IPM in Florida
Fruiting Vegetables

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Principal Pests of Pepper in SW Florida

Pepper weevil

Melon thrips

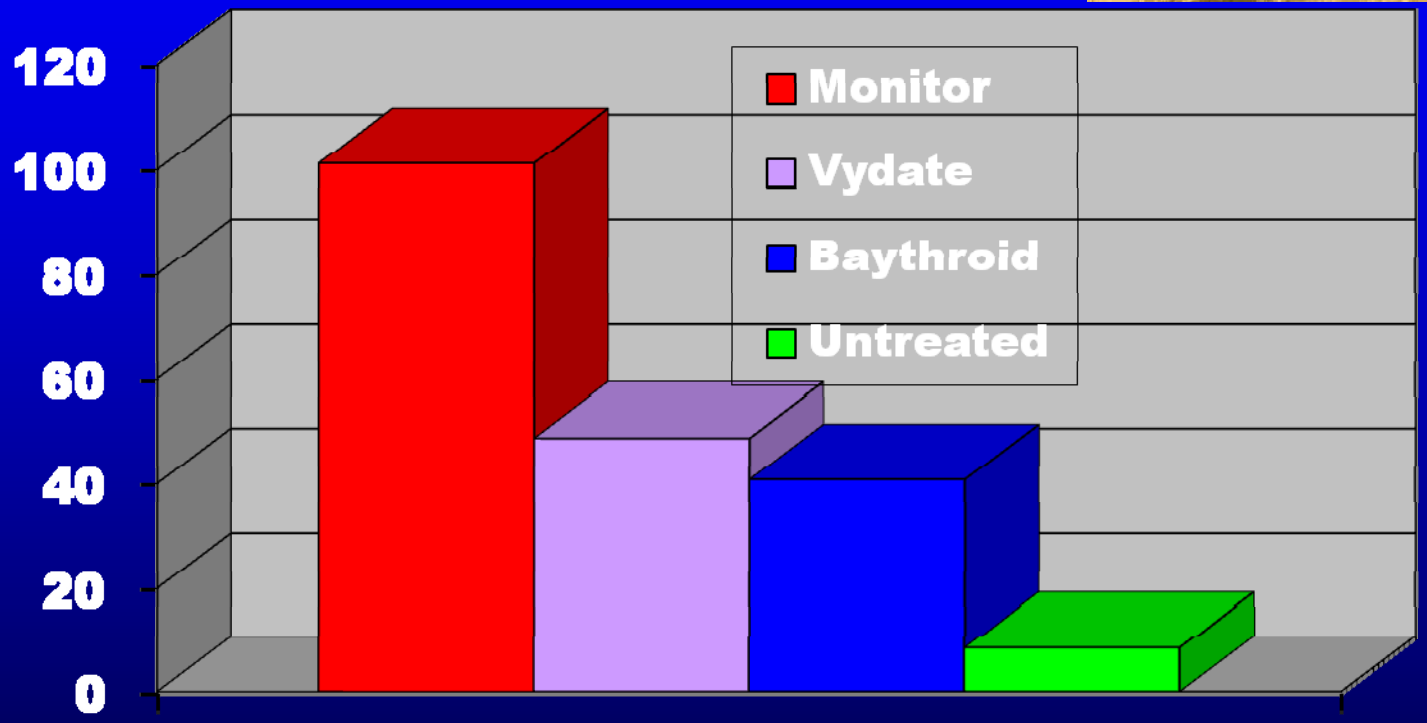
Beet Armyworm

Broadmite

Western flower thrips

Aphids/potyvirus

Secondary Pest Outbreak: Melon Thrips 1994



Effect of 6 weekly sprays over 4 sampling periods

Avoiding Insecticide Backlash

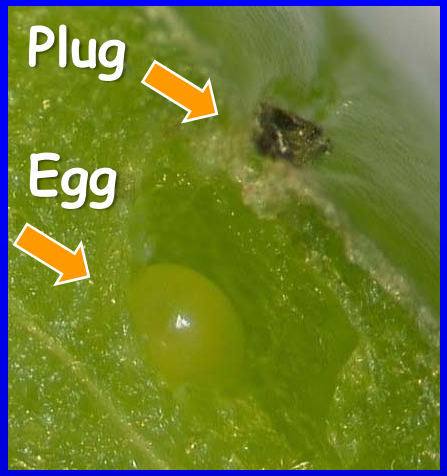
- Cultural controls to reduce pest populations
  - Host free period in summer
  - Shortened crop cycles
  - Rapid crop destruction
  - Crop rotation
  - Weed control
  - No over-fertilization
- Use selective insecticides
  - Avoid carbamates, OPs, endosulfan and especially pyrethroids
  - Use nicotinoids as drenches where appropriate
  - Use spinosyns only for thrips control.

Pepper Weevil
Anthonomus eugenii

- **Biology**
  - **Life cycle, host plants, phenology**
- **Scouting**
  - **Counts, Pheromone traps**
- **Management**
  - **Cultural, Chemical, Biological**

Adult Prefers feeding on flower buds

Prefers laying eggs near calyx of young fruit



Egg laid in small cell sculpted by mandibles and covered by a plug

Larvae burrow into fruit, feed on seeds

Infested fruit often fall to the ground where adult emerges

Photos by E. Rodriguez

Pepper Weevil Biology

- Egg incubation: 3 to 5 days
- 3 larval instars: 13 to 17 days
- Pupal stage: 3 to 6 days
- Preoviposition: 2 to 3 days
- Fecundity: 340 eggs in 1 month
- Adult longevity: 3 months
- Limited host range
  - Reproduces on pepper, nightshade

Scouting Pepper Weevil

Adults: Concentrate on

- Field margins
- Upper 1/3 of plant
- Leaf axils and blooms
- Pheromone traps

Also Look For:

- Punctured/fallen fruit or blooms

Cultural Control of Pepper Weevil

- At least 3 months fallow
- Control nightshade
- Plant in isolated locations
- Avoid sequential planting
  - Rotate crops
- Shorten crop cycles
- Remove and destroy infested fruit
- Plow down and incorporate old crops

Chemical Control of Pepper Weevil

- Only adult subject to insecticidal control
- Cryolyte Na3AlF6 moderate efficacy
  - Use early to avoid yield effect
- Foliar neonicotinoids
  - Actara most effective
  - Assail and Venom also active
  - Same mode of action
- Vydate
  - Some resistance seen
  - 3 - 4 pts
- Capture (bifenthrin), Cobalt (chlorpyrifos and gamma-cyhalothrin), Other pyrethroids
  - Only late season, only if necessary

Biological Control of Pepper Weevil

- ***Catalaccus hunteri***

  Most common parasitoid generally

  Attacks 3rd instar, feeds externally

  Flower buds and small fruit only

- ***Triaspis sp***

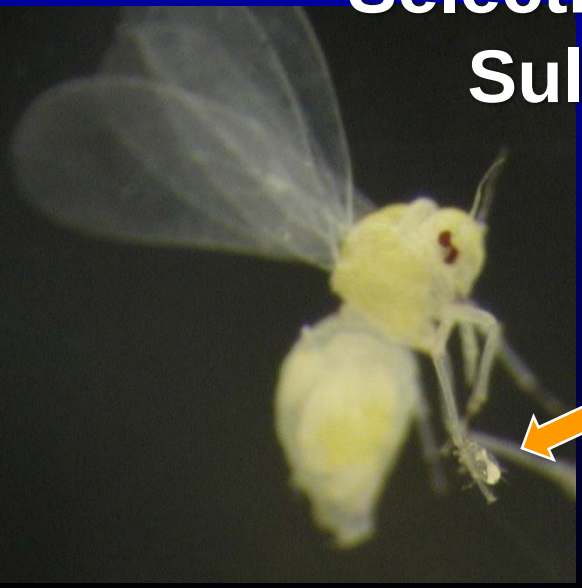
  Most common in Nayarit Mexico

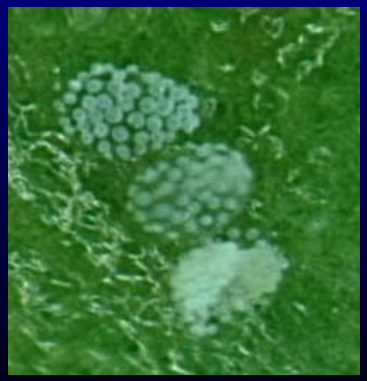
  Attacks egg, feeds internally on larva

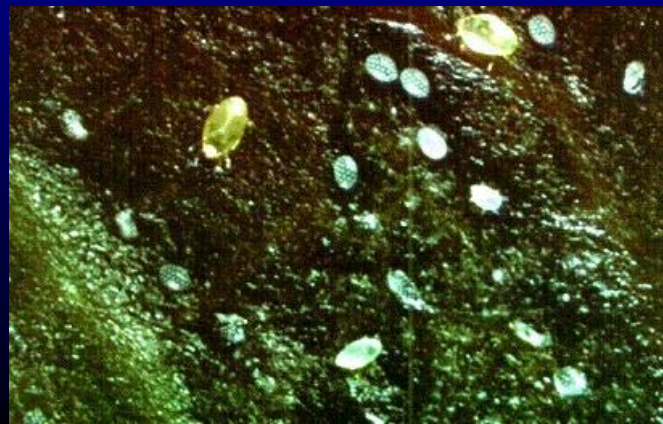
  Released but not recovered in Florida

Broad Mite:
Polyphagotarsonemus lattus

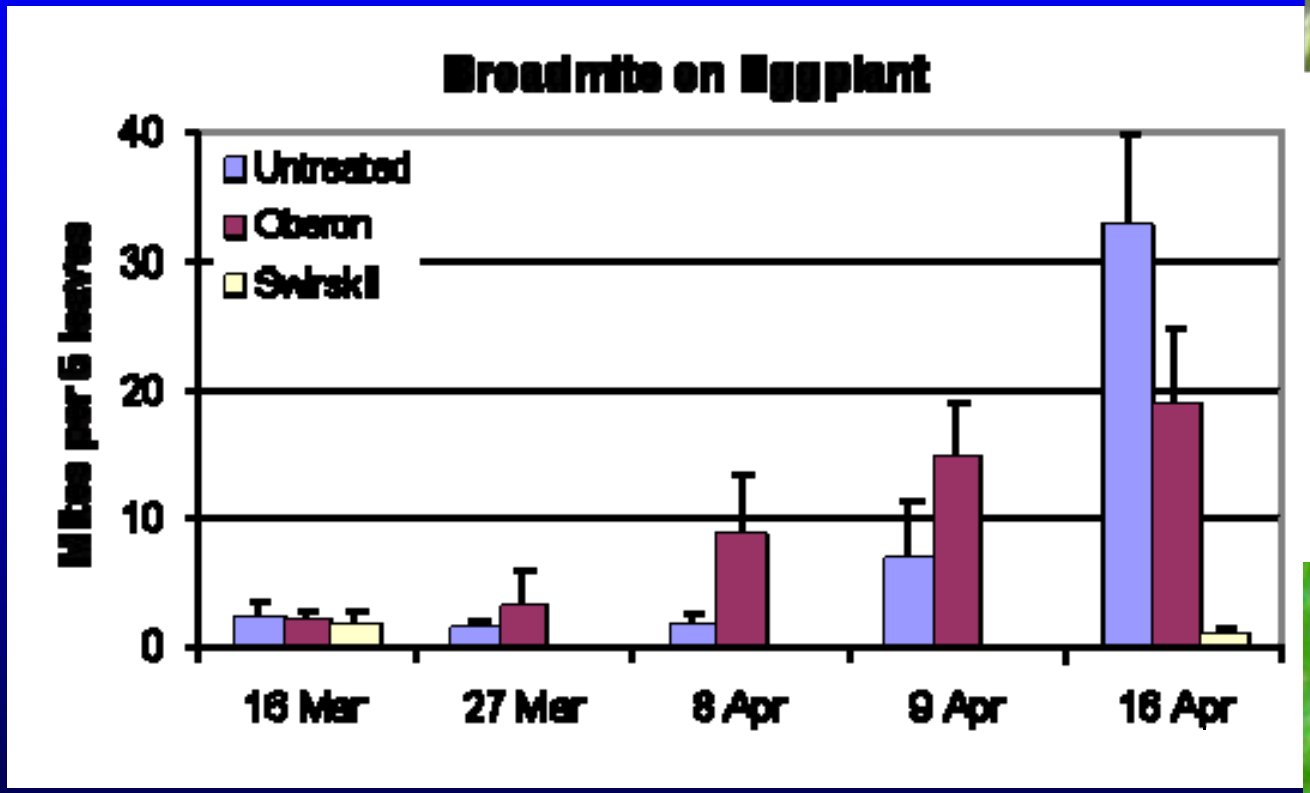
- Midseason (dry weather) pest
- Aggregated distribution
- Phoretic on whiteflies/aphids
- Some insecticides may aggravate
- Selective acaracides preferred:
  Sulfur, abamectin, dicofol







Biological Control of Broadmite with *A. swirskii* : Immokalee Spring 2007



These mites eat thrips too!

J. Castillo

Selective Insecticides for Beet Armyworm Control

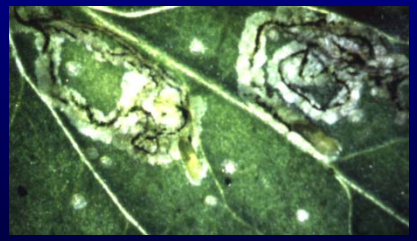
- Avaunt
- Intrepid
- Proclaim
- Bt
- Rimon
- Coragen
- Synapse

Conclusions/Recommendations: Pepper

- Avoid broad spectrum insecticide or use only late in the crop cycle
- Use selective insecticides for lep control
  - Save spinosyns for thrips
- Cultural practices to control pepper weevil
  - ✓ At least 3 months fallow
  - ✓ Control nightshade
  - ✓ Plant in isolated locations
  - ✓ Avoid sequential planting
    - ✓ Rotate crops
  - ✓ Shorten crop cycles
  - ✓ Remove and destroy infested fruit
  - ✓ Plow down and incorporate old crops

Principal Tomato Pests in South Florida

Whitefly *Bemisia tabaci* and TYLCV



Leafminers:
Liriomyza trifolii

Spidermites
Tetranychus urticae

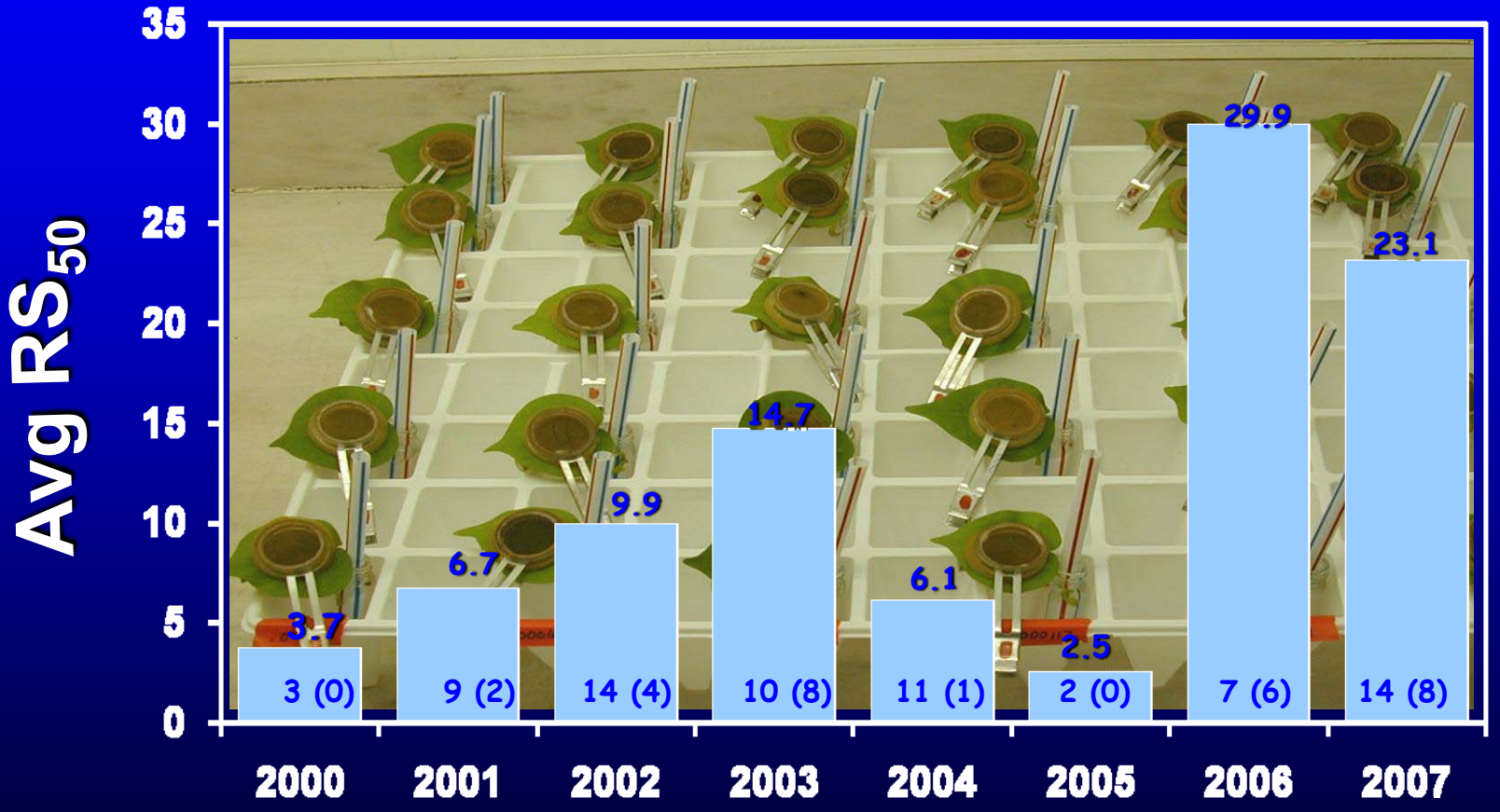
Western Flower thrips and Tomato

- WFT really not a problem if no TSWV
- Orius does not colonize tomato well
- Oviposition dimpling possible with high numbers
- Use spinosyn products only for at least 2 of 4 susceptible pests causing damage
  - Worms, Leafminer, Pinworm, Thrips

Challenges to Insecticidal Control of *B. tabaci* on Florida Vegetables

- RS_{50} values for imidacloprid have increased 8 fold since 2000 and 12 fold since 2005
- RS_{50} values for thiamethoxam have increased 14 fold since 2003
- Imidacloprid off patent; 2 other nicotinoids registered
- Biotype Q confirmed in nursery/retail outlets in five Florida counties – not in field yet

Relative Susceptibility of *B. tabaci* adults from Nicotinoid-Treated Fields in South Florida



N (RS_{50} > 10)

D. Schuster

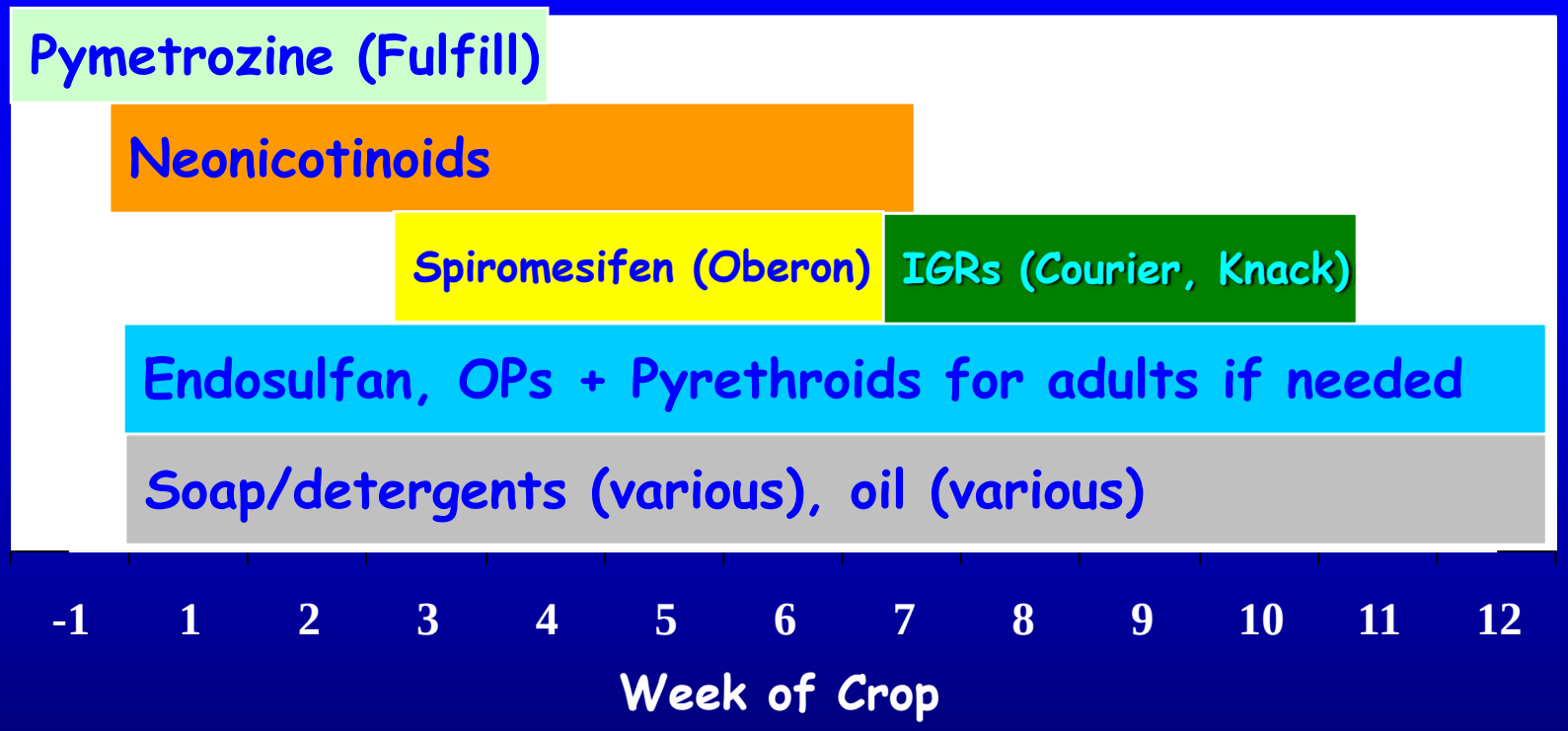
UNIVERSITY OF FLORIDA IFAS

RS_{50} Values of Selected Whitefly Populations for Selected Insecticides – Spring 2007

	Neonicotinoids				Pyrethroid	Organochlorine
Population	Admire	Assail	Platinum	Venom	Bifenthrin	Endosulfan
Apollo Beach	7.3	----	10.2	4.0	116.4	2.8
FM	5.6	----	4.8	----	----	1.4
Homestead	28.3	----	21.9	----	29.8	1.3
NECollier	85.8	1.2	22.9	----	110.8	1.3
Parrish-1	47.8	----	6.5	7.0	240.9	1.6
SWFREC	33.2	1.3	21.8	7.1	233.6	1.7
SWHendry	29.6	3.9	----	----	114.1	----
TomG#2	5.5	----	10.5	2.8	----	----
No. Pop^{ns}	14	6	18	10	6	8
Avg RS_{50}	23.1	2.6	10.3	4.8	140.9	1.6

D. Schuster

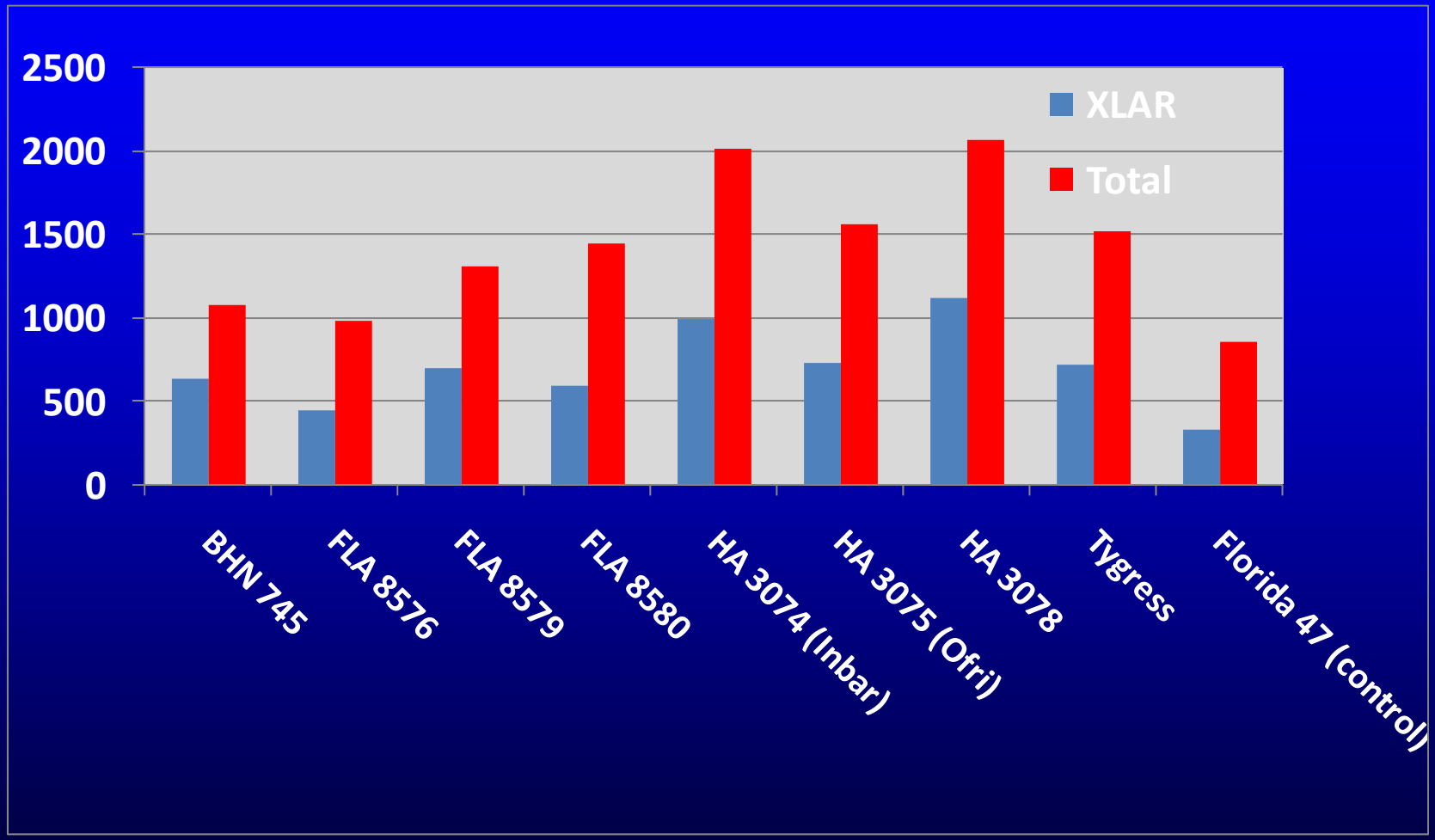
Recommended Insecticidal Control Practices



- Rotate to non-neonicotinoids after first 6 weeks or for nymph or adult control
- Use selective vs broad spectrum insecticides
- Do not apply insecticides to weeds on field perimeters to conserve natural enemies

TYLCV Resistant Varieties

Fruit Yields, Spring 2008



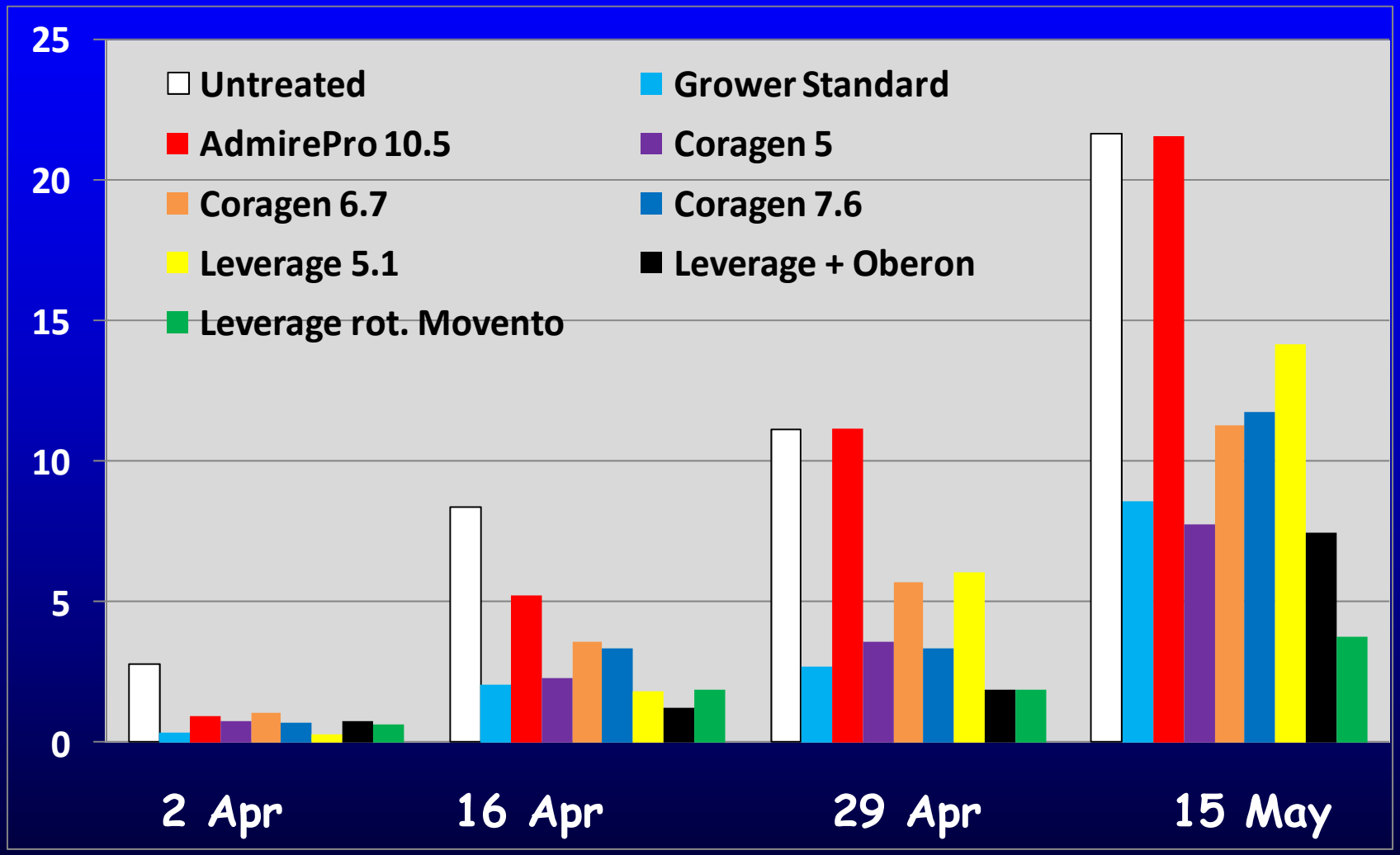
Monica Ozores-Hampton et al., Proc. Tomato Institute 2008

Whitefly Nymphs Tomato Spring 2008_1

Date	28-Feb	17-Mar	25-Mar	31-Mar	7-Apr	10-Apr	14-Apr	5-May
Volume	4 oz/plant	20 gal/acre	4 oz plant	40 gal/acre	40 gal/acre	4 oz/plant	60 gal/acre	90 gal/acre
Treatment								
Control								
Standard	Admire Pro 10.5 oz	Fulfill 2.75 oz		Thionex 3 EC 21.3 oz	Thionex 3 EC 21.3 oz		Courier 40 SC 13.6 oz	Courier 40 SC 13.6 oz
Admire Pro	Admire Pro 10.5 oz							
Coragen -L	Admire Pro 10.5 oz		Coragen 5.0 oz					
Coragen -M	Admire Pro 10.5 oz		Coragen 6.7 oz			Coragen 6.7 oz		
Coragen - H	Admire Pro 10.5 oz		Coragen 7.6 oz					
Leverage* 2.7 SC	Admire Pro 10.5 oz	Leverage 5.1 oz		Leverage 5.1 oz	Leverage 5.1 oz			
Leverage + Oberon 2 SC	Admire Pro 10.5 oz	Leverage 5.1 oz Oberon 8.5 oz		Leverage 5.1 oz Oberon 8.5 oz	Leverage 5.1 oz Oberon 8.5 oz			
Leverage Movento 240 SC	Admire Pro 10.5 oz	Leverage 5.1 oz		Leverage 5.1 oz	Leverage 5.1 oz		Movento 5.0 oz	Movento 5.0 oz

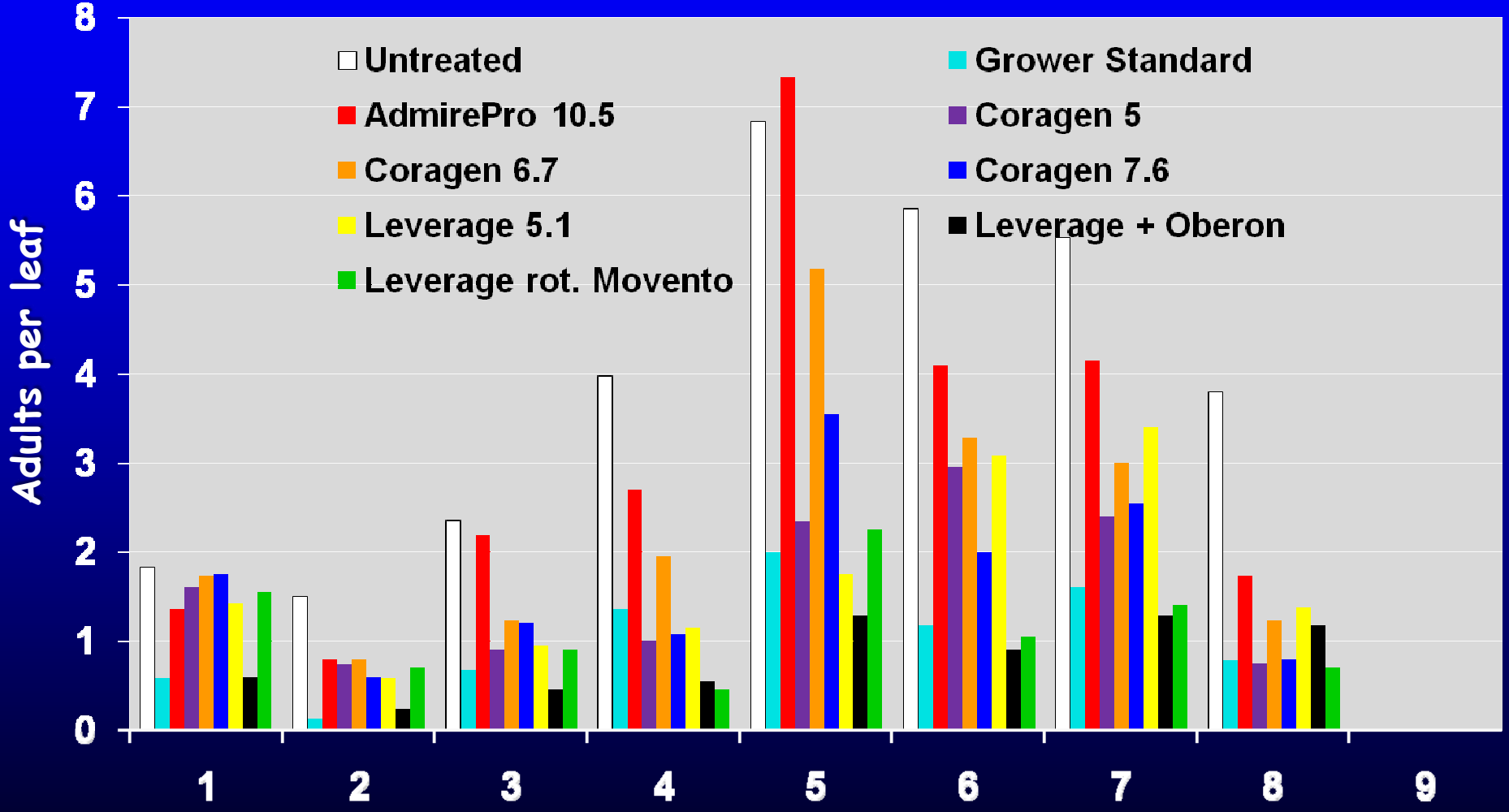
* Imidacloprid 17%, Cyfluthrin 12%

Whitefly Nymphs Tomato Spring 2008-1



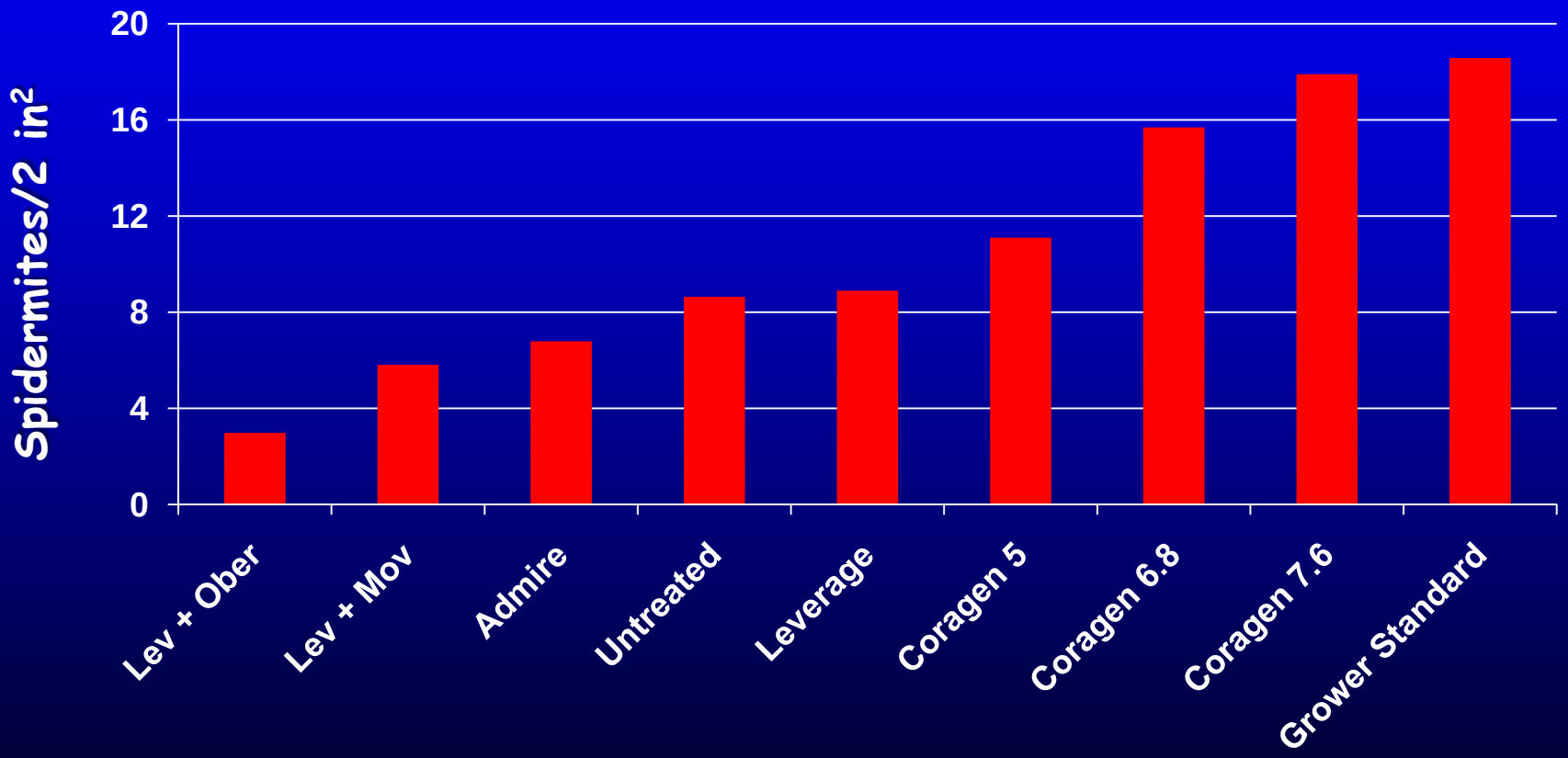
All Treatments Included AdmirePro

Adult Whiteflies Tomato Spring 2008-1



All Treatments Included AdmirePro

Spidermites 15 May



Insecticidal Control of Whitefly Spring 2008:

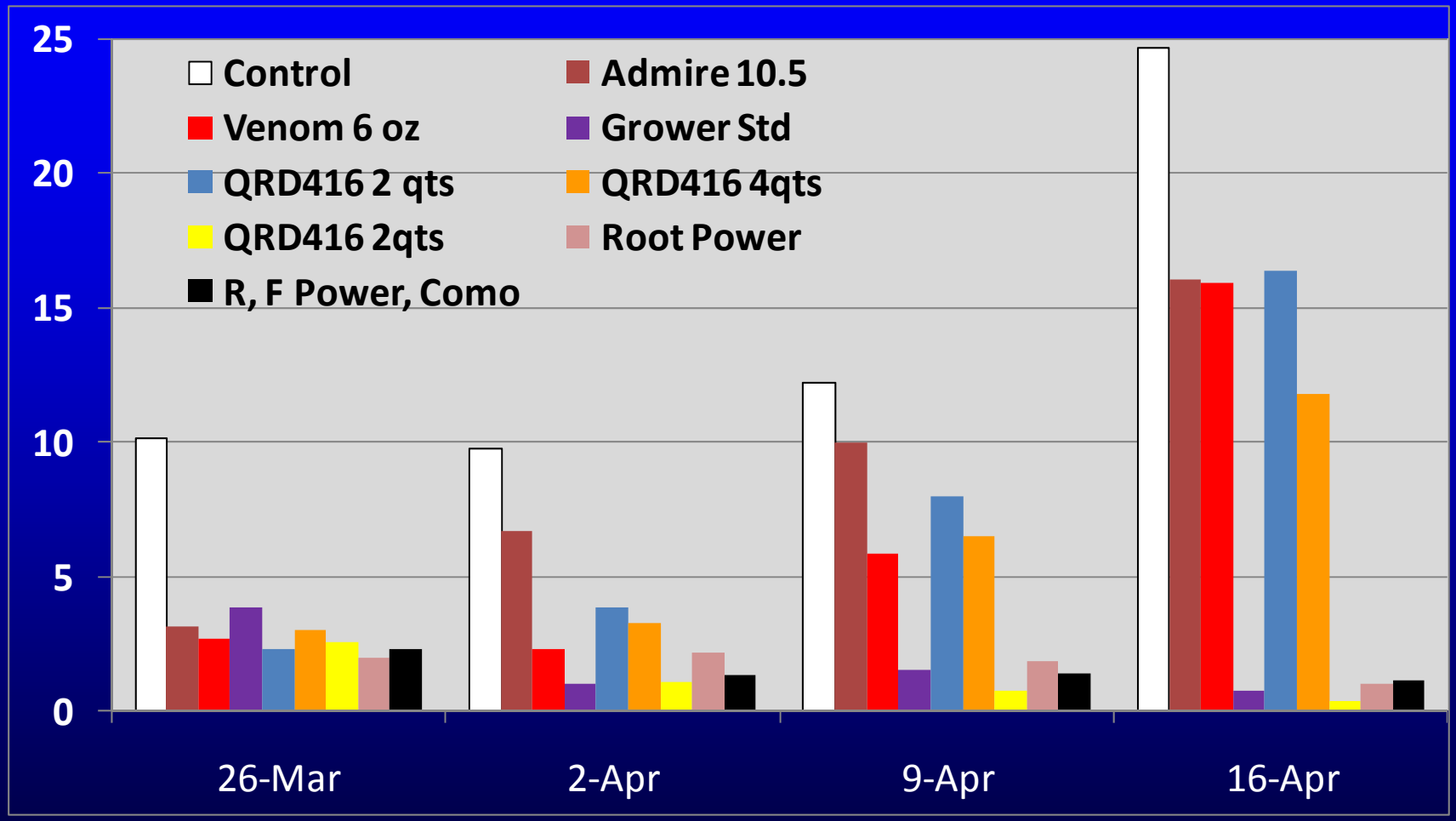
Phil Stansly, Barry Kostyk, Robert Riefer

		Foliar applications by date and application volume (gal/ac)							
		24-Mar (40)	31-Mar (40)	7-Apr (40)	15-Apr (60)	22-Apr (70)	28-Apr (90)	5-May (90)	13-May (90)
Standard Protocol:									
Fulfill	50 WG	X							
Thionex	3EC		X			X			X
Knack	11 WG			X			X		
Oberon	2 SC				X			X	
QRD416*		X	X	X	X	X	X	X	X
Flower Power		X	X	X	X	X	X	X	X
Como		X	X	X	X	X	X	X	X

Venom in Grower Standard.

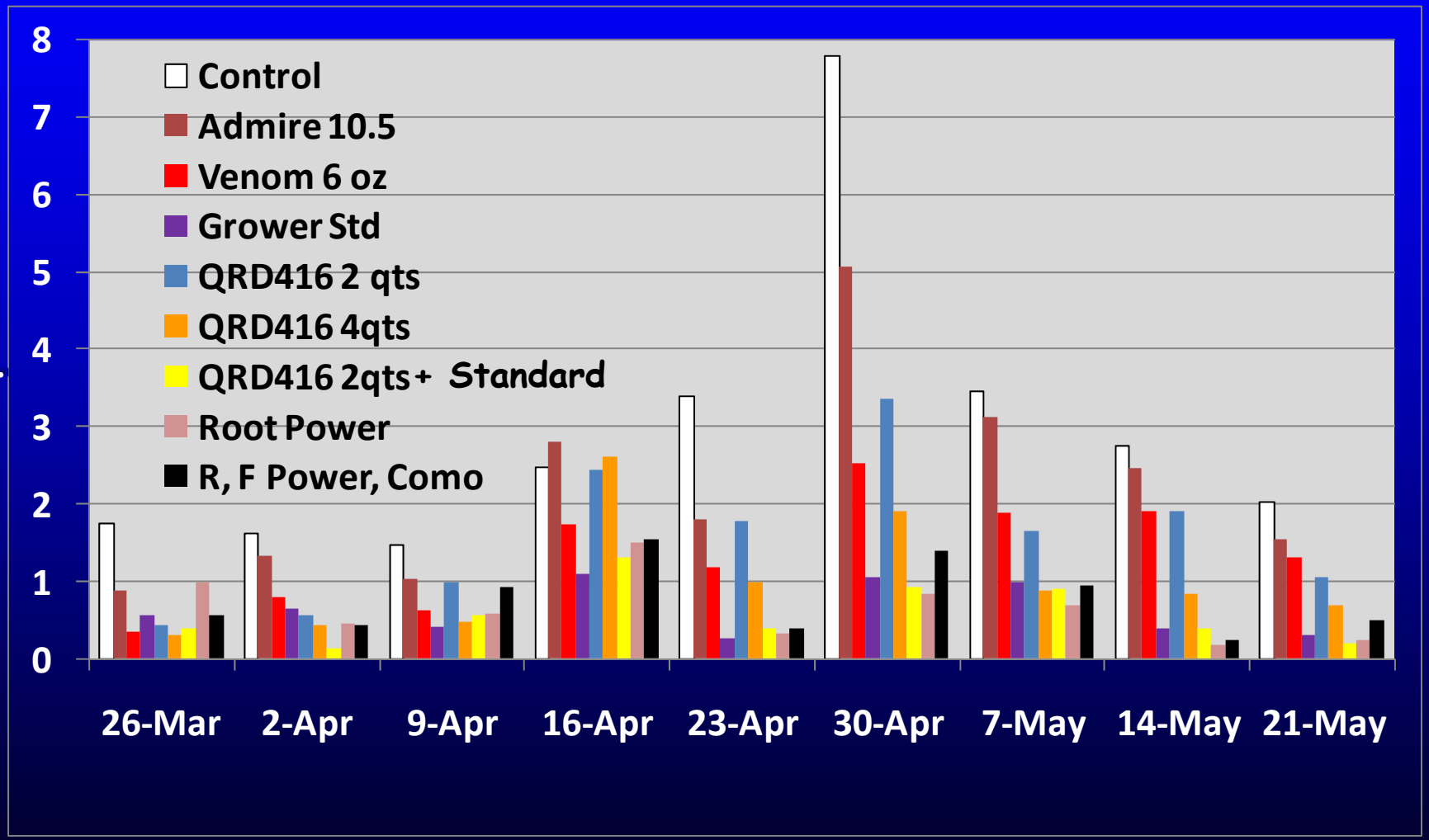
*4 qt rate and one 2 qt rate QRD alone. Second 2qt rate w/ AdmirePro standard.

Whitefly Nymphs Tomato Spring 2008_2

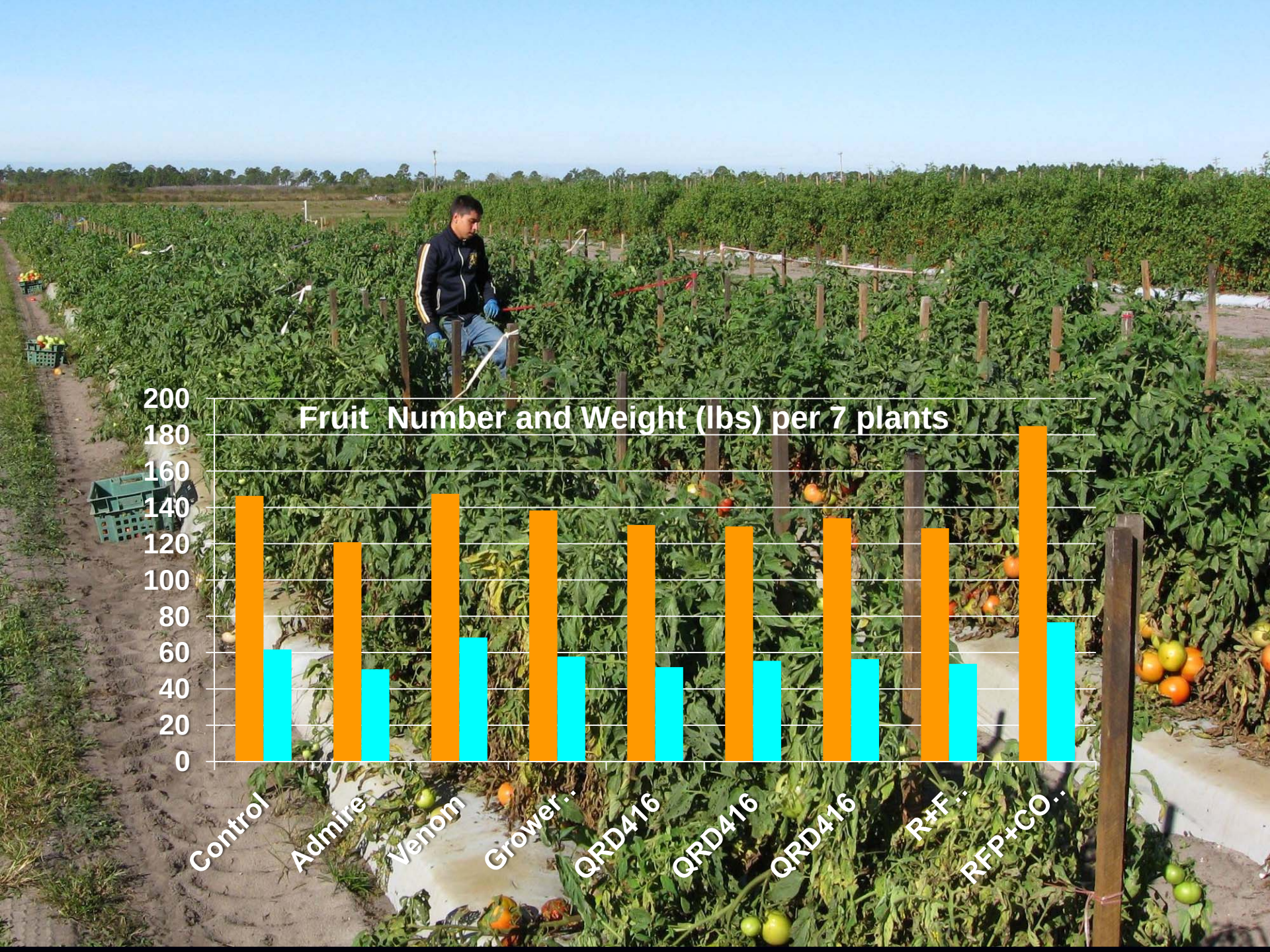


Grower Std w/ Venom. QRD & Power Treatments with AdmirePro

Adult Whiteflies Tomato Spring 2008_2



Grower Std w/ Venom. QRD & Power Treatments Included AdmirePro


Fruit Number and Weight (lbs) per 7 plants
200
180
160
140
120
100
80
60
40
20
0
Control
Admire
Venom
Grower...
QRD416
QRD416
QRD416
R+F...
RFP+CO...

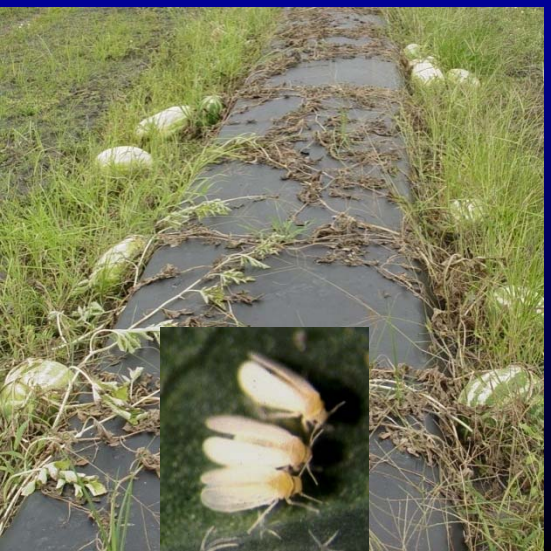
Conclusions: Whitefly Field Trials Spring 2008

- Imidacloprid drench wore of quickly
  - Better control with dinitefuron
- Marginal whitefly control with rynaxypyr
  - Induced spidermite infestation as did grower standard with 2 sprays of endosulfan despite 2 sprays of spiromesafen
- Some whitefly control with QRD (Requiem)
  - *Chenopodium* terpenoid extract
- Increased yield with Flower/Root Power + Como combination.

Watermelon Vine Decline Caused by *Bemisia*-transmitted Squash Vein Yellowing Virus

Phil Stansly and Pam Roberts
University of Florida
SW Florida Research and Education Center
Immokalee FL

Shaker Kousik
USDA-ARS Charleston



UNIVERSITY OF FLORIDA
EXTENSION
Institute of Food and Agricultural Sciences

Symptoms of watermelon vine decline in south Florida

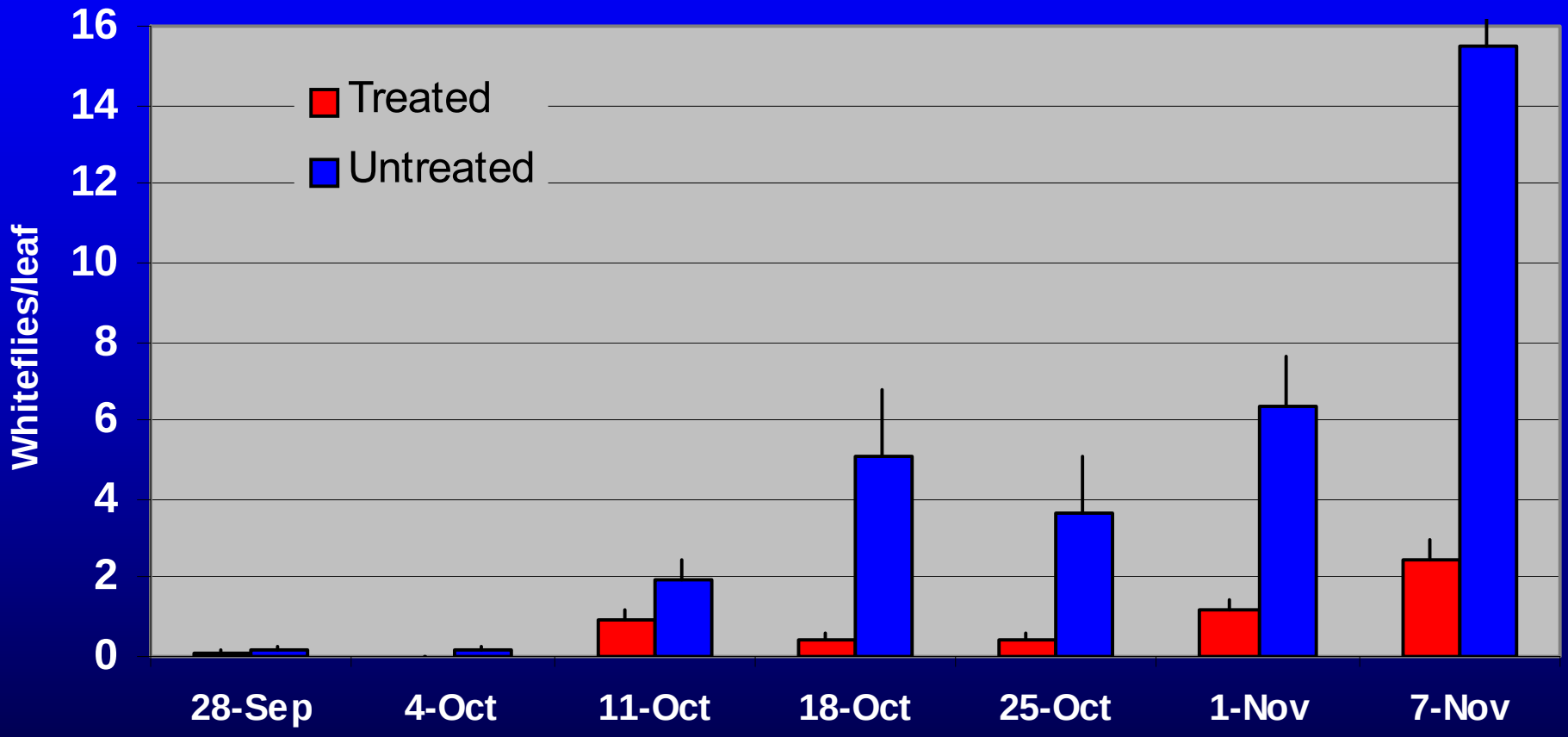
- Symptoms observed approaching harvest
- Patchy yellowing of vines
- Scorched leaves
- Wilted plants
- Rapid vine collapse on mature plants
- Rind discoloration
- 100% plant death in some fields.


Experimental setup SWFREC
2006-2008
Infected Squash

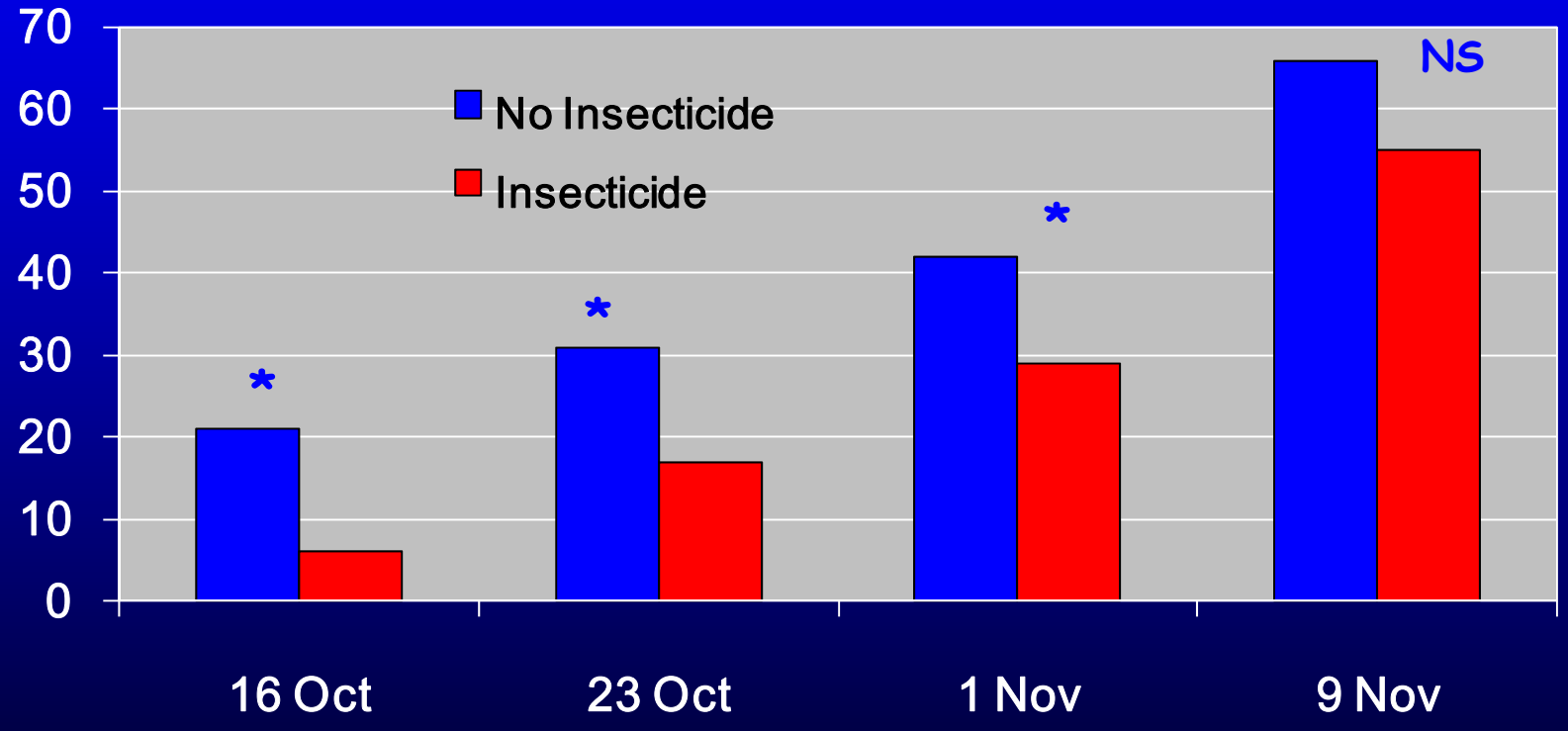
Decline Everywhere but in the Screenhouses Spring and Fall

Gradient of Symptom Severity Correlated with Distance from Inoculated Squash

Adult Whiteflies on Watermelon

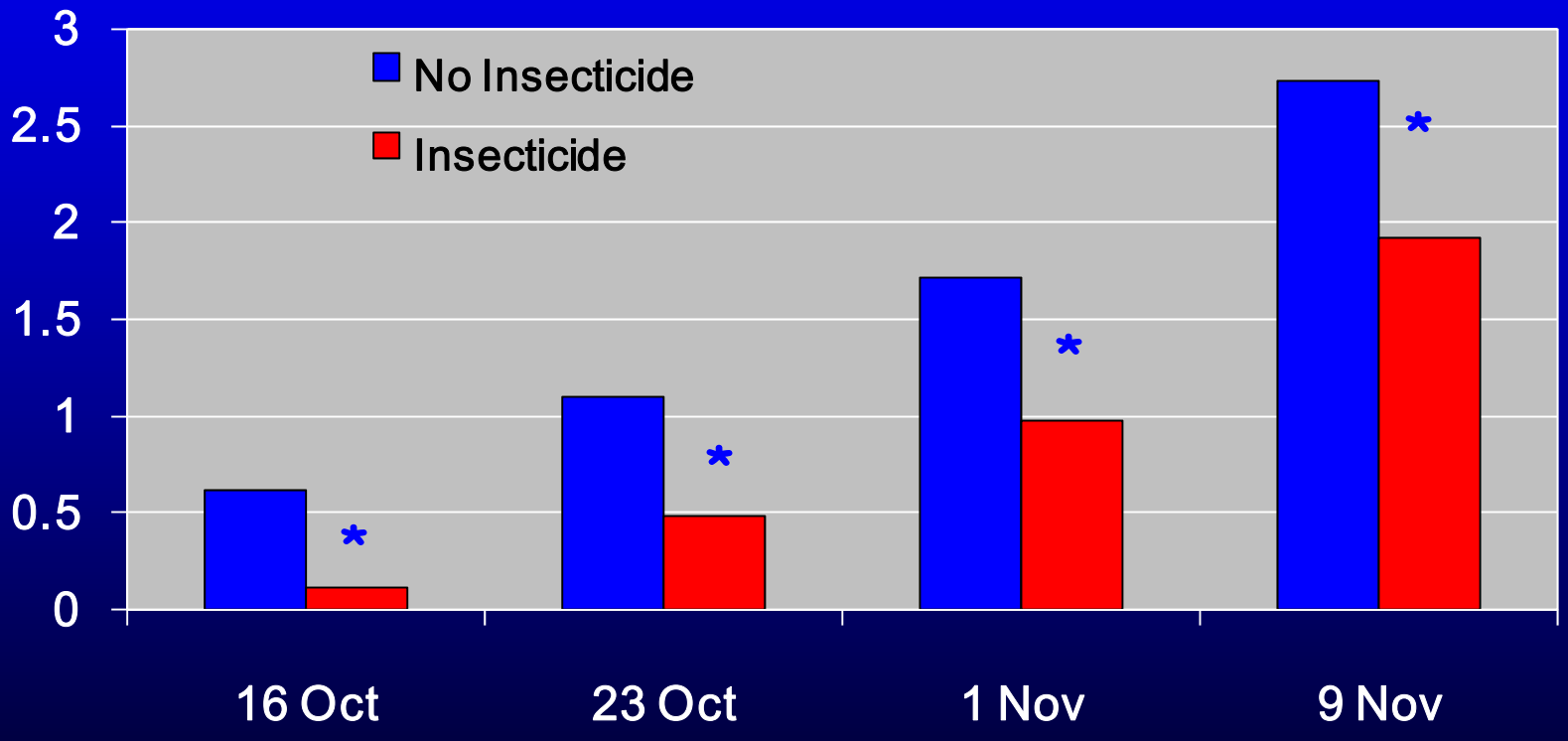


Incidence of Vine Decline on Insecticide Treated and Untreated Plants Fall 2006



*Significant at P < 0.0001

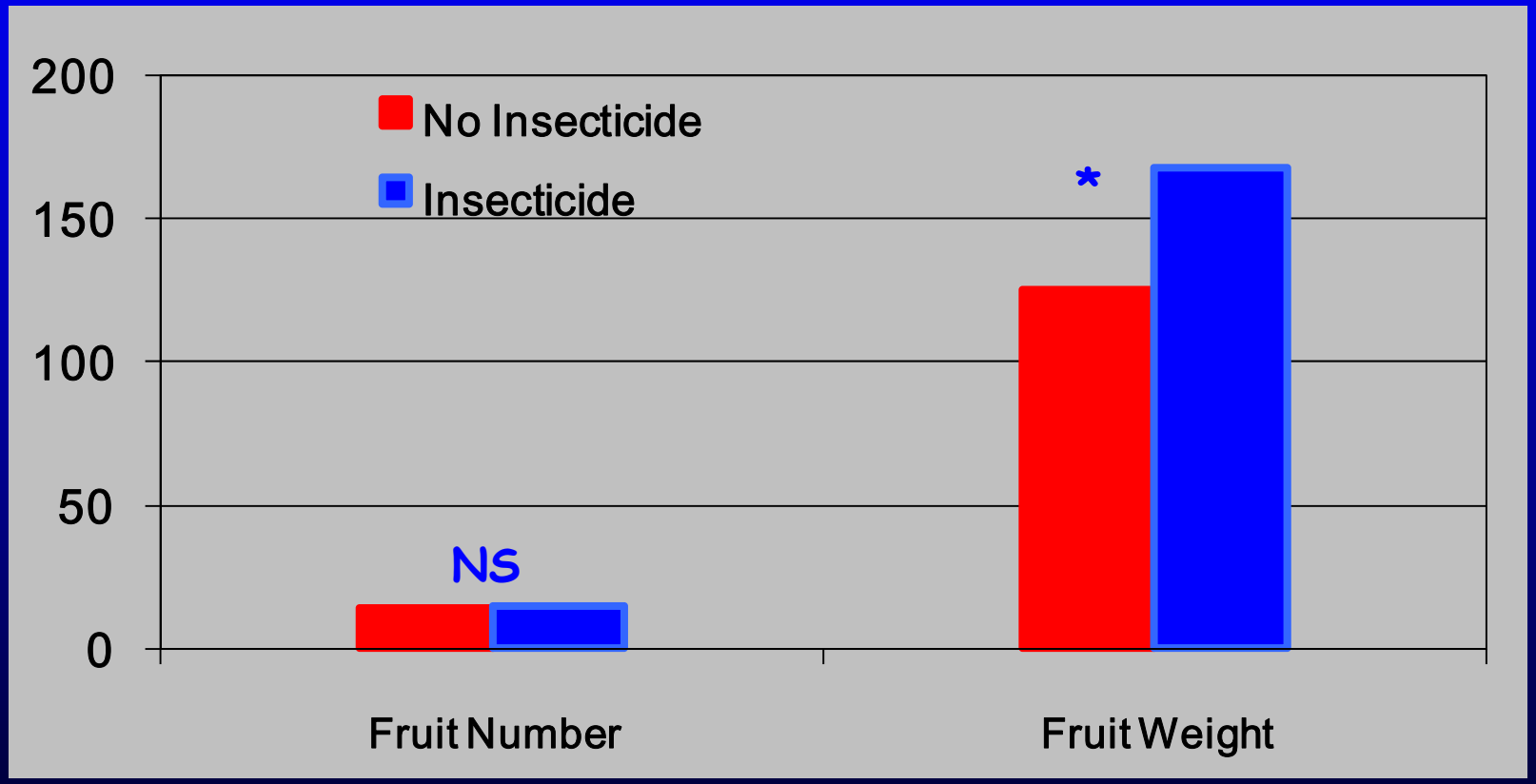
Mean Severity of Vine Decline on Insecticide Treated and Untreated Plants Fall 2006



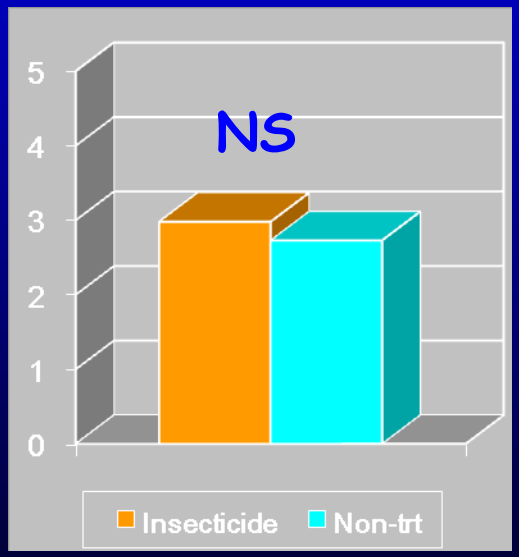
*Significant at P < 0.0001

Effect of Insecticide Treatment on Spread of SqVYV Decline in Watermelon

Number and weight of fruit per plot of 10 insecticide treated and non-treated plants



*Significant at P< 0.025



Mean Fruit Severity Rating

Conclusions: WVD

- The causative agent for watermelon vine decline in south Florida appears to be exclusively SqVYV transmitted by *B. tabaci*
- Watermelon plants protected by screen from whiteflies did not decline
- Insecticide applications reduced whitefly numbers and vine decline incidence and severity and increased fruit weight
- Future research will focus on the epidemiology of watermelon vine decline and effectiveness of whitefly control as a management practice

SWFREC

Vegetable Entomology

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