Technology • Koppert • Natural Insect Control • Plant Products • Rincon-Vitova • Syngenta Bioline</td>
</tr>
<tr>
<td><strong>31. Chrysoperla rufilabris</strong>&lt;br&gt;Lacewing&lt;br&gt;(aphids and any other small soft bodied insects on ornamentals, vegetables and citrus)</td>
<td>A-1 Unique • American Insectaries • Beneficial Insectary • Gardens Alive • The Green Spot • Harmony Farm Supply • IPM Labs • Natural Insect Control • Peaceful Valley • Planet Natural • Rincon-Vitova • Three Trees Farm</td>
</tr>
</tbody>
</table>
The Natural Enemies and Biopesticides

Table 2- Nematodes (8)
Table 3- Predatory mites (10)
Table 4- Predatory insects (15)
Table 5- Parasitic wasps (23)
Table 6- Biopesticides (21)
Table 7- Companies and websites (49)
Many companies provide detailed information on how to use their products.

The best companies deliver excellent customer service for site-specific biocontrol.

The marketplace ultimately determines the usefulness of commercial natural enemies.
IPM Florida Website

• About IPM Florida
• Contact Us
• Success Stories
• Projects
• Reports
• Extension Resources
• Training

• Funding
• Employment
• Events
• Our Listserv
• Related Links
• Site Map

• Planning
• Scouting
• Pest Identification
• Tactics
• Measuring IPM
• Invasive Species
• GMOs
• Soil Quality
• Water Quality/BMPs

Recent Additions
Ask Extension
IPM Florida provides statewide, interdisciplinary and inter-unit coordination and assistance for UF/IFAS integrated pest management research Extension and education faculty

http://ipm.ifas.ufl.edu