Insecticide Effectiveness, Young Tree Care and CHMA Summaries

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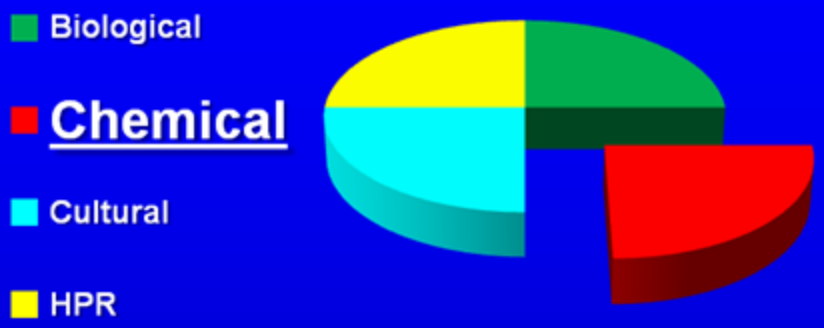
Insecticidal Control: Considerations

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



Insecticide Efficacy Trials: Methods

http://www.imok.ufl.edu/entomology/

- Location: UF-Southwest Florida Research and Education Center, Immokalee, FL
- 'Valencia' orange trees planted 1998
- Trees pruned with a hand-held hedger to induce new growth and encourage ACP infestation
- Both bed and swale sides of the trees were sprayed using a Durand Wayland 3P-10C-32 air blast speed sprayer @ 120 gp or Proptec™ rotary atomizer sprayer @ 10 gpa
- RCBD design, 4 replicates
- 5 trees per plot, 3 central trees included in post treatment evaluations

Evaluation Methods

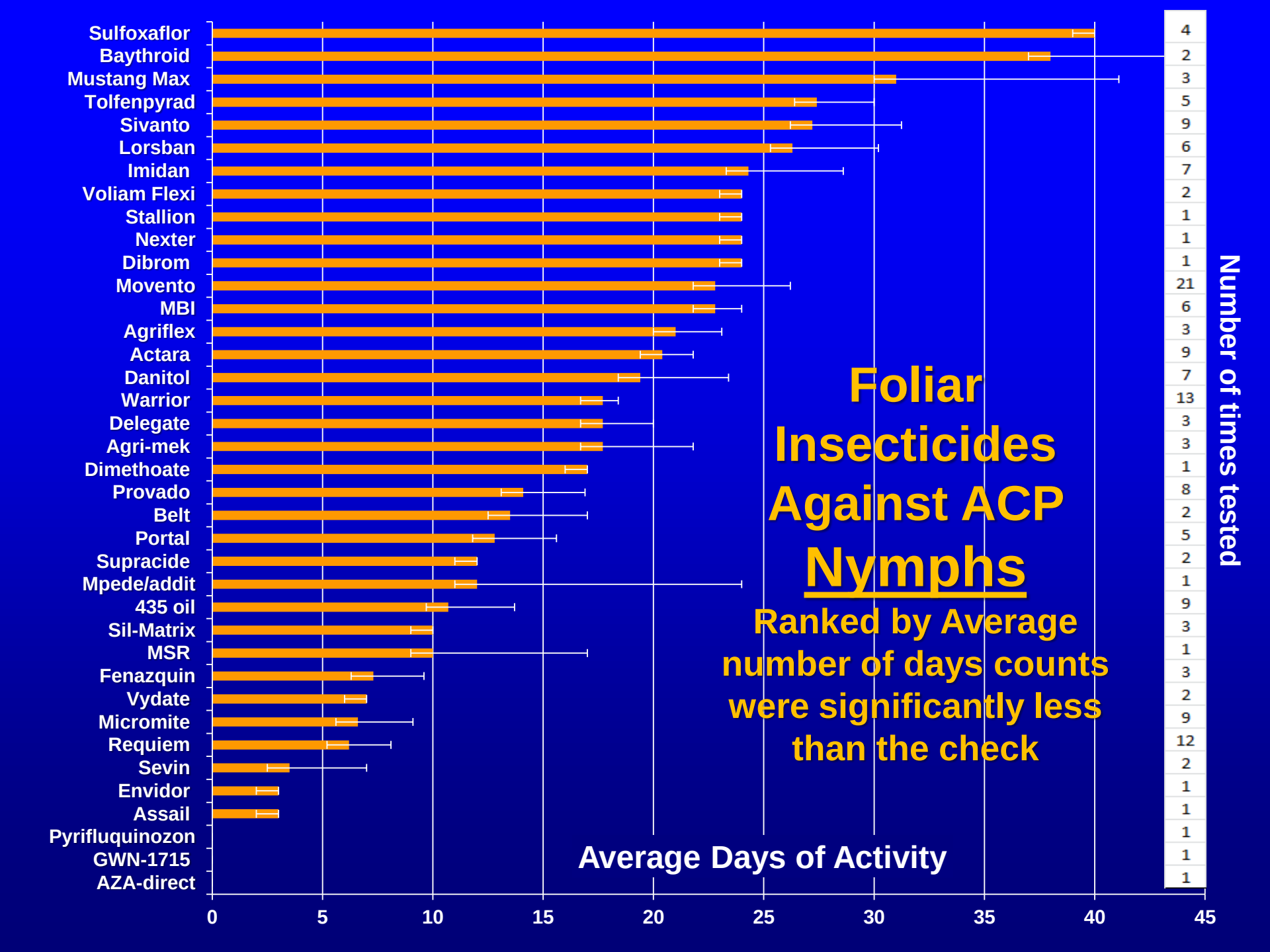
- ✓ **Estimation of ACP adults**
  - **“Tap Sample” :**
    22 x 28 cm laminated white paper sheet or clipboard-
    Tap branches three times
    Four tap samples per tree

- ✓ **Estimation of immature densities**
  - **Ten randomly selected shoots per plot collected and examined under a stereomicroscope in the laboratory to count ACP nymphs**

Insecticide Efficacy: Published Trials

23 Reports, Ca. 250 Treatments: Available on this Website

1. **Stansly, P. A., J. M. Conner, and J. R. Brushwein. 2002.** Control of citrus leafminer and Asian citrus psylla in sweet orange, 2001. Arthropod Management Tests 27.pp.D10.
2. **Stansly, P. A., and K. A. Jackson. 2006.** Soil applied insecticidal control of Asian citrus psyllid and citrus leafminer, 2005. Arthropod Management Tests 31.pp.D19.
3. **Stansly, P. A., and J. A. Qureshi. 2007.** Evaluation of two foliar insecticides for control of Asian citrus psyllid on orange, 2006. Arthropod Management Tests 32.pp.D11.
4. **Stansly, P. A., and J. A. Qureshi. 2007.** Insecticidal control of Asian citrus psyllid through foliar applications on orange, 2006. Arthropod Management Tests 32.pp.D10.
5. **Stansly, P. A., B. C. Kostyk, and J. A. Qureshi. 2008.** Soil applied insecticidal control of Asian citrus psyllid and citrus leafminer, 2007. Arthropod Management Tests 33.pp.D10.
6. **Stansly, P. A., J. A. Qureshi, and B. C. Kostyk. 2008.** Control of Asian citrus psyllid and citrus leafminer through spray applications of insecticide in orange, 2007. Arthropod Management Tests 33.pp.D11.
7. **Stansly, P. A., J. A. Qureshi, and B. C. Kostyk. 2008.** Spray application of insecticides to control Asian citrus psyllid and citrus leafminer on orange, 2007. Arthropod Management Tests 33.pp.D12.
8. **Stansly, P. A., J. A. Qureshi, and B. C. Kostyk. 2008.** Sprays of guava leaf extract and insecticides to control Asian citrus psyllid and citrus leafminer on orange, 2007. Arthropod Management Tests 33.pp.D13.
9. **Stansly, P. A., and B. Kostyk. 2009.** Soil applied insecticidal control of Asian citrus psyllid and citrus leafminer, 2008 Arthropod Management Tests 34.pp.D2.
10. **Stansly, P. A., B. Kostyk, and M. Huffman. 2009.** Persistance of liquid and granular slow release formulations of soil applied insecticides for Asian citrus psyllid control, 2007 Arthropod Management Tests 34.pp.D11.
11. **Stansly, P. A., B. Kostyk, and M. Huffman. 2009.** Persistance of standard and slow release soil application of Imidacloprid for citrus psyllid control, 2007 Arthropod Management Tests 34.pp.D10.
12. **Stansly, P. A., J. A. Qureshi, and B. Kostyk. 2009.** Control of Asian citrus psyllid and citrus leafminer with foliar applications of insecticides in oranges during Summer, 2008 Arthropod Management Tests 34.pp.D12.
13. **Stansly, P. A., J. A. Qureshi, and B. Kostyk. 2009.** Control of Asian citrus psyllid with foliar applications of insecticide in oranges during bloom, 2008 Arthropod Management Tests 34.pp.D13.
14. **Stansly, P. A., J. A. Qureshi, and B. Kostyk. 2009.** Foliar applications of insecticides against Asian citrus psyllid in Oranges: Summer, 2008 Arthropod Management Tests 34.pp.D9.
15. **Stansly, P. A., J. A. Qureshi, and B. Kostyk. 2009.** Foliar applications of Spinetoram compared to commonly used insecticides for control of Asian citrus psyllid and citrus leafminer in oranges: 2008 Arthropod Management Tests 34.pp.D8.
16. **Stansly, P. A., J. A. Qureshi, and B. C. Kostyk. 2010.** Efficacy of foliar applications against Asian citrus psyllid and citrus leafminer in oranges Summer, 2009. Arthropod Management Tests 35.pp.D8.
17. **Stansly, P. A., J. A. Qureshi, and B. C. Kostyk. 2010.** Foliar applications of insectices for control of Asian citrus psyllid in oranges during bloom, 2009. Arthropod Management Tests 35.pp.D7.
18. **Stansly, P. A., J. A. Qureshi, and B. C. Kostyk. 2010.** Foliar applications of some selective insecticides to suppress Asian citrus psyllid and citrus leafminer in oranges, 2009 Arthropod Management Tests 35.pp.D9.
19. **Stansly, P. A., J. A. Qureshi, and B. C. Kostyk. 2010.** Foliar insecticides against Asian citrus psyllid and citrus leafminer in oranges, 2009. Arthropod Management Tests 35.pp.D10.
20. **Stansly , P. A., and B. C. Kostyk. 2011.** Soil applied insecticidal control of Asian citrus psyllid, 2009. Arthropod Management Tests 36.pp.D4.
21. **Stansly , P. A., J. A. Qureshi, and B. C. Kostyk. 2011.** Effect of spray volume and sprayer type on efficacy of insecticides for control of Asian citrus psyllid and citrus leafminer on oranges: 2010. Arthropod Management Tests 36.pp.D16.
22. **Stansly , P. A., J. A. Qureshi, and B. C. Kostyk. 2011.** Foliar applications of BYI02960 compared to commonly used insecticides for control of Asian citrus psyllid and citrus leafminer in oranges:summer, 2010. Arthropod Management Tests 36.pp.D15.
23. **Stansly , P. A., J. A. Qureshi, and B. C. Kostyk. 2011.** Foliar insecticides for control of Asian citrus psyllid and citrus leafminer on oranges, Spring, 2010. Arthropod Management Tests 36.pp.D14.


Foliar Insecticides Against ACP
Nymphs
Ranked by Average number of days counts were significantly less than the check
Average Days of Activity
Number of times tested
Sulfoxaflor
Baythroid
Mustang Max
Tolfenpyrad
Sivanto
Lorsban
Imidan
Voliam Flexi
Stallion
Nexter
Dibrom
Movento
MBI
Agriflex
Actara
Danitol
Warrior
Delegate
Agri-mek
Dimethoate
Provado
Belt
Portal
Supracide
Mpede/addit
435 oil
Sil-Matrix
MSR
Fenazquin
Vydate
Micromite
Requiem
Sevin
Envidor
Assail
Pyrifluquinozon
GWN-1715
AZA-direct
4
2
3
5
9
6
7
2
1
1
1
21
6
3
9
7
13
3
3
1
8
2
5
2
1
9
3
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10
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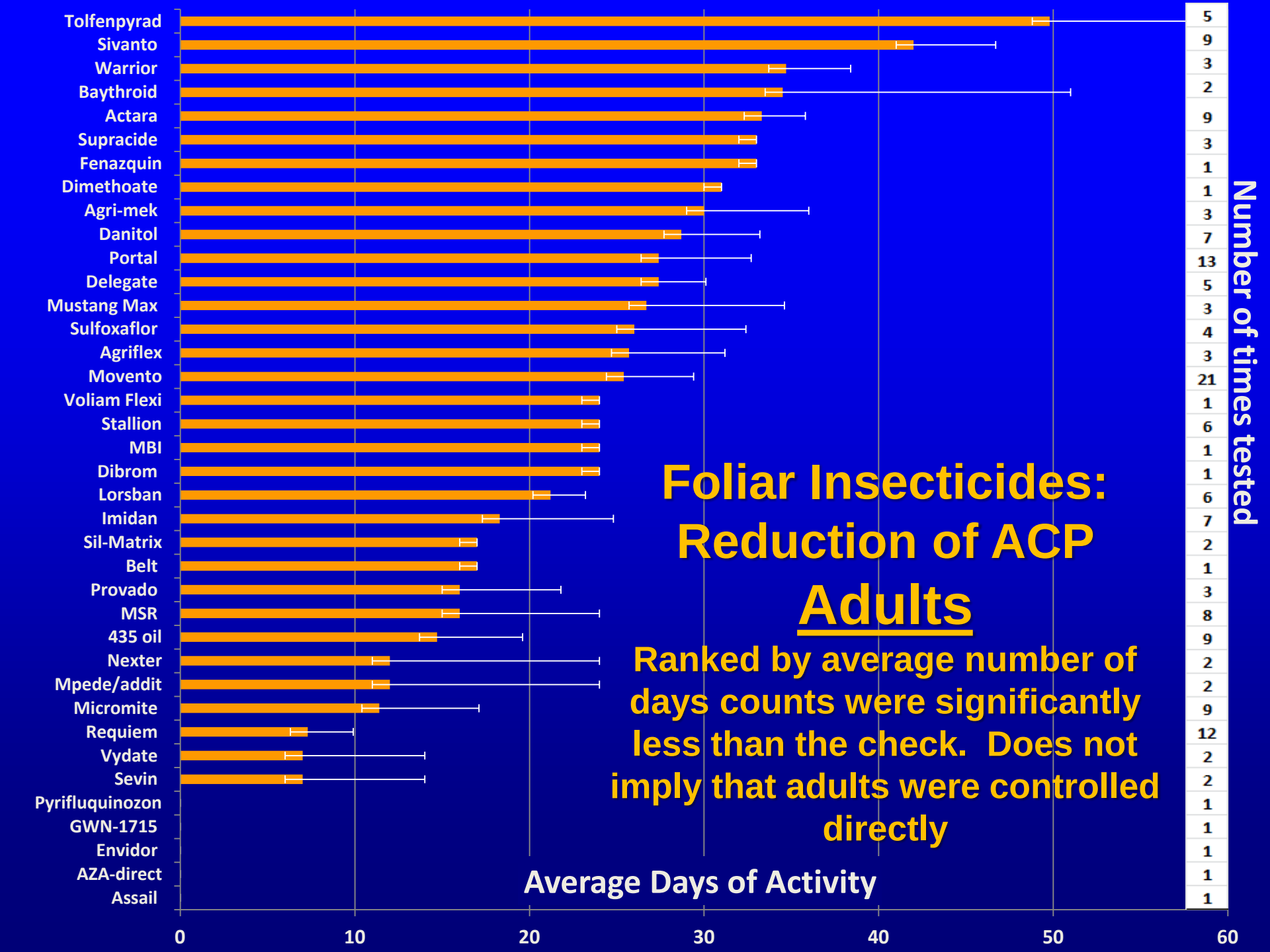
25
30
35
40
45


Tolfenpyrad
Sivanto
Warrior
Baythroid
Actara
Supracide
Fenazquin
Dimethoate
Agri-mek
Danitol
Portal
Delegate
Mustang Max
Sulfoxaflor
Agriflex
Movento
Voliam Flexi
Stallion
MBI
Dibrom
Lorsban
Imidan
Sil-Matrix
Belt
Provado
MSR
435 oil
Nexter
Mpede/addit
Micromite
Requiem
Vydate
Sevin
Pyrifluquinozon
GWN-1715
Envidor
AZA-direct
Assail
5
9
3
2
9
3
1
1
3
7
13
5
3
4
3
21
1
6
1
1
6
7
2
1
3
8
9
2
2
9
12
2
2
1
1
1
1
1
Number of times tested
Foliar Insecticides:
Reduction of ACP
Adults
Ranked by average number of days counts were significantly less than the check. Does not imply that adults were controlled directly
Average Days of Activity
0
10
20
30
40
50
60

Example Insecticide Programs for ACP and other pests

	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					Delegate*	leafminer	5
Apr					Oil	weevils	3 1A
May	Oil	Oil	Oil	Oil	Portal^	spidermite rustmite	15
Jun			Abamectin* or Delegate*	Abamectin* or Delegate*	Abamectin*^	leafminer (rustmite w/ Agriflex)	(6,4) 5
Jul	Oil	Oil	Oil	Oil	OIL	leafminer rustmite	6
Aug							1B
Sep				Micromite*^	Micromite*^	leafminer rustmite weevils	21
Oct						weevils	3
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

Program for Resets

- THE GOOD NEWS: Using drenches of imidacloprid, thiamethoxam (Platinum) and clothianidan (Belay) you should be able to get 3 or more years control in solid sets, longer in resets. Cyazapyr (MOA 28) coming soon (hopefully).

THE BAD NEWS: All 3 products available today are

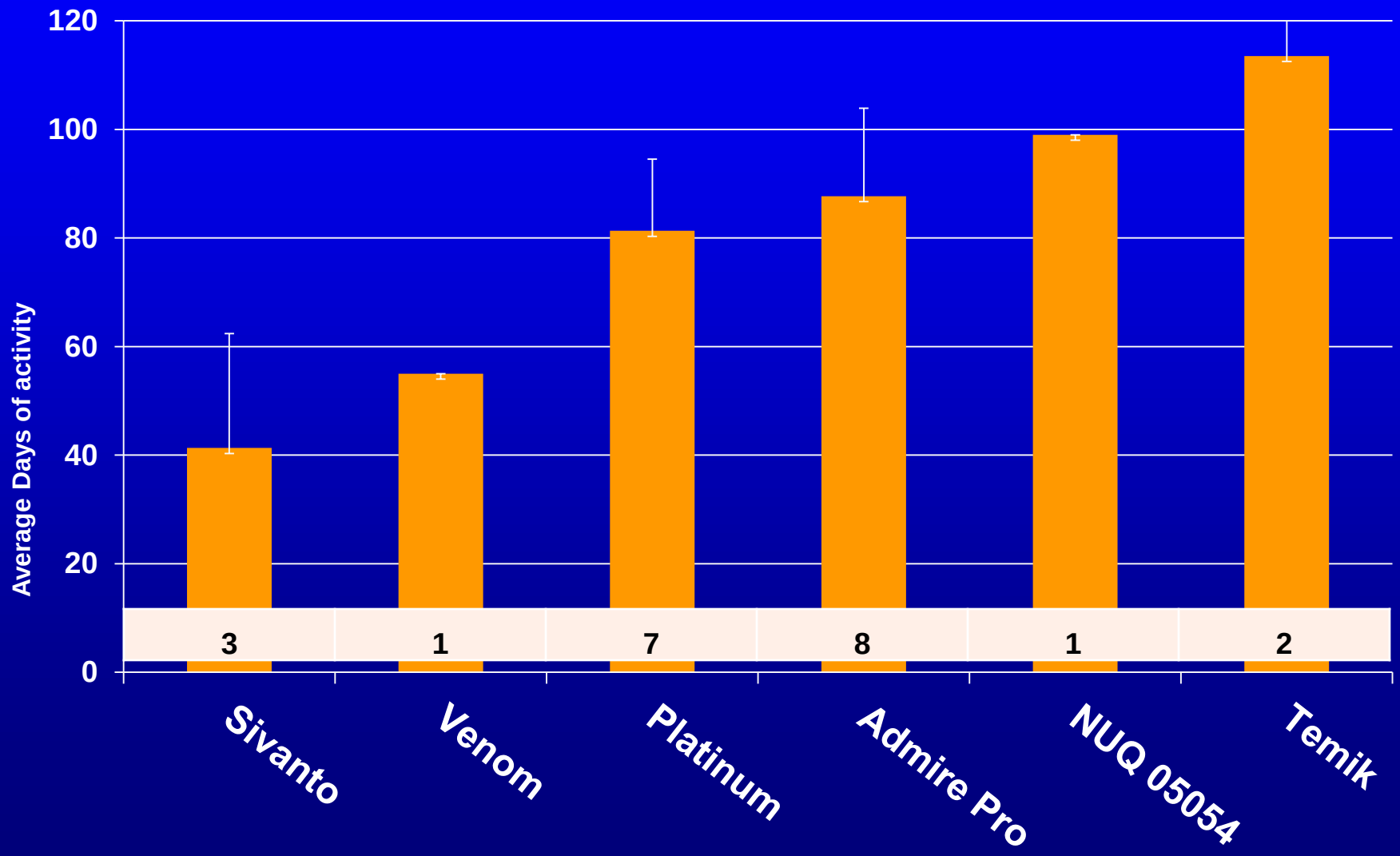
- Neonicotinoids with the same mode of action (MOA – 4)

- Alternate soil applications of these products with sprays of insecticides with different MOAs.

- Limit sprays of imidacloprid, Actara or Agriflex in older blocks to at most one per year.

Systemic Insecticides Against ACP Nymphs

Ranked by Average Days of Activity and Times Tested on young trees



Soil Applied Insecticidal Control of ACP and CLM on Young Citrus with Cyazypyr and Neonicotinoid Insecticides

- Young citrus planted May 2010
- Soil drench application: 300 ml of water per tree, then irrigated lightly to incorporate
- Products and rates tested: Verimark™ 20 SC: 10.25, 15.4 and 25 oz/ac, Admire Pro 4.6 AC: 7 oz/ac and Platinum 75 WG: 2.67 oz/ac assuming 145 trees/ac
- Only CLM found in 2010
- Adults ACP (15) into sleeve cages one branch on two trees per each plot, 4 Mar 2011. Cages were removed 21 Mar and 5 flushes per plot sampled for ACP and again for CLM on 19 Apr.

Exp. 2: Results, CLM

Treatment	Product (oz/acre)	Larvae per 3 leaves				
		10-Sep	23-Sep	8-Nov	19 Apr	11 May
Untreated		4.40 a	15.70 a	5.25 a	2.33 a	2.10 a
Admire Pro 4.6 SC	7.0	0.00 b	0.00 b	0.40 b	1.40 ab	1.40 ab
Platinum 75 WG	2.67	0.00 b	0.10 b	0.55 b	0.63 bc	0.80 bc
HGW 20 SC	10.25	0.00 b	0.00 b	0.40 b	0.06 c	0.00 c
HGW 20 SC	15.38	0.00 b	0.00 b	0.00 b	0.06 c	0.00 c
HGW 20 SC	24.97	0.00 b	0.00 b	0.00 b	0.00 c	0.00c

All 3 rates cyazypyr and Platinum still showed activity against CLM 295 DAT

Exp. 2: Results, ACP

Treatment	Product (oz/acre)	Eggs (No.)	Nymphs (No.)	Eggs (No.)	Nymphs (No.)	Nymphs (No.)	Infested Shoots (%)
		21 Mar 11		19 Apr 11		11 May 11	
Untreated		21.9 a	3.9	13.1 ab	42.4 a	92.1 a	100
Admire Pro	7.0	5.3 b	1.4	5.5 bc	26.1 ab	57.6 ab	100
Platinum 75 WG	2.67	1.6 b	0.4	16.6 a	19.3 bc	44.9 ab	100
HGW 20 SC	10.25	2.1 b	0.7	0.8 c	0.3 c	61.9 ab	100
HGW 20 SC	15.4	0.6 b	0.05	6.6 bc	9.3 bc	11.9 b	80
HGW 20 SC	25.0	4.1 b	2.6	0.3 c	0.3 c	13.0 b	40

Medium and high rate cyazypyr still showed activity against ACP nymphs 273 DAT

Experiment 3: Three-Year Study

			29-Jul-10	21-Oct-10	24-Jan-11	25-Apr-11	22-Jul-11	24-Oct-11
Untreated	untreated		----------					
Rot1cy150	Hgw 86 20 SC	10.25 oz	x		x		x	
	Admire pro	7.0 oz		x				x
	Platinum 75	2.67 oz				x		
	Hgw 86 20 SC	15.38 oz	x		x		x	
Rot2cy225	Admire pro	7.0 oz		x				x
	Platinum 75	2.67 oz				x		
	Admire pro	7.0 oz	x				x	
Rot3cy150	Hgw 86 20 SC	10.25 oz		x		x		x
	Platinum 75	2.67 oz			x			
	Admire pro	7.0 oz	x				x	
Rot4cy225	Hgw 86 20 SC	15.38 oz		x		x		x
	Platinum 75	2.67 oz			x			

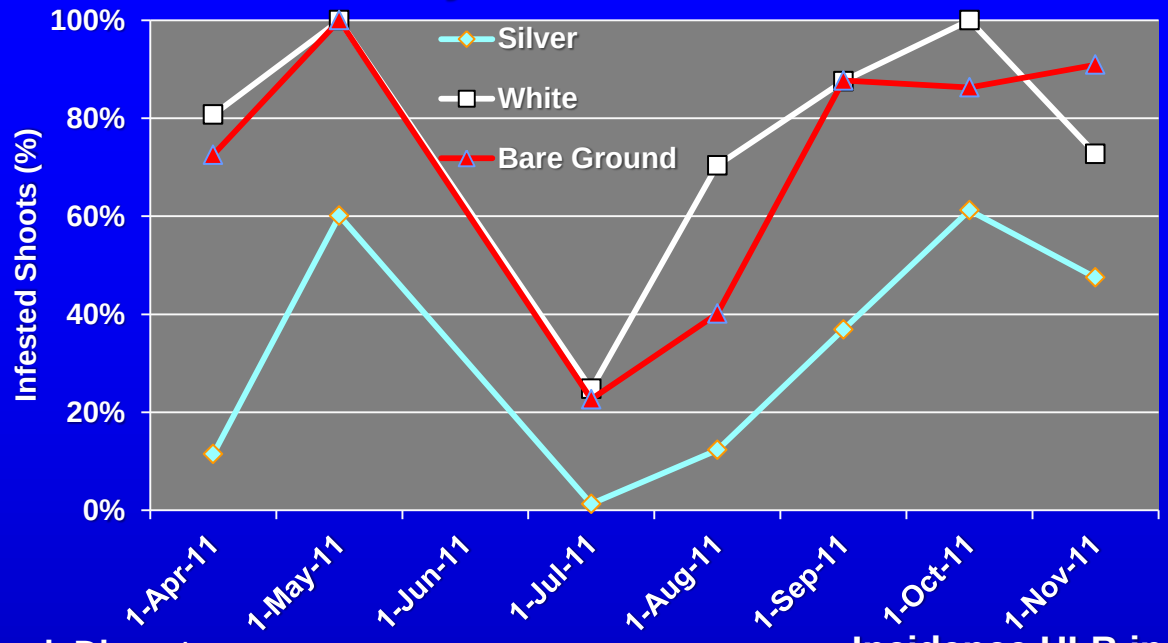
	Nymphs per Flush 2011						
	13-Apr	18-May	14-Jun	13-Jul	9-Aug	30-Sep	24-Oct
Untreated	66.17 a	78.08 a	95.77	18.60 a	20.68 a	21.35 a	37.8 a
Rot1cy150	0.00 b	0.00 b	0.75 b	8.48 b	0.85 b	0.60 b	4.35 b
Rot2cy225	0.00 b	0.00 b	0.03 b	4.70 bc	0.00 b	0.70 b	0.15 b
Rot3cy150	0.00 b	2.36 b	11.88b	4.88 bc	0.00 b	1.22 b	0.90 b
Rot4cy225	0.00 b	0.00 b	0.00 b	0.48 c	0.00 b	0.45 b	8.45 b

Experiment 3: PCR Results

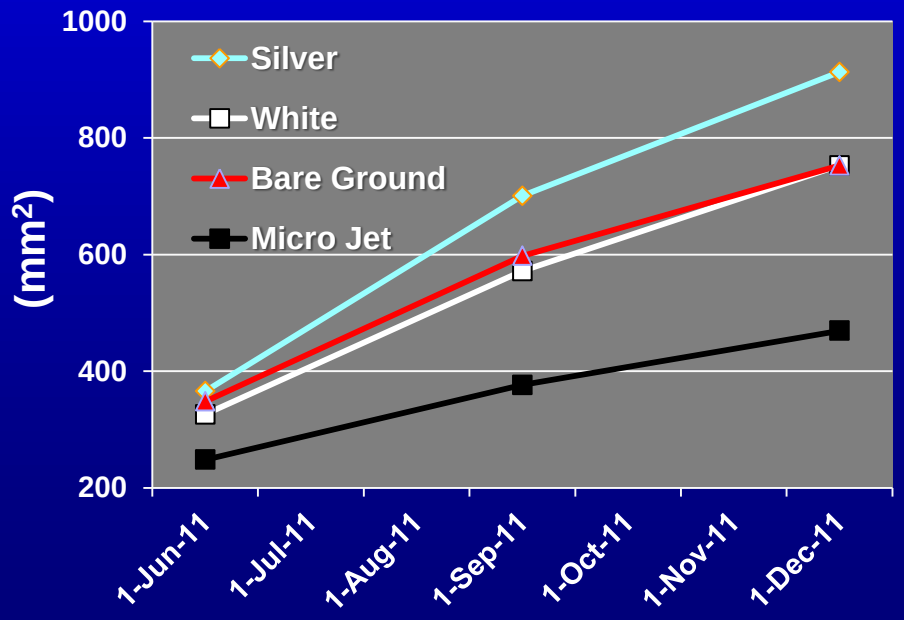
		Rate O/zac	Application Dates					PCR (%) N=36	
			29-Jul-10	21-Oct-10	24-Jan-11	25-Apr-11	22-Jul-11	+	?
Untreated			----------					28	2.8
Rot1cy150	HGW 86 20 SC	10.3	x		x		x		
	Admire pro	7.0		x				8.3	5.6
	Platinum 75	2.7				x			
Rot2cy225	HGW 86 20 SC	15.4	x		x		x		
	Admire pro	7.0		x				5.7	0
	Platinum 75	2.7				x			
Rot3cy150	Admire pro	7.0	x				x		
	HGW 86 20 SC	10.3		x		x		8.3	0
	Platinum 75	2.67			x				
Rot4cy225	Admire pro	7.0	x				x		
	HGW 86 20 SC	15.4		x		x		0	0
	Platinum 75	2.7 oz			x				


The UV Reflective Mulch System
• ACP protection
• Weed Control
• Drip irrigation

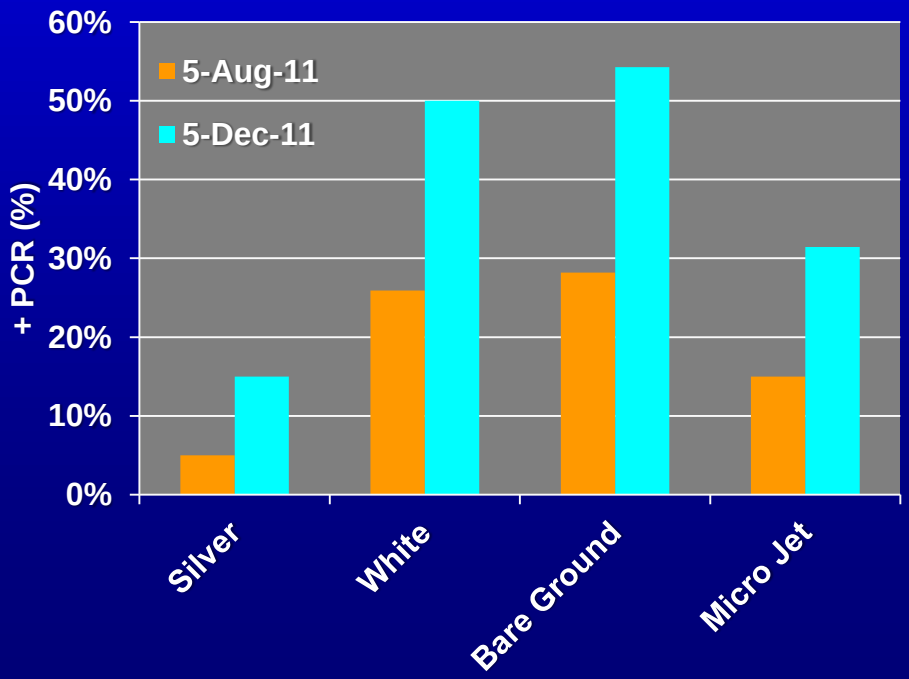
Psyllid Infestation



Trunk Diameter



Incidence HLB in 40 trees

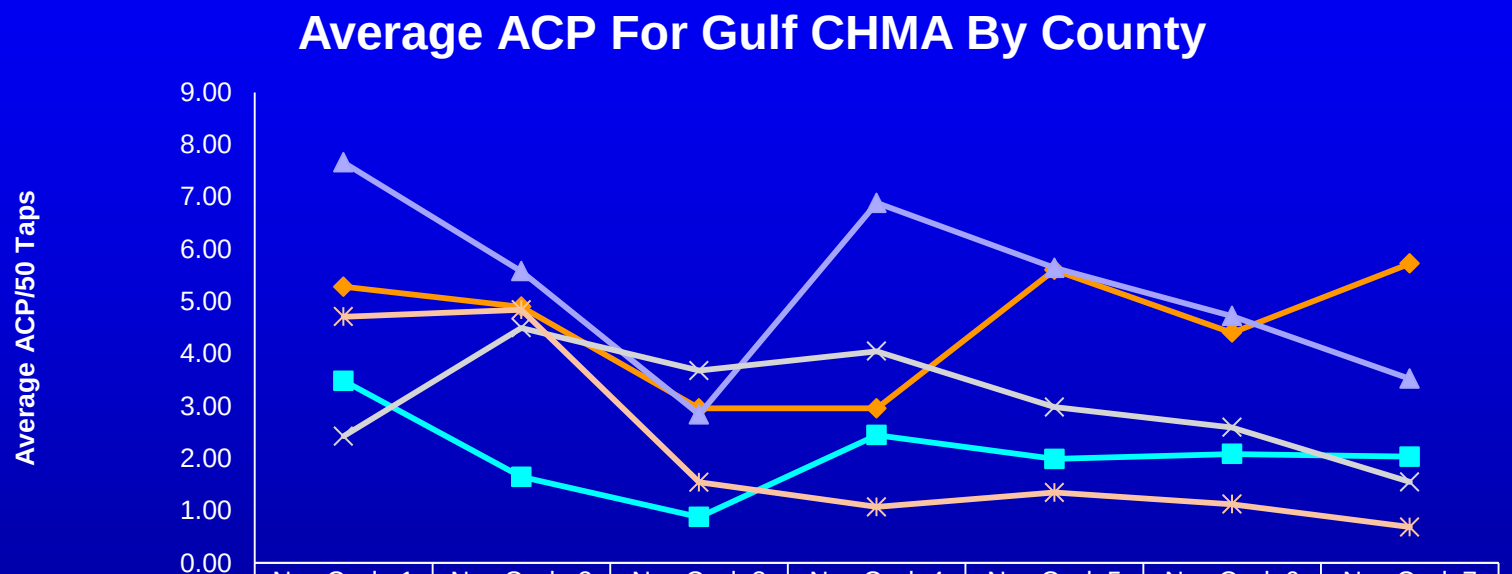


Toward an "Area Wide" IPM

- State/National Scale
  - Research and Extension
  - HLB Bibliographic Database (www.imok.ufl.edu/entomology)
- Regional Scale (CHMAs)
  - Coordinated sprays
  - Release of beneficials (Future)
  - Data sharing
    - ACP Adults (present CHRP program)
      - HLB Infection levels
      - Incidence of secondary pests and diseases
      - Populations of beneficials
- Grove/Block
  - Data collection
  - Pest/disease management
  - Corrective foliar nutrition
  - Flush management

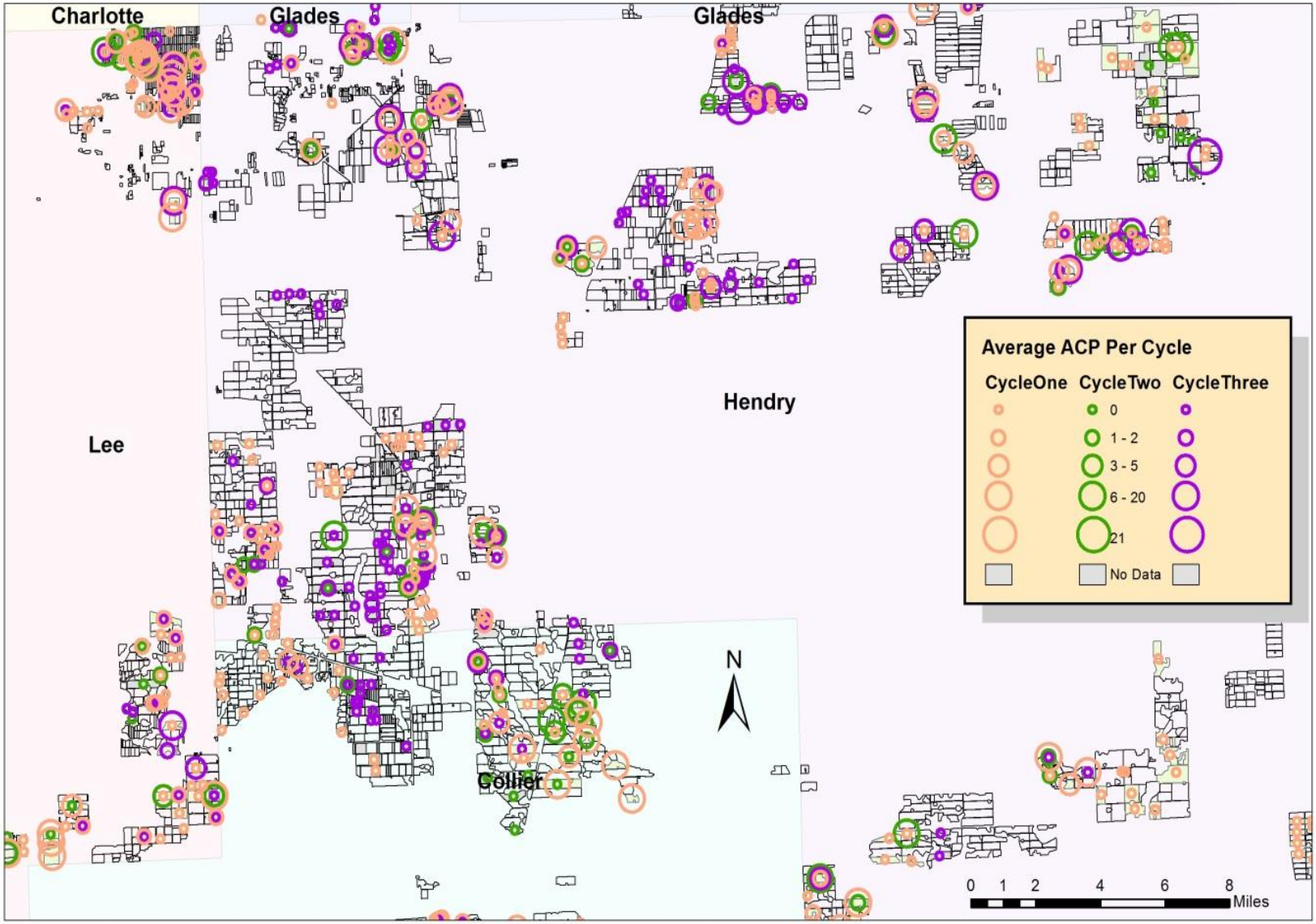
HLB is providing the need and opportunity to cooperate at different levels and upgrade citrus production technology

Gulf CHMA County Averages



	NewCycle 1 9-Aug	NewCycle 2 31-Aug	NewCycle3 19-Sep	NewCycle4 12-Oct	NewCycle5 2-Nov	NewCycle6 23-Nov	NewCycle7 14-Dec
CHARLOTTE	5.28	4.90	2.96	2.96	5.61	4.41	5.73
COLLIER	3.48	1.65	0.88	2.45	1.99	2.08	2.03
GLADES	7.66	5.58	2.84	6.89	5.64	4.72	3.52
HENDRY	2.42	4.50	3.68	4.05	2.98	2.59	1.55
LEE	4.71	4.84	1.54	1.07	1.35	1.12	0.69

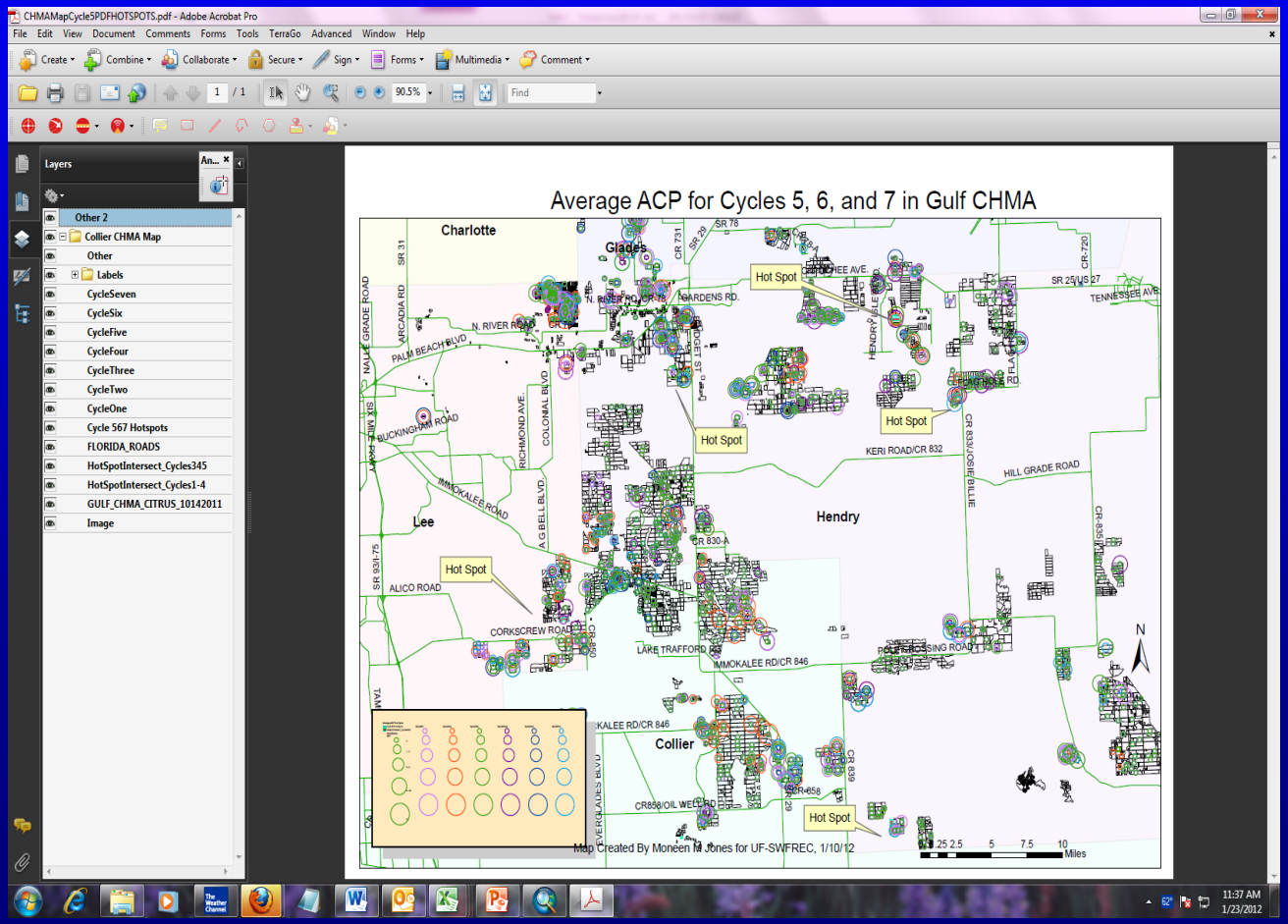
Average ACP for Cycles 1, 2 and 3 in Lee and Hendry Counties



Interactive Map

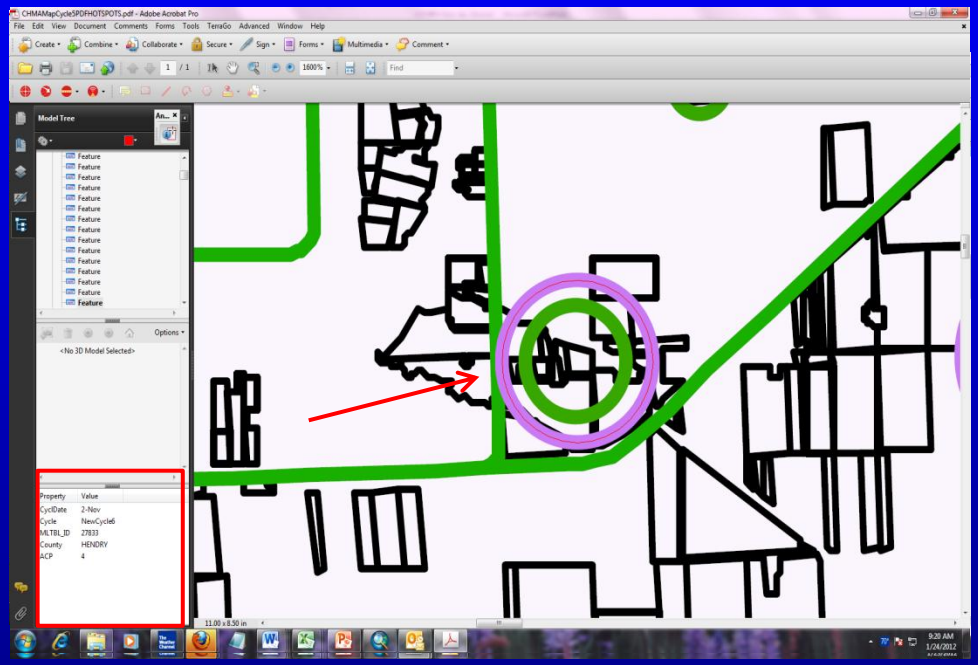
- CHMA cycle data from Excel file converted into ArcGIS shape files
- Can view data temporally and spatially
- Able to turn on and off layers to compare specific cycle data
- A ‘hot spots’ layer for last 3 cycles of data

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



Choosing and Comparing Cycles

- 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
(purple shown)
attribute data

Summary

- Spray programs need to satisfy many criteria
  - Effectiveness, Economy, Rotation, Pest Complex, Beneficials
- Soil drenches provide good protection for young trees
- UV reflective mulches add an extra level of ACP protection
- Mulch system requires drip but provides other benefits (weed control, enhanced growth)
- Effectiveness ratings, example programs, and interactive Gulf CHMA monitoring summaries available on IMOK website: www.imok.ufl.edu/Entomology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Cameron Brennan


Mauricio Pinto


Robert Riefer


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