Research Update -- Avocado Thrips, Persea Mite, and Pesticide Resistance Management

Avocado Spring Seminar Series, April, 2009

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Research Objectives

Objective 1. Screen new pesticides and continue evaluation of current materials (optimize methods of application, timing, use of oil and adjuvants)

- Veratran D (Available on avocados Feb. 1997)
- Success (1998), Agri-Mek (1999), Entrust (2003), Delegate (2007)
- Danitol (expected 2010, 6 Field research trials in 2009)
- Search for new chemistries (Movento, BYI-8330, NNI-0101, others)

- General observation – avocado thrips levels vary from year to year and from grove to grove - monitoring by a knowledgeable grower or PCA is needed to determine if treatments are needed

  - Presence of leaf flushes and young fruit favor avocado thrips buildup

  - High levels of predators help slow the buildup of avocado thrips

Monitoring is KEY -- Avoid unnecessary sprays

Monitoring for Avocado Thrips in Spring

- Avocado thrips do best under moderately cool temperatures (68-76 °F)
- Under hot conditions (> 90 °F), populations crash
- Smaller fruit are more susceptible to damage by avocado thrips
- As fruit become larger (1.5 inches or more in diameter) - large numbers of thrips are needed to cause significant levels of fruit scarring

Context of Chemical Control Research with Avocado Pests

Avocado Thrips, *Scirtothrips perseae*

- Worldwide, few examples of good biological control of pestiferous thrips species (chemical intervention is often required)
  - *Scirtothrips citri* (Citrus thrips)
  - *Scirtothrips aurantii* (South African citrus thrips)
  - *Scirtothrips dorsalis* (Chili thrips or yellow tea thrips)

IRAC Classification of Avocado Thrips Materials

Pesticide	Company	Pesticide Class	IRAC Class
Agri-Mek	Syngenta, generics	Avermectin, macrocyclic lactone	6
Success, Entrust, Delegate	Dow	Spinosyn, macrocyclic lactone	5 (apparent cross resistance to class 6)
Veratran D	Dunhill	Two plant alkaloids	Unclassified
Danitol (expected 2010)	Valent	Pyrethroid - NOT REGISTERED YET	3

- **ABAMECTIN - Agri-Mek 0.15 EC, generics**
  - Abamectin is relatively slow in killing avocado thrips
  - Quite persistent in leaves, with control persisting 6-10 weeks or more (increases the potential for resistance)
  - Also effective in suppressing persea mite populations (supplemental label in 2005)
  - pH of water should be 5-9, better above 6

- **SABADILLA – Veratran D**
- 10-15 lb Veratran D 0.2% in 10-40 gpa by air or 20-100 gpa by ground; If 200 gpa is used, increase to 20 lb per acre; 24 h REI
  - Screen size should be 20 mesh or larger (to avoid plugging)
  - Acidify water to pH 4.5 (citric acid or other) prior to adding Veratran D to the tank\
  - Do not use additives, especially nutritionals (is a stomach poison and may reduce thrips feeding activity)
  - More effective in warm weather (when thrips are actively feeding)

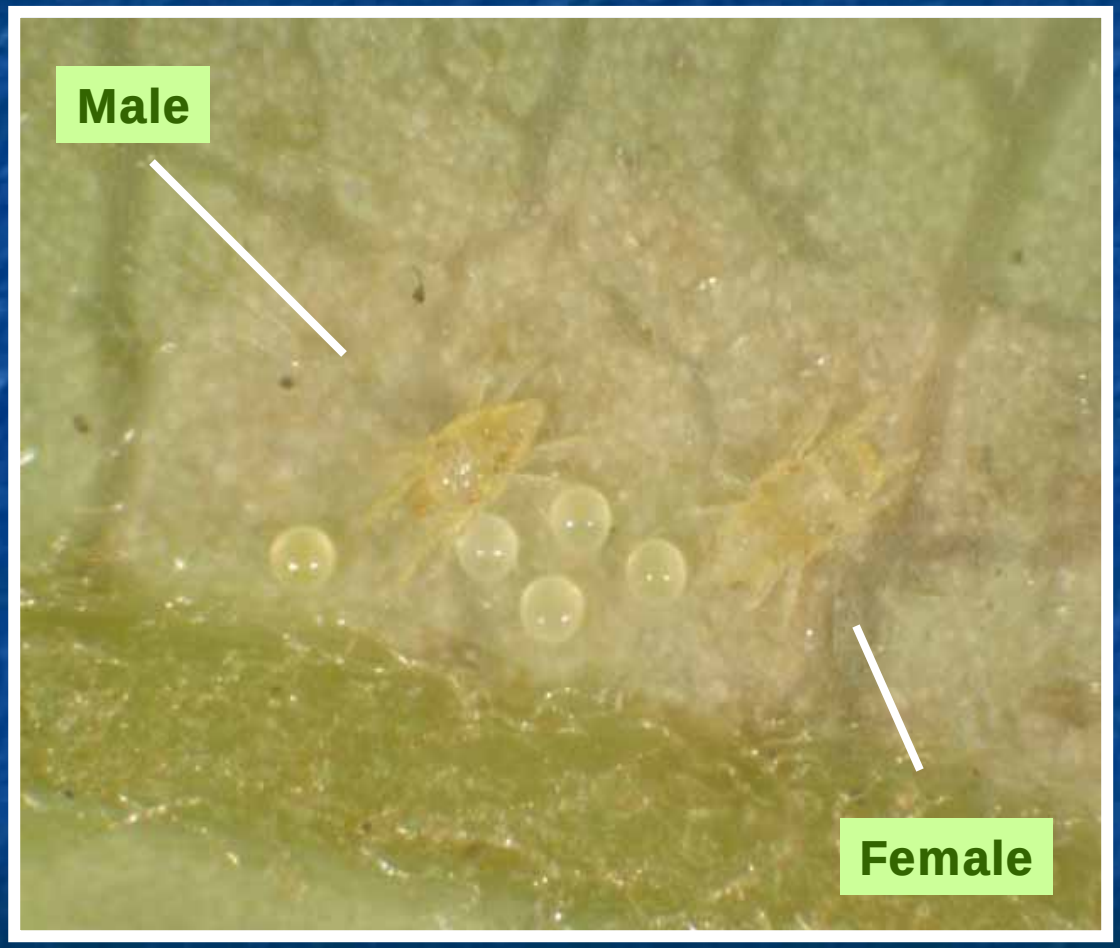
- **SPINETORAM – Delegate (25%) WG**
  - Similar chemistry as spinosad (Success, Entrust) but is a synthetic product (no organic use)
  - Registered on avocados (Tropical Tree Fruits) in late 2007
  - Use 4 - 7 oz/ acre + oil or adjuvent
  - 4 h REI, 1 day PHI
  - Toxic to bees, see label restrictions
  - More persistent and effective than spinosad (Success, Entrust)

- **2009 Research Trials**
  - Agri-Mek (standard) vs. Delegate vs. Danitol (Not registered yet) (2 plots treated with each material)
  - 3 field trials in the south (Barcinas, Davis, Hand) and 3 in the north (Holden, Machiltt, Roberts)
  - 2 pre-bloom treatments by air (Davis, Hand), 2 post-bloom treatments by air (Machlitt, Roberts), 2 post-bloom treatments by ground (Barcinas, Holden)
  - Weekly thrips counts by the PCA, they call treatment timing, fruit scar counts late summer by Morse lab

Resistance Management

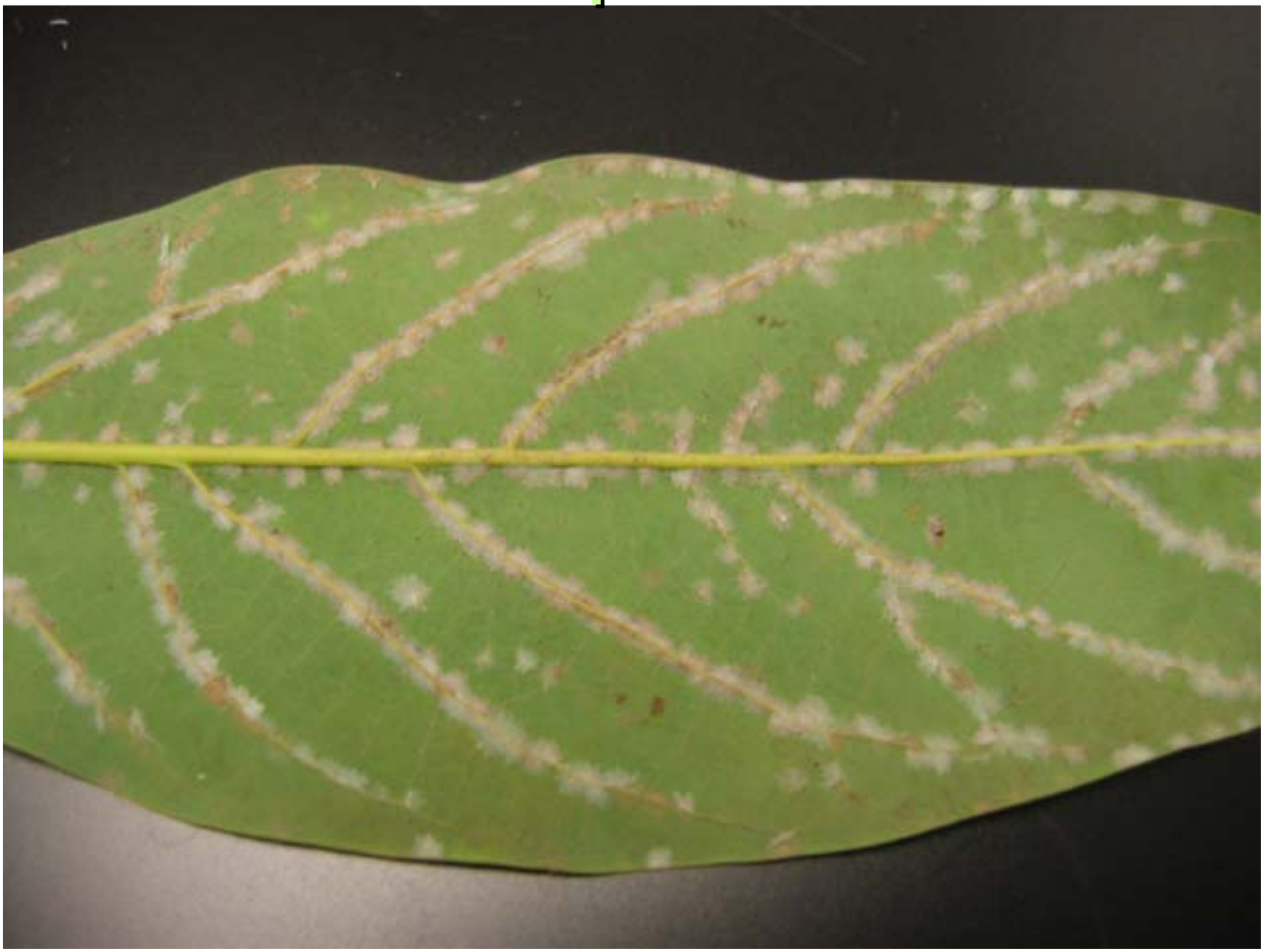
- Bioassay for resistance at field sites reporting poor control against avocado thrips or persea mite
  - Veratran D resistance in avocado thrips confirmed at two field sites
  - Loss of Agri-Mek susceptibility confirmed in a persea mite field population
  - Citrus thrips resistance to Agri-Mek in Ventura lead to a reduction in Success susceptibility
  - Flower thrips resistance to Success in Australia lead to reduction in Agri-Mek susceptibility
- Resistance of avocado thrips and/or persea mite to Danitol expected if this material is overused (use only once every OTHER year)

Persea Mite



Oligonychus perseae (Acari: Tetranychidae)

Avocado persea mite



- Many groves do not require a persea mite treatment in a particular year

  - Monitor persea mites on mature leaves
  - In some groves, populations appear cyclical -- high for 2 years or so and then lower
  - Leaf drop tolerance for persea mite feeding (increases when > 7.5-10 % of the leaf surface is damaged)

Progress - Persea Mite Pesticides

- Strong data set from Irvine persea mite pesticide trial in 2005-06 supported Zeal and Envidor registration packages
- Both trials in 2006-07 (Piru, Somis) were ruined by the January 2007 freeze (had gone on late 2006 to see the impact on 2007 population levels)
- Guy Witney attended fall 2007 IR-4 meeting and was able to get IR-4 started on Fujimite residue work in 2008
- Goleta spray trial applied 9-26-07
- Second Goleta trial applied 10-9-08
- 5 Field trials, 3 strong data sets, data consistent between trials
  - Agri-Mek + oil, Zeal + oil, and Envidor hold for ca. 80-100 days (when control levels decline to very low levels)

IRAC Classification of Persea Mite Materials

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Agri-Mek	Syngenta, generics	Avermectin, macrocyclic lactone	6
Danitol (expected 2010)	Valent	Pyrethroid - NOT REGISTERED YET	3
Zeal (expected 2010)	Valent	Phenetole - NOT REGISTERED YET	Class 10B
Envidor (expected 2010)	Bayer	Ketoenole - NOT REGISTERED YET	Class 23
Fujimite (2012?)	Nichino	Mitochondrial electron transport inhibitor	Class 21

Key Points in Avocado Resistance Management

- Don't overuse Agri-Mek in 2009
  - Do not apply Agri-Mek in spring for avocado thrips AND THEN AGAIN in summer for persea mite (hold to maximum of 1 application per season)
  - Use Veratran D or Delegate in rotation for avocado thrips control
- Do not use imidacloprid or other trunk injections until they are registered and have been shown to be effective (Admire Pro CANNOT be injected - this formulation will not work)
- In 2010, Danitol, Zeal, and Envidor should be registered
- Avocado thrips -- rotate Agri-Mek/Delegate, Danitol, Veratran D
- Persea mite -- rotate Zeal, Envidor after they are registered
- Danitol resistance VERY LIKELY if this material is over-used -- appears effective against both avocado thrips and persea mite but should be used only once EVERY OTHER YEAR once it is registered