Mites and Aphids

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Mites in Walnuts

- Web-spinning mites, *Tetranychus* spp.
  - *T. urticae, T. pacificus, T. turkestani,*
  - important secondary pests

- Red spider mites, *Panonychus ulmi*
  - no webbing
  - much less important

- Walnut blister mite, *Eriophyes erinea*
  - not important

Walnut Spider Mites

Web-spinning spider mites	Non web-spinning spider mites
Tetranychus urticae (Twospotted Mite TSM)	*Panonychus ulmi* (European Red Mite ERM)
Tetranychus pacificus (Pacific Mite PM)	
Tetranychus turkestani (Strawberry Mite SM)	

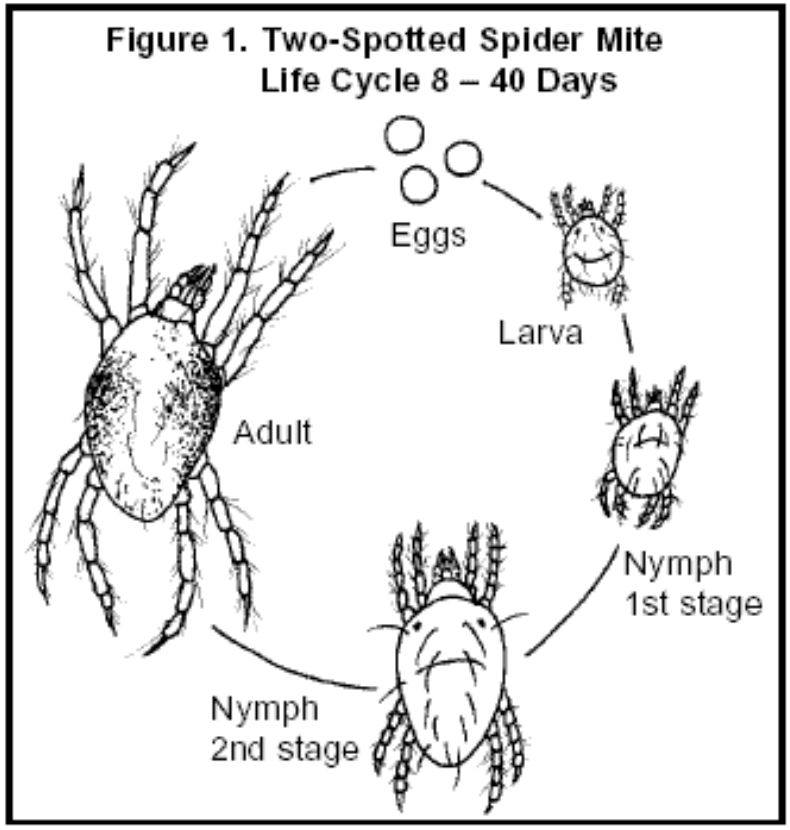
TSM, *T. urticae*

?

ERM, *P. ulmi*

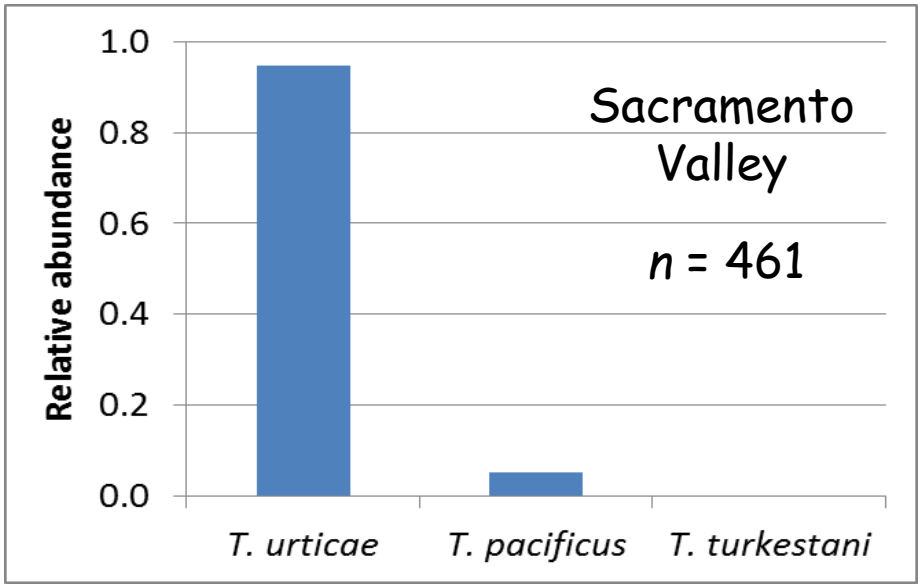
Life Cycle and Seasonality of *Tetranychus*

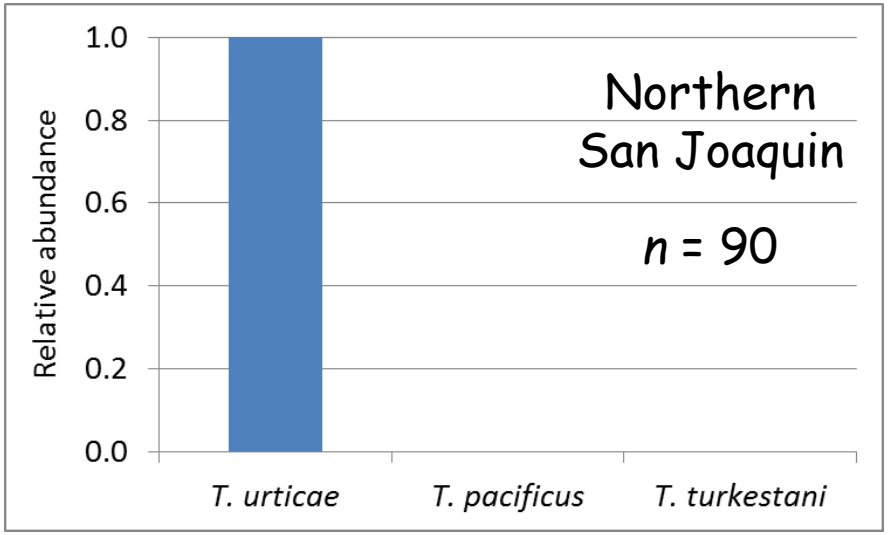
- Overwintering: adult females under bark or in litter
- Apr - May: feed in lower canopy
- June - Aug: spread through canopy
- Sep - Oct: enter diapause

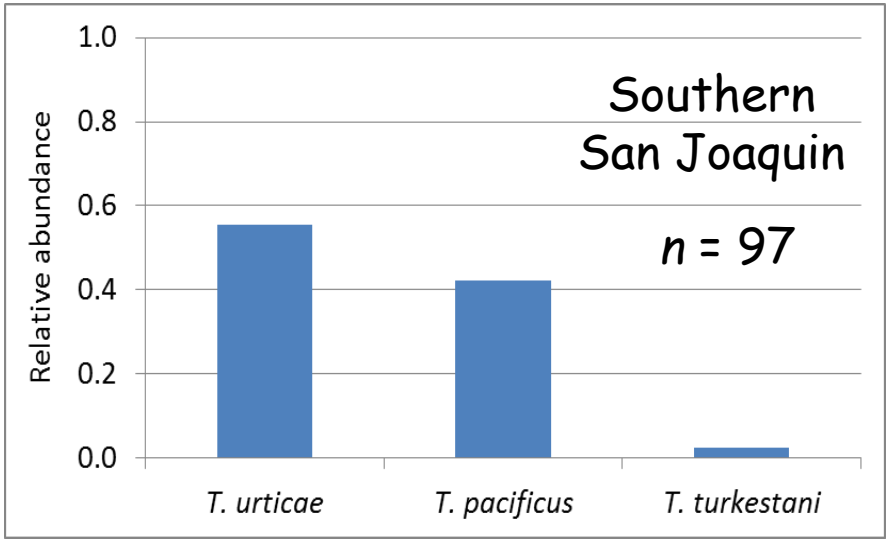


Relative Abundance of Web-Spinning Spider Mites

From cumulative samples collected regularly throughout the season







Spider Mite Predators

Type IV

Euseius stipulatus

Type III

Typhlodromus caudiglans

Type II

Western predatory mite WPM
Galendromus occidentalis

Ladybird beetle
Stethorus picipes

Amblyseius similoides

Six-spotted thrips
Scolothrips sexmaculatus

Predatory Mites and Their Food Types

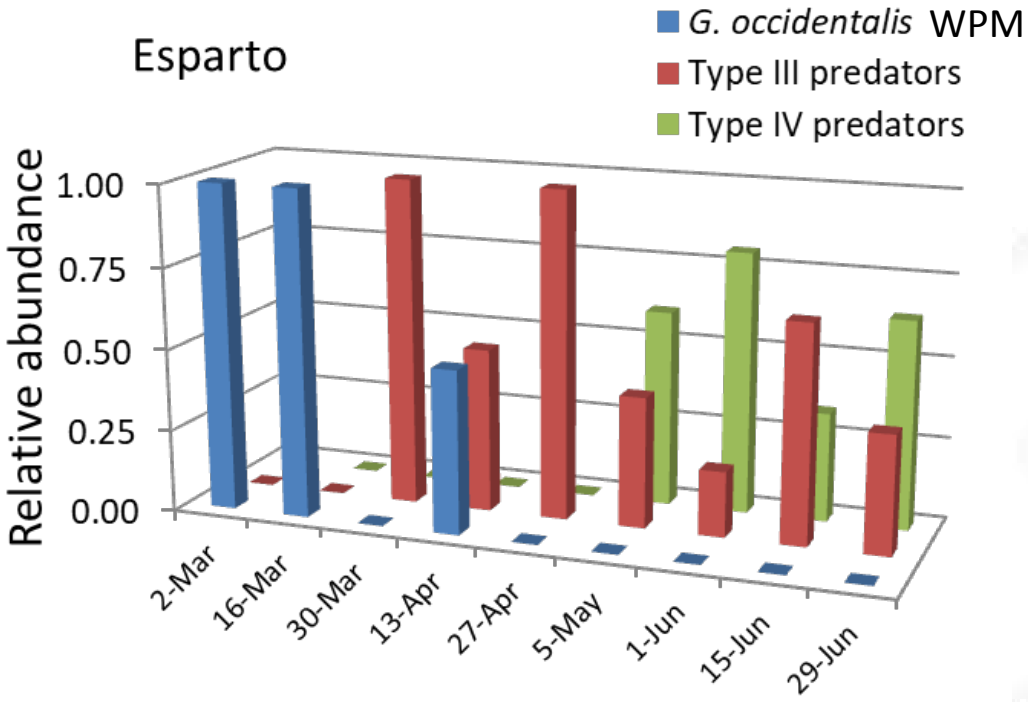
Type IV Pollen + mites + insects + leaf sap	Type III Mites + pollen + insects	Type II Web-spinning spider mites
Euseius quetzali	*Amblyseius similoides*	*Galendromus occidentalis*
Euseius stipulatus	*Metaseiulus citri*	*Neoseiulus californicus*
Euseius tularensis	*Typhlodromus caudiglans*	

Spider Mite Management in Walnuts

- Spider mite activity has increased in recent years
- Is western predatory mite an effective predator in late leaf-out nut crops, such as walnuts?
- Could changes in pesticide use in walnuts have disrupted biological control?

Western Predatory Mite in Walnuts

- Leaf-out date so late that WPM can't persist in walnuts through spring
- Recolonizes again Jul-Sep



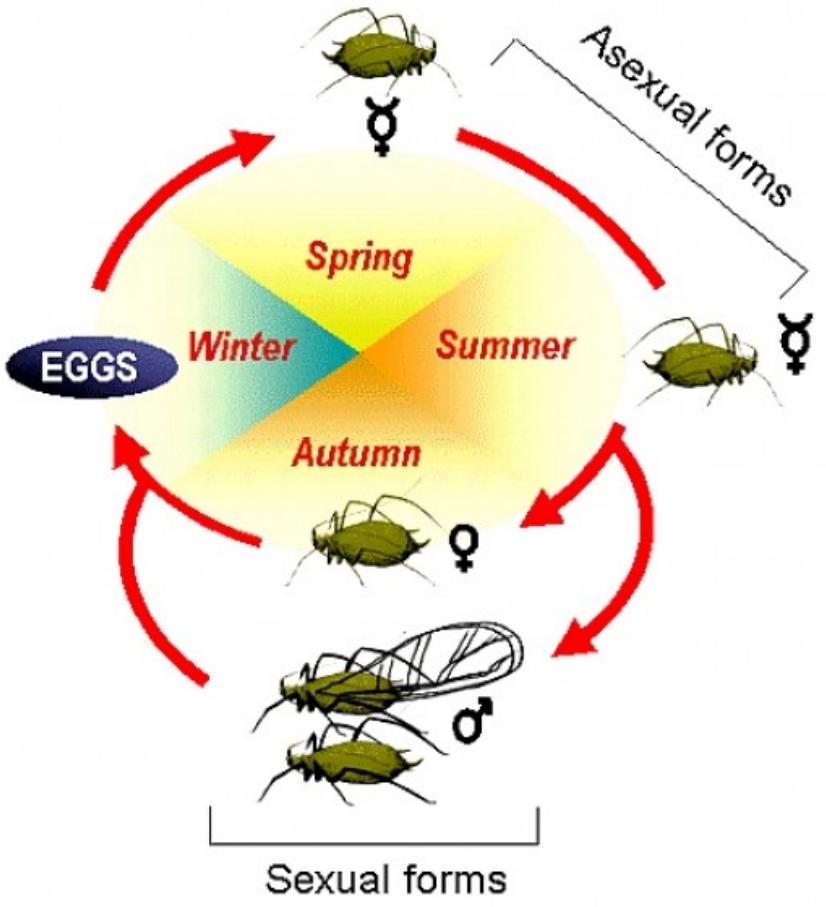
Aphids in Walnuts

- Walnut aphid
  Chromaphis juglandicola
  Underside of leaf
  Important secondary pest

- Dusky-veined aphid
  Panaphis juglandis
  Top side of leaf along midrib – ant attended
  Much less important

Life Cycle and Seasonality

- Overwinter as eggs on twigs
- Apr - Eggs hatch
- Jun - Peak in DVA activity
- May & Aug - Peaks of WA activity
- Oct – Sexual phase of life cycle, oviparae lay eggs



Life cycle 7-14 days

Initial Status and Damage

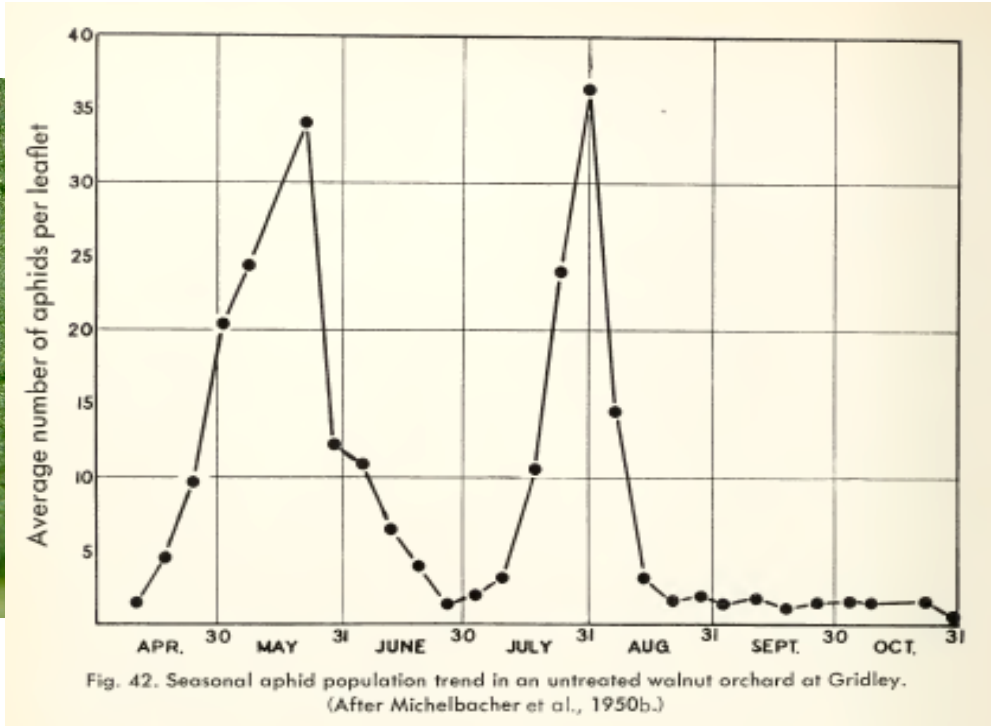


Fig. 42. Seasonal aphid population trend in an untreated walnut orchard at Gridley. (After Michelbacher et al., 1950b.)

Considered 'probably the most important insect attacking walnut'
(Michelbacher & Ortega 1958)

Damage occurs above 15 aphids/leaflet through sunburn - 70-75% increase in off-grade nuts

Indigenous Predators of Walnut Aphids

Convergent ladybeetle
Hippodamia convergens

Ash-grey ladybeetle
Olla v-nigrum

Green lacewing
Chrysoperla johnsoni

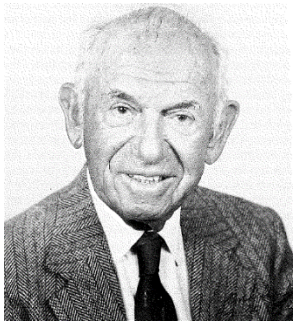
Biological Control of Walnut Aphid

1968 – *Trioxys pallidus* imported from Iran. Established and provided control throughout Central Valley

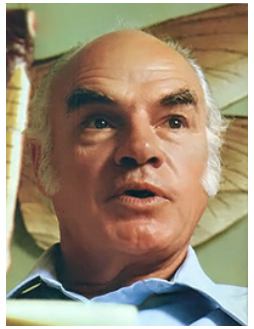
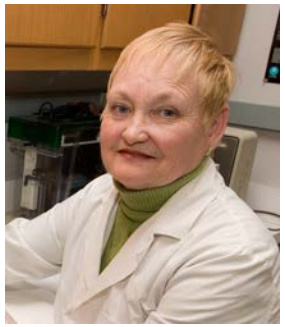
1970s on – Secondary outbreaks in Jul/Aug only, due to disruption by Guthion (for 2nd gen CM)

1988/91 – Guthion resistant strain of *T. pallidus* developed and released in Central Valley

Biological Control Research and Extension





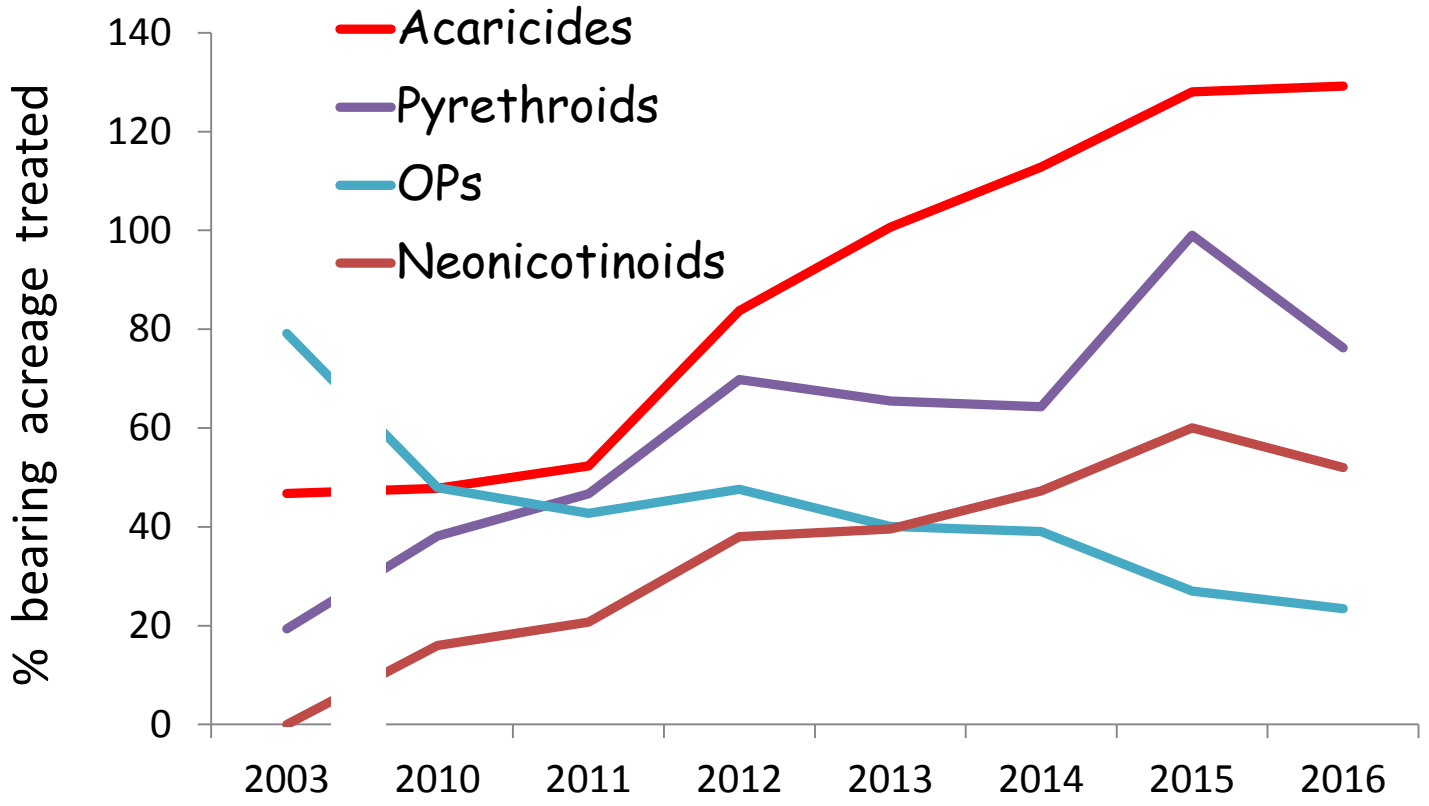





An effective team effort reduced walnut aphid from a primary to secondary pest – an achievement to remember


Recent Changes in Pesticide Use in Walnuts

- Many of the replacements for OPs are not selective and not compatible with IPM
- Secondary pest (aphids/spider mites) problems arise



(Data from CDPR, PUR, 2016)

Lab-Based Bioassays of Pesticide Selectivity

Product	Active ingredient	Target	% walnut acres treated 2016	*Galendromus occidentalis*	*Trioxys pallidus*
Insecticides					
PYR	Bifenthrin	WHF/CM/NOW	37		
DIA	Chlorantraniliprole	CM	35		
NEO	Acetamiprid	WHF/CM/NOW	29		*
IGR	Methoxyfenozide	CM	23		
NEO	Imidacloprid	WA	22		*
OP	Chlorpyrifos	All	21	*	
PYR	Lambda-cyhalothrin	CM	16		
SPI	Spinetoram	CM/NOW/WHF	13		
Miticides					
AVE	Abamectin	TSM	55		
IGR	Hexythiazox	TSM	17	*	*
METI	Bifenazate	TSM	15		*
IGR	Etoxazole	TSM	14		
ATPI	Propargite	TSM	7	*	
METI	Cyflumetofen	TSM	7		*
METI	Fenpyroximate	TSM	7		*

IOBC rating after Boller et al. (2008)

Harmless <30%

Moderate 30-80%

Harmful >80%

* from Koppert/ Biobest scores for *Neoseiulus californicus* or *Aphidius* spp.

Walnut Trial 2016 - Selective Acaricides

- Howard, Lodi applied Jul 31
- All materials reduced TSM and WPM
- Nealta more selective than Fujimite, kept TSM low for longer