Cooperative Efforts in Managing Whitefly Resistance to the Neonicotinoid Chemistry in Florida

David J. Schuster
University of Florida, IFAS
Gulf Coast Research & Education Center
Wimauma, FL
Generalized Production Cycle for Tomato in Southern Florida
Tomato mottle

Tomato yellow leaf curl
# Nicotinoid Insecticides for Tomatoes

<table>
<thead>
<tr>
<th>Common name</th>
<th>Product name(s)</th>
<th>Application</th>
<th>Registration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imidacloprid</td>
<td>Admire/Provado</td>
<td>Soil/Foliar</td>
<td>1994</td>
</tr>
<tr>
<td>Thiamethoxam</td>
<td>Platinum</td>
<td>Soil</td>
<td>2001</td>
</tr>
<tr>
<td>Acetamiprid</td>
<td>Assail</td>
<td>Foliar</td>
<td>2002</td>
</tr>
<tr>
<td>Dinotefuran</td>
<td>Venom</td>
<td>Soil/Foliar</td>
<td>2005</td>
</tr>
</tbody>
</table>

**Properties:** Group 4A Insecticides  
- Systemic/translaminar  
- Interfere with nicotinic acetylcholine receptor  
  (death in 2 - 48 hrs)  
- Contact and ingestion activity  
- Control aphids, whiteflies, some beetles
Monitoring for Resistance to Nicotinoids

- Bioassay developed in 1999
- Monitoring began in 2000
- Funding provided by industry
  - Florida Tomato Committee
  - Bayer CropScience
$\text{LC}_{50}$ values estimated and $\text{RR}_{50}$ value calculated
Monitoring Susceptibility (RR$_{50}$) of Whitefly Adults from Nicotinoid-Treated Tomato Fields to Imidacloprid Using a Laboratory Bioassay
Resistance Management Program Initiated

- Resistance management recommendations formulated
  - Insecticide program recommendations
  - Cultural manipulation recommendations
- Recommendations presented at grower meetings
Monitoring Susceptibility (RR$_{50}$) of Whitefly Adults from Nicotinoid-Treated Tomato Fields to Imidacloprid Using a Laboratory Bioassay
Ad Hoc Resistance Management Working Group

- University of Florida – research & county extension personnel
- Chemical industry representatives – Bayer CropScience, Cerexagri & Syngenta Crop Protection
- Crop consultants – Glades Crop Care & KAC Agricultural Research
- Grower group representative - FFVA
Ad Hoc Resistance Management Working Group Activities

- Revise the existing resistance management recommendations
- Expand and intensify the extension of these recommendations to growers
- Establish an area-wide demonstration of recommendations in southwest Florida
Nicotinoid Resistance Management
Recommendations

Use Proper Insecticide Program

Do not use Admire Pro on transplants or use only once

Use Admire Pro (7ozs) or Platinum (8ozs) at transplanting

Do not split applications of Admire Pro or Platinum

Never follow a nicotinoid application with another nicotinoid application

Save nicotinoids for crops without virus or disorders
Nicotinoid Resistance Management
Recommendations

Cultural Manipulations

Observe two-month tomato-free summer period
Nicotinoid Resistance Management
Recommendations

Cultural Manipulations

Observe two-month tomato-free summer period
Use a correct crop destruction technique
  Destroy crop promptly and efficiently between seasons
  Use oil with burn-down herbicide to kill whiteflies
  Time burn-down sprays to avoid windy periods
  Destroy crop block by block as harvest is completed
Nicotinoid Resistance Management Recommendations

Cultural Manipulations

Observe two-month tomato-free summer period

Use a correct crop destruction technique

Other cultural practices to reduce SLWF

- Plant whitefly-free and virus-free transplants
- Delay planting new crops as long as possible
- Destroy old crops immediately after harvest
- Manage whitefly infested host plants
- Manage weeds within crop
- Avoid u-pick or post harvest pin-hooking
Nicotinoid Resistance Management Recommendations

Cultural Manipulations

- Observe two-month tomato-free summer period
- Use a correct crop destruction technique
- Other cultural practices to reduce SLWF
- Do unto your neighbor as you would have him do unto you
  - Keep abreast of neighboring operations
- Participate in regional, cooperative effort
Expanded and Intensified Grower Education Activities

• Presentations at meetings
  – UF/IFAS sponsored statewide and regional grower meetings
  – UF/IFAS Extension in-service training
  – Agrichemical industry sponsored local and statewide grower meetings
  – Agrichemical industry sales staff meetings
Recommendations for Management of Neonicotinoid Resistance for Florida Tomato Production

(Neonicotinoids include Admire, Plauditum, Pronto, and Assail)

1. Observe a minimum two-month crop free period from mid-June to mid-August.

2. Use a correct crop destruction technique which includes destruction of existing whitfly populations in addition to the physical destruction of the crop.
   a. Prompt and efficient crop destruction between fall and spring crops to minimize whitfly numbers and sources of TYLCV.
   b. Use a broad-spectrum herbicide such as Paraquat or Diuron in conjunction with a heavy application of oil (2-4% solution) to quickly kill whitflies.
   c. Time burn down sprays to avoid crop destruction during windy periods, especially when prevailing winds are blowing whitflies toward adjacent plantings.
   d. Destroy crops block by block as harvest is completed rather than waiting and destroying the entire field at one time.

3. Reduce overall whitfly populations by strictly adhering to cultural practices including:
   a. Plant whitfly-free transplants.
   b. Delay planting new fall crops as long as possible and destroy old crops immediately after harvest to create or lengthen a tomato free period.
   c. Control whitfly infested weeds, abandoned crops, and volunteer plants.
   d. Control whitfly weed host reservoirs on field edges and ditch banks.
   e. Manage weeds within crops to minimize interference with spraying.
   f. Avoid weeding or pre-harvesting operations unless effective whitfly control measures are continued.

4. Use a proper whitfly spray program. Follow the label

   a. On transplants, either do not use a neonicotinoid or apply only 7 days before shipping. Use products in other chemical classes, including Fulvet, before this time.
   b. Use a neonicotinoid Admire (16 oz/ac) or Plauditum (8 oz/ac) at transplanting. Use products of other chemical classes as the control from the neonicotinoid diminishes.
   c. Do not use Admire at less than 16 oz/ac or Plauditum at less than 8 oz/ac.
   d. Do not use a split application of Admire or Plauditum (i.e., do not apply at transplanting and then again later).
   e. Never follow a soil or foliar application of a neonicotinoid with another soil or foliar application of the same or different neonicotinoid on the same crop or in the same field within the same season (i.e., do not treat a double crop with a neonicotinoid if the main crop was treated previously, unless the double crop is planted at least 60 days after the main crop).

5. Do unto your neighbor as you would have him do unto you.

   Leaving out for your neighbor’s welfare may be a strange or unwelcome concept in the highly competitive vegetable industry but it is your best interest to do just that. Growers need to remember that should the whitflies develop full-fledged resistance to the neonicotinoids, it’s not just the other guy that will be hurt—everybody will feel the pain. This is why the Resistance Management Working Group has focused on encouraging region-wide cooperation in this effort.

   Knowing what is going on in the neighbor’s fields is important. Growers should try to keep abreast of operations in upwind fields, especially harvesting and crop destruction, which both disturb the foliage and cause the whitfly to fly. Now that pyrethrum has been added to the list of TYLCV hosts, growers will need to keep in touch with events in that crop as well.

For additional Information:
IRAC (Insecticide Resistance Action Committee) Website – [http://www.irac-online.org](http://www.irac-online.org)

Insecticide Resistance: Causes and Action

A joint effort between the Southern Region Integrated Pest Management Center and the Insecticide Resistance Action Committee

Mode of Action (MOA) Initiative

What Can You Do About Insecticide Resistance?

The best strategy to combat insecticide resistance is prevention. Minimizing pest numbers, maximizing natural pest control, and understanding insect behavior is essential. A few key recommendations include:

- **Monitor pests**: Scouting is one of the key activities in the implementation of an integrated pest management (IPM) strategy. Monitoring population levels and assessing the effectiveness of control measures helps in making decisions about pesticide application and the need for intervention.

- **Focus on economic thresholds**: Insecticides should be used only when necessary to control pest populations that exceed the economic threshold for crop damage.

- **Timing of application**: Proper timing of pesticide applications is crucial to ensure effective control. Applications should be made when pests are most vulnerable, such as during their vulnerable stages of development.

- **Residual activity**: Residual action is important for control of pests that may re-infest treated areas after treatment. It helps in reducing the pest population and protecting the crop.

- **Route of pesticide administration**: Understanding the mode of action of the pesticide is crucial to effectively control pests. Different pesticides may work through different mechanisms, which can be targeted during the formulation of control strategies.

- **Monitor for resistance**: Regular monitoring for resistance development is essential to ensure that the pest population remains susceptible to the pesticides used. This helps in delaying resistance development and maintaining the effectiveness of pest control strategies.

- **Use multiple control strategies**: Using a combination of control strategies, such as biological control, cultural practices, and pesticides, can help in managing resistance and maintaining effective pest control.

- **Pesticide rotation**: Rotating pesticides with different modes of action helps in managing resistance. This reduces the selection pressure for resistance development and maintains the effectiveness of pesticides.

- **Post-treatment monitoring**: Monitoring pest populations after pesticide application helps in assessing the effectiveness of the control measures and identifying any resistance development.

- **Adaptations to control strategies**: Adaptations to control strategies, such as modifying application rates or timing, can help in managing resistance.

- **Pesticide stewardship**: Practicing pesticide stewardship, such as following proper application techniques and storing pesticides correctly, is crucial in maintaining their effectiveness.

- **Regulatory guidelines**: Following regulatory guidelines and recommendations for pesticide use is essential to ensure safe and effective pest control.

- **Education and awareness**: Educating stakeholders, including farmers, researchers, and policymakers, about the importance of pest control and the risks of resistance development can help in promoting effective pest management practices.

- **Research and development**: Continued research and development of new pesticides and resistance management strategies can help in managing resistance and maintaining effective pest control.
Expanded and Intensified Grower Education Activities

- Presentations at meetings
- Written Communications
Whitefly Management Update

Compiled by Phyllis Gilreath and Dave Schuster

Whiteflies are becoming more and more of a concern to growers and homeowners. They are a major pest problem in the southern United States and are known for their ability to transmit plant diseases. In addition to causing damage to crops, whiteflies can also decrease the yield and quality of produce.

To control whitefly populations, it is important to implement integrated pest management (IPM) strategies. This includes monitoring whitefly populations, using cultural practices such as crop rotation and proper irrigation, and applying systemic insecticides as needed.

TYLCV: Pogo Was Right

Brian Pogue and Dave Schuster

TYLCV: Pogo Was Right

This season, in spite of our beloved western yellow (SWY) monitors, there has been a surprisingly high incidence of Tomato Yellow Leaf Curl Virus (TYLCV) in many Central Florida tomato fields. At a recent grower meeting in Bradenton, participants heard a review of the current situation, discussed a plan for virus identification and whitefly biology, and were reminded of the importance of monitoring whitefly populations.

TYLCV is a virus that can cause significant damage to tomato plants. Infected plants may show symptoms such as yellowing leaves, stunted growth, and reduced yields. The virus is transmitted by whiteflies, and can be spread throughout the plant by feeding on the plant tissues.

The TYLCV virus is a concern for tomato growers because it can lead to significant losses in yield and quality. In addition, the virus can be transmitted to other crops, which can pose a risk to other tomato fields.

To control TYLCV, it is important to implement integrated pest management (IPM) strategies. This includes monitoring whitefly populations, using cultural practices such as crop rotation and proper irrigation, and applying systemic insecticides as needed.

Summer conditions are not conducive to producing crops that can compete with those from more northern regions, whose tomatoes are produced during the summer. This means that farmers must find ways to increase their production and avoid the summer slump.

The use of TYLCV-resistant varieties is one way to mitigate the impact of TYLCV on tomato production. These varieties are resistant to the virus and can help growers avoid the cost and time required to manage the virus.

In conclusion, TYLCV is a significant concern for tomato growers in Central Florida. It is important to implement integrated pest management strategies to control whitefly populations and prevent the spread of TYLCV throughout the tomato fields.

For more information on how to control TYLCV and other plant diseases, contact your local agricultural extension agent or visit the website of the Florida Department of Agriculture and Consumer Services.
**VEGETARIAN**

**Newsletter**
A Vegetable Crop Extension Publication
Vegetation 03-05
University of Florida
Institute of Food and Agricultural Sciences
Cooperative Extension Service

---

**UPCOMING EVENTS CALENDAR**

- Various Extension Events in South Florida. Contact Dave Molloy at 674-4652.
- Mycotoxins Alternatives Field Day, UF/IFAS Gainsville Valley, Live Oak, FL, May 6, 2003. 9am-11am. (Preliminary)
- Twisted Field Day, UF/IFAS Gainsville Valley, Live Oak, FL, May 30, 2003. For more information, contact Karen Harris at 352-386-1725 or kaharris@ufl.edu.
- Open Day at Florida State Horticultural Society, June 5, 2003. 7:50 am - 4:50 pm

---

**May/June 2004 Calendar**

- June 6-8: Florida State Horticultural Society Meeting, Sheraton World Resort, Orlando. For more details, visit the website at http://www.fhsr.org.
- June 10: Nutrient Management and Soil Water Management CCA Seminar, 8 am - 5 pm. UF/IFAS SW. Florida Research and Education Center, Hwy 29 N, Immokalee, FL. 800-996-CALES. Cost is $90. To register, contact Mary Hartley at 863-263-4677 or e-mail: mhartley@ufl.edu. To see an agenda, visit the SWREC website at http://www.uwesc.ufl.edu/.
- June 15: General Standards (CORE) Private Applicator Ag Pesticide License Exam Preparation Class 9-11 am. Manatee County Extension Service. Extra given immediately following class. 2 CORE CEUS approved for licensed applicators.
- June 21-23: 1st International Symposium on Tomato Diseases and 15th Annual Tomato Disease Workshop, Crowne Plaza at Walt Disney World Orlando. Contact Tim Tornabene at 205-482-1754 or e-mail: tont@isat.ufl.edu or visit the website http://plankton.bio.ufl.edu/.
- June 21-23: S.O.G. (Sudden Oak Death) Workshop, Manatee County Extension Service, Palmetto. This workshop is tentatively scheduled for late June or early July. For more information, call 727-452-24 for additional information.

---

**A past on the hook, though only a few vertebrates removed from a kick in the pants, is miles ahead in results. (Sememl Gert)**

---

The Manatee County Extension Service staffs are overwhelming the benefits of entrepreneurship and civic involvement for those who are willing to commit time and effort to improving the quality of life in their communities. This is achieved through objectives established by the Manatee County Extension Service.
Cooler temperatures have prevailed across south Florida as typical late fall/early winter weather pattern has become established. Frost-free weather pattern is expected to continue, compensated by dryer and windless conditions that have also brought significant rainfall to most of the region over the past few weeks.

Mostly clear weather allowed fieldwork to progress on schedule as south Florida growers continue recovery efforts following Hurricane Wilma. Growers remain busy cleaning up and replanting fields destroyed or damaged by Wilma in addition to working along those crops that survived the storm.

As fall crops come off, it is important to practice good sanitation to avoid movement of whiteflies into later plantings and a buildup in populations that carry over to the spring crop.

Growers are urged to continue to practice the following recommendations:

- **Nicotineal Resistance Management Recommendations**
  - Reduce overall whitefly populations by strictly adhering to cultural practices including:
    - Plant whitefly-free transplants
    - Delay planting new crops as long as possible and destroy old crops immediately after harvest to create or lengthen a tomato-free period
    - Do not plant new crops near or adjacent to infested weeds or crops, abandoned fields awaiting destruction or areas with volunteer plants
    - Use UV-reflective (aluminum) plastic soil mulch
    - Control weeds on field edges if scouting indicates whiteflies are present and natural enemies are absent
    - Manage weeds within crops to minimize interference with spraying
    - Avoid up-pick or pin-hooking operations unless effective control measures are continued
  - Do not use a nicotineal (like Admire) on transplants or apply only once 7-10 days before transplanting; use other products in other chemical classes, including Fulfellite, before this time;
  - Apply a nicotineal like Admire (16 oz/acre) or Platinum (6oz/acre) at transplanting and use products of different chemical classes (such as the insect growth regulators Couridil or Knack®) as the control with the nicotineal diminishes. Note: Couridil and Applaud are the same active; hypronfenex. Couridil is labeled for whitefly on tomato and snap bean. The mode of action is chitinase inhibitor. Dimilin and Knack are juvenile hormone mimics labeled for whitefly control on training vegetables.
  - Never follow an application (soil or foliar) of a nicotineal with another application (soil or foliar) of the same or different nicotineal on the same crop or in the same field within the same season (i.e. do not treat a double crop with a nicotineal if the main crop had been treated previously);
  - Use applications of acaricides for crops threatened by whitefly-transmitted plant viruses or whitefly-inflicted disorders (i.e. tomato, beans or squash) and consider the use of chemicals of other classes for whitefly control on other crops.

**Weather Summary**

<table>
<thead>
<tr>
<th>Date</th>
<th>Min</th>
<th>Max</th>
<th>Rainfall</th>
<th>Hours Below Certain Temperature</th>
<th>Bees</th>
</tr>
</thead>
<tbody>
<tr>
<td>11/19-12/20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ft Lauderdale</td>
<td>58.8</td>
<td>80.1</td>
<td>7.3</td>
<td>9.8</td>
<td>17.7</td>
</tr>
<tr>
<td>Fort Pierce</td>
<td>62.9</td>
<td>80.3</td>
<td>7.3</td>
<td>9.8</td>
<td>17.7</td>
</tr>
<tr>
<td>Homestead</td>
<td>44.1</td>
<td>84.2</td>
<td>0.3</td>
<td>9.6</td>
<td>17.5</td>
</tr>
<tr>
<td>Immokalee</td>
<td>43.0</td>
<td>84.1</td>
<td>1.48</td>
<td>9.1</td>
<td>17.5</td>
</tr>
</tbody>
</table>

**Worms**

Scouts in Homestead reported problems with a fairly large fall armyworm hatch over the past week or so, and note that they are still seeing occasional problems with wireworm, cutworm, and lesser corn stalk borer on young corn. A range of worms including beet armyworm, southern armyworm and tomato fruit worm are present in eggplant, pepper and tomato and growers report problems with melon worms and melonworms on squash and squashes.

Growers and scouts in the Glades indicate that fall armyworm pressure is high in recent days. Reports indicate hatch-outs of up to 80% on young corn, with many surrounding blocks near the same age ranging anywhere from 30-50% infestation.

Reports from Manatee County indicate that worms still around in moderate numbers and note some problems with diamondback moth in cabbage.

Around southwest Florida, growers and scouts indicate that pressure is starting to pickup with mainly beet and southern armyworms. Melonworms are reported to moderate to heavy in cucurbits in some places.
1. UV reflective mulch - The theory behind these products is that they reflect a particular spectrum of light wavelengths that tend to damage SWF. An example of this is when they fly over fields. If you can keep them from landing, they may reduce the severity of virus infections. Keep in mind that there is a difference between the gray or silver mulch and the UV-enhanced or metallic mulches. Researchers with the most positive results used the most reflective mulches on plant growth and virus reduction. Growers in the Glades area may already be using reflective mulch for this purpose. The benefits of reflective mulch are similar to those of using UV-enhanced or metallic mulches. In all cases, these mulches are more reflective than black or other shades, and they may provide a cost-effective way to reduce virus infections.

2. Sticky traps - Growers have asked about the benefits of the yellow sticky traps to help monitor SWF populations. Since we plant new fields, yellow sticky traps were placed vertically or horizontally around the perimeter of a field. The traps catch the number of SWF in the field. Sticky traps are also helpful during the season. Vertical orientation helps monitor what is moving within the field, while horizontal orientation can detect the presence of SWF in the field. Traps should be checked and replaced at least weekly.

3. Use of reflective mulch - This may be a key cultural practice in coming years. The IFAS tomato breeding program recommended that tomatoes be grown in the field with reflective mulch. In recent years, some studies have proven that reflective mulches provide a cost-effective way to reduce virus infections. In all cases, these mulches are more reflective than black or other shades, and they may also provide a cost-effective way to reduce virus infections.

4. During the season - A number of practices can be followed to minimize the impact. You have heard and read about these actions that are worth reviewing briefly. These include:
   - Never follow an application of a mixture with another application of the same or different nematicide on the same crop within 48 hours. This might also be true of SWF applications. Additionally, growers and field observations indicate that these products do not improve SWF control on TYLCV or CPMV compared to other chemical products.
   - Manage weeds within the crop to prevent them from competing for nutrients and water. This includes controlling weeds before they become a problem. In addition, grower and field observations indicate that these products do not improve SWF control on TYLCV or CPMV compared to other chemical products.
   - Manage weeds within the crop to prevent them from competing for nutrients and water. This includes controlling weeds before they become a problem. In addition, grower and field observations indicate that these products do not improve SWF control on TYLCV or CPMV compared to other chemical products.
   - Manage weeds within the crop to prevent them from competing for nutrients and water. This includes controlling weeds before they become a problem. In addition, grower and field observations indicate that these products do not improve SWF control on TYLCV or CPMV compared to other chemical products.

[Information from Dave Schaefer, Steve Dixon, Joe Farmer, and Karen Bishop, July 2003]
Monitoring Susceptibility of Whiteflies to Imidacloprid and Resistance Management for Nicotinoid Insecticides

David J. Schuster, Sandra Thompson, and Roy F. Morris

Imidacloprid is a neonicotinoid insecticide that is widely used for controlling whiteflies in Florida. A method was developed to determine the susceptibility of whiteflies to imidacloprid. This method was tested for susceptibility of whiteflies in the laboratory and for trapping an infiltrated colony and for testing nine field populations using a high throughput liquid handling system. Results indicate that whiteflies from high-throughput liquid handling systems were more susceptible to imidacloprid than whiteflies from field populations. Field populations from different locations were less susceptible than laboratory populations. The susceptibility of whiteflies to imidacloprid was determined by measuring the growth rate of whiteflies exposed to different concentrations of imidacloprid. The MIC was calculated for each population and compared to the laboratory populations. The MIC for laboratory populations was significantly lower than the MIC for field populations. These results suggest that resistance management strategies for imidacloprid should be implemented to prevent the development of resistance. It is recommended that adults from field populations be collected and tested for resistance to imidacloprid. Additionally, the use of alternate insecticides that do not exhibit resistance to imidacloprid may be necessary to control whitefly populations.
Biorational Insecticides for Integrated Pest Management in Tomatoes

David J. Schuit and Philip A. Stacy

Integrated Pest Management (IPM) systems define an array of all available tools to manage pests in an environmentally sustainable manner. Inorganic insecticides are one set of tools. The approach to pest management used at UF/IFAS recommends a system of cultural methods, hand-picking, and chemical applications, with insecticides used only when needed. This system has been successful in reducing pest populations without negative impacts on the environment. The approach to IPM discussed here includes cultural, biological, and chemical methods. The UF/IFAS IPM system has been applied to a wide range of crops and pests. In this paper, we focus on the use of biorational insecticides in tomato production.

Scouting for Insects, Use of Thresholds and Conservation of Beneficial Insects on Tomatoes

David J. Schuit

Integrated Pest Management (IPM) systems define an array of all available tools to manage pests in an environmentally sustainable manner. Inorganic insecticides are one set of tools. The approach to pest management used at UF/IFAS recommends a system of cultural methods, hand-picking, and chemical applications, with insecticides used only when needed. This system has been successful in reducing pest populations without negative impacts on the environment. The approach to IPM discussed here includes cultural, biological, and chemical methods. The UF/IFAS IPM system has been applied to a wide range of crops and pests. In this paper, we focus on the use of biorational insecticides in tomato production.

A Threshold for Timing Applications of IGRs to Manage the Silverleaf Whitefly and Irregular Ripening on Tomato

David J. Schuit

Silverleaf Whitefly, Bemisia argentifolii, is a pest of tomato throughout the world. The species is a significant problem in Florida, where it causes economic losses to growers. The pest is primarily controlled using insecticides. The use of insecticides can lead to resistance development, which can reduce their efficacy. In addition, insecticides can have negative impacts on beneficial insects. Therefore, there is a need for alternative methods to manage the Silverleaf Whitefly. In this paper, we discuss the use of insect growth regulators (IGRs) as a tool to manage the Silverleaf Whitefly and irregular ripening on tomato.
Monitoring Relative Susceptibility (RR$_{50}$) of Whitefly Adults from Nicotinoid-Treated Tomato Fields to Imidacloprid Using a Laboratory Bioassay

<table>
<thead>
<tr>
<th>Year</th>
<th>Avg RR$_{50}$</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>3.7</td>
<td>3 (0)</td>
</tr>
<tr>
<td>2001</td>
<td>6.7</td>
<td>9 (2)</td>
</tr>
<tr>
<td>2002</td>
<td>9.9</td>
<td>14 (4)</td>
</tr>
<tr>
<td>2003</td>
<td>14.7</td>
<td>10 (8)</td>
</tr>
<tr>
<td>2004</td>
<td>6.1</td>
<td>11 (1)</td>
</tr>
<tr>
<td>2005</td>
<td>2.5</td>
<td>2 (0)</td>
</tr>
</tbody>
</table>
ACKNOWLEDGMENTS

Industry

Bayer CropScience
Syngenta Crop Protection
Glades Crop Care, Inc.
KAC Agricultural Research
Agricultural Crop Consulting, Inc.
Integrated Crop Management, Inc.
Agri-Tech Services, Inc.
Numerous cooperating tomato growers

University of Florida

Phyllis Gilreath
Gene McAvoy
Jane Polston
Phil Stansly & Jim Conner