Integrated Management of Asian Citrus Psyllid in Florida

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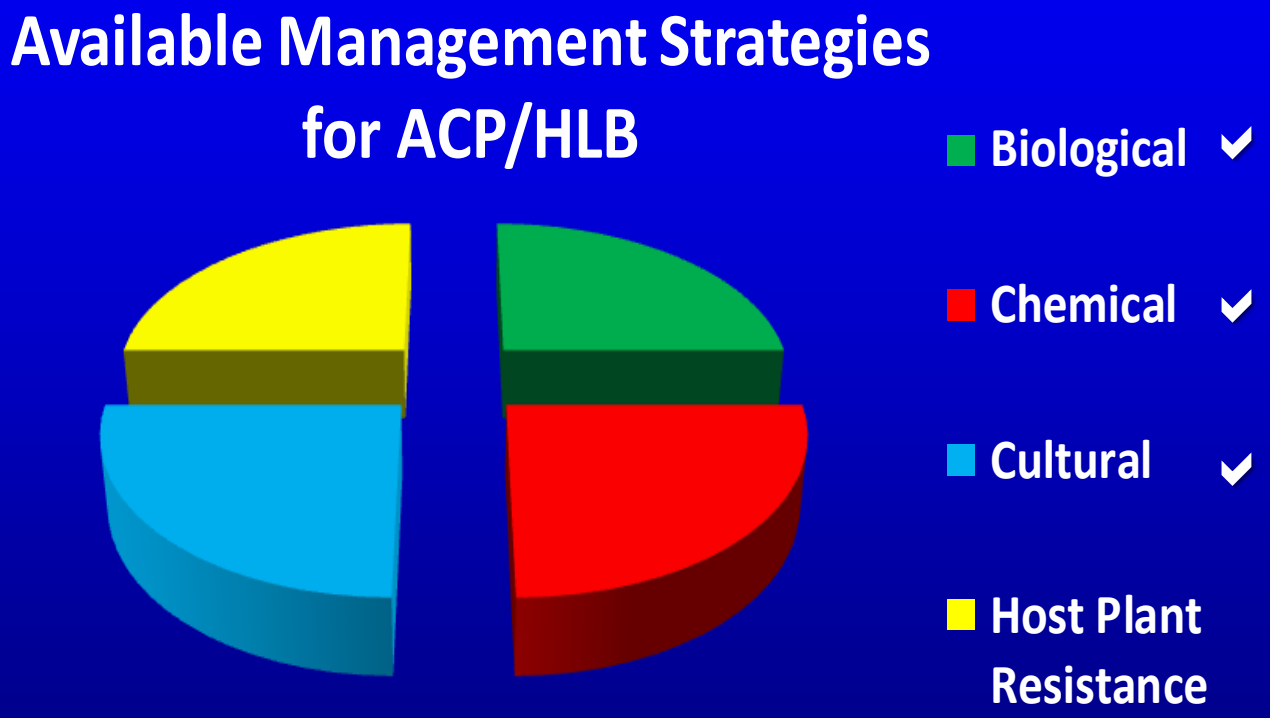
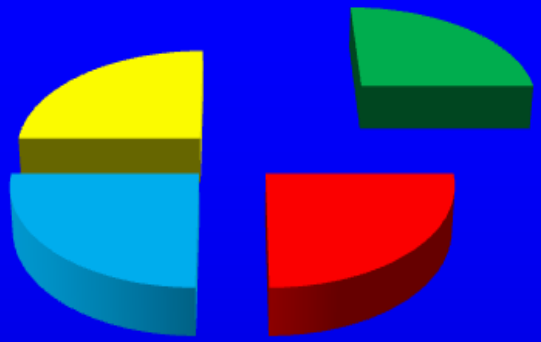
UNIVERSITY OF FLORIDA
EXTENSION
Institute of Food and Agricultural Sciences

"IPM is pest management employing biological, chemical, and cultural controls, and utilizing monitoring techniques to determine if treatments are necessary"



Biological Control

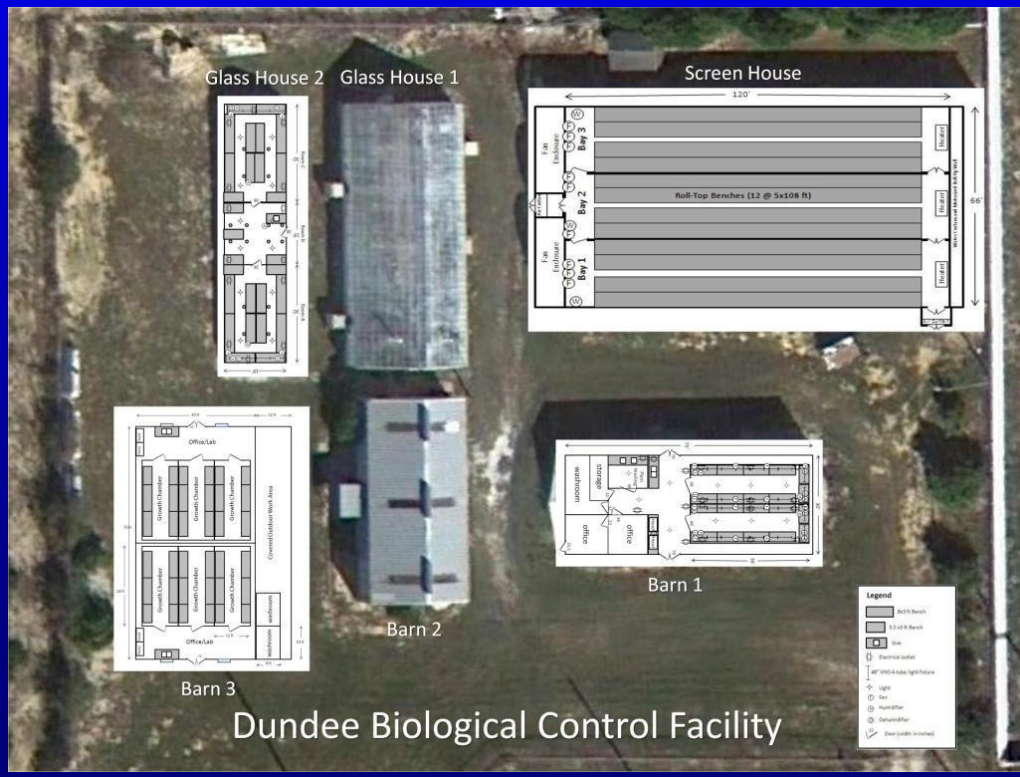


Conservation of Natural Enemies

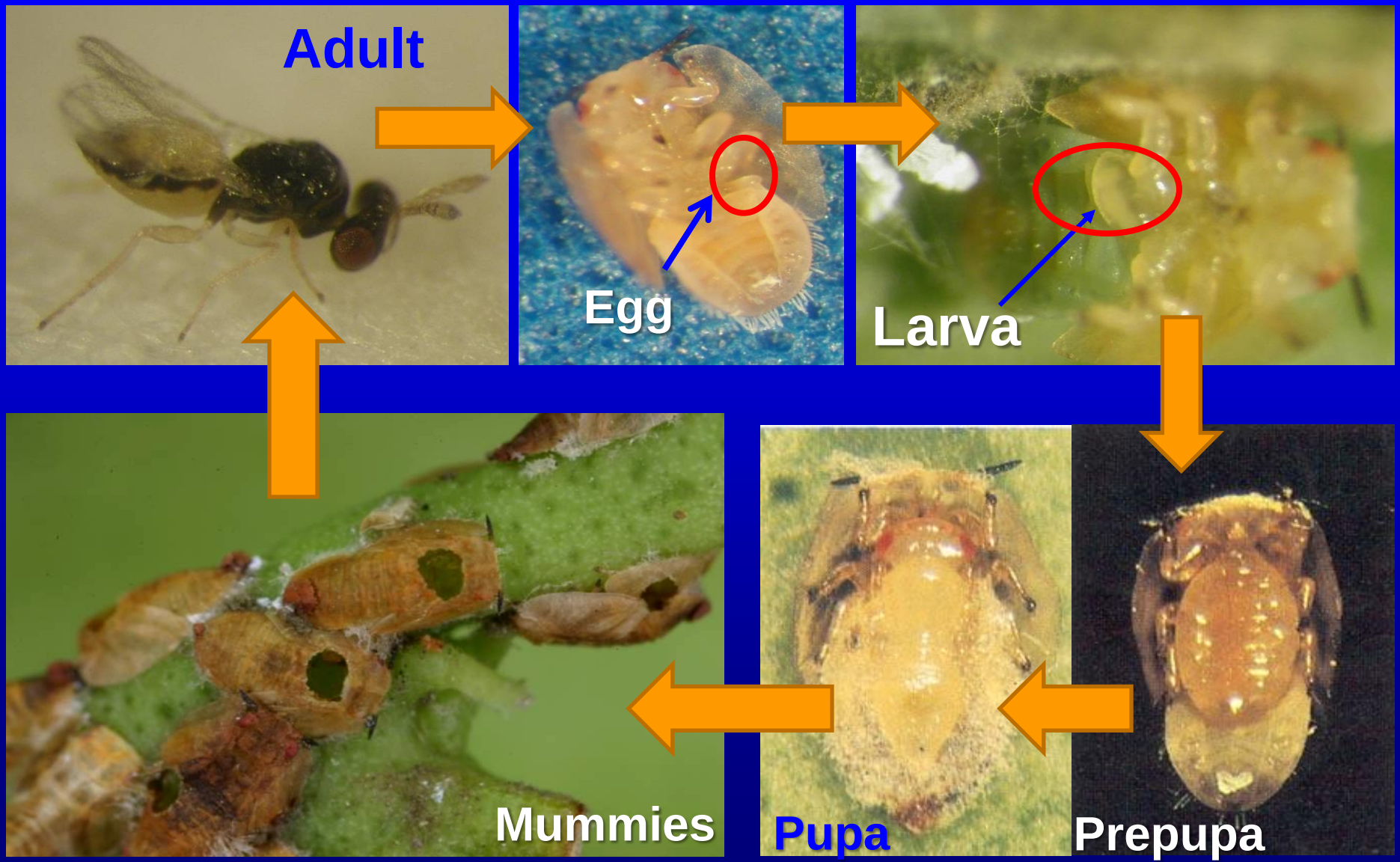
- Limit broad-spectrum insecticides to dormant season
- Selective insecticides in growing season

Augmentation of *Tamarixia radiata*

- Pilot studies under way
- DPI Facility in Dundee
  - Dr. Robin Stuart



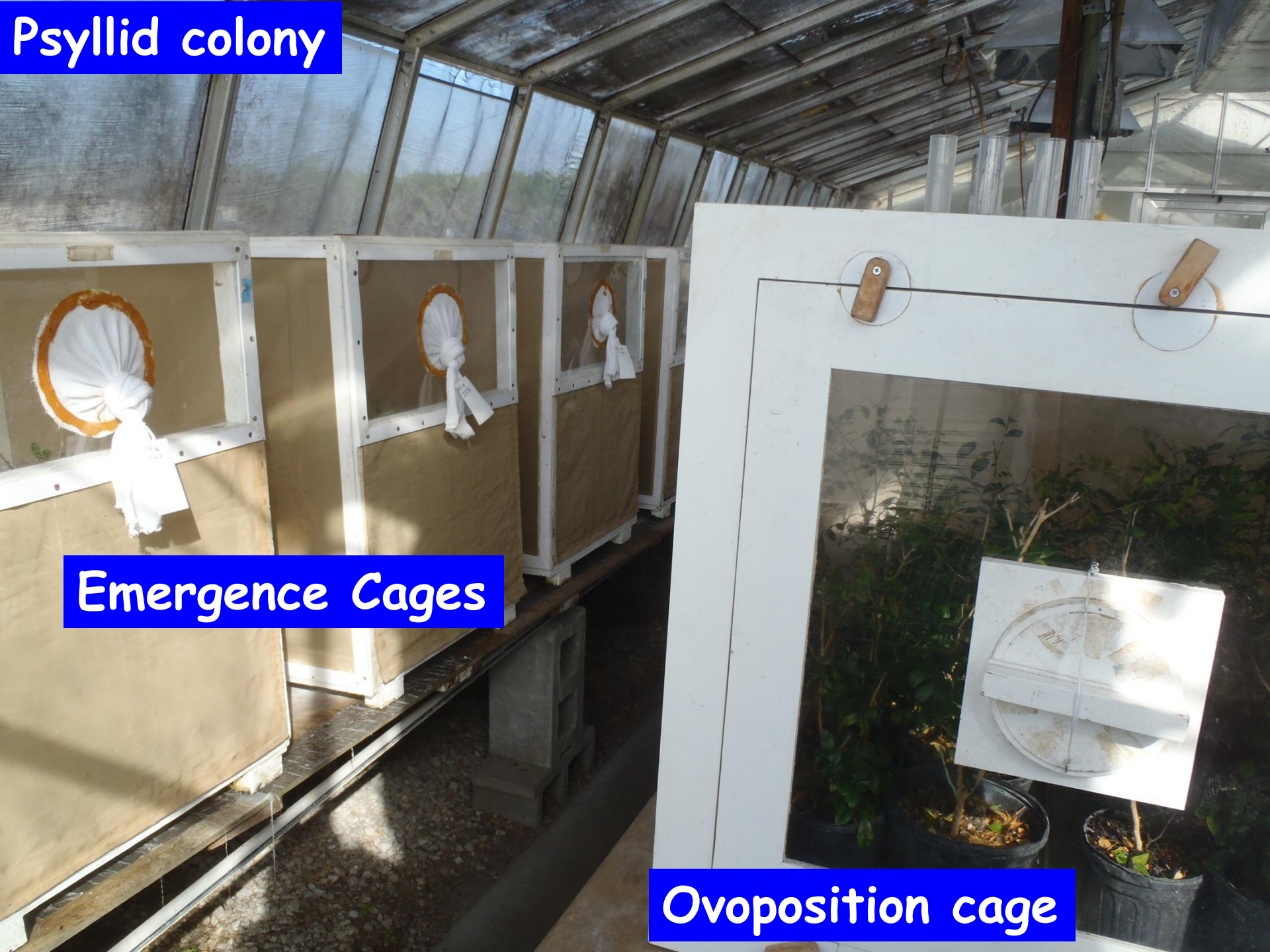
Life Cycle of *Tamarixia radiata*



Production of Tamarixia Radiata at SWFREC

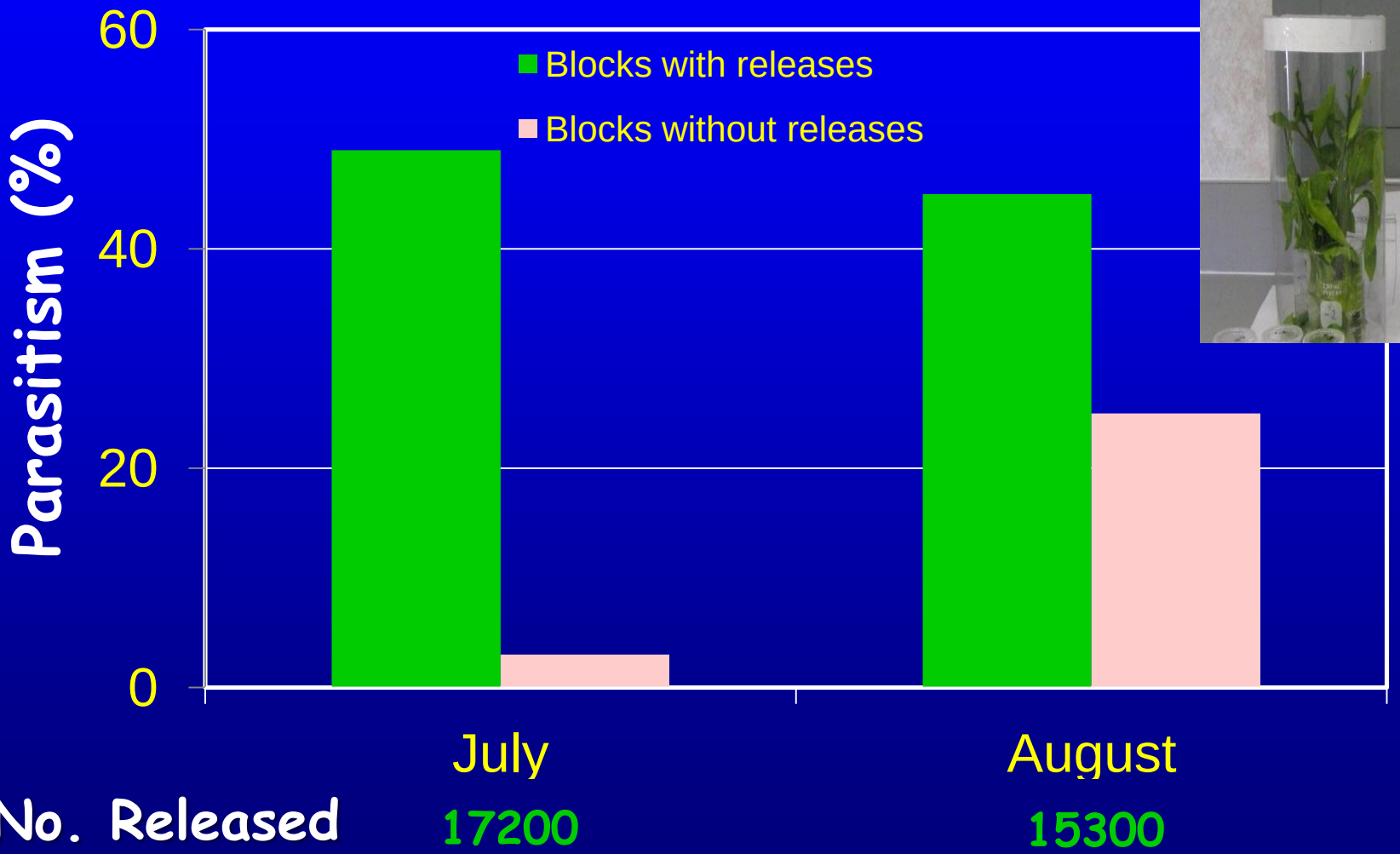
José Castillo

Production of clean Murraya


Psyllid colony
Emergence Cages
Ovoposition cage


Oviposition and Emergence cages for *T. radiata*
Over 160,000 wasps released 2011

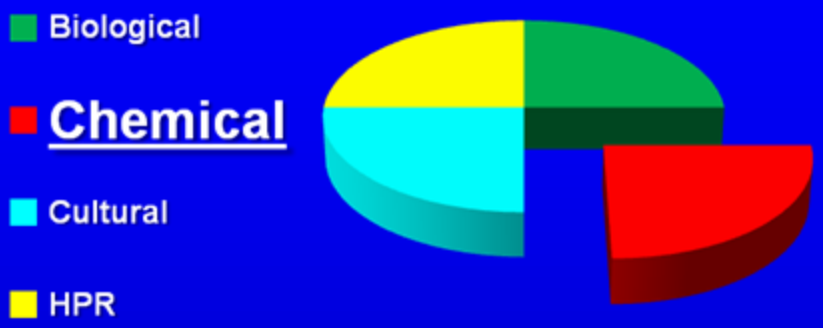
Parasitism observed during Jul-Aug of feral nymphs at SWFREC in blocks with and without *T. radiata* releases, 2011: J. Qureshi



Field production of T. radiata: J. Qurehsi

Insecticidal Control: Considerations

- When to spray
  - Dormant vs growing season
  - "On demand" vs Calendar
    - Thresholds, risk-cost/benefit
- How to spray
  - Low Volume vs High Volume
  - Air vs Ground
- What to spray
  - Label restrictions
  - Efficacy
    - Adults/nymphs
  - Resistance management
    - Frequency of use
    - Rotation MOAs
  - Secondary pests
    - Leafminers, mites, scales
  - Conservation beneficials
    - Broad-spectrum vs Selective



Example Insecticide Programs for ACP and other pests in Florida

	Insecticide Sprays per year (excluding oil alone)					Other pests Controlled	MOA**
	One	Two	Four	Five	Seven		
Jan	Pyrethroid	Pyrethroid	Pyrethroid	Pyrethroid	Pyrethroid		3
Feb			Movento*^	Movento*^	Movento *^	rustmite, scales	23
Mar					Portal^	spidermites rustmites	21
Apr					Delegate*	Leafminer	5
May	Oil	Oil	Oil	Oil			
Jun			Abamectin* or Delegate*	Abamectin* or Delegate*	Abamectin*^	leafminer rustmite	6 5
Jul	Oil	Oil	Oil	Oil	OIL	leafminer rustmite	
Aug							
Sep				Micromite*^	Micromite*^	leafminer rustmite weevils	15
Oct							
Nov-Dec		OP	OP	OP	OP		1B

*Generally applied with oil or another surfactant ǂ May not be necessary due to low populations
^ Primarily for control of nymphs ** www.irac-online.org

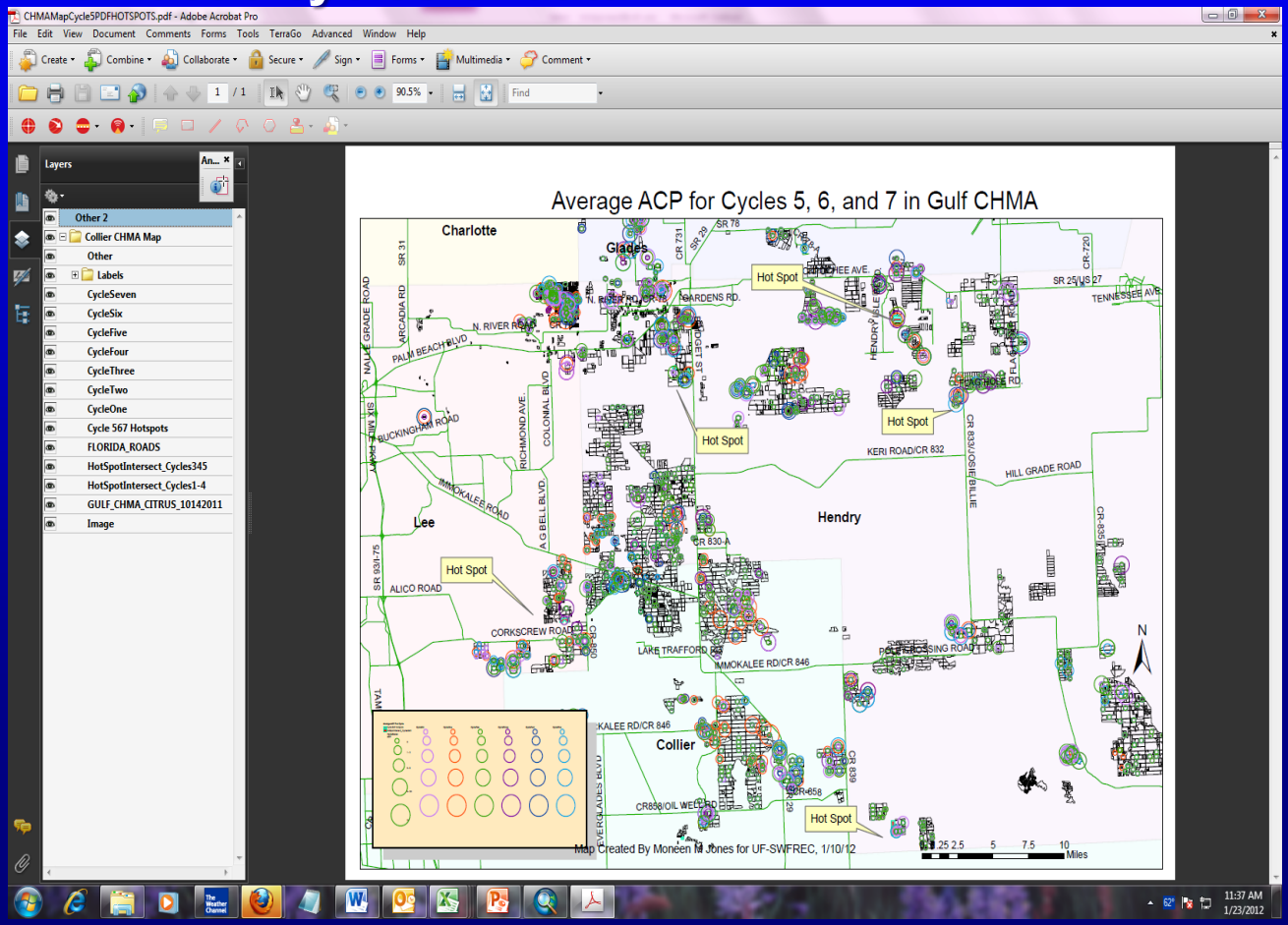
Young Tree Programs

- Drenches of neonicotinoids (MOA = 4): imidacloprid, thiamethoxam (Platinum) and clothianidan (Belay) may provide up to 3 or more years control in solid sets, longer in resets. Need to be alternated with sprays with different MOA
- Cyazapyr (cyantraniliprol MOA 28) and possibly other chemistry hopefully available for soil application soon.
- Best of 4 treatments rotating cyazapyr with neonicontinoids still zero HLB after 21 months compared to 30% in untreated check
- Meanwhile, limit sprays of imidacloprid, Actara or Agriflex in older blocks to at most one per year.

Using CHRP data: Interactive Map: M. Jones

- CHMA cycle data from www.flchma.org converted into ArcGIS shape files
- Can view data temporally and spatially
- Able to turn on and off layers to compare specific cycle data
- A 'hot spots' layer for last 3 cycles of data

In this example, 3 layers are selected and Hot Spots are noted



Choosing and Comparing Cycles

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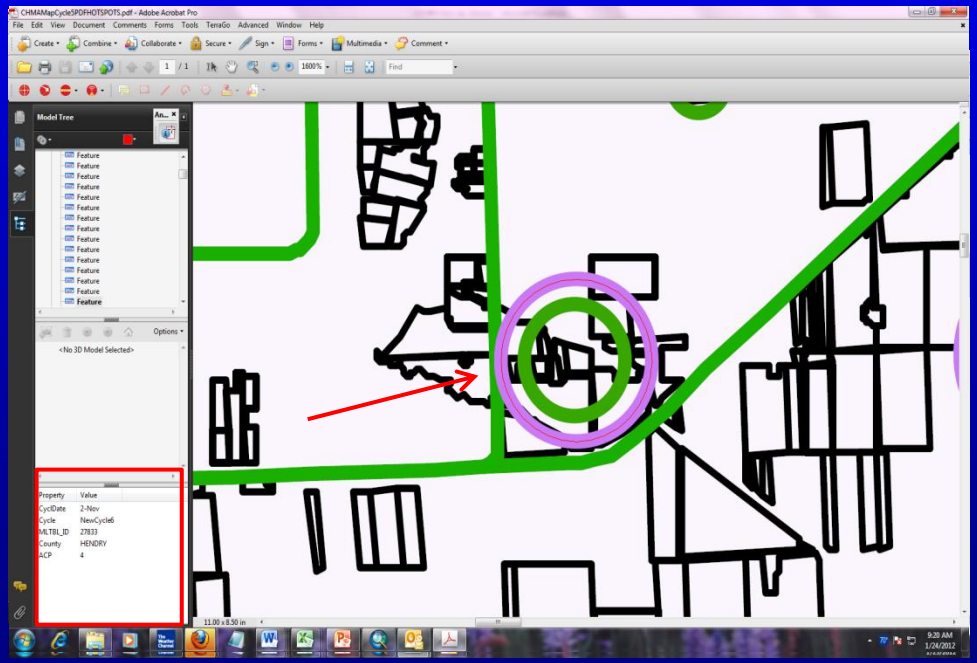
- Click on the cycles you want by turning on the ‘eye’ button
- Example shows comparing Cycle 6 to Cycle 7 data
- Cycle 7 has reduced # of ACP

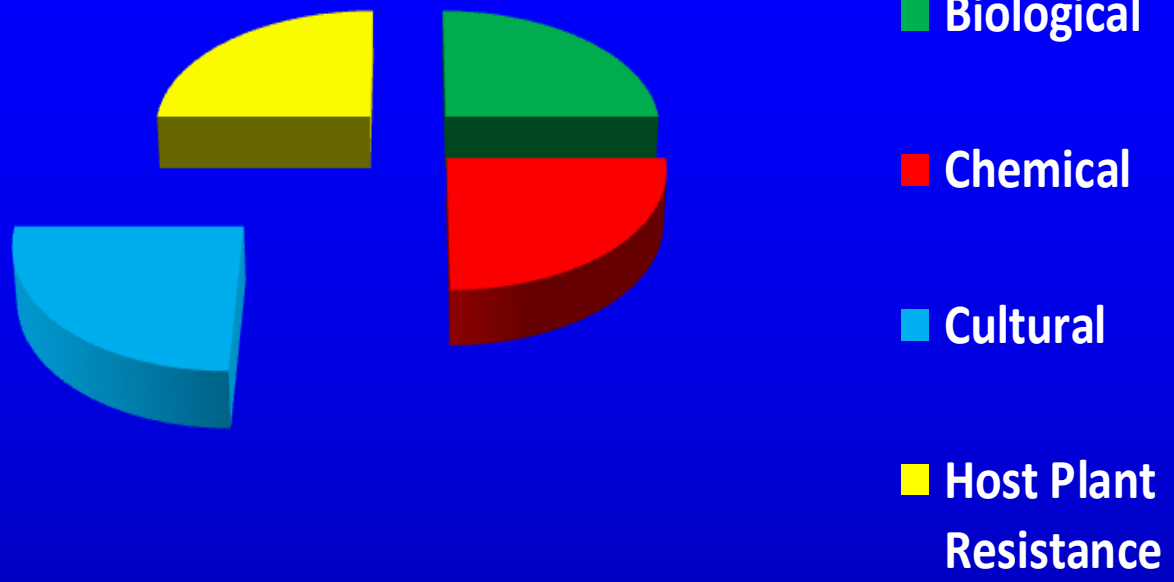


Cycles 6 & 7 Selected
(Cycle 6 = purple circles)
(Cycle 7 = green circles)

Clicking on a circle show its attribute data

Insecticidal Control

- Necessary for surviving HLB
- Need to control costs, limit collateral damage and resistance
- Dormant spray of pyrethroids and/or OPs most effective treatment
- Different and more selective chemical classes for growing season depending on pests
- Real time data on pest and disease incidence needed to make best decisions
- Additional insecticides needed for young tree programs that depend largely on drenches



Cultural Practices for Management of HLB

- Foliar nutrition
- UV Reflective Mulch

Role of Vector Control and Nutrition in Management of HLB

Experimental Design

Objective: Evaluate effect of a foliar nutritional program and insecticidal control of ACP on ACP number, HLB incidence and yield

- 13.75 ac. 'Valencia' on 'Swingle'
- Planted April 2002
- Defoliated 2005
- HLB detected spring 2006
- 2 x 2 factorial (RCBD 4 reps)
  - 16 plots
  - Average 124 trees per plot

	No-Insecticide	Insecticide
No-Nutritional	Control	Insecticide
Nutritional	Nutritional	Nutritional + Insecticide

Insecticide alone
Nutritional+Insecticide

2008

1. Danitol 16 oz (May)
2. Delegate @ 4oz (Aug)
3. Delegate @ 4 oz (Nov)

2009

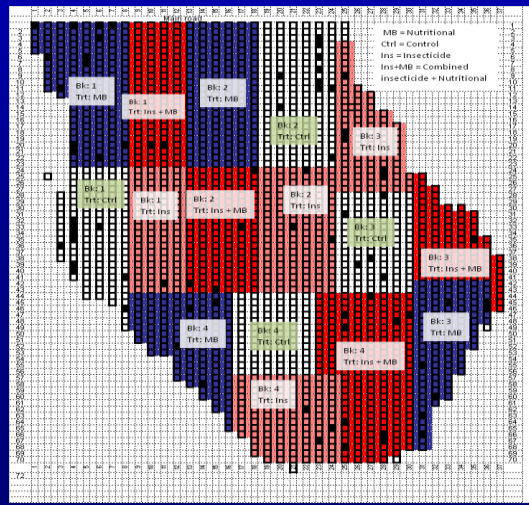
4. Mustang @ 4.3 oz (Jan)
5. Movento @10 oz (Apr)
6. Lorsban @ 3pt (Sep)
7. Dimethoate @ 1 pt (Dec)

2010

8, Danitol @ 12 oz (Feb)
9. Delegate @5 oz (May)
10. Lorsban @ 3pt (Jul)
11. Imidan @ 1 lb (Nov)

Nutritional alone
Nutritional+Insecticide

Nutrient Program 3 times/year	Rate/ac
Serenade Max WP	2.25 lb
Saver (Salicylic acid)	1 qt
3-18-20 with K-Phite	8 gal
13-0-44 fertilizer	8.5 lb
Techmangan ($MnSO_4$)	8.5 lb
Zinc Sulfate	2.8 lb
Sodium Molybdate	0.85 oz
Di-Oxy Solv Organic	2 qt
Epsom Salts	8.5 lb
435 oil	5 gal



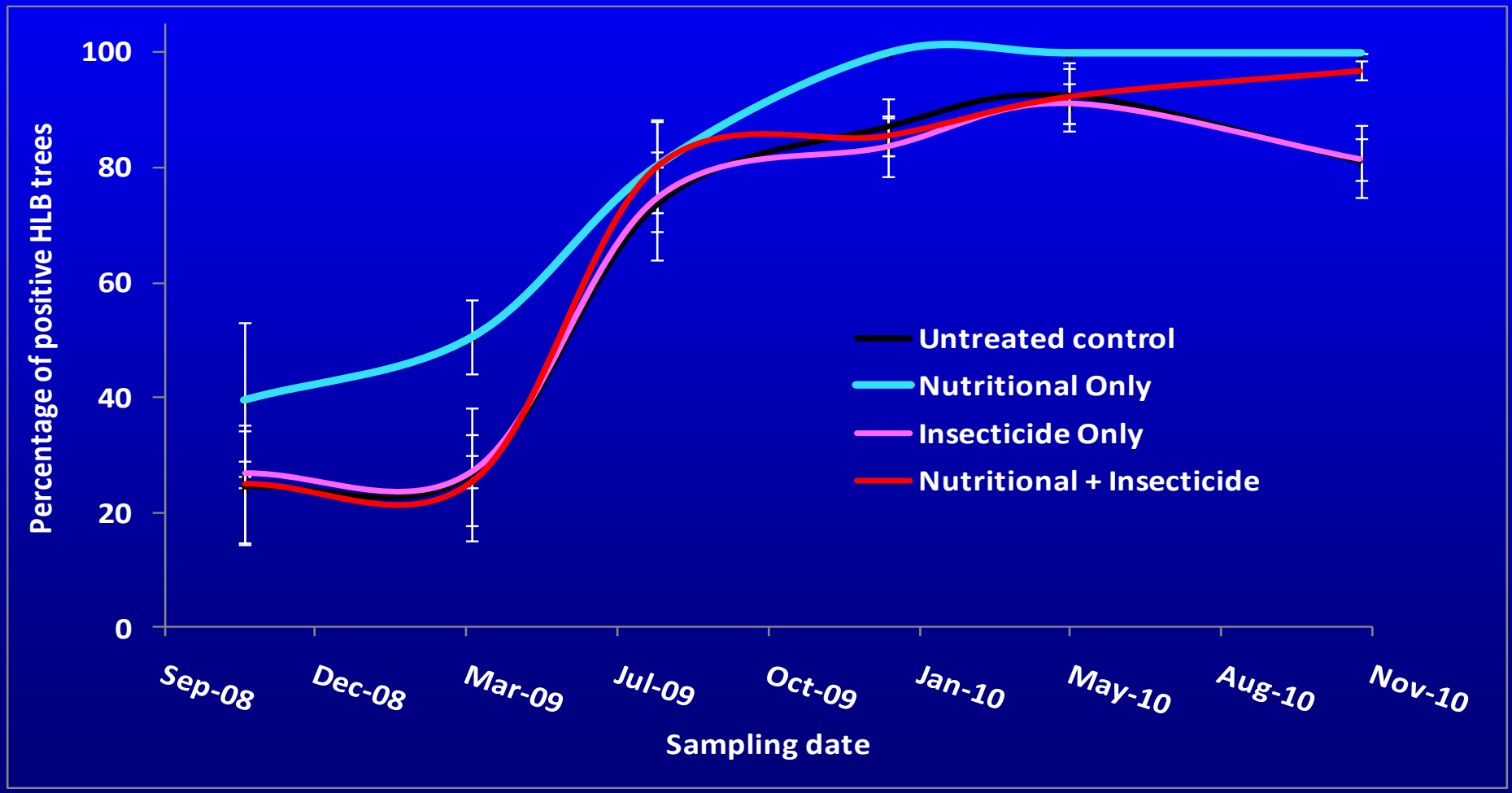
Effects on ACP population

40 taps per plot every 2 weeks
Sprays at 0.2 ACP/tap

$$Insect \times days = \int_{Initial\ date}^{Final\ date} \frac{No.\ Adult\ ACP}{Tap\ sample}$$

Effects on HLB incidence in plants

PCR of most infective branch on 20% of trees



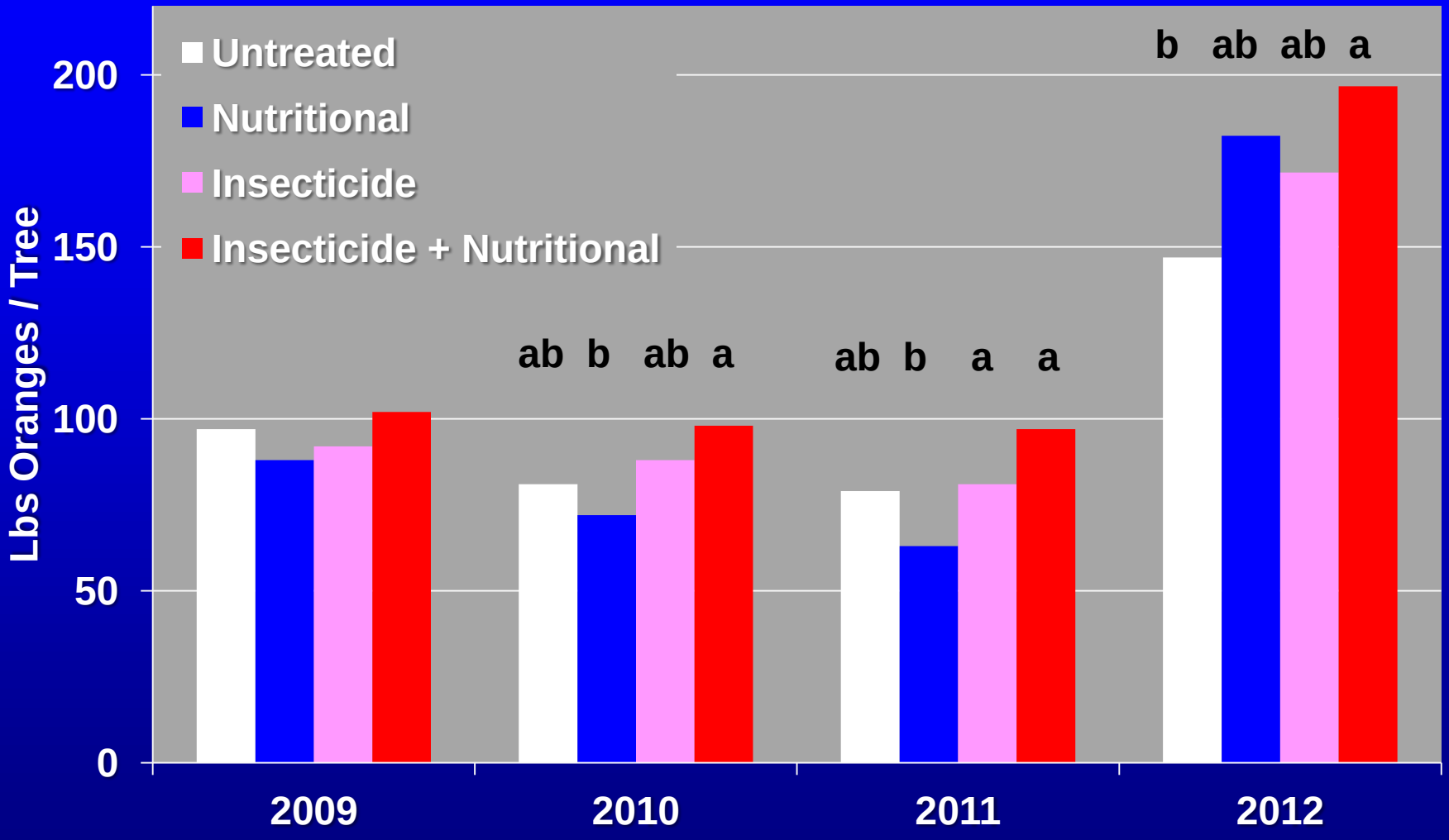
Yield and Quality Evaluation

March 2010

Oranges hand picked into 10-box tubs by supervised crews. Tared weight of oranges in each tub was recorded in the field using a Gator Deck Scale 500 ± 1 lb.

A 10 lb composite fruit sample was taken from each plot and evaluated at the CREC fruit quality laboratory.

Yield Effects in HLB Infected Trees

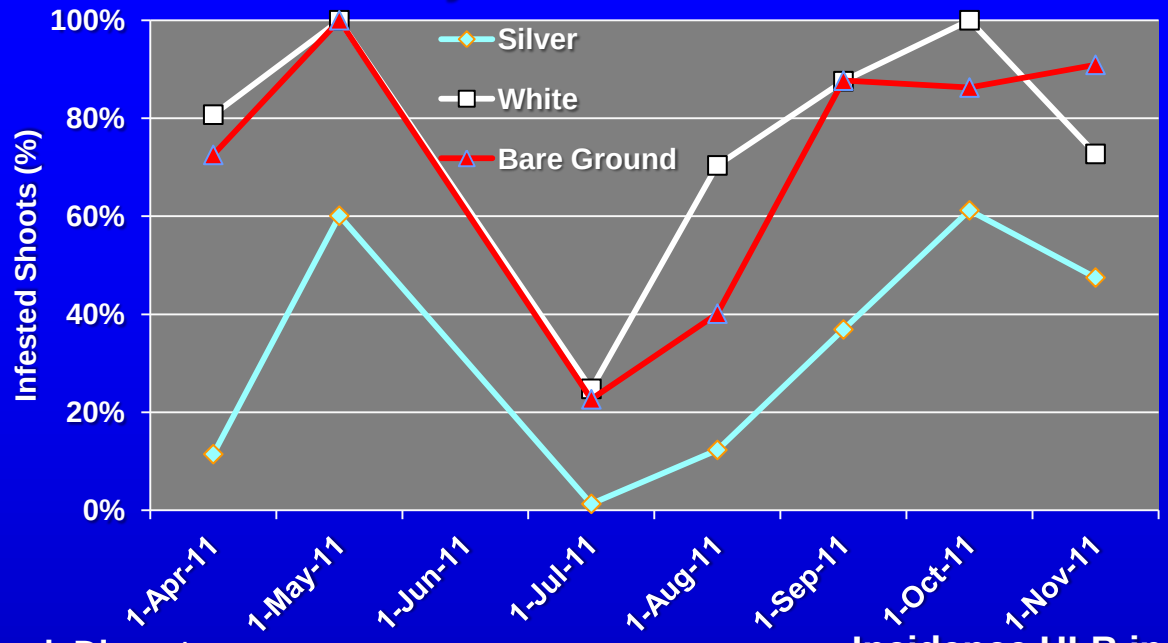


Difference between untreated and Nutritional+Insecticide in 2012 = 83 boxes / acre = $994

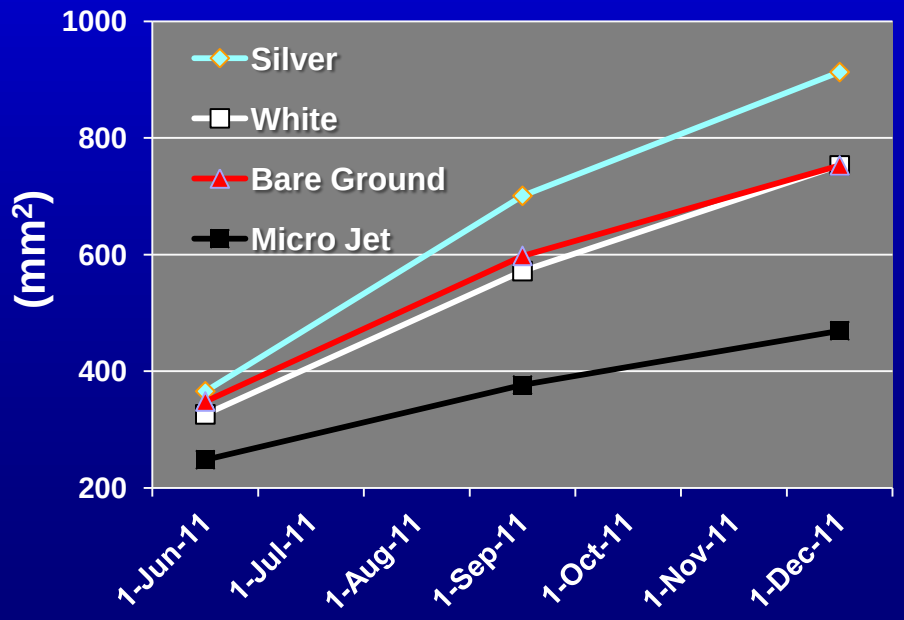
The UV Reflective Mulch System: Scott Croxton

- ACP protection
- Weed Control
- Drip irrigation

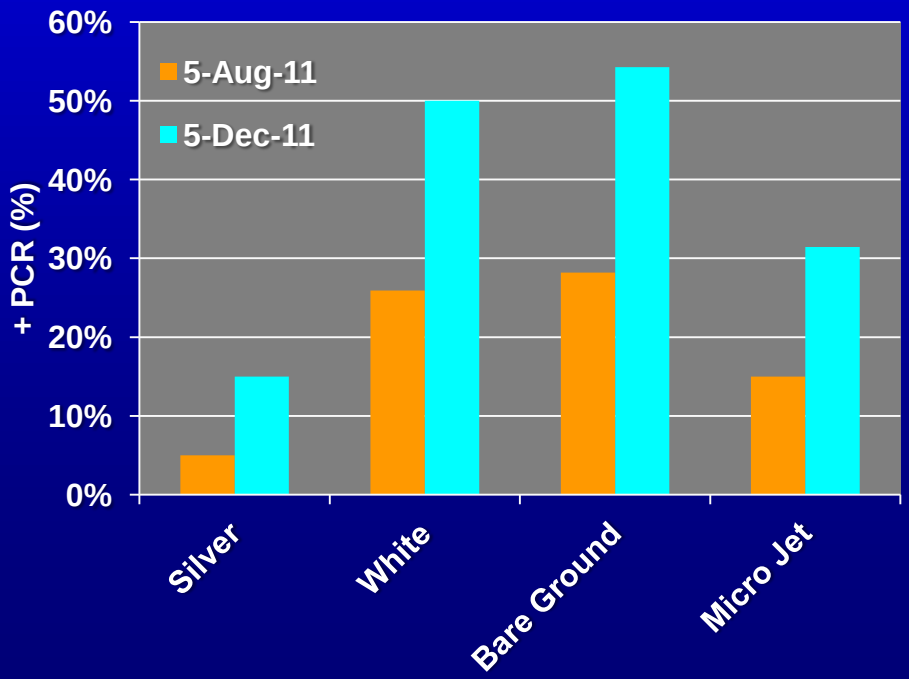
Psyllid Infestation

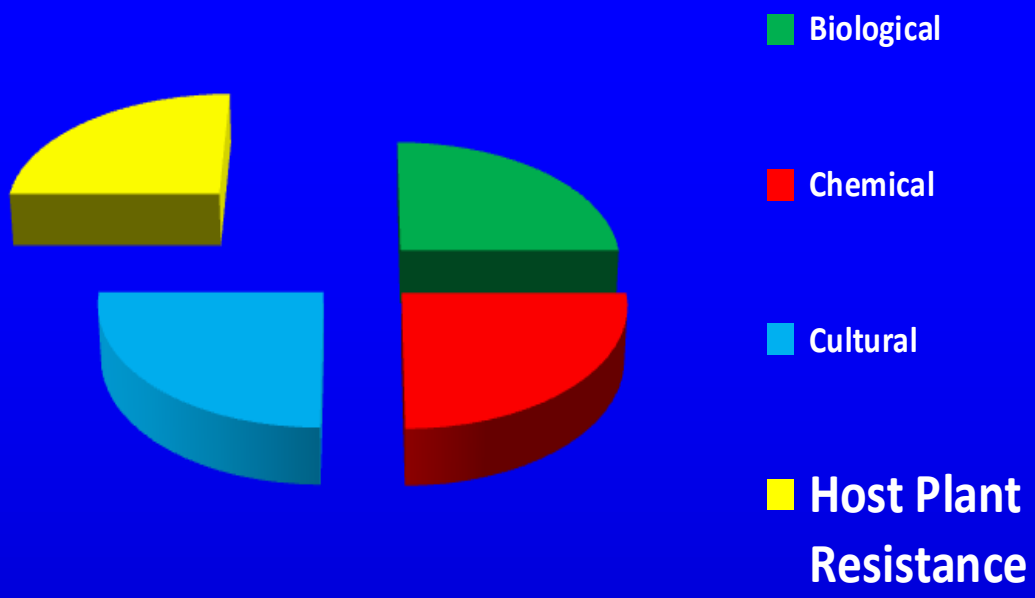


Trunk Diameter



Incidence HLB in 40 trees

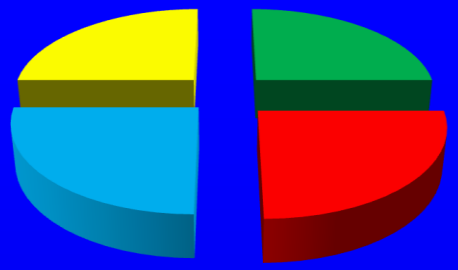




Host Plant Resistance for Management of HLB

- Existing Rootstocks or scions
- Genetically modified
  - Anti-microbial “Spinach” genes transferred to citrus
    - Dr. Erik Mirkov, Plant Pathologist: Texas AgriLife Research
      Texas AgriLife Research and Extension Center at Weslaco
  - Encouraging greenhouse results in Florida
  - EPA permission “3-4 years” out

Summary



- Integration of all available tools required to manage HLB effectively
- Insecticides to slow spread and re-inoculation of the HLB pathogen
- Biological control to reduce need for insecticides to manage ACP and other pests
- Cultural practices to improve tree health and young tree programs
- Help hopefully coming from HPR
- Knowledge based systems for better decisions at regional and grove level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Dr. César Monzó


Dr. Moneen Jones


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