

## Sustained Insecticide Performance Against Whiteflies in Multi-Cropping Systems: Past Success and New Challenges



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### Sweetpotato Whitefly

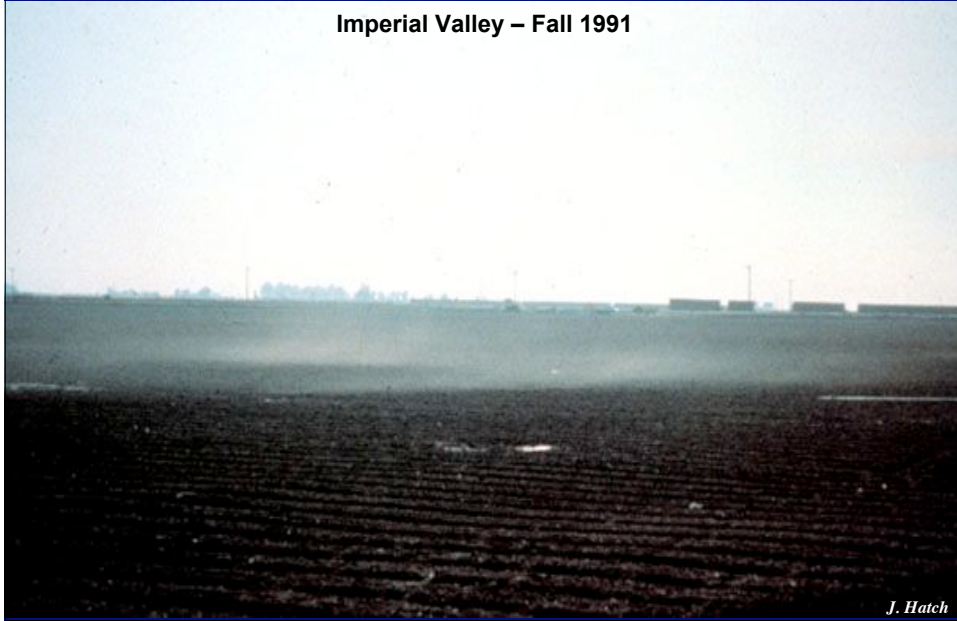
*Bemisia tabaci* – B biotype

- Polyphagous pest
- Multivoltine pest
- Adults very mobile



## Whitefly "cloud" over newly established produce field

Imperial Valley – Fall 1991



*J. Hatch*

## Shared Whiteflies, Shared Chemistries

Winter Vegetables



Spring Melons



**Synergized Pyrethroids**



Fall Vegetables and Melons



Cotton



## *Imidacloprid* **Admire®**

Ideal WF Control in Vegetables / Melons

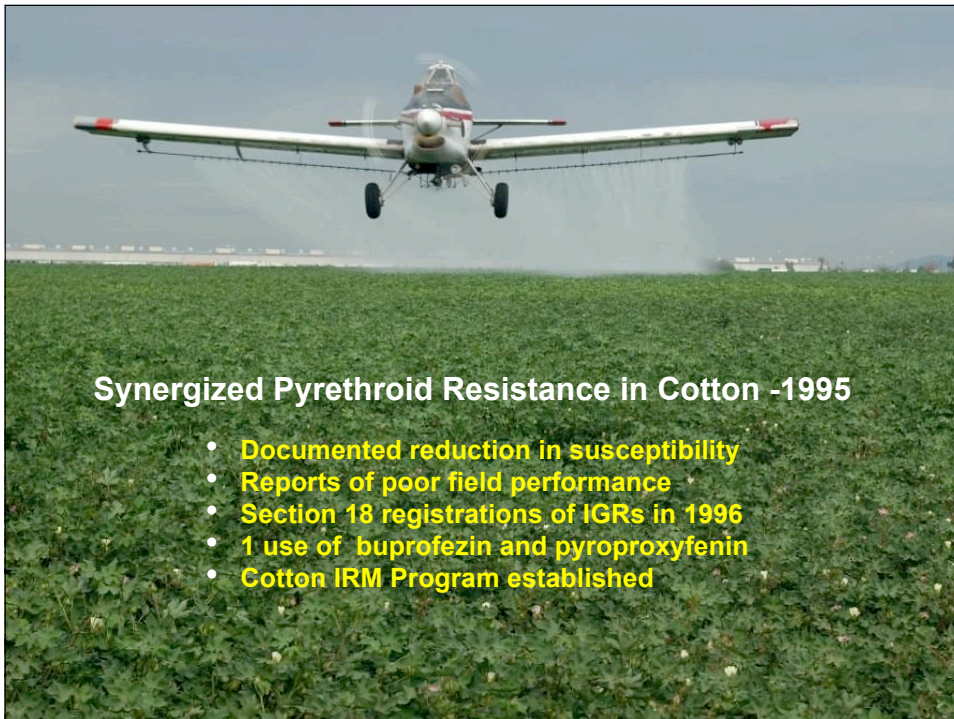
Section 18 Registrations - 1993

- At-plant soil application
- Immediate plant protection
- 45-60 d residual control

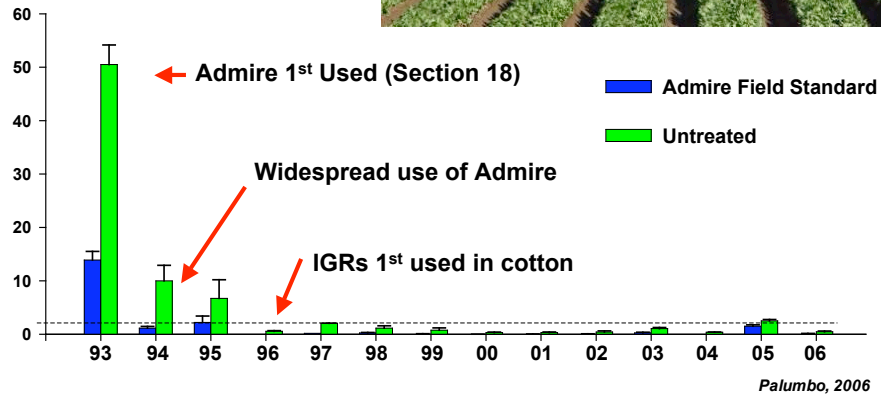


## Synergized Pyrethroid Resistance in Cotton -1995

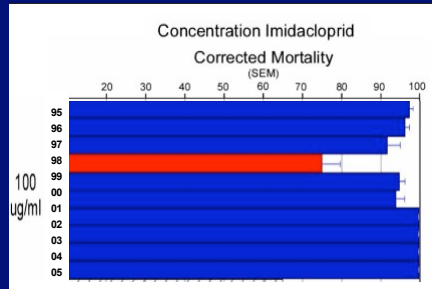
- Documented reduction in susceptibility
- Reports of poor field performance
- Section 18 registrations of IGRs in 1996
- 1 use of buprofezin and pyroproxyfenin
- Cotton IRM Program established



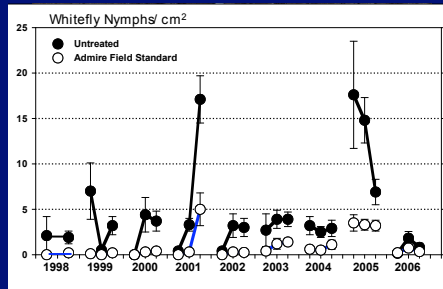
## Area-wide Impact on *Bemisia* Whitefly



## Sustained Susceptibility



## Sustained Efficacy in Commercial Broccoli





Whiteflies have not had a significant economic impact on the *Yield or Quality* of vegetables or melons in Arizona for the past 14 years.

## 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

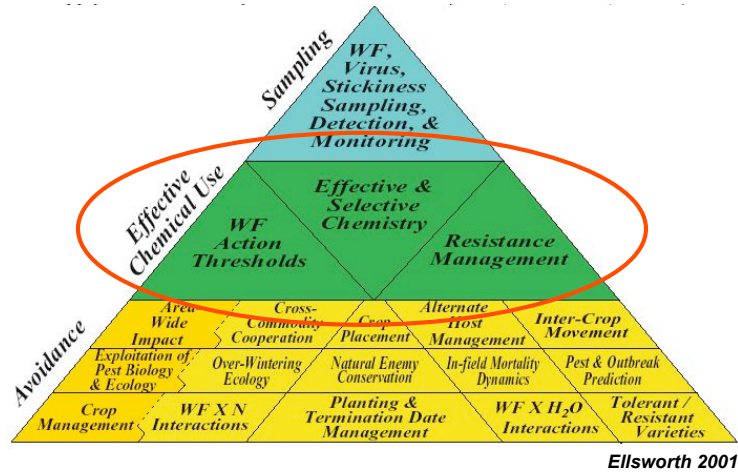
- Polyphagy, mating behavior, and dispersal capability

### IPM Practices



## IPM Practices

- Avoid Problems through Cultural Controls
- Scouting, Sampling and Detection
- Effective Chemical Use



## Effective Chemical Use

### Limitation and Segregation of Chemistries



## Using Admire™ on Desert Vegetable Crops

### Product Efficacy Management

Because of heavy reliance on Admire™ for whitefly and aphid control on vegetables in the lower desert region of Arizona, sustaining product efficacy is of great concern.

- Consider using foliar materials for whitefly control under low risk situations.
- If possible, avoid using any formulation of imidacloprid (Admire™ or Provado™) in cotton.
- If by the thinning and heading stages, whiteflies are building up on fall produce or fall melons, consider applying a non-imidacloprid foliar material to eliminate possible tolerant individuals.
- Avoid using Admire™ after whitefly pressure subsides for aphid control in produce scheduled for harvest before aphid populations traditionally develop.

Kerns & Palumbo 1995

## Expansion of the Neonicotinoid Chemistry

### 1) New Product Registrations - 2006

- Centric / Platinum: *cotton, melons*
- Intruder / Assail: *cotton, leafy vegetables*
- Venom: *cotton, melons and leafy vegetables*

### 2) Documented cross-resistance

### 3) Multiple applications allowed by labels

### 4) Risk of increased selection pressure

**“ We can't rely on a *de facto* system anymore “**

# Proactive Resistance Management



THE UNIVERSITY OF ARIZONA  
 Cooperative Extension  
[cals.arizona.edu/pubs/insects/az1319.pdf](http://cals.arizona.edu/pubs/insects/az1319.pdf)

IPM Series No. 17  
 AZ1319 – 5/2003

## Cross-commodity Guidelines for Neonicotinoid Insecticides in Arizona

John C. Palumbo<sup>1</sup>, Peter C. Ellsworth<sup>1</sup>, Timothy J. Dennehy<sup>1</sup>, Robert L. Nichols<sup>2</sup>

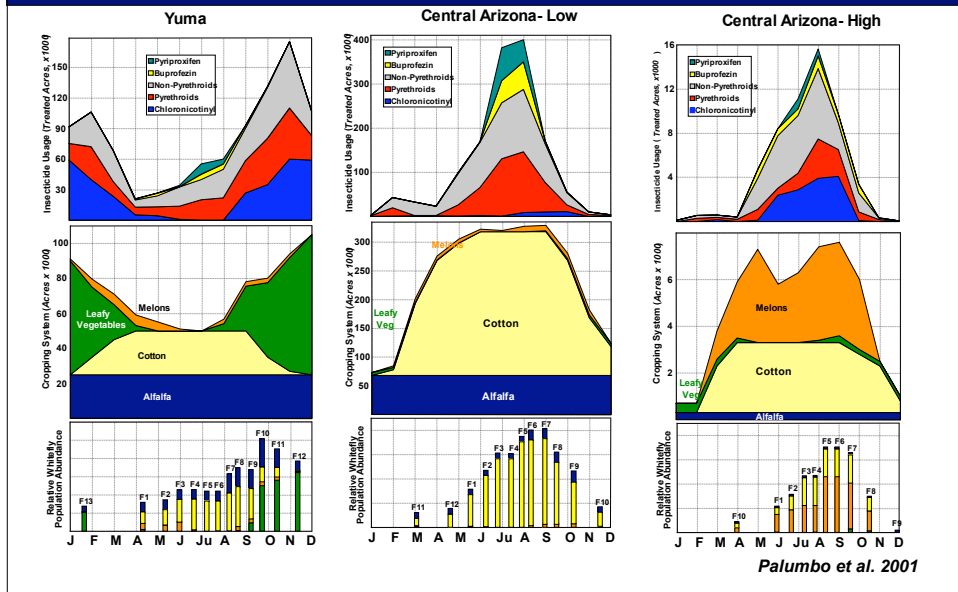
<sup>1</sup>University of Arizona, <sup>2</sup>Cotton Incorporated



Developed in collaboration with and endorsed by  
 Arizona Crop Protection Association  
 Arizona Cotton Growers Association  
 Cotton Incorporated  
 Western Growers Association

### Risk Associated with Cropping Systems

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





## Defining a Crop Community

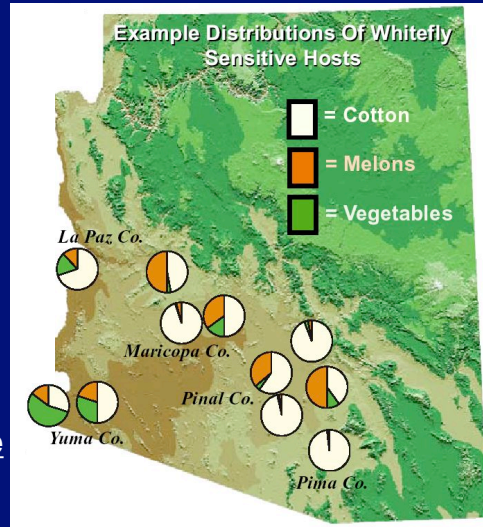
### 1) Multi-crop Community

- Cotton
- **Melons**
- **Vegetables**

“Crops grown within a 2 mile radius of each other during year”

### 2) Cotton Intensive

### 3) Melon / Cotton Intensive



### 1. Limit Neonicotinoid Uses

*Summary Guidelines: Maximum number of uses per crop season for neonicotinoids in three different cropping communities.*

Community	Cotton	Melons	Vegetables
<b>Multi-Crop</b>	0	1*	1**
<b>Cotton / Melon</b>	1	1*	—
<b>Cotton-Intensive</b>	2	—	—

\*Soil only; \*\*Soil or Foliar

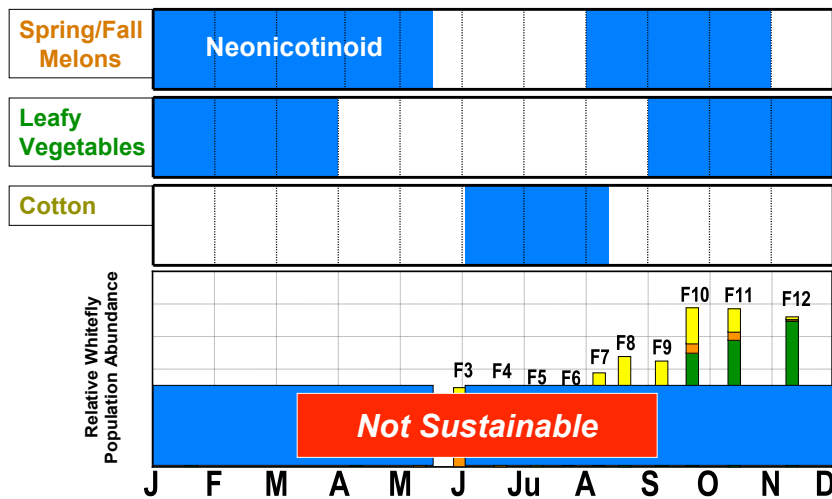
## Multi-Crop Communities.....additional guidelines



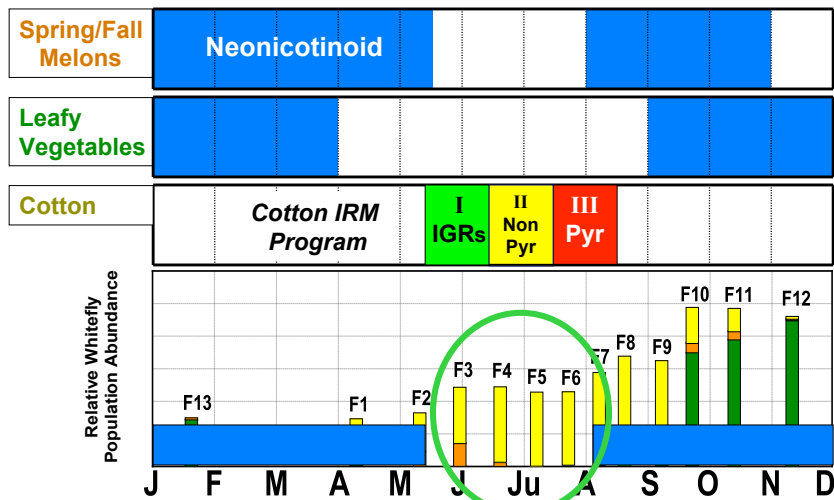
- No more than 1 use per crop in melons and vegetables
- Soil at-planting recommended.
- Split applications are not recommended
- Do not apply foliar neonicotinoid following the use of a soil applied neonicotinoid
- **Do not apply any neonicotinoid product to cotton**

### Resistance Risks with Shared Neonicotinoid Uses in a MCC

(eg., Yuma – potential usage)



## Preserve a Neonicotinoid-free Period in Multi-Crop Communities



### Will Adoption of these Guidelines

Passive "De facto" IRM



Proactive IRM

Sustain the efficacy of *Neonicotinoids* in Multi-Crop Communities

???

## Grower / PCA Assessment



### Anecdotal Evidence

- Since 2003 Guidelines have definitely created awareness of the issue

**“I apologize, I sprayed some Intruder on my cotton today”**

*Yuma PCA – July 2003*

### Grower Survey Data

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

## 2006 Head Lettuce Insect Losses Workshop

- Do not apply a foliar neonicotinoid following a soil use





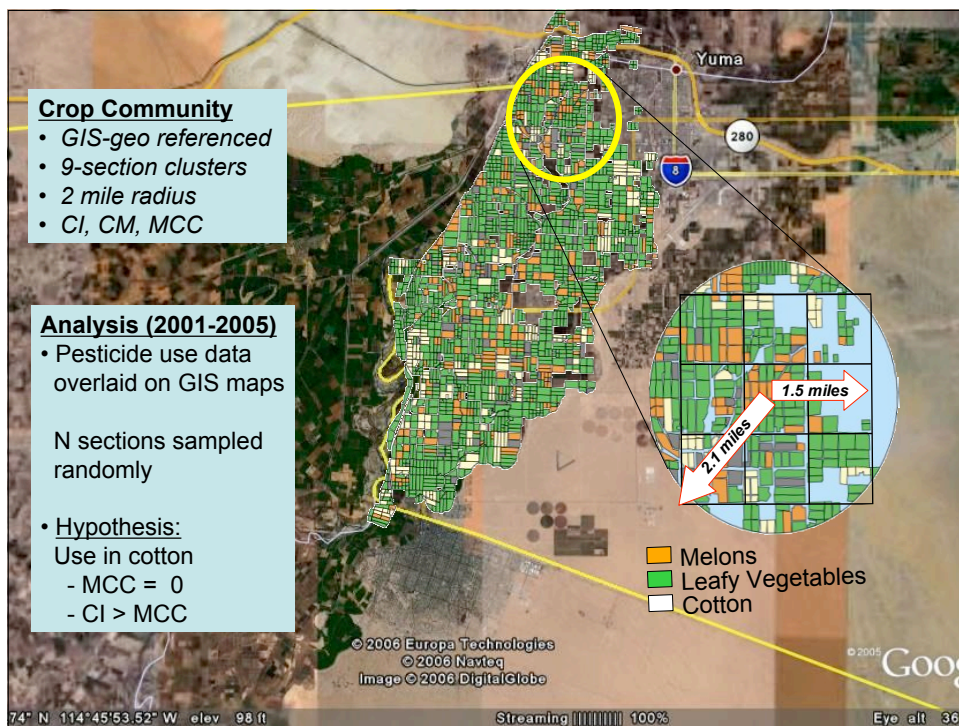
## Measurement of Group Adoption of Guidelines

- Compliance is voluntary
- Section level pesticide records ( 1080 - pesticide use reporting )
- Measure temporal & spatial changes in adoption
- Neonicotinoid usage in cotton within Multi-crop Communities

*Summary Guidelines: Maximum number of uses per crop season for neonicotinoids in three different cropping communities.*

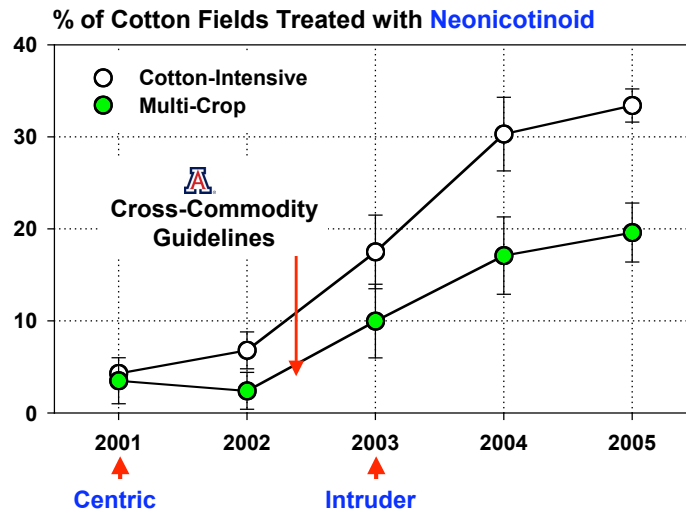
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## Community-level Neonicotinoid Use in Cotton

Hypothesis: 0 use in MCC



## Challenges and Constraints to Sustained Efficacy

### A. Generic imidacloprid

- Lower \$ cost = higher use rates
- Confusion in class recognition (*foliars*)

### B. Expansion of neonicotinoid labels

- New Crop Labels - on melons and leafy vegetables
- Home / Garden / Ornamental - *imidacloprid*
- Alfalfa/Seed Crops - *future registrations ?*

### C. Market forces

- Promote Neonicotinoid use in Cotton
- Leafy Vegetables / Melons

## Challenges and Constraints to Sustained Efficacy

### D. New Chemistry in the Pipeline

- Trends toward more selective chemistries
- Grower attitudes:  
*"Industry always comes through with new technology"*
- Industry attitudes:  
*"Resistance is a source of innovation"*

### E. Complacency and apathy

- "Little Suzy needs new shoes"
- Reduced rates / split (multiple) applications
- Sloppy soil applications on vegetables and melons