

Update on Citrus Integrated Pest Management

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Mites



Texas citrus mite



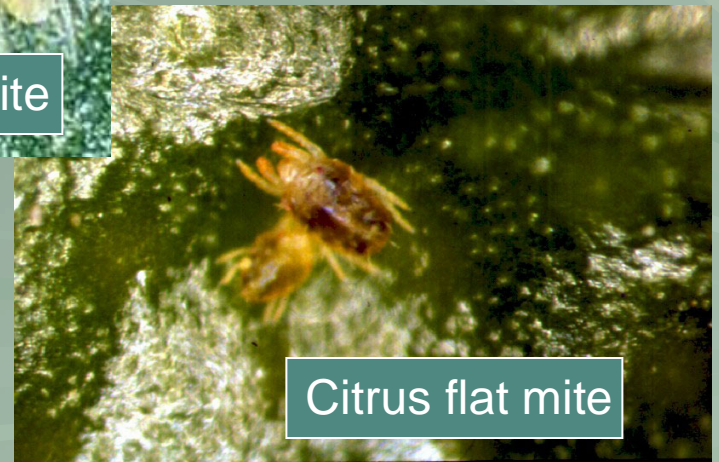
Citrus red mite



Two-spotted spider mite



Yuma spider mite



Citrus flat mite

Texas Citrus Mite

Eutetranychus banksi

- Favors cool low humidity conditions.
- Occurs most years.
- Most common from February until June.
- Large mite, males have very long legs.
- Feeds on upper leaf surface; occasionally the fruit.
- Do not produce webbing.



Damage

- Foliar feeding causes stippling and leaf discoloration.
- High populations can cause leaf abscission.
- Under high populations they will often infest and feed on the fruit causing rind scarring.



Control

- Sustained temperatures above 100°F will quickly reduce Texas citrus mite populations.
- An entomogeneous fungi, *Neozygites floridana*, commonly causes epizootics.
- Probably not necessary to treat populations relegated to the leaves
 - Foliar mites in Florida, 15 mites per leaf threshold.
 - Arizona, 10% infested fruit.

Citrus Red Mite

Panonychus citri

- Favors cool low humidity conditions.
- Usually not common.
- Most common from February until June; sometimes in the fall.
- Fairly large mite with a velvet red body and prominent long reddish bristles on tubercles.
- Feeds on upper leaf surface; occasionally the fruit.
- Do not produce webbing.



Damage

- Foliar feeding causes pale stippling and leaf discoloration.
- High populations can cause leaf abscission.
- Under high populations they will often infest and feed on the fruit causing rind silvering and scarring.



Control

- Sustained temperatures above 100°F will quickly reduce citrus red mite populations.
- An entomogeneous fungi commonly causes epizootics following rain events.
- Probably not necessary to treat populations relegated to the leaves
 - Foliar mites in Florida, 15 mites per leaf threshold.
 - Arizona, 10% infested fruit.

Citrus Flat Mite

Brevipalpus lewisi

- Heat tolerant mite.
- Common every year.
- Most abundant from July through September, but can be found almost year round.
- Very small mites; the immature mites are bright red.
- Found on the leaves, but prefer the fruit.
- Do not produce webbing.



Damage

- Citrus flat mite prefers to feed on the fruit in locations where some sort of damage has already occurred; spreading the damage.
- Damage to fruit less than 1 inch in diameter is very similar to citrus thrips.
- Feeding by citrus flat mite tends to be more irregular in shape than thrips damage.
- Damage to fruit 1 to 2 inches causes a brownish, corky and scab like appearance.
- Damage to larger fruit will appear similar, but may not be evident until the fruit has been fumigated.



Control

- Miticides maybe necessary when 10% of the fruit less than 1 inch in diameter is infested.
- Or when fruit 1 to 2 inches in diameter average 3 to 5 mites per fruit.
- Or when larger fruit averages 20 mites per fruit.

Twospotted Spider Mite

Tetranychus urticae

- Very heat tolerant.
- Occasionally problematic.
- Most frequent in August and September.
- Feed primarily on the undersides of leaves but higher populations can be found on the tops and on the fruit (usually between fruit clusters).
- Produce a profuse amount of webbing.
- Similar in appearance to the Yuma mite, but generally more greenish in color with translucent eggs.



Damage

- Foliar feeding causes yellow speckling and leaf reddening.
- High populations can cause leaf abscission which is most severe in groves suffering heat and water stress.
- Under high populations they will often infest and feed on the fruit causing russetting or brown scabbing to the rind.



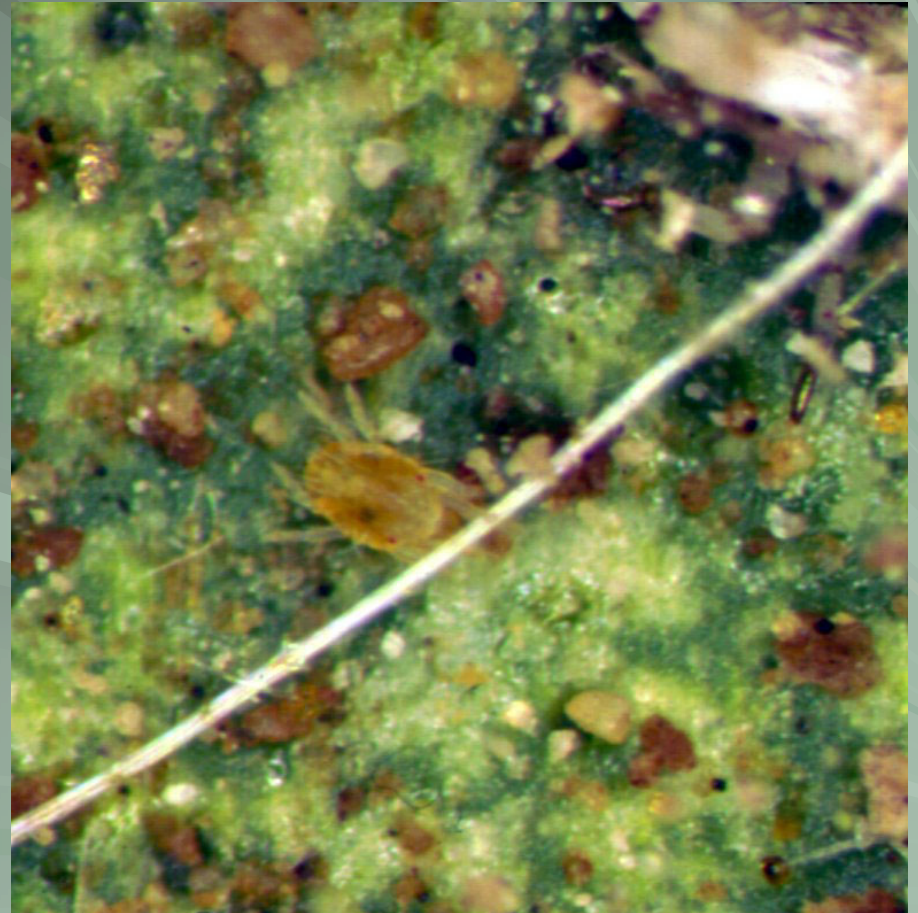
Control

- Probably not necessary to treat populations relegated to the leaves
 - Foliar mites in Florida, 15 mites per leaf threshold.
 - Arizona
 - 10% the fruit less than 1 inch in diameter is infested.
 - When larger fruit averages 3 to 5 mites per fruit.

Yuma Spider Mite

Eotetranychus yumensis

- Favors warm, dry, dusty conditions.
- Common most years.
- Most abundant from January through June, but can often be found in July, and in the fall.
- Omnivorous and will feed on plants and other arthropods.
- Prefers to feed on the underside of leaves and produces a light webbing.
- Difficult to distinguish from the two-spotted mite, but is usually more “pinkish” and has peach-colored eggs.



Damage

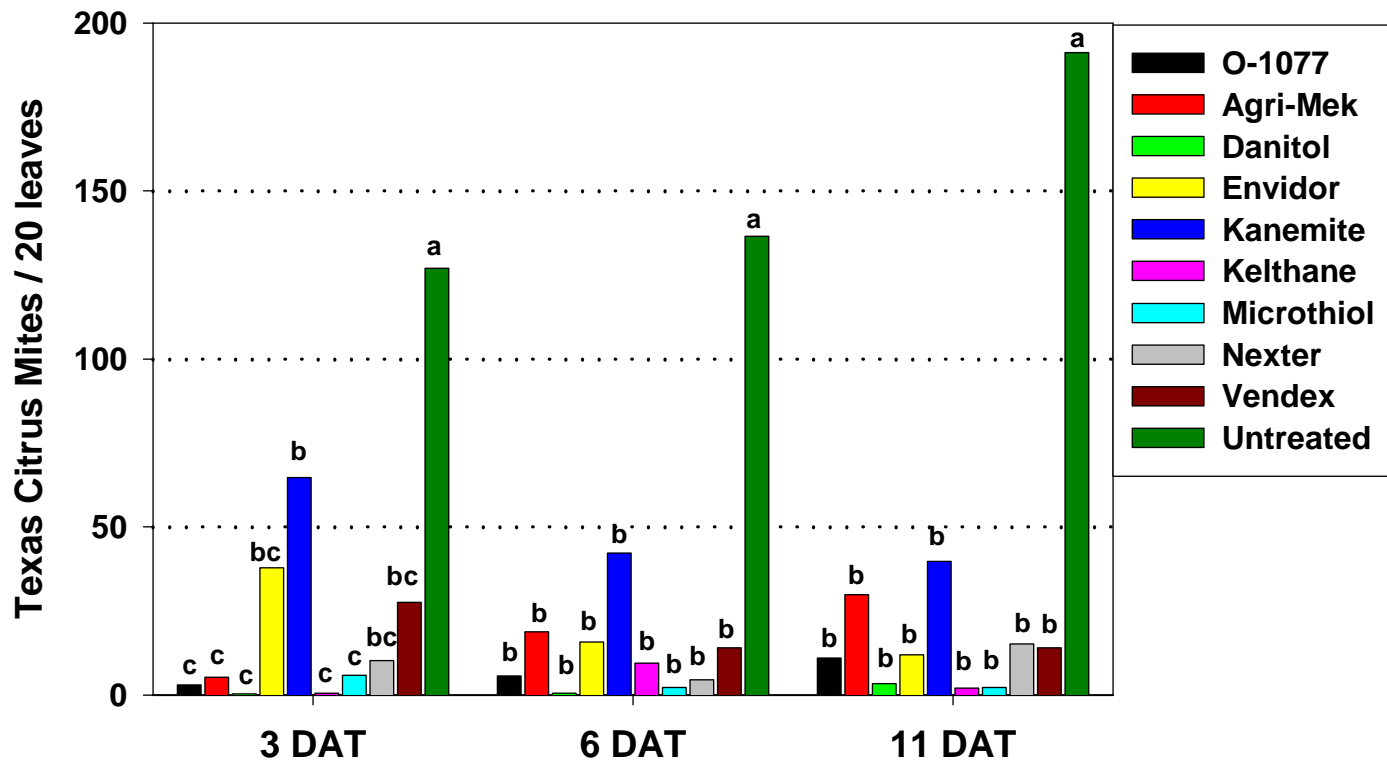
- Foliar feeding causes pale stippling and leaf discoloration.
- High populations can cause leaf abscission.
- Under high populations they will often infest and feed on the fruit causing rind pitting and scarring.



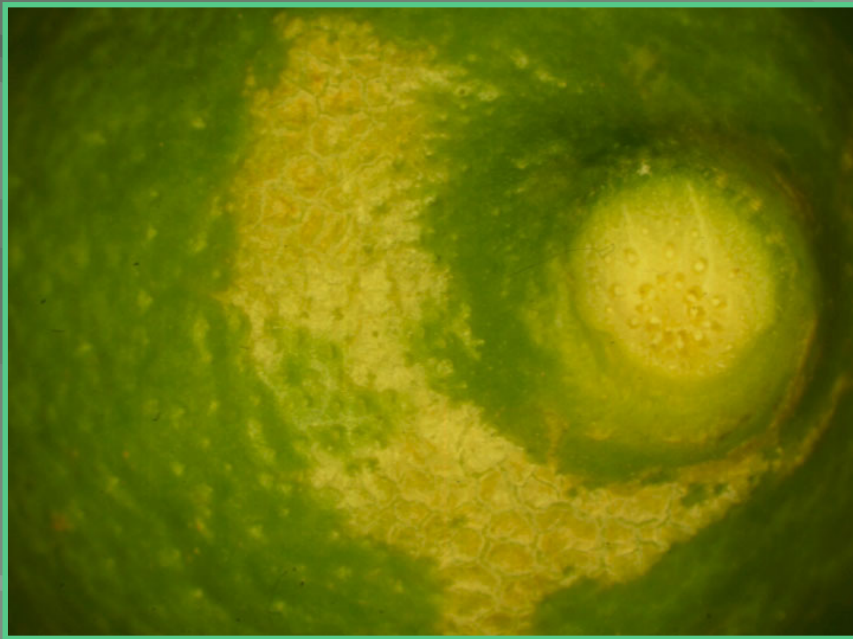
Yuma Spider Mite Recommendations

- Ignore or conserve them when relegated to the leaves.
 - Predaceous habit far outweighs minor leaf damage.
 - Mature citrus can withstand a great deal of foliar damage.
- Treat with a miticide when they move to the fruit in significant numbers.
 - Foliar mites in Florida, 15 mites per leaf threshold.
 - Arizona
 - 10% the fruit less than 1 inch in diameter is infested.
 - When larger fruit averages 3 to 5 mites per fruit.

Chemical Control of Mites



Citrus Thrips Research



Pyrethroid Use

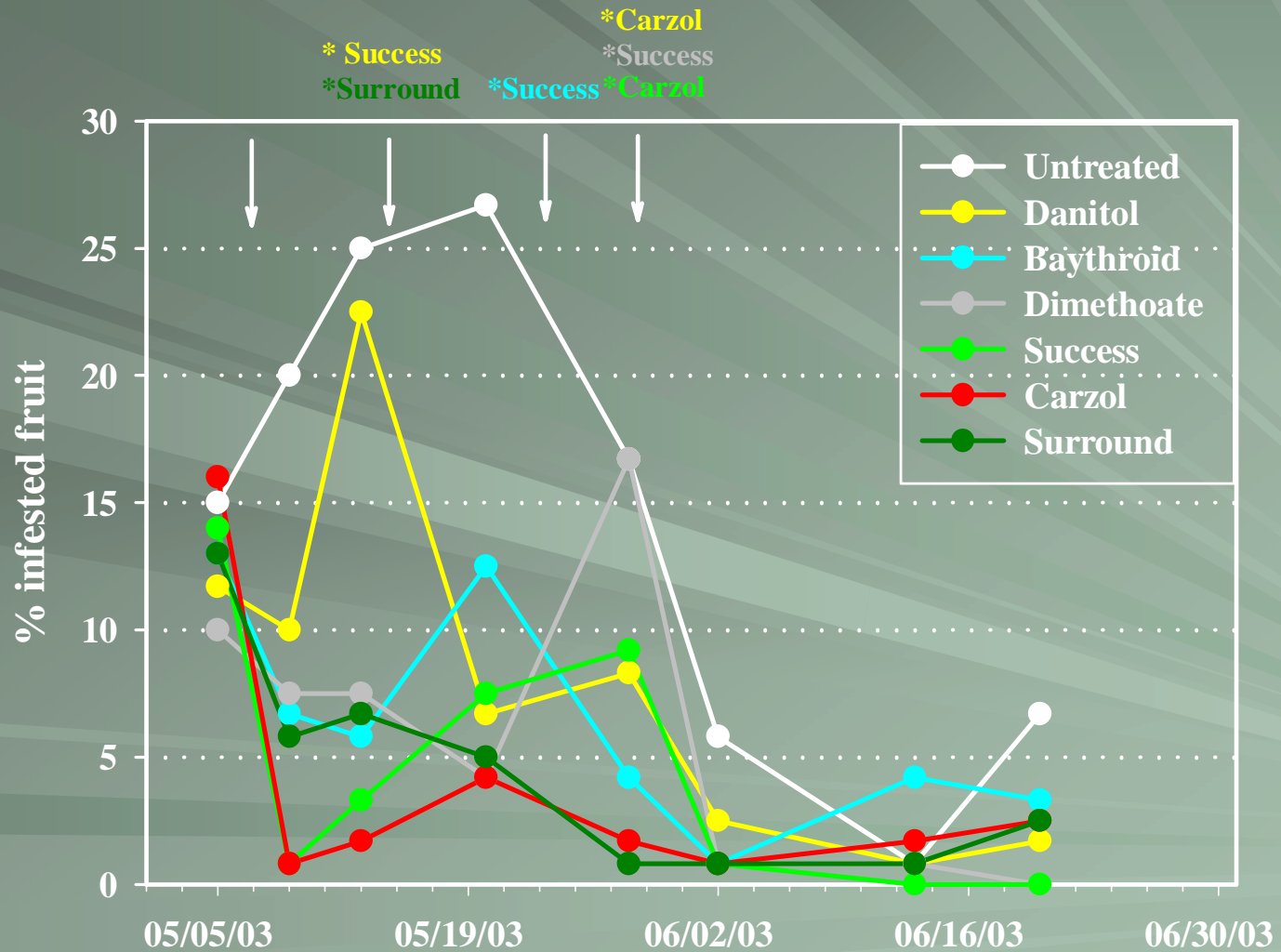
- Use only in early Spring.
- Do not use when temperatures exceed 95°F.



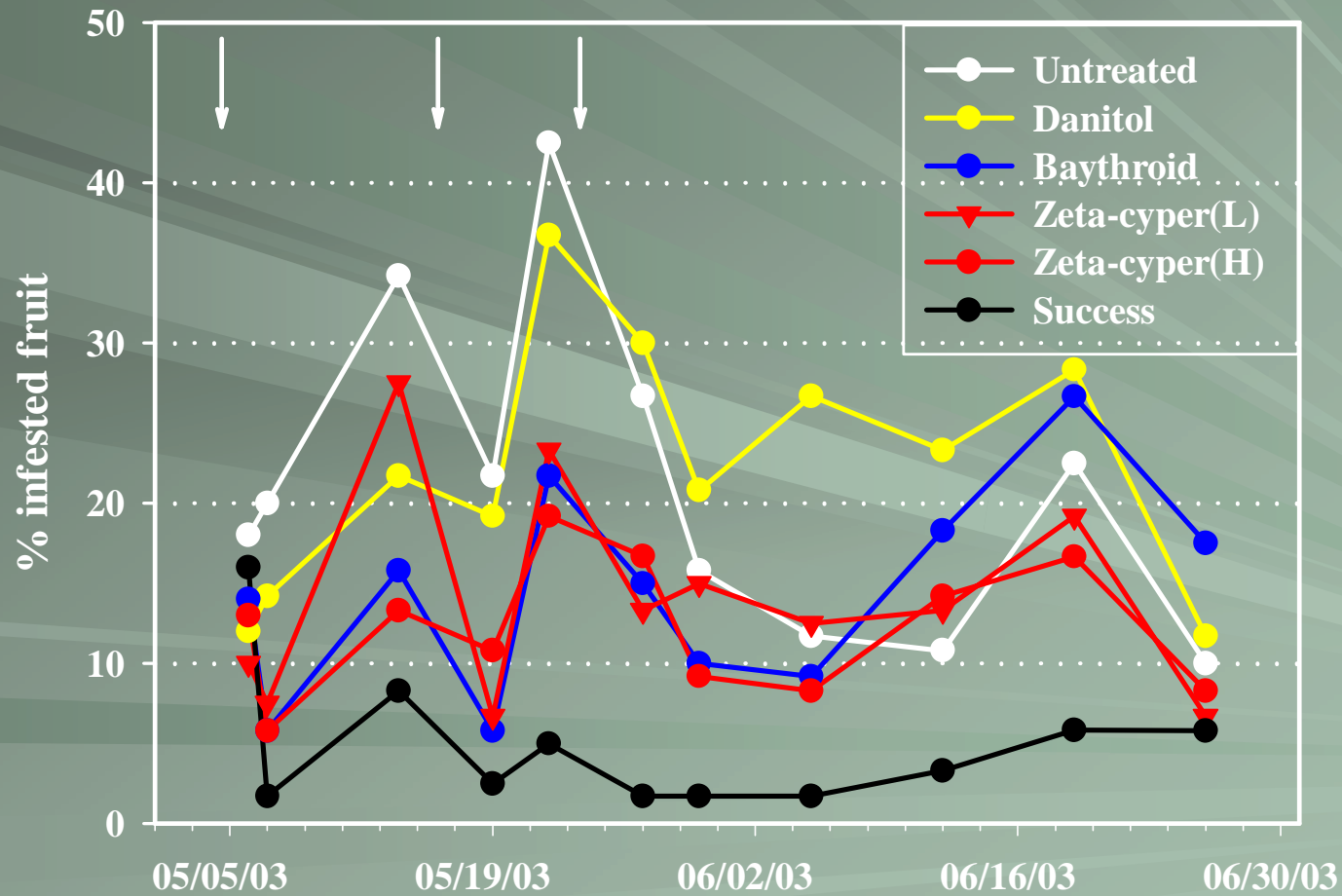
Rotation Test, 2003

Application #1	Application #2	Application #3
Danitol 21oz	Success 6 oz	Carzol 1.25 lbs
Baythroid 6.4 oz	Success 6 oz	Carzol 1.25 lbs
Dimeth. 2 lbs-ai	Success 6 oz	Carzol 1.25 lbs
Success 6 oz	Carzol 1.25 lbs	Success 6 oz
Carzol 1.25 lbs	Success 6 oz	Success 6 oz
Surround 35 lbs	Surround 35 lbs	Surround 35 lbs
Untreated	Untreated	Untreated

Rotation Test, 2003



Pyrethroid Efficacy 2003

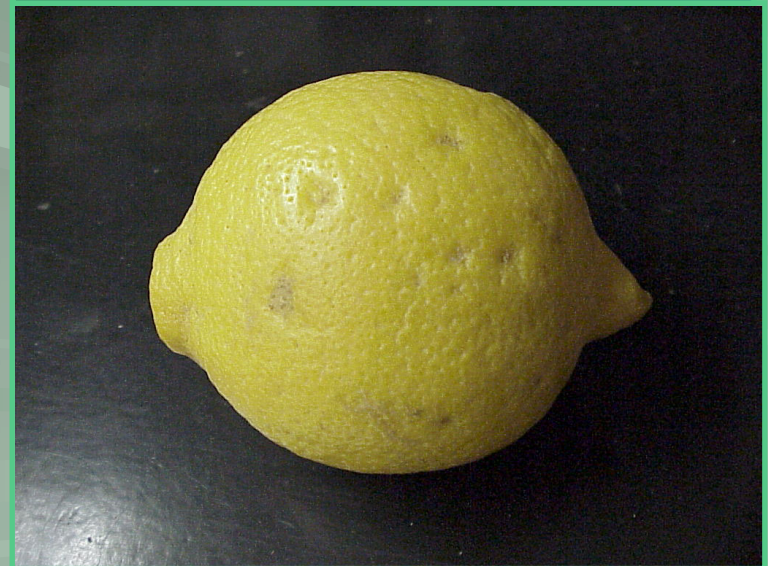


Predaceous Mites



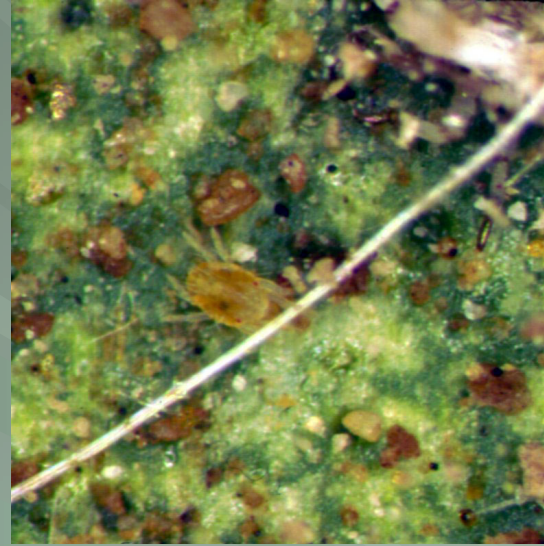
Tydeus sp.

Yuma Spider Mite



New Pyrethroid Recommendations

- Use only one application of any pyrethroid per season.
- Use Danitol for thrips control only when mites are also problematic.
- Use Baytrhoid when targeting only thrips.



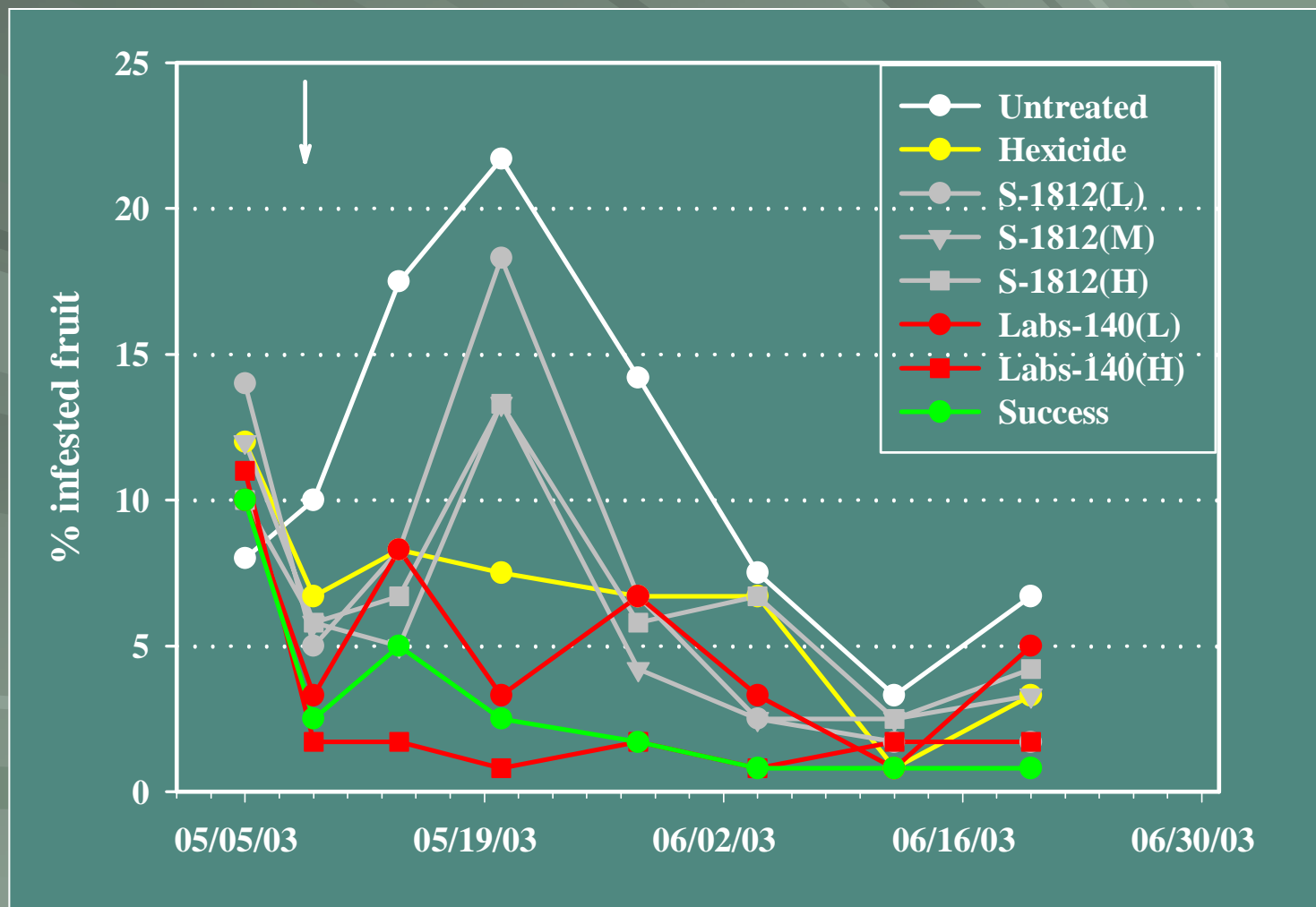
New Thrips Control Methods



Experimental Insecticides

Name	Chemical	MOA	Rates
Hexacide	Rosemary oil	Octopamine neuroreceptor inh.	2 lbs-ai/ac
S-1812	Pyridanil	Not reported	0.15, 0.20 & 0.30 lbs-ai/ac
Labs-140-F01	Not reported	Feeding paralysis	200 & 400 g-ai/ha

Experimentals Test



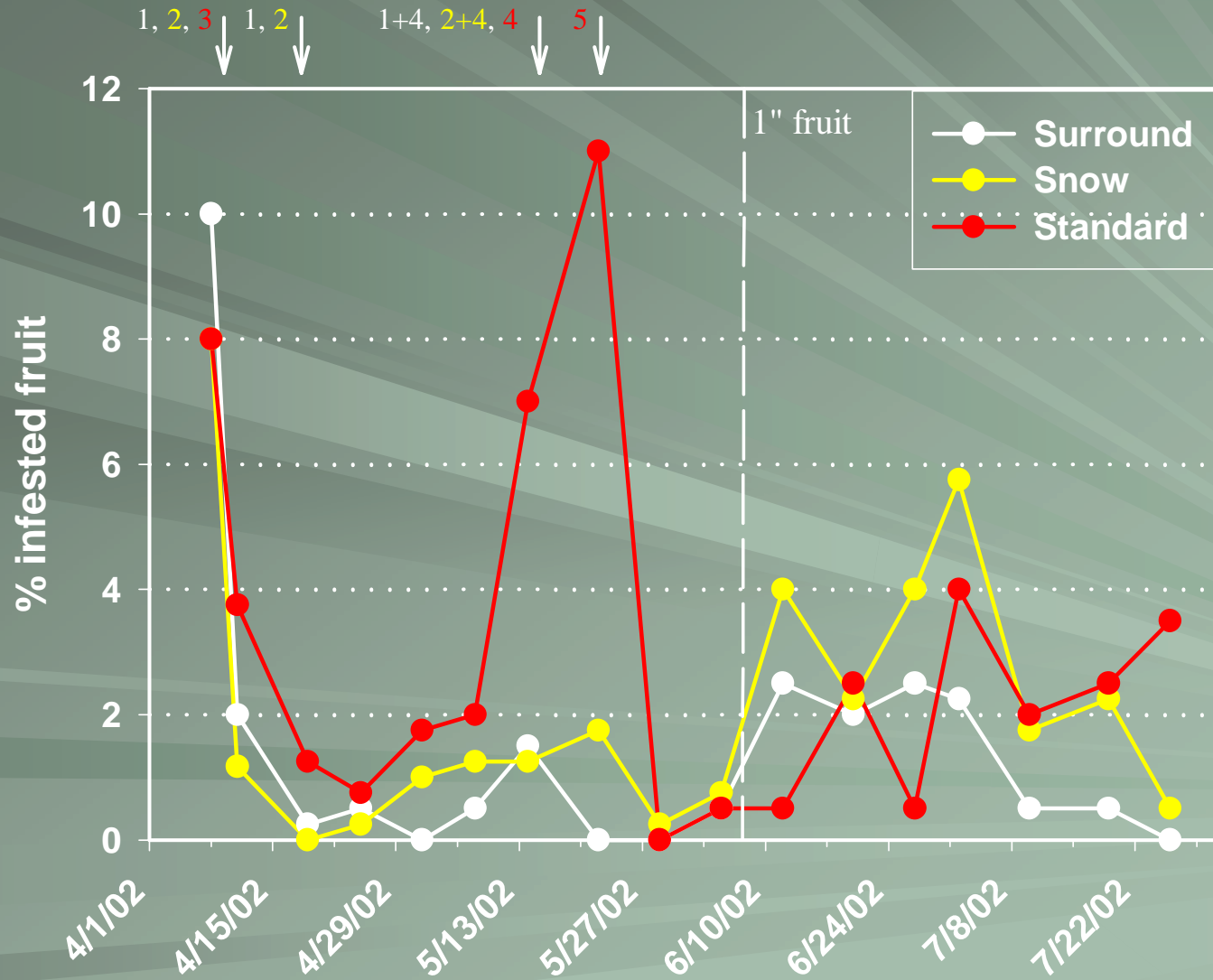
Particle Films



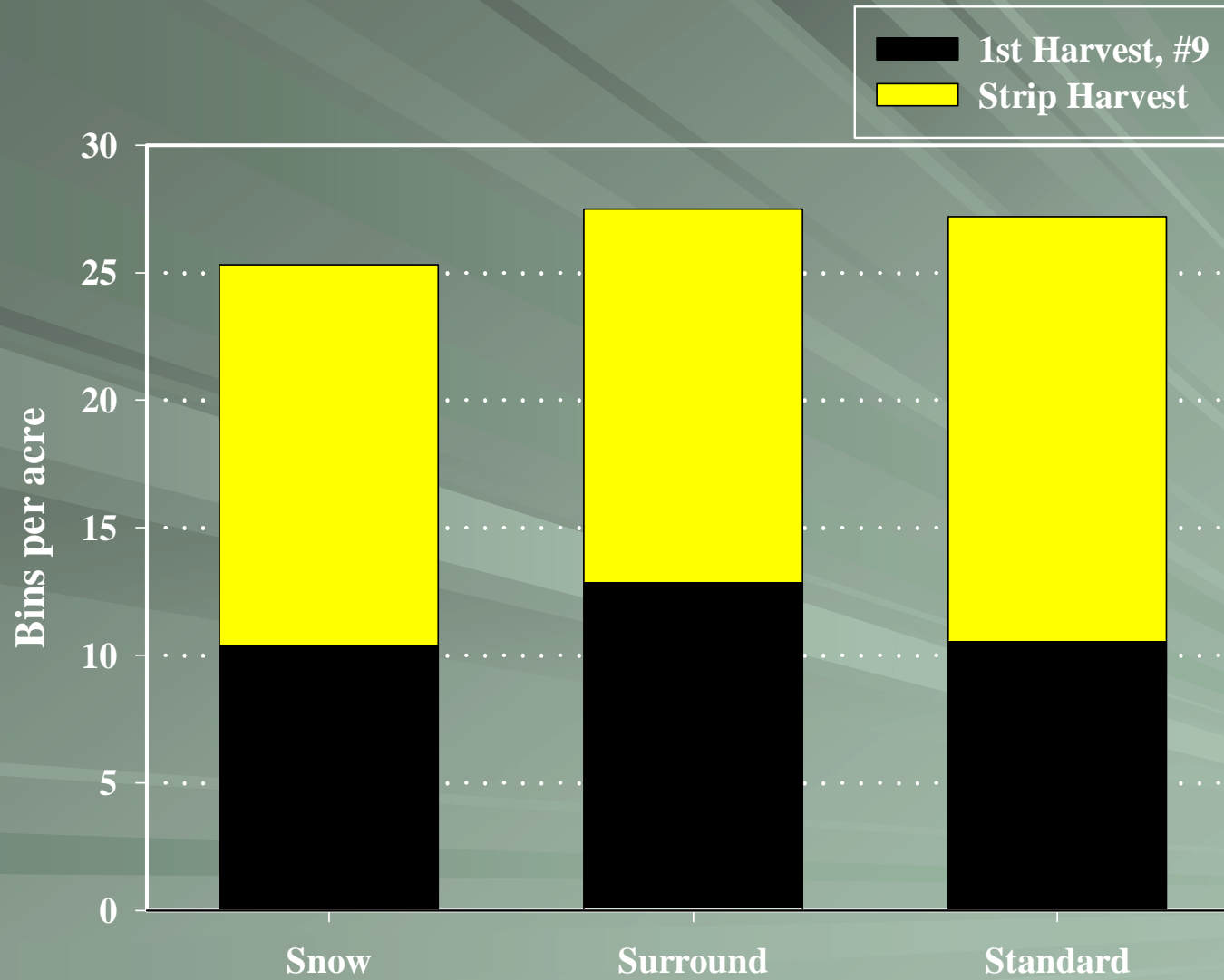
Particle Films vs Standard, 2002

¹Surround 50 lbs/ac, ²Snow 80 lbs/ac, ³Baythroid 6.4oz/ac

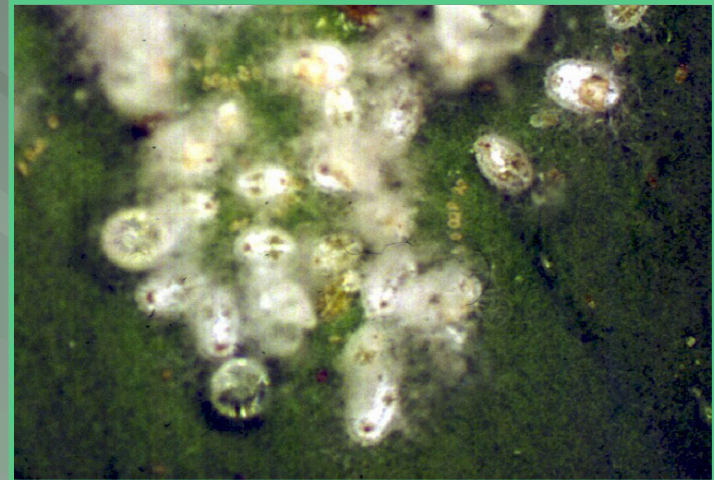
⁴Danitol 21 oz/ac, ⁵Success 8oz/ac



Particle Films



Woolly Whitefly (*Aleurothrixus floccococus*)



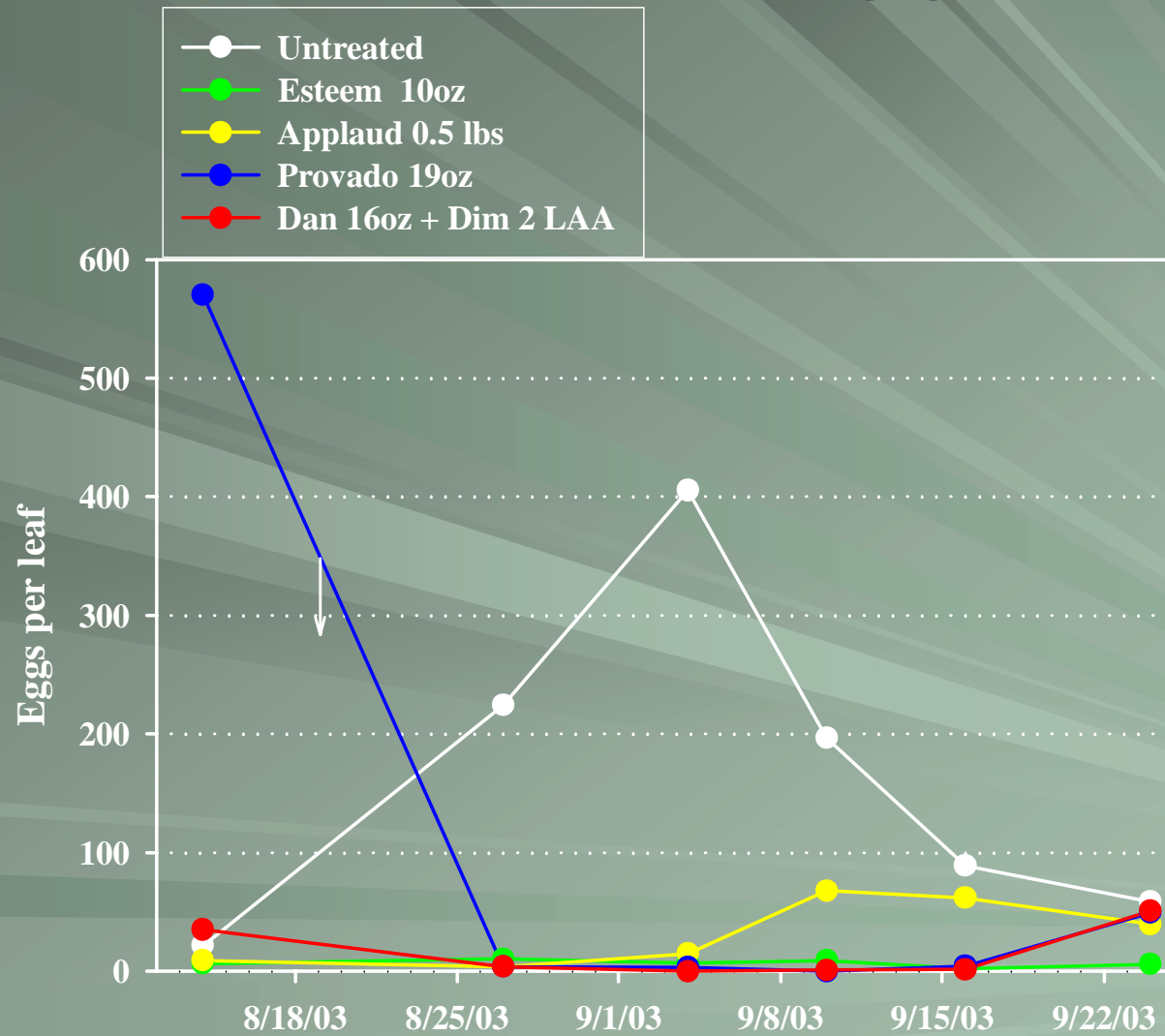
Foliar Insecticides



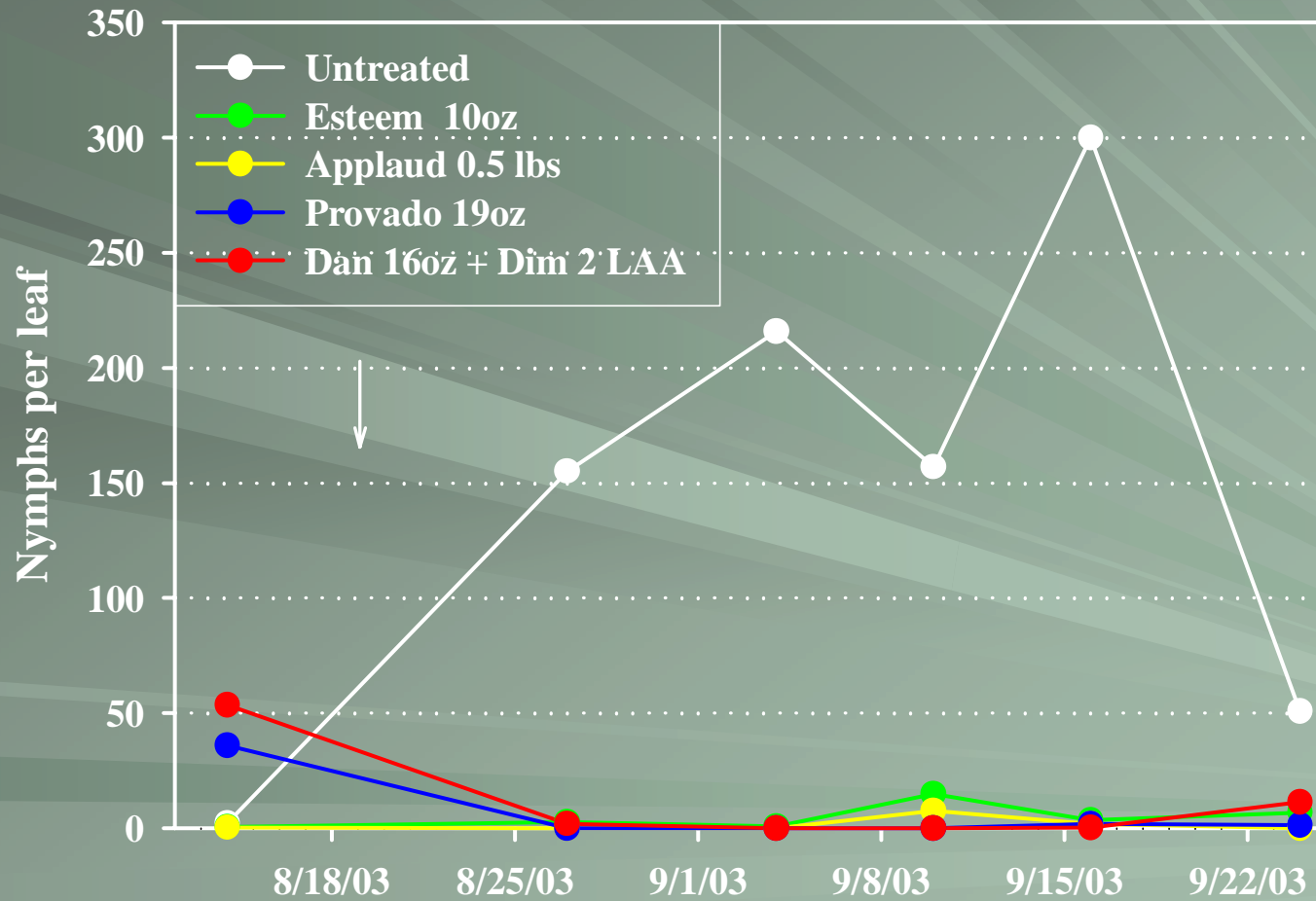
Foliar WWF Test

Treatment	Rate
Esteem	10 oz/ac
Provado	19 oz/ac
Applaud	0.5 lbs/ac
Danitol + Dimethoate	16 oz/ac + 2 lbs-ai/ac
Untreated	

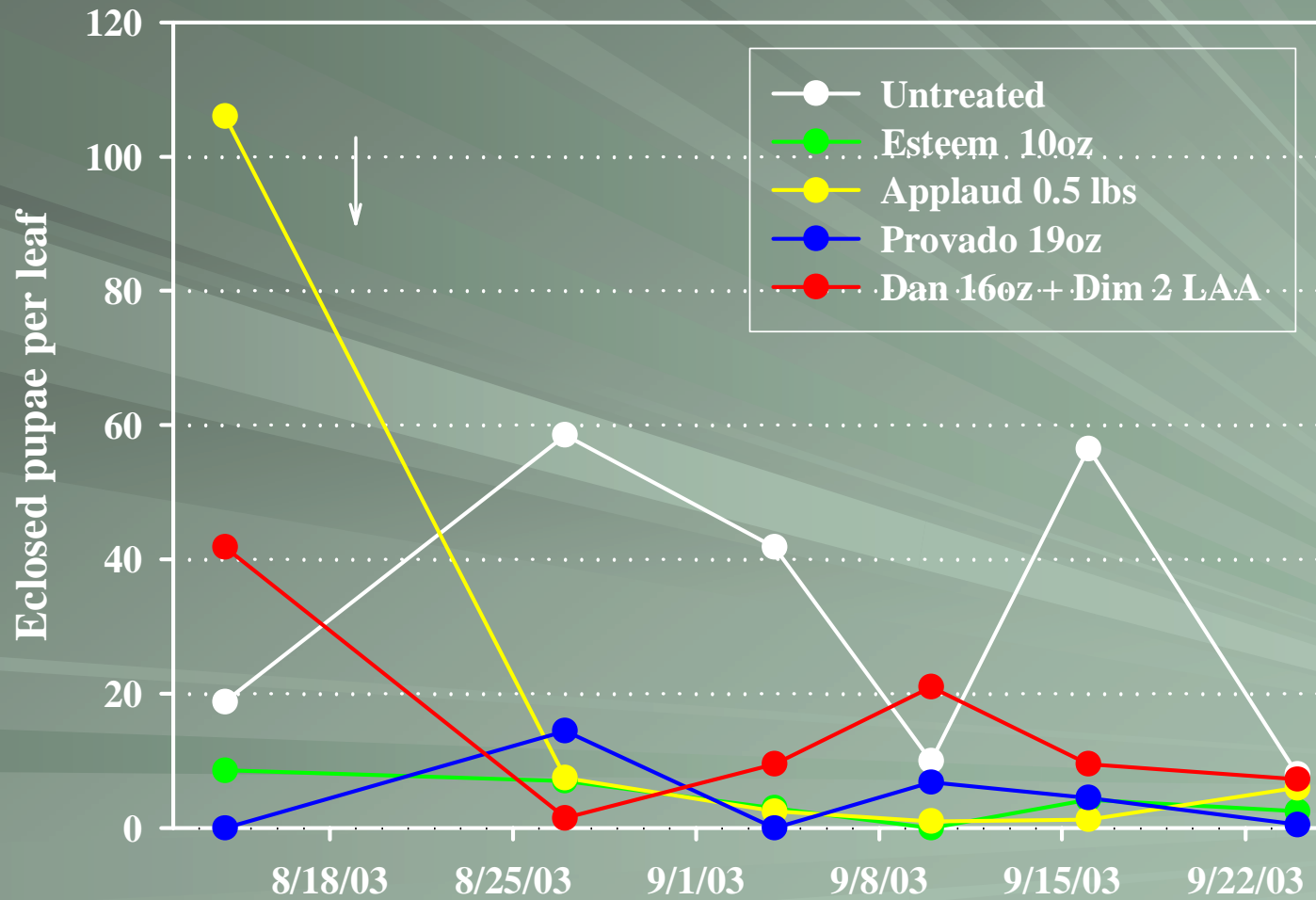
Impact on Eggs



Impact on Nymphs



Impact on Eclosed Pupae



Admire for Woolly Whitefly

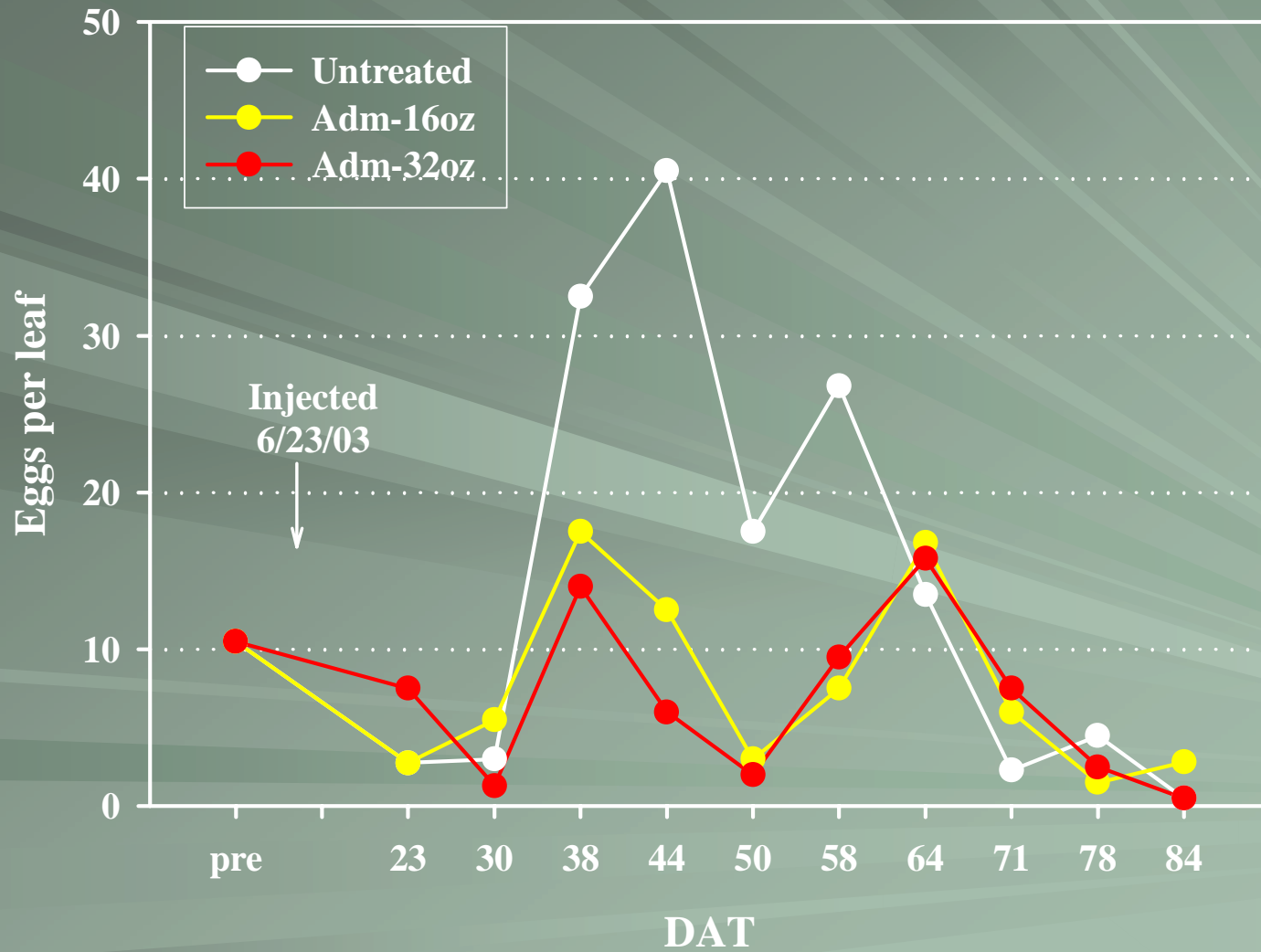


Admire at 16 & 32 oz/ac injected 8 inches at 9 gal/ac volume

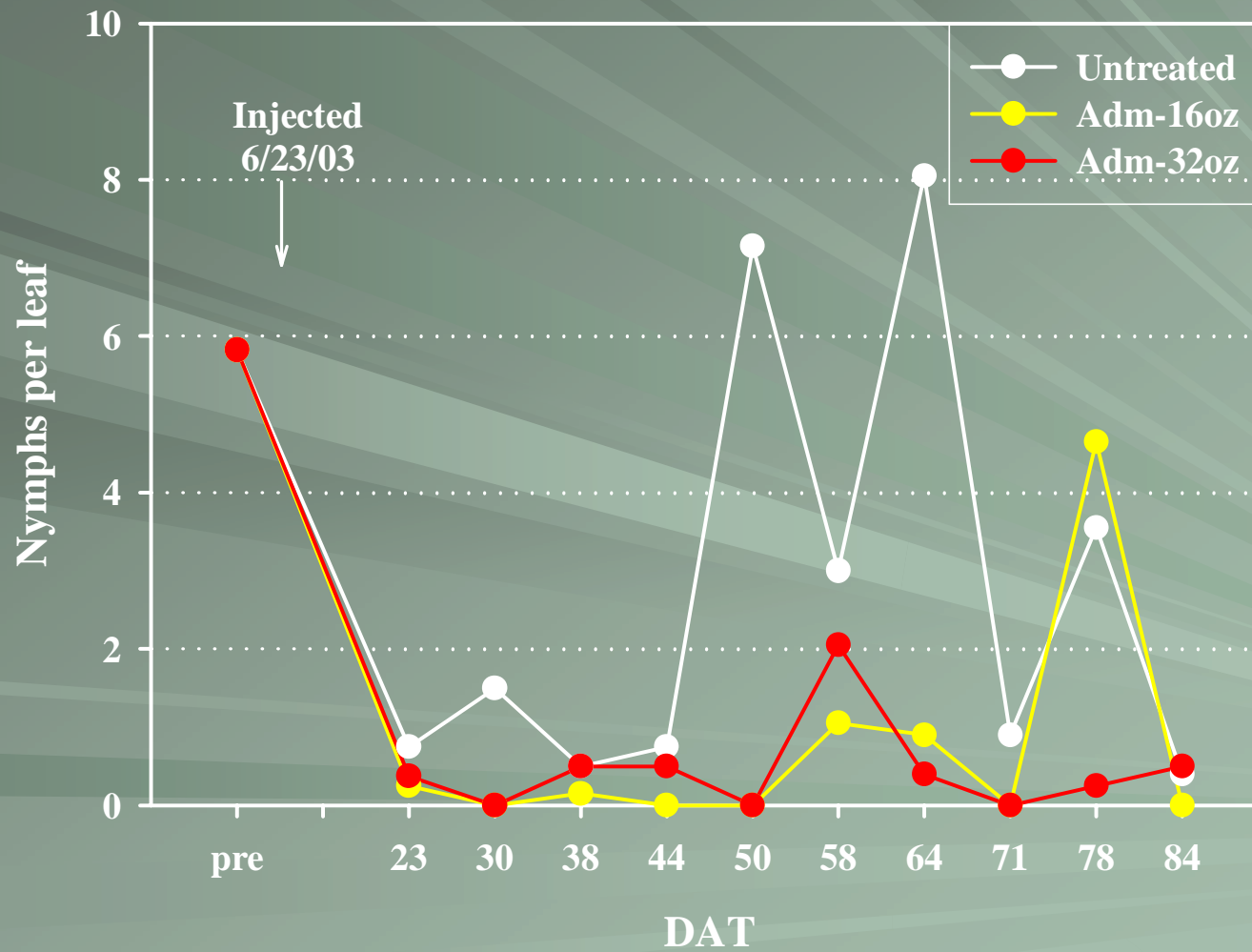
Impact on Adults



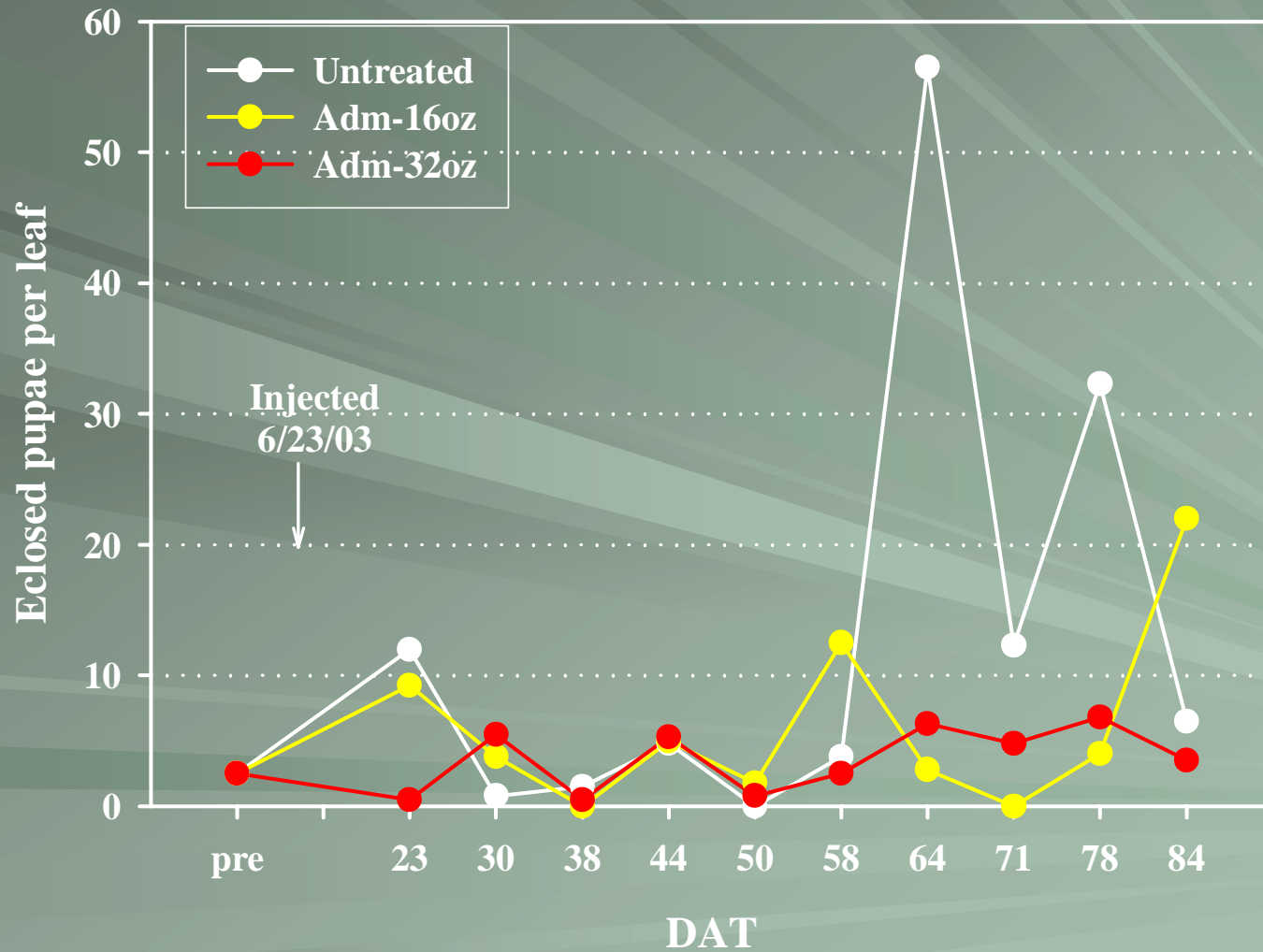
Impact on Eggs



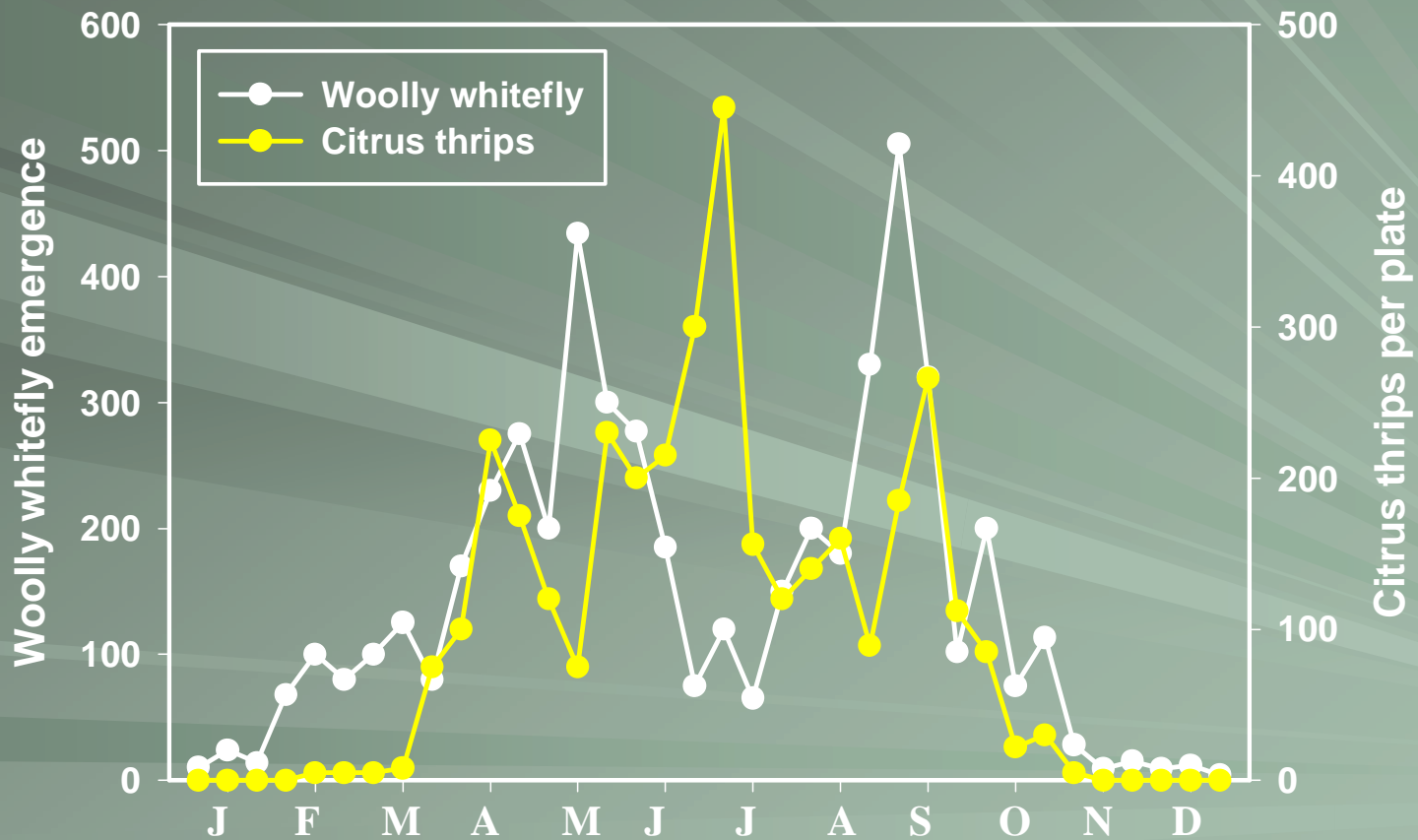
Impact on Nymphs



Impact on Eclosed Pupae



Woolly Whitefly / Citrus Thrips Population Dynamics



Key to WWF Management is Biocontrol

- There are a number of naturally occurring parasitoids that prey on WWF in Arizona.
- An *Eretmocerus* sp. appears to be the primary parasitoid, and appears to be key to sustainable WWF management.
- A number of predators including lacewings and mites have been observed feeding on WWF.



Eretmocerus sp.

Insecticide Choices



Current recommendations for woolly whitefly management

■ Spring

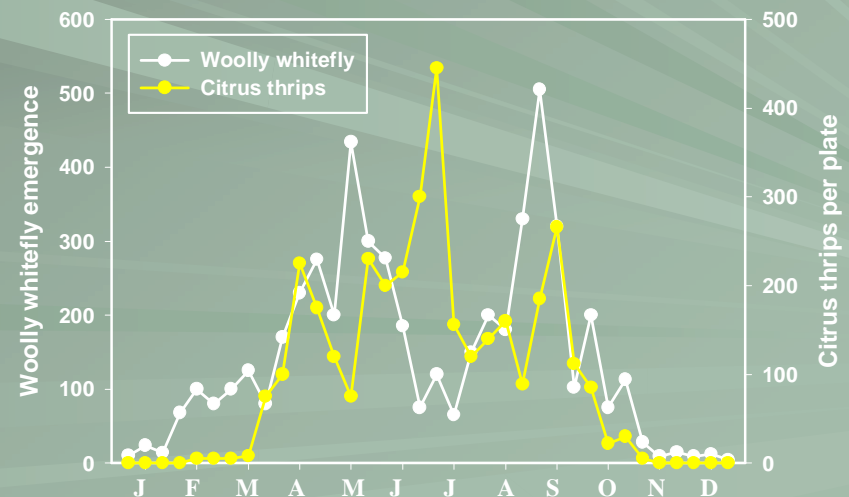
- use oils to suppress WWF populations.
- avoid harsh insecticides for thrips when WWFs are present, ie use Success.

■ Summer

- primarily adults present - use Provado or Danitol / OP tank mixes (hard on beneficials).
- when large numbers of immatures begin to appear, – use Esteem or Applaud.

■ Use only ground applications.

■ On large trees or tight groves, use high spray volumes 200-400 gpa.



Citrus Mealybug Management



Traditional Control

- Lorsban
- Supracide



- Interfere with natural control
 - *Anagrapus* sp.

Mealybug Test

Treatment	Rate
Applaud – 1 application	1 lbs/ac
Applaud – 1 application	2 lbs/ac
Applaud – 2 applications	1 lbs/ac
Applaud – 2 applications	2 lbs/ac
Untreated	

Applaud Efficacy

