A Grower Initiated Approach for Sustaining Neonicotinoid Efficacy Across Commodities

From 1991-1993 in AZ and CA, outbreaks of whiteflies caused > $500 million worth of damage to cotton, melons & vegetables.

**Sweetpotato Whitefly**
Bemisia tabaci – B biotype

- Multivoltine pest
- Polyphagus pest
- Exponential population growth

- Adults very mobile

**Whitefly “cloud” over newly established produce field**

Imperial Valley – Fall 1991

**Highly Mobile Pest in Diverse, Cropping system**
Shared Whiteflies Among Key Whitefly Hosts
Imidacloprid Admire®
Neonicotinoid

Ideal Whitefly Control:
• Pre-plant injection
• Drip Chemigation
• Immediate plant protection

45-60 d residual control

Synergized Pyrethrloids in Arizona Cotton - 1995

• Documented reduction in susceptibility in lab bioassays
• Reports of poor field performance in Central Arizona
• Prompted the Section 18 registrations of IGRs in 1996

Impact of Admire and IGRs on Whitefly Suppression

Palumbo, in press

Sustained Susceptibility

Dennehy 2004

Sustained Efficacy in Commercial Broccoli

Palumbo 2004
Whiteflies have not affected Yield or Quality in Yuma for the past 13 years where Admire has been applied properly.

Passive “de facto” Management

**Cropping system**
- Large acreages of untreated host plants serve as refugia
- Alfalfa, seed crops, weeds, ornamental landscape

**Whitefly biology and ecology**
- Polyphagy, mating behavior, and dispersal capability

**IPM Practices**
- Limitation and segregation of chemistries
  - 1 use of imidacloprid in vegetables and melons
  - 1 use of IGRs in cotton
- Spatial and Temporal Insecticide Rotations
- Exposure to other non-neonicotinoid a.i.s for other pests.
  (acephate, chlorpyrifos, endosulfan, methomyl)
- Foliar Neonicotinoids (Provado) not used in cotton,
  Not labeled in melons

Expansion of the Neonicotinoid Chemistry

Neonicotinoid Registrations in Arizona - 2005

<table>
<thead>
<tr>
<th>A.I.</th>
<th>Product</th>
<th>Application</th>
<th>Crops Uses</th>
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<tbody>
<tr>
<td>acetamiprid</td>
<td>Assail, Intruder</td>
<td>Foliar</td>
<td>Lettuce, Cole, Cotton</td>
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<td>dinofuran</td>
<td>Venom</td>
<td>Foliar, Soil</td>
<td>All</td>
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<td>imidacloprid</td>
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<td>Melons, Lettuce, Cole</td>
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<td>Gaucho, etc.</td>
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<tr>
<td>imidacloprid</td>
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Arizona Cross-Commodity Working Group

- Arizona Cotton Growers Association
- AZ Cotton Research & Protection Council
- Cotton Incorporated
- Western Growers Association
- Arizona Veg Growers Association
- Yuma Vegetable Shippers Association
- Arizona Crop Protection Association
- Arizona Department of Agriculture
- University of Arizona
- AgriChemical Industry

Understanding Cropping Systems

- Insecticide Use Patterns
- Seasonal Crop Diversity
- WF Population Dynamics

Defining a Crop Community

1) Multi-crop Community
   - Cotton
   - Melons
   - Vegetables
2) Cotton Intensive
3) Melon / Cotton Intensive

Cross-commodity Guidelines for Neonicotinoid Insecticides in Arizona

- Palumbo et al. 2001
- Understanding Cropping Systems
- Proactive Management
- Defining a Crop Community
1. Fundamentals of Whitefly Management
- Avoid Problems through Cultural Controls
- Scouting, Sampling and Detection
- Ensure Effective Chemical Use

2. Limit Neonicotinoid Use

Multi-crop Community
- Not more than one use per crop in melons and vegetables.
- Soil at-planting recommended.
- Split applications are not recommended
- Do not apply any neonicotinoid product to cotton
3. Exclusion

Preserve a Neonicotinoid-free Period in MCC

- Do not apply a foliar applied neonicotinoid following the use of a soil applied neonicotinoid.

2. Limit Neonicotinoid Use

Cotton-intensive Community

- No more than two neonicotinoid uses per cotton crop.
- This includes seed treatment.
- Sprays should not be applied consecutively, but rotated with alternative chemistry.

Resistance Risks Associated with Neonicotinoid Uses in a Cotton-Intensive Community
4. Harmonize Chemical Use
   • Rotation of chemistries

Cotton-Intensive Community

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<td>AZ Whitefly IPM Program</td>
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Relative Whitefly Population Abundance

Will Adoption of the Cross-commodity Guidelines

Passive "defacto" IRM

Pro-Active IRM

Sustain the long-term efficacy of Neonicotinoids in our cropping communities

Anecdotal Evidence

• Guidelines have definitely created awareness of the issue
  "I apologize, I sprayed some Intruder on my cotton today"
  Yuma PCA – July 2003

Survey Data

• 2005 Cotton Insect Losses Workshop
  Yuma Co., 8 PCAs responded (4987 acres)
  • 4 had used Intruder in cotton
    • on 27% of the acres, 1.3 sprays

Poster # 427
Challenges and Constraints to Sustained Efficacy

A. Generic imidacloprid
   - Lower cost could mean more use or higher rates
   - Confusion in class recognition

B. Expansion of neonicotinoid labels
   - Products – effective seed and foliar alternatives
   - Crop labels: acetamiprid on melons
   - New A.I.s - clothianidin

C. Market forces
   - Cotton: cost of IGR’s relative to cotton prices
     - free demo product
   - Lettuce/Cole/ Melons: cost of Admire vs. Generics

D. New Chemistry in the Pipeline
   - Trends toward selective chemistries
   - Grower: “Industry always comes through with new technology”
   - Industry: “Resistance is a source of innovation”

E. Grower-consultant complacency and apathy
   - “Little Susy Needs New Shoes”
   - Reduced rates / split (multiple) applications
   - Sloppy soil applications on vegetables and melon

Challenges and Constraints to Sustained Efficacy

Admire® Efficacy in Commercial Broccoli
1998-2005

n = 5-9 field sites / year

Avg % Reduction of Large Nymphs compared to UTC

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<th>Year</th>
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n = 5-9 field sites / year
Admire Field Standard
Untreated

Yuma Valley – Arco Ranch #7
Oct 10, 2005

All IPM Programs are Local