Spider Mite Management in Walnuts

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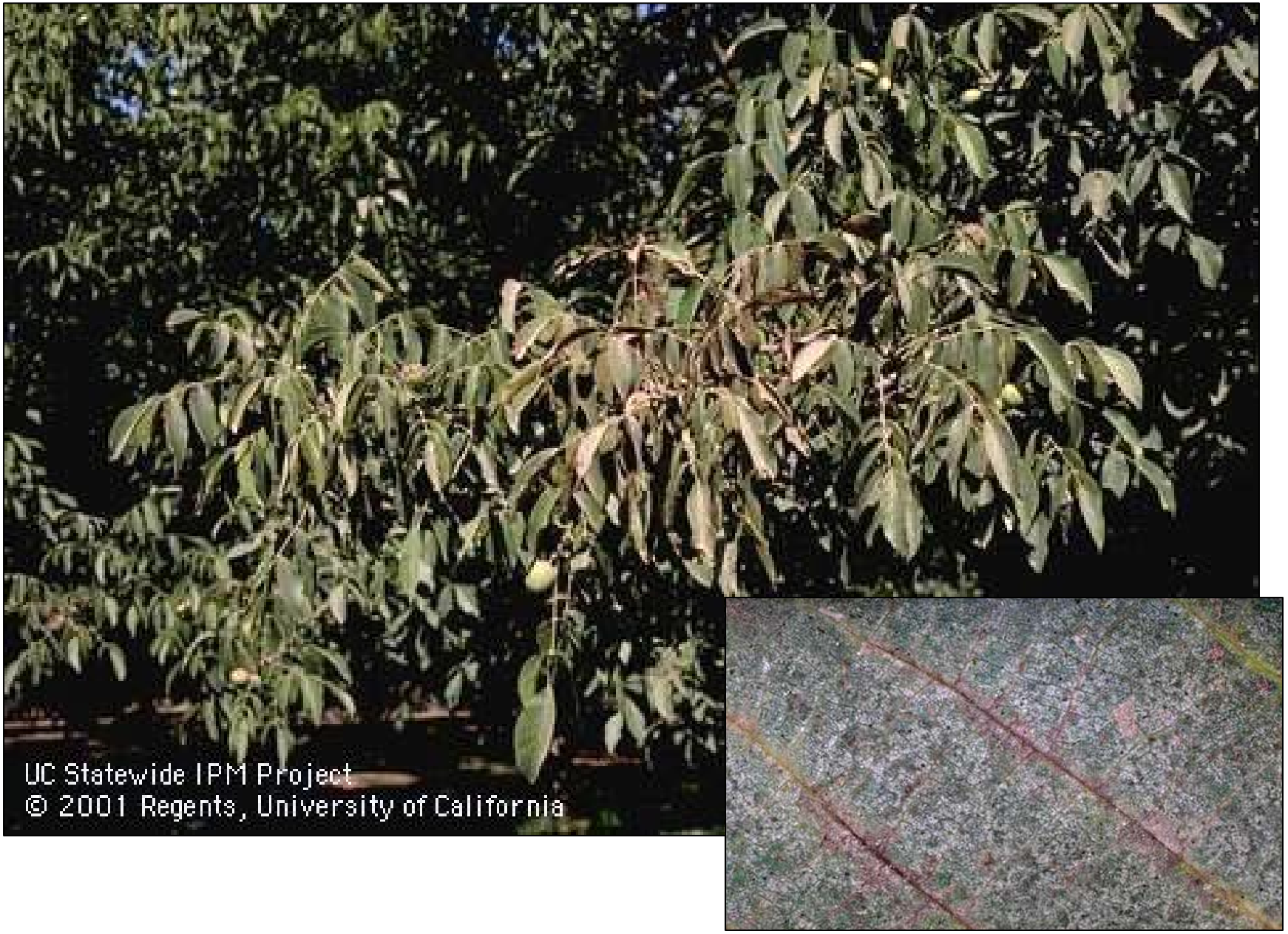
Tehama Co. Walnut Day, 2008

Mite damage

- Leaf stippling
- Browning of leaves
- Leaf desiccation/drop
- Early defoliation
  - Reduces yields
  - Reduces quality
- Late defoliation
  - Interferes with harvest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Pacific or twospotted spider mite
Overwintering female

Pacific or twospotted spider mite
Being eaten by a western predatory mite

Western predatory mite

European red mite

Overwintering stage

- Reddish orange mature females
- Protected areas in the tree
- Leaf litter, trash on the ground

Spring

- Become active in warm weather
- Begin feeding on walnut leaves or ground cover
- Lay eggs on the undersides of leaves

Summer

- Populations increase in June/July
- Colonies develop on undersides of leaves
- Heavy populations go to tops of leaves

cont'd

- Reproduce quickly
- Multiple generations
- Generation in as little as 7 days
- Proliferate in dusty conditions
- Proliferate in the absence of biocontrol

Mite-promoting conditions

- Dust
- Orchard operations (i.e., mowing cover crops)
- Water-stressed trees
  - Insufficient irrigation
  - Excessively hot weather
- Use of broad-spectrum insecticides
  - Lack of beneficial organisms

Monitoring

- Start in mid- to late-May
- Monitor weekly
- Use field bindweed as an indicator
- Check hotspots and field edges (dusty)
- Look for brown leaf clusters
  - Lower branches in inner canopy
- Check random infested leaflets for predators

Western Predatory Mite

Galendromus (Metaseiulus) occidentalis

- Teardrop shaped, clear to red
- Most dependable predator
- Can complete life cycle in 7 days
- Can provide compete control of spider mites
- Often arrive late, since no alternate food source in the spring

Sixxpotted thrips

Scolothrips sexmaculatus

- Larvae yellowish, cilindrical
- Adults with 6 spots
- Both are predacious on mites
- Can provide compete control of spider mites
- Often arrive late, since no alternate food source in the spring

Thresholds to treat

- Treat if brown clusters of leaves are present on 10% of the trees, and no predators are present
- If predators (mites, thrips, spider mite destroyers) are present on at least half of the leaflets, they will probably control mites (increase monitoring to make sure)

Threshold Modifications

- If very hot weather is anticipated, pull the trigger a little early
- If population is increasing in early June or July, and leaf drop will be severe enough to expose the nuts to sunburn or interfere with sweeping at harvest, then pull the trigger
- Mite build-ups by mid-August can be ignored

Treatments

Agri-Mek

- 2.5-5 fl oz/100 gal
  or
  10-20 fl oz/ac
- Label recommends addition of hort oil
- Effective against propargite-resist mites

Omite

- 1.5 lb/100gal
  or
  4-6 lb/ac (5-12.5lb/ac)
- Do not use within 14 days of oil
- Some resistance documented in the SJV, not consistent

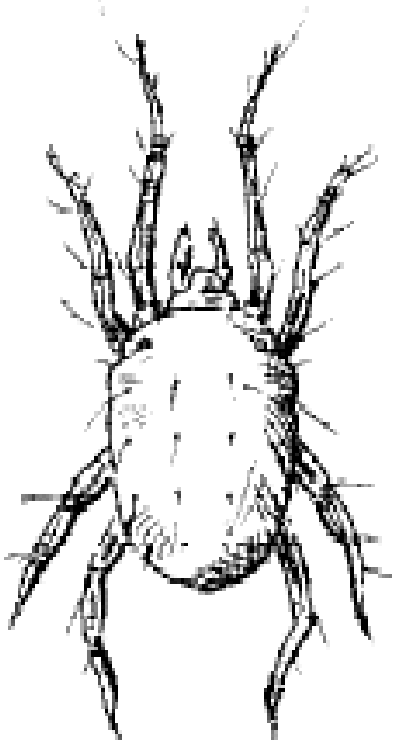
Life Cycle

egg

larva

protonymph

deutonymph



adult

Registration Status of Selected Miticides for Use Against Spider Mites[1] in California. (Current as of March, 2007)

David Haviland; Entomology Farm Advisor, UCCE- Kern County

Key: YES = fully registered for use NB = registered for use on non-bearing crops only No = not registered for use

	IRAC	Nut Crops			Stone Fruits					Citrus	Pome Fruits		Grape	Cotton
	Number[2]	Almond	Pistachio	Walnut	Apricot	Cherry	Peach	Plum	Nectarine		Apple	Pear		
Acramite	25	YES	YES	YES	NB	NB	YES	YES	YES	NB	YES	YES	YES	YES
Agri-Mek	6	YES	no	YES	no	no	no	YES	no	YES	YES	YES	YES	no
Apollo	10A	YES	no	YES	YES	YES	YES	no	YES	no	YES	YES	YES	no
Carzol	1A	no	no	no	no	no	YES	no	YES	No[3]	YES	YES	no	no
Comite	12C	no	no	no	no	no	no	no	no	no	no	no	no	YES
Danitol	3	no	no	no	no	no	no	no	no	YES	YES	No[3]	No[3]	No[3]
Desperado	21	YES	YES	YES	no	no	YES	YES	YES	no	no	no	no	no
Dicofol	UNC	no	no	YES	no	no	no	no	no	YES	YES	YES	YES	YES
Ecotrol	-	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Envidor	23	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	no
Fujimite	21	YES	YES	YES	NB	NB	NB	NB	NB	No	YES	YES	YES	YES
Kanemite	20B	YES	YES	no	no	no	no	no	no	YES	YES	YES	no	no
Kelthane	UNC	no	no	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Nexter	21	YES	YES	YES	no	no	YES	YES	YES	YES	YES	YES	YES	no
Oberon	23	no	no	no	no	no	no	no	no	no	no	no	no	YES
Omite	12C	YES	NB	YES	NB	YES[4]	NB	NB	YES	YES[5]	NB	NB	YES	no
Onager	10A	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Vendex	12B	YES	no	YES	no	YES	YES	YES	YES	YES	YES	YES	YES	no
Zeal	10B	YES	YES	YES	NB	NB	NB	NB	NB	NB	YES	YES	YES	YES
Zephyr	6	no	no	no	no	no	no	no	no	no	no	no	no	YES

[1] Spider mite species include *Tetranychus* spp. (pacific, two-spotted, strawberry, McDaniel, Carmine spider mites), *Panonychus* spp. (European, citrus red mites), *Eotetranychus* spp. (Willamette, Yuma spider mites), *Eutetranychus banksi* (Texas citrus mite)

[2] Insecticide Resistance Action Committee (IRAC) numbers used to denote different modes of action. Same number indicates same mode of action

[3] Miticide is registered for the crop, but one or more spider mites are not listed on the label as target pests

[4] For use on non-bearing, or post-harvest on bearing

[5] For use on any non-bearing, or post-harvest on bearing navels or grapefruit

[6] OMRI certified for use on organic crops

Table of Some of the Most Common Miticides for Use Against Spider Mites[1] in California (Version 2, Mar 2007)[2]

David Haviland; Entomology Farm Advisor, UCCE- Kern County

Miticide	Active Ingredient	Producer	Targeted life stages and mode of action	IRAC Number[3]
Acramite	bifenazate	Chemtura	contact toxin on all stages by unknown mechanism in nervous system	25
Agri-Mek	abamectin	Syngenta	contact or ingestion toxin that paralyzes juveniles and adults; death by starvation	6
Apollo	clofentezine	MANA	growth regulator of mite eggs and some nymphs	10A
Carzol	formetanate	Gowan	contact toxin that inhibits acetylcholinesterase and monoamine oxidase	1A
Comite	propargite	Chemtura	contact on juveniles and adults by inhibition of ATP synthesis	12C
Danitol	fenpropathrin	Valent	nerve toxin to juveniles and adults by modification of sodium channels (pyrethroid)	3
Desperado	pyridaben/sulfur	Wilbur-Ellis	contact on juveniles and adults by inhibition of energy production, plus sulfur	21
Dicofol	dicofol	multiple	contact toxin of juveniles and adults with unknown mode of action	UNC
Ecotrol	botanical oils	EcoSMART	contact on all stages; inhibits nervous system by blocking octopamine receptors	-
Envidor	spirodiclofen	Bayer	contact on all mite stages by inhibiting lipid biosynthesis; most effective on juveniles	23
Fujimite	fenpyroximate	Nichino	contact toxin to eggs, juveniles and adults; inhibits electron transport in the mitochondria	21
Kanemite	acequinocyl	Arysta	contact toxin to eggs, juveniles and adults; inhibits electron transport in the mitochondria	20B
Kelthane	dicofol	Dow	contact toxin of juveniles and adults with unknown mode of action	UNC
Nexter	pyridaben	BASF	contact on juveniles and adults by inhibition of energy production	21
Oberon	spiromesifen	Bayer	contact on all mite stages by inhibiting lipid biosynthesis; most effective on juveniles	23
Omite	propargite	Chemtura	contact on juveniles and adults by inhibition of ATP synthesis	12C
Onager	hexythiazox	Gowan	mite growth regulator; adult females lay sterile eggs; contact toxin on eggs and juveniles	10A
Vendex	fenbutin-oxide	Du Pont	contact toxin to juveniles and adults by inhibition of ATP synthesis	12B
Zeal	etoxazole	Valent	contact toxin on eggs; inhibits molting of juveniles; adult females produce sterile eggs	10B
Zephyr	abamectin	Syngenta	contact or ingestion toxin that paralyzes juveniles and adults; death by starvation	6

[1] Spider mite species include *Tetranychus* spp. (pacific, two-spotted, strawberry, McDaniel, Carmine spider mites), *Panonychus* spp. (European, citrus red mites), *Eotetranychus* spp. (Willamette, Yuma spider mites), *Eutetranychus banksi* (Texas citrus mite)

[2] Pesticide-related information is always changing. To recommend changes to the table please contact David Haviland. dhaviland@ucdavis.edu, 661 868-6215

[3] Insecticide Resistance Action Committee (IRAC) numbers used to denote different modes of action. Same number indicates same mode of action

Newer miticides

Growth Regulators

- Envidor
  - Inhibits lipid biosynthesis on immatures
  - Have to molt, slow-acting; mites must come in physical contact
- Onager
  - Adult females lay sterile eggs, some contact on juveniles
- Zeal
  - Adult females lay sterile eggs, contact on eggs, some on juveniles
  - Some translaminar activity
- Apollo
  - Growth regulator of eggs and nymphs
  - Facelift by MANA

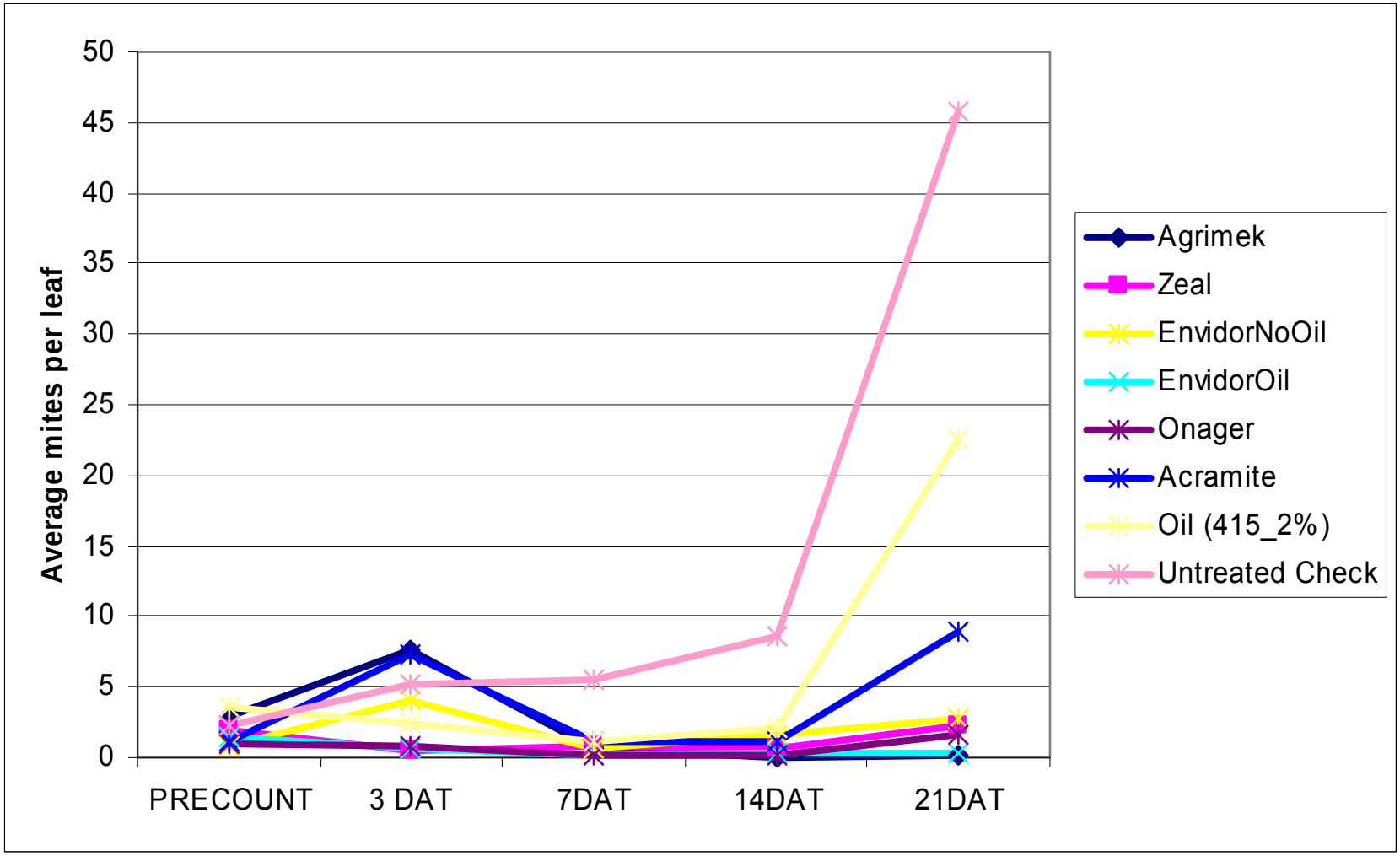
Contact

- Fujimite
  - Contact to all stages, same MOA as Nexter
- Desperado
  - Don’t really have information on it, same a.i. as Nexter

Data from other trials

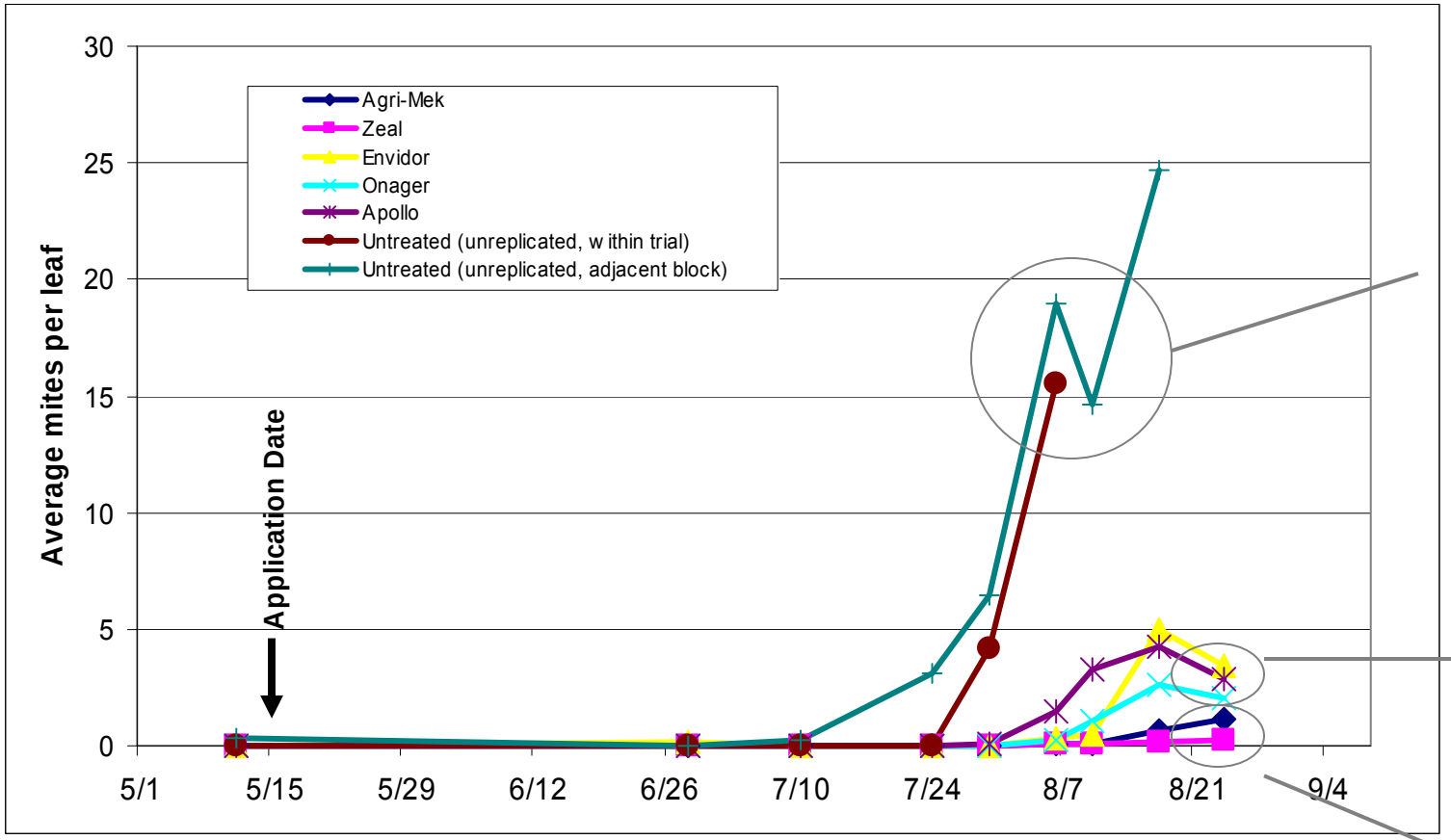
- Growth Regulators (Envidor, Zeal, Onager)
  - Plum 2005 (June)
    - All better than Acramite, but not as good as Agri-Mek
  - Peach 2006 (May)
    - All three comparable (but numerically just below) Agri-Mek
    - Envidor slightly longer residual than Zeal or Onager
  - Almond 2006-7 (May, July, July)
    - All good, Zeal longest residual early in the season
    - All good, Envidor longest residual at hull split
- Fujimite
  - Plum 2005 (June) and Peach 2006 (May)
    - Flared mites (very toxic to predatory mites)
  - Almond (Mid-July 2006, 2007)
    - 5+ weeks control (controls defoliated in 4 weeks)
    - Best candidate as an Omite replacement
  - Growers reporting very good results (but be careful early)

Peach Trial, 2006



Almonds- preventative trial (2007)

2.5 acre plots, 6 replications, applications made with mite densities undetectable

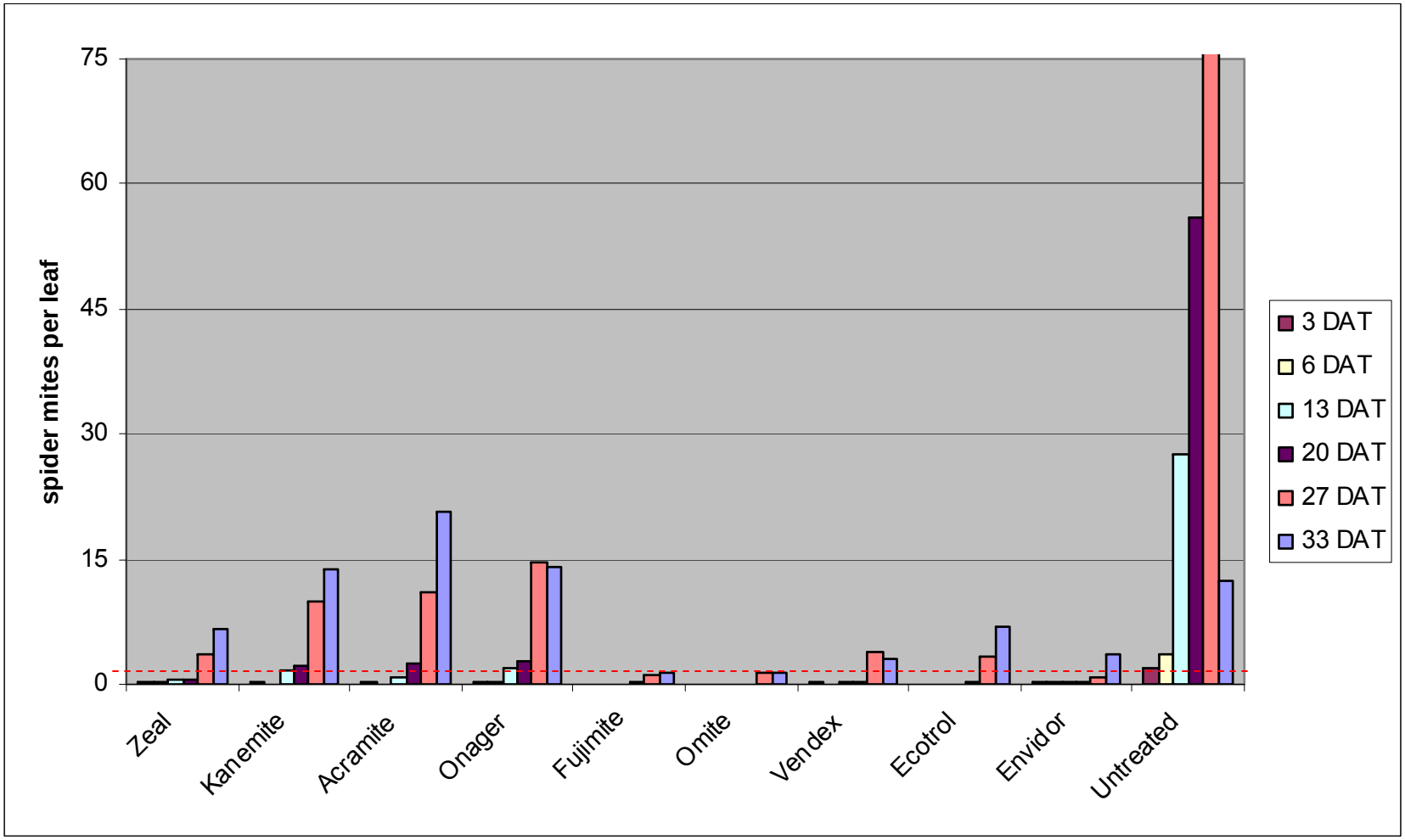


Unreplicated control plots

Apollo
Envidor
Onager

Agri-Mek
Zeal

Large scale non-bearing almonds



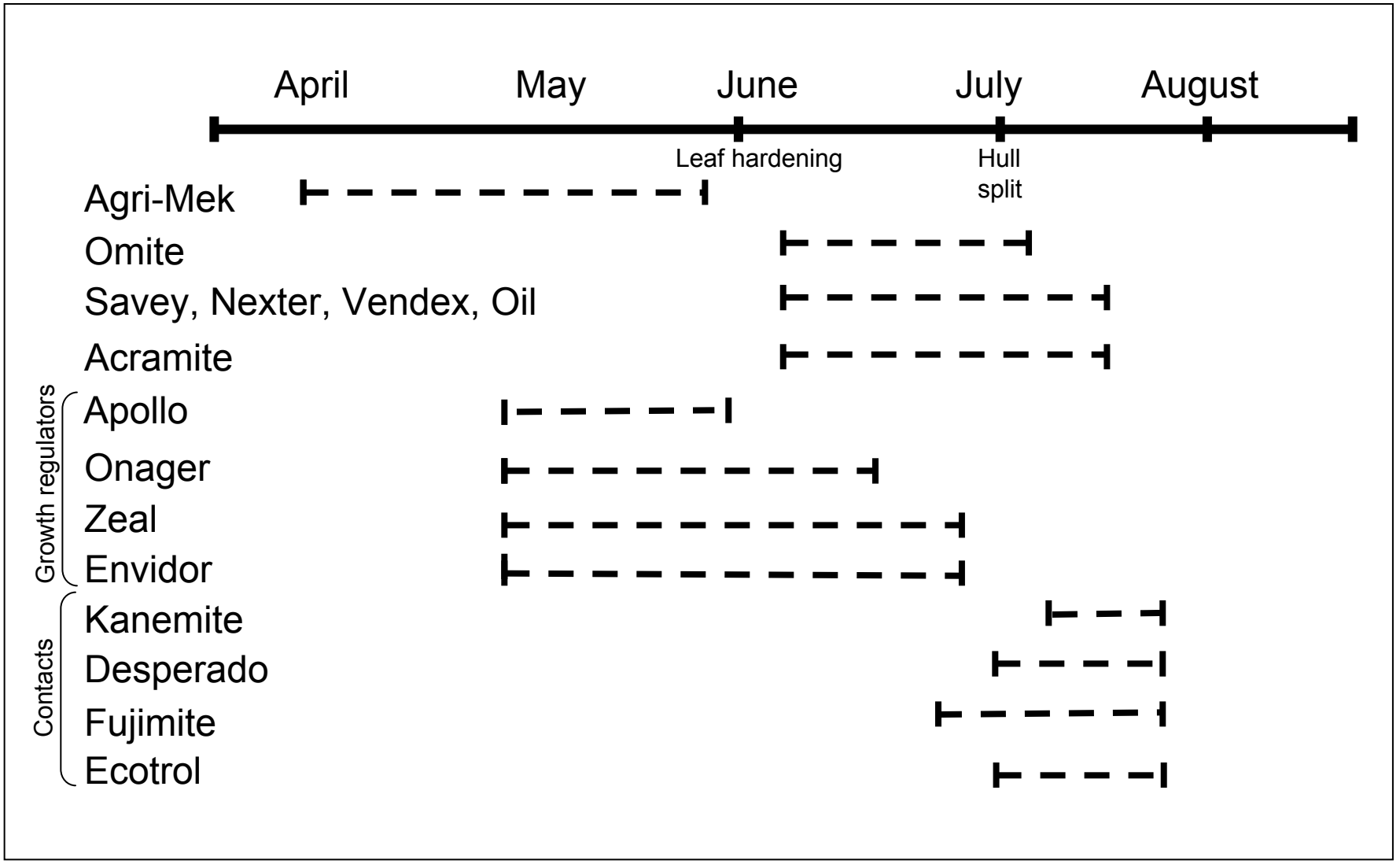
Effects of miticides on predators

general statements (verdict still out on some)

- Thrips
  - Agri-Mek → Agri-Mek very toxic

- Mites
  - Agri-Mek → Moderate+
  - Onager → Moderate
  - Zeal → Toxic (sterilized)
  - Envidor → Moderate +
  - Acramite → Soft to Moderate
  - Fujimite → Toxic (contact)
  - Kanemite → Moderate
  - Desperado → Toxic (contact)
  - Ecotrol → Unknown

Placement Recommendations in Almonds




Thank you
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Tri-County Walnut Day, 2008

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