

# Update on Citrus Integrated Pest Management

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## Mites



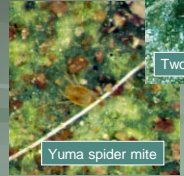
Texas citrus mite



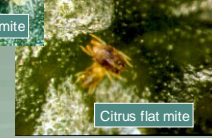
Citrus red mite



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

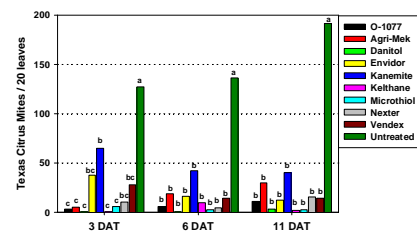
- Foliar feeding causes pale stippling and leaf discoloration.
- High populations can cause leaf abscission.
- Under high populations they will often infest and feed on the fruit causing rind pitting and scarring.



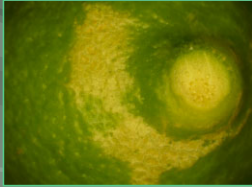
## Yuma Spider Mite Recommendations

- 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

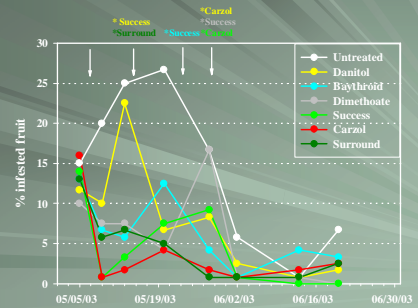
- Use only in early Spring.
- Do not use when temperatures exceed 95°F.



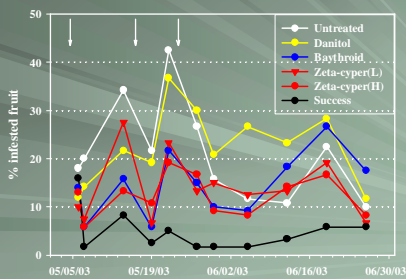
## Rotation Test, 2003

| Application #1   | Application #2  | Application #3  |
|------------------|-----------------|-----------------|
| Danitol 21 oz    | 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

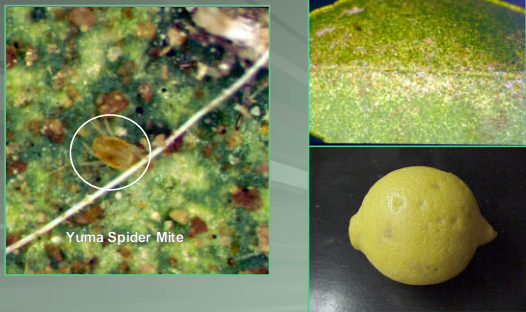


## Predaceous Mites



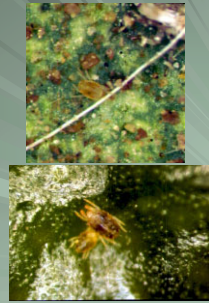
*Tydeus sp.*

## 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 Baythroid when targeting only thrips.



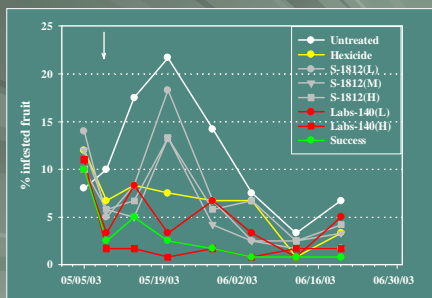
## New Thrips Control Methods



## Experimental Insecticides

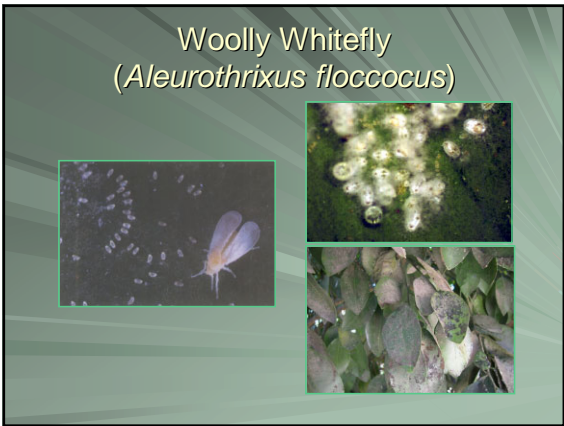
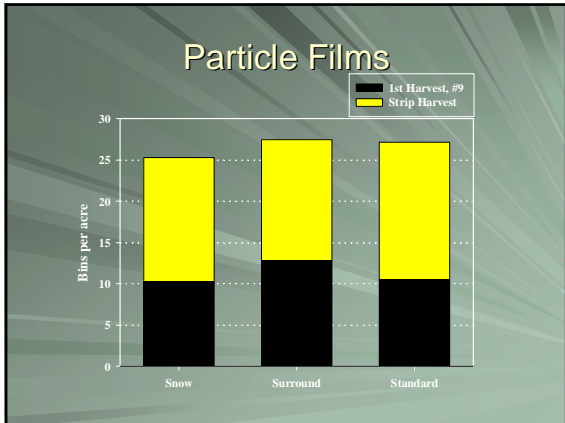
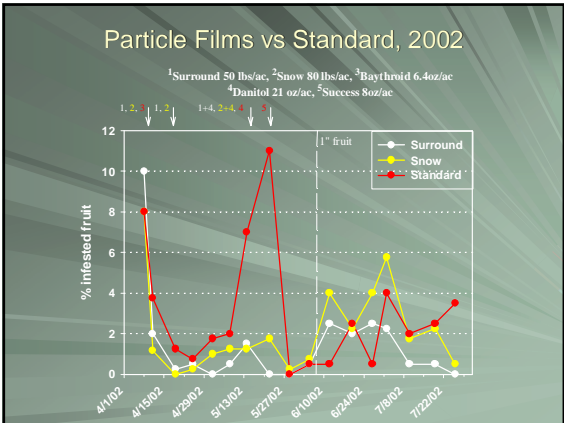
| Name         | Chemical     | MOA                           | Rates                       |
|--------------|--------------|-------------------------------|-----------------------------|
| Hexacide     | Rosemary oil | Octopamine neuroreceptor inh. | 2 lbs-ai/ac                 |
| S-1812       | Pyridanil    | 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



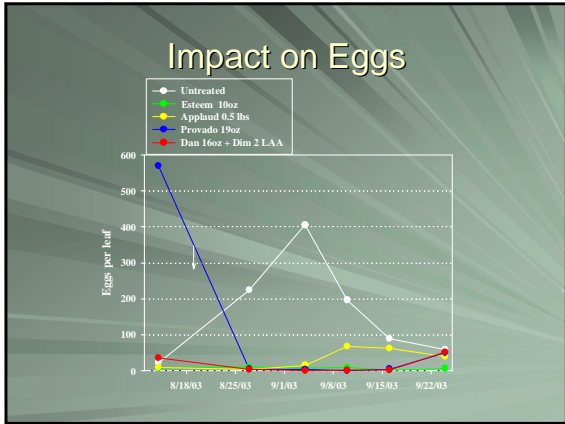
## Particle Films



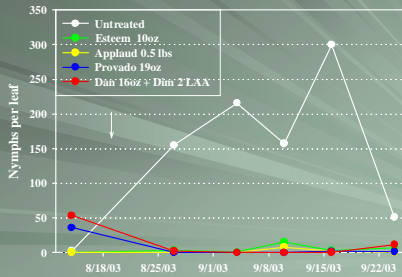


### Foliar WWF Test

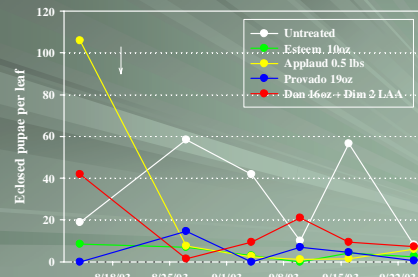
| Treatment            | Rate                   |
|----------------------|------------------------|
| Esteem               | 10 oz/ac               |
| Provado              | 19 oz/ac               |
| Applaud              | 0.5 lbs/ac             |
| Danitol + Dimethoate | 16 oz/ac + 2 lbs-ai/ac |
|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



### Impact on Nymphs



### Impact on Eclosed Pupae

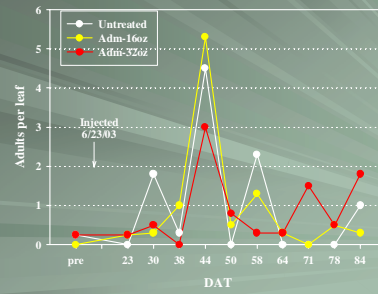


### Admire for Woolly Whitefly

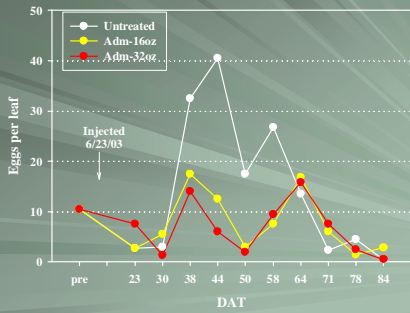


Admire at 16 & 32 oz/ac injected 8 inches at 9 gal/ac volume

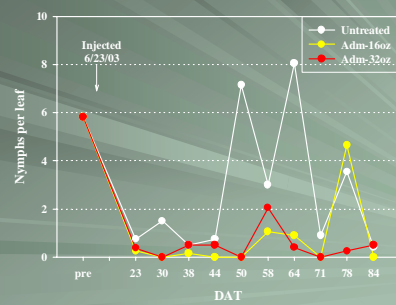
### Impact on Adults

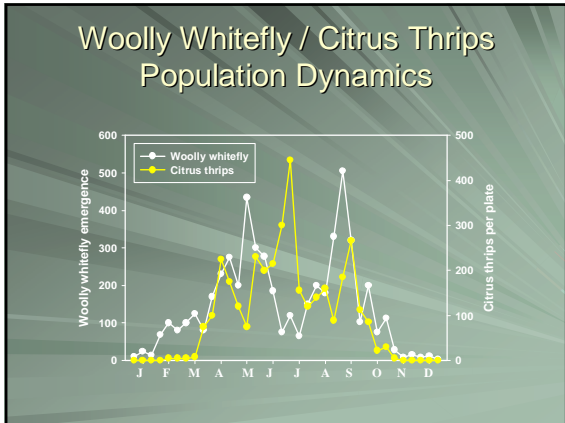
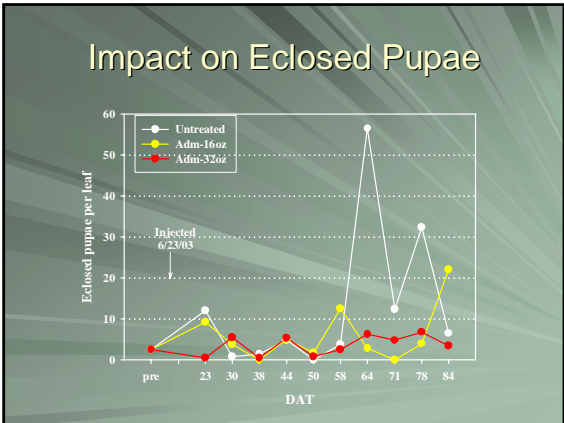


### Impact on Eggs



### Impact on Nymphs





### Key to WWF Management is Biocontrol

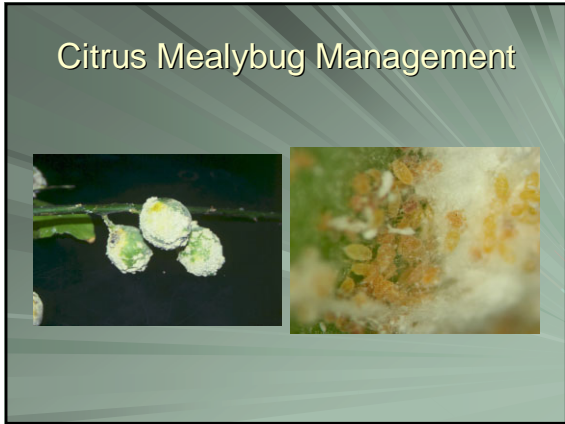
- There are a number of naturally occurring parasitoids that prey on WWF in Arizona.
- An *Eretmocerus* sp. appears to be the primary parasitoid, and appears to be key to sustainable WWF management.
- A number of predators including lacewings and mites have been observed feeding on WWF.

*Eretmocerus* sp.



### 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.





## Traditional Control

- Lorsban
- Supracide



■ Interfere with natural control  
– *Anagaphus* 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

