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Understanding Mites in Deciduous Tree Fruit Orchards

David Williams

13 February 2018

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Mites found on deciduous fruit trees

Spider mites:

- TSM *Tetranychus urticae*
- ERM *Panonychus ulmi*
- Bryobia *Bryobia rubrioculus*

Rust Mites (Eriophiidae):

- Apple rust mite *Aculus schlechtendali*
- Peach silver mite *Aculus fockeui*
- Pearleaf blister mite *Eriophyes pyri*

False spider mites: *Tenuipalpidae*

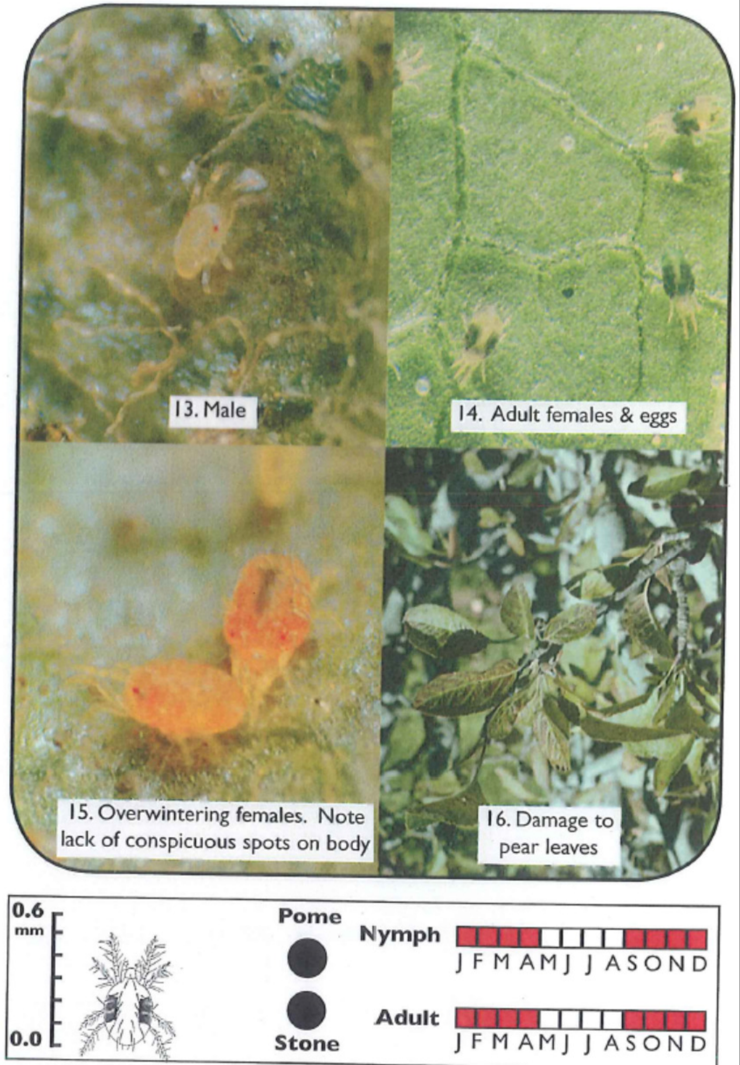
Tarsonemids: *Tarsonemidae*

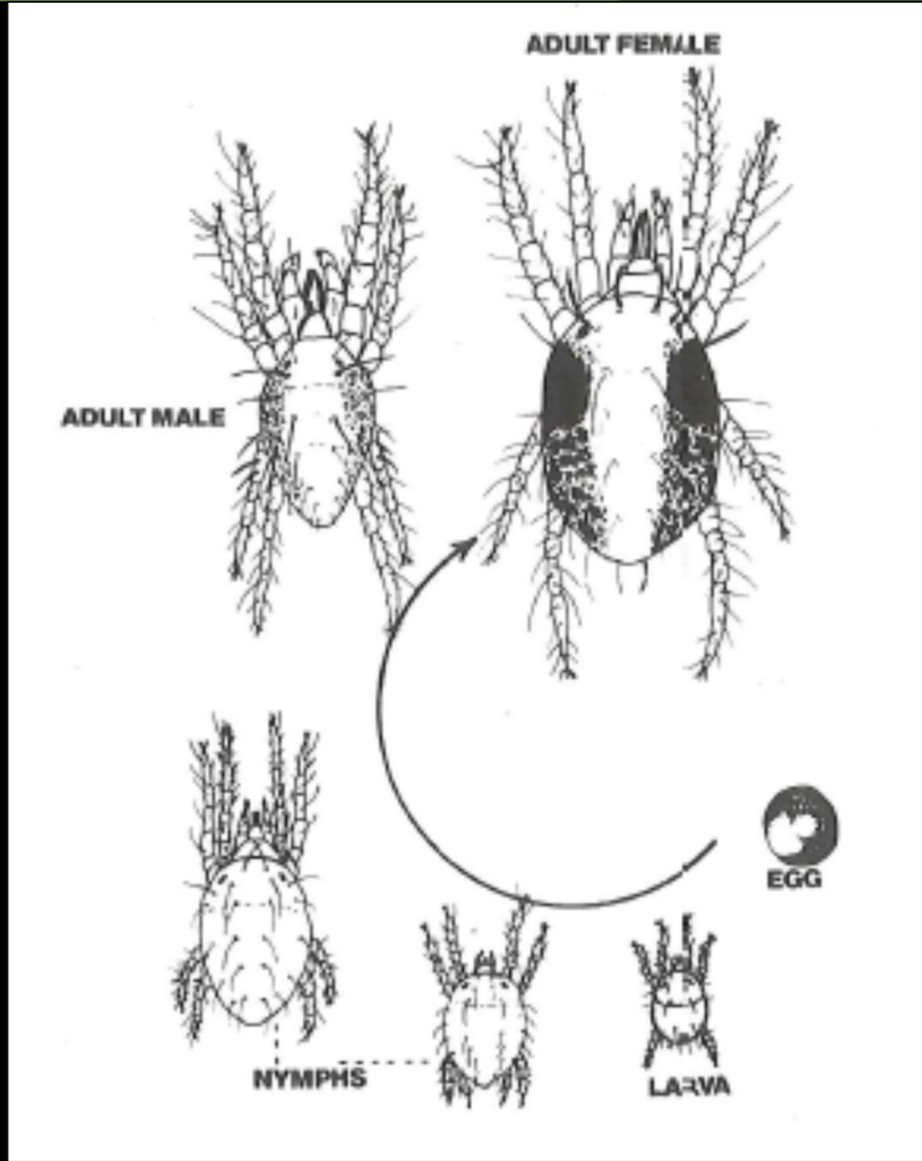
Tydeids: *Tydeidae*

Beetle mites: *Oribatidae*

Spider mites

Two-spotted Spider Mite *Tetranychus urticae*





TSM Life Cycle

- Females go orange when entering diapause (hibernation)
- Males do not diapause
- Female resumes activity in spring
- Unfertilised eggs produce males
- Fertilised eggs produce females
- 3-14 eggs/day and average 70 eggs/ female (max=200)
- Hatch 3-5 days, egg-adult 7-14 days
- Optimal temperature 30-32 ^{o}C
- Infestation starts low near crotch, spreads up and outwards

Spider mites

New incursion: *Tetranycopsis horridus*

ERM Life Cycle

- Overwinters as **red eggs** on tree around spurs, buds etc
- **Eggs onion shaped, striated, with stalk**
- Eggs hatch around green tip stage
- Mites on both sides of leaf
- Damage scattered evenly over leaf = speckling
- Infestation usually starts on outer parts of tree
- Not much webbing
- Eggs tend to resist predatory mites
- Optimal temperature 25-28 ^{o}C

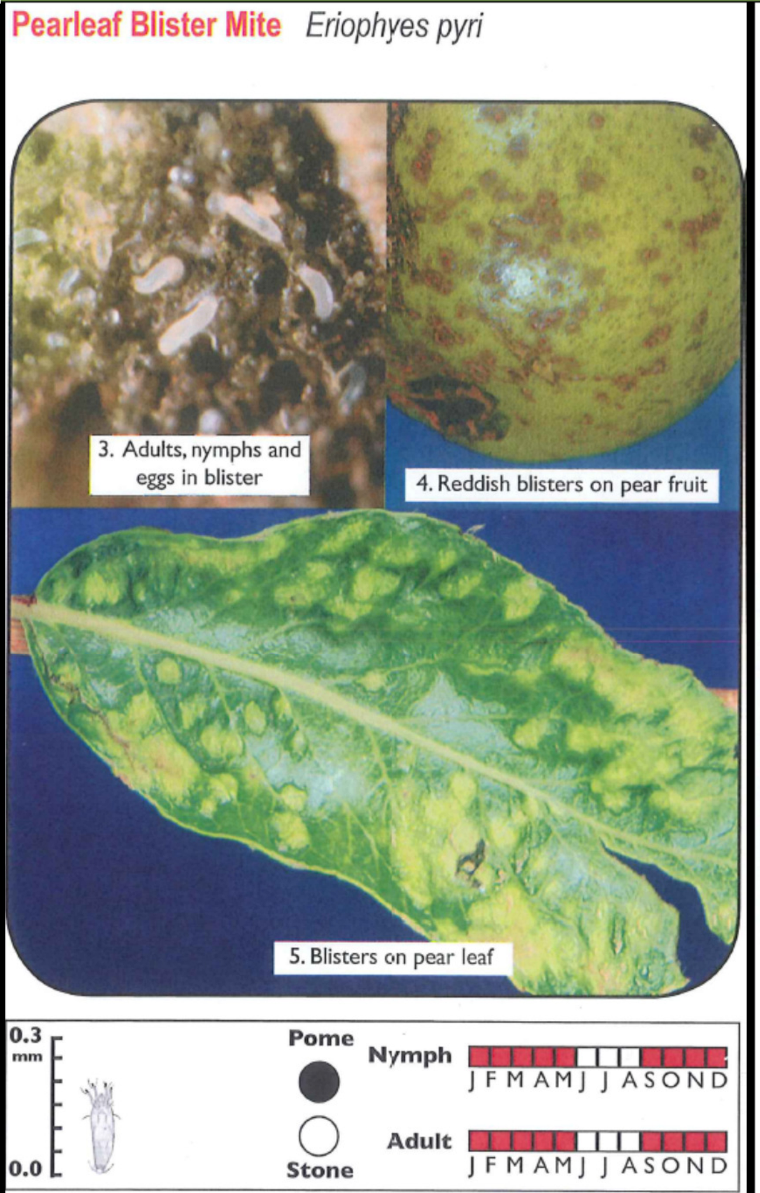
Bryobia Life Cycle

- Overwinters as **red eggs** on tree around spurs, buds etc
- **Eggs spherical shaped, smooth, no stalk**
- Eggs hatch around green tip stage
- Mites on both sides of leaf but **nocturnal feeder so in day clusters on twigs near leaves**
- Damage scattered evenly over leaf = some speckling but often more silvering/ bronzing
- Infestation usually starts on outer parts of tree
- Not much webbing
- Eggs tend to resist predatory mites
- Development faster in hot, dry weather and retarded in wet weather

Leaf scorch

- Reduces fruit set next season
- Reduces fruit size
- Effect lasts for one season after damage
- Size of effect depends on when scorch occurs
- Increased by water stress
- Develops in predictable response to mite pressure

Eriophiid mites

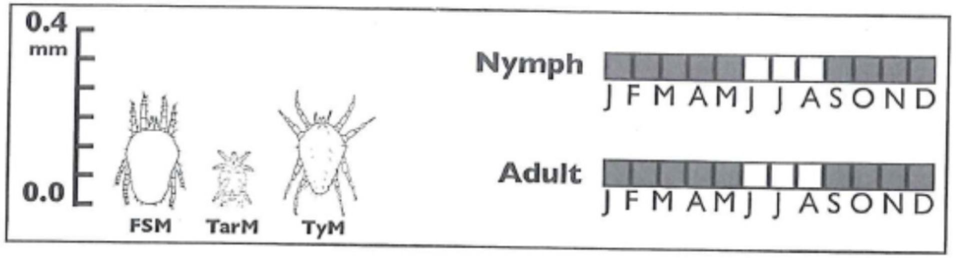


Eriophyid (rust) mites

- **Tiny** (adult 0.15mm long), **elongated**
- Females overwinter under bark and bud scales
- Move to expanding leaves in spring to lay eggs that produce females and males
- Lay 4 eggs/day (av 87 eggs each) at 22 ^{o}C
- Generation in 10 days at 22 ^{o}C
- Overwintering females produced again in late summer-autumn
- Populations > 300/leaf cause damage
- **Good food source for predatory mites**

Other mites

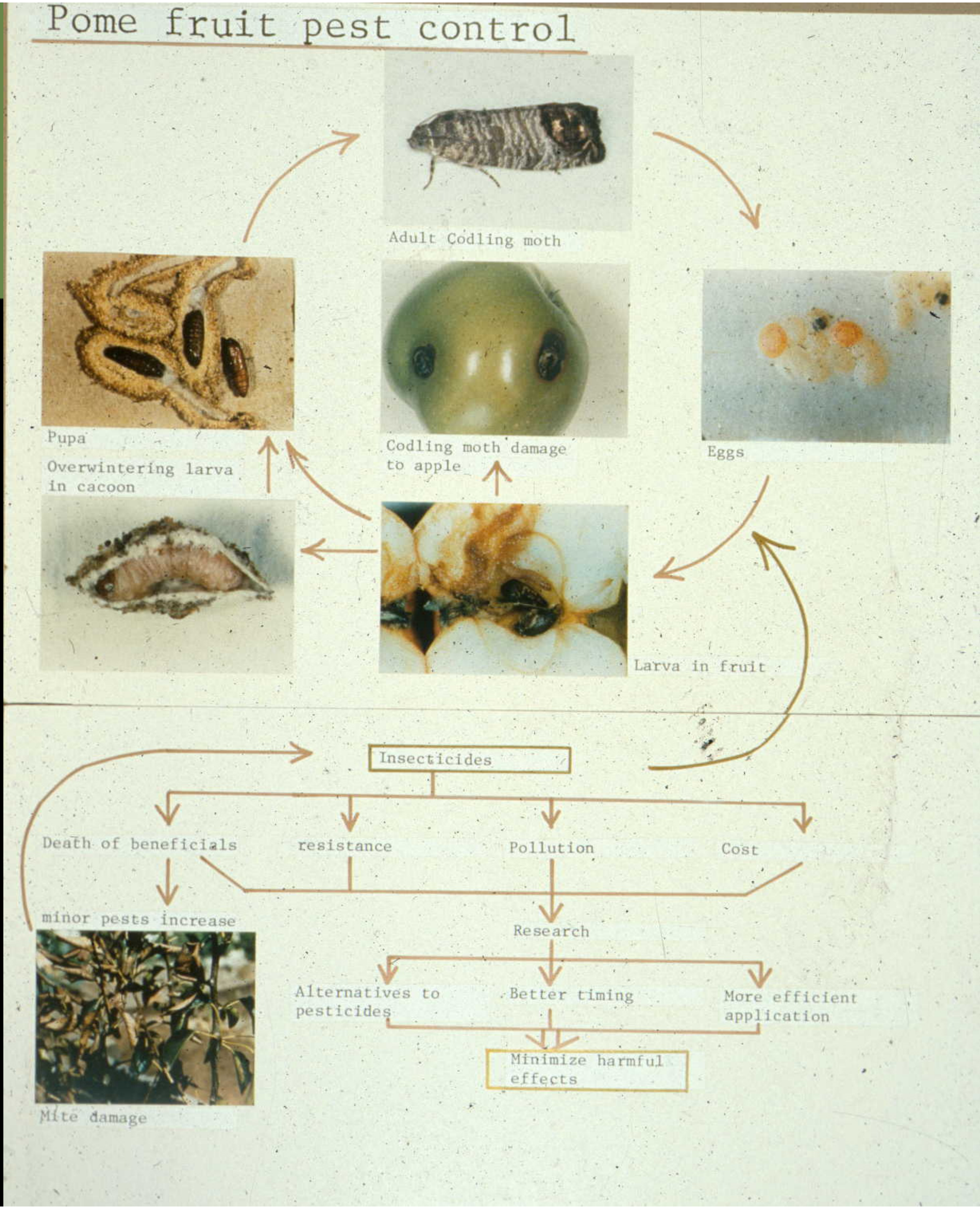
False Spider Mites, Tarsonemid Mites, Tydeid Mites



False Spider Mites (Tenuipalpidae): Incidental, not regarded as harmful or beneficial. Flat, somewhat resembling spider mites and often reddish coloured with patterns of dark pigmentation. Eggs elliptical and usually red or orange, nymphs and larvae also red or orange. These mites lie pressed to leaf with their legs extended in front and to sides posteriorly in a characteristic pose.

Tarsonemid Mites: Incidental, not regarded as harmful or beneficial. Tiny, golden yellow mites with shiny elliptical bodies. Appear to feed on detritus, pollen and fungi and found mainly on undersides of leaves.

Tydeid mites: Incidental, not regarded as harmful or beneficial. These have diamond-shaped body, short pale legs, and dull orange, cream or brownish with a pale stripe running down centre of back. Feed on fungi, dead plant and insect material. They may provide an alternative food source for predatory mites.



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Chemical control

- Difficult due to location and habits
- Rapid pest population increase in warm weather
- Timing is product-critical
- Webbing gives protection
- Cost of miticides
- Resistance to organotins, ovicides (clofentezine, hexythiazox) numbers game
- Resistance management misunderstood

Biological Control

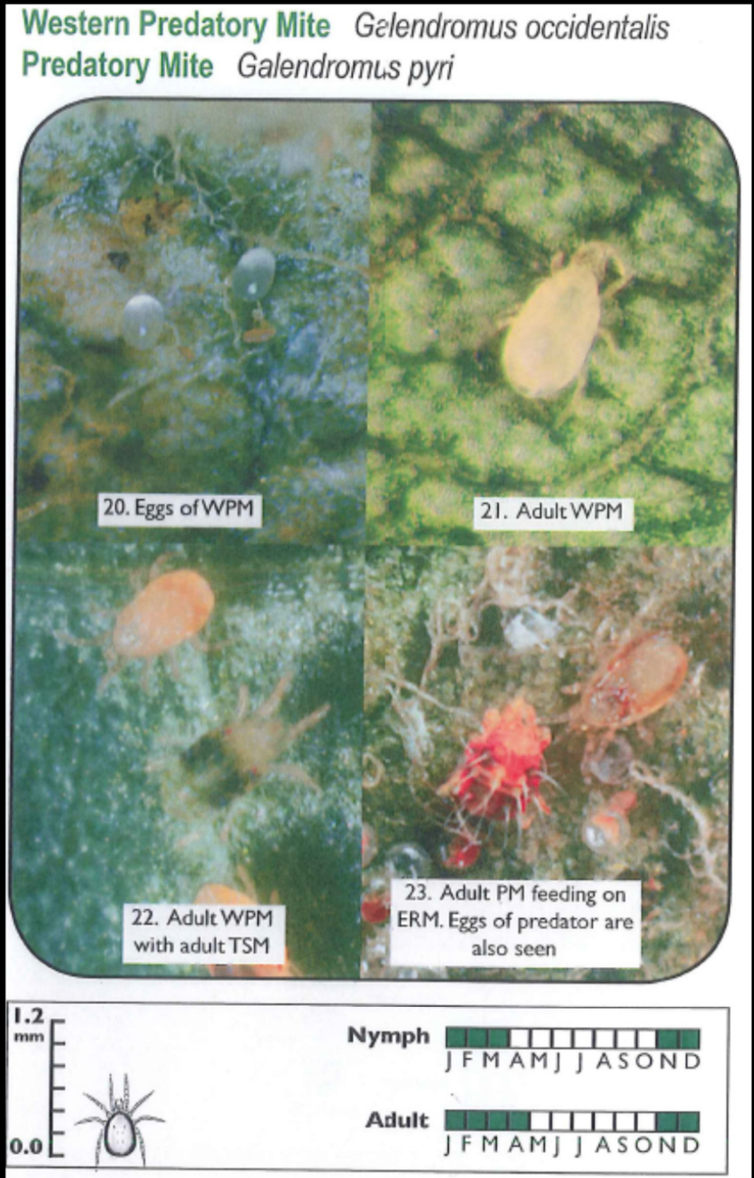
- Pesticide resistant predatory mites
- OP resistant *Galendromus (= Typhlodromus) occidentalis* 1972
- Carbamate resistant *G.occidentalis* 1980
- Pyrethroid resistant *G.pyri* 1983
- Other species
- Reduce miticide usage by >70%
- Help delay resistance developing in pest species
- Changes in insecticide usage affect Stethorus and other generalist predators

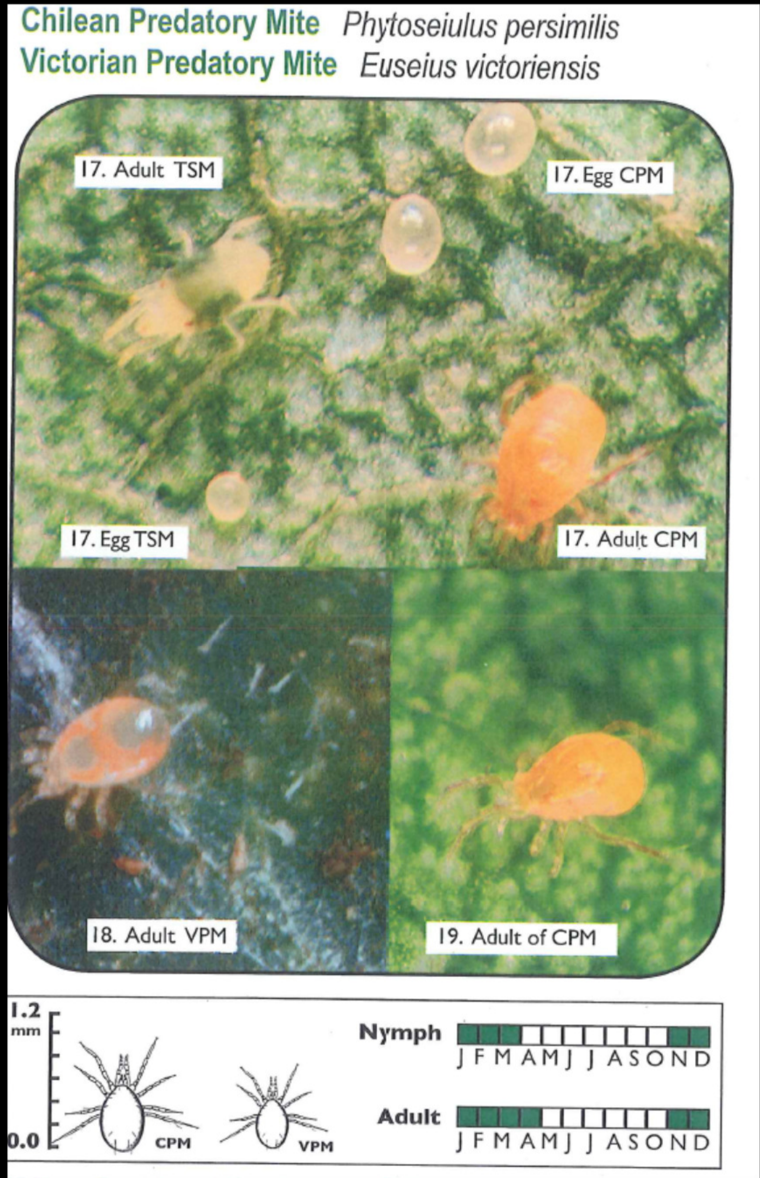
1970-80

Introduction of predatory mites

- Resistant to range of organophosphate insecticides
- Introduced to control phytophagous spider mites
- Grown on soy beans in field at Tatura for distribution

Predatory mites





Other introduced species:
Neoseiulus californicus, Amblyseius fallacis

IPM (or IPDM)

- Systematic approach to pest and disease management
- Combines use of:
  - natural enemies
  - cultural practices
  - selective chemicals
- Optimises pest and disease management decisions:
  - reduce crop damage
  - reduce environmental impact
  - improve returns

- **Based on thresholds:**
  - Pests can be present without causing economic damage
  - Each pest/ crop has a threshold beyond which control is required

- Similar to tolerance of pain
  - Everyone has individual level of tolerance
  - Various ways of responding to unacceptable pain

Factors determining level of pest attack

pest population build-up

- Climate
- Initial population carry-over
- Predation

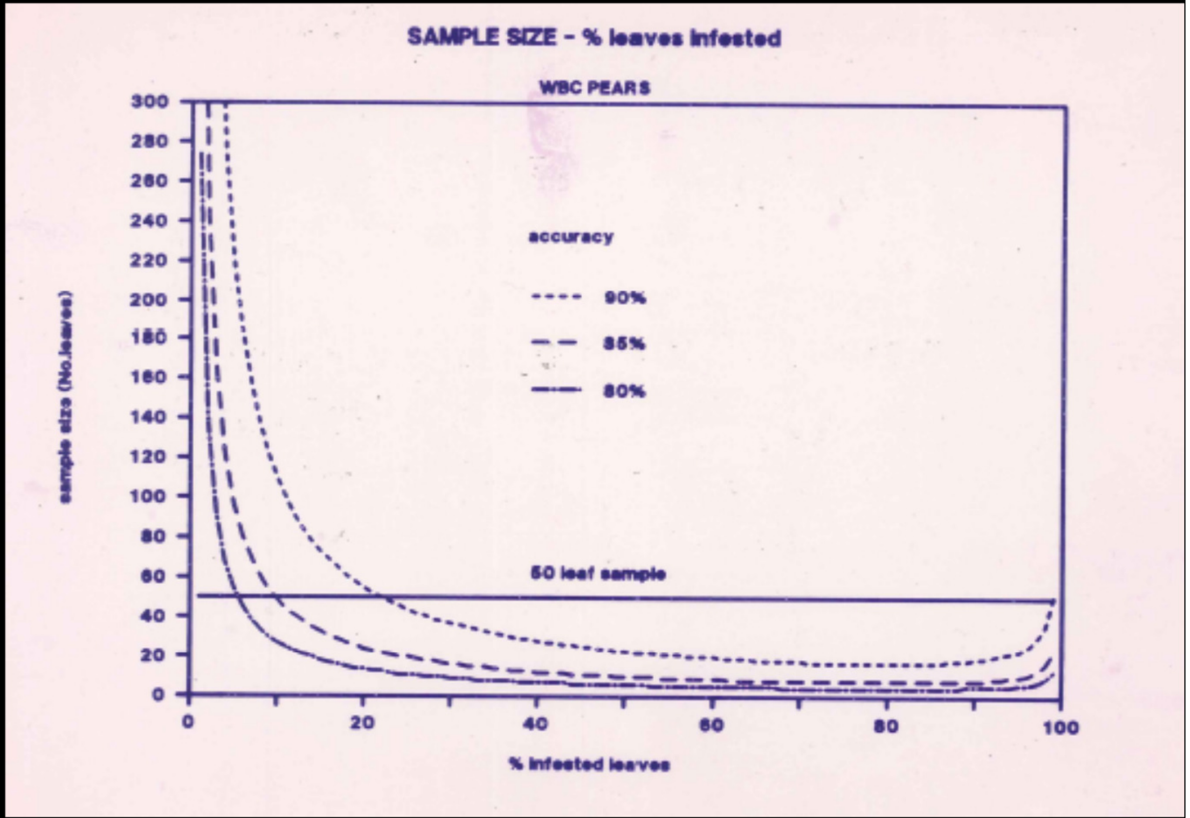
Timing of infestation relative to crop growth

Efficacy of control measures

- Timing
- resistance

Sampling

- % leaves infested is economical, fast, and you do not have to count every mite on a leaf
- Good relationship between mites/leaf and % leaves infested until >90% infested
- 5o leaf sample gives good accuracy/ reliability of population estimates
- Can be converted to CLIDs (cumulative leaf infested days) for predicting damage
- CLIDs accounts for multiple species, predation, and spraying



New techniques were invented to improve interpretation of thresholds

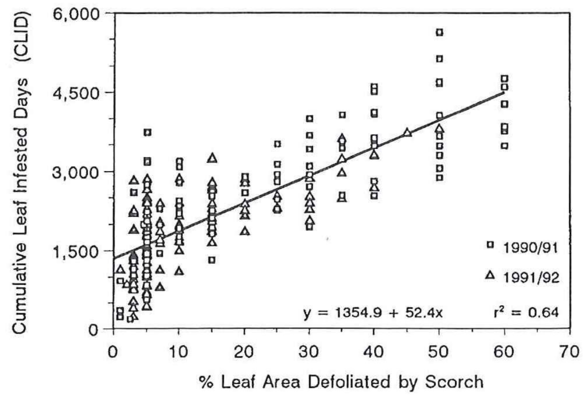


Figure 5. Leaf scorch response of Bartlett pear to Cumulative Leaf Infested Days (CLID) over two seasons.

e.g. Cumulative Leaf Infested Days (CLIDs)

- **Leaf scorch is not a simple desiccation process**
- **Low levels of scorch reduce fruit set and yield next season**
- **Leaf scorch is function of level & duration of mite infestation**
- **Presence-absence monitoring:**
  - accuracy as good as mites/leaf
  - > Simplicity
  - < cost

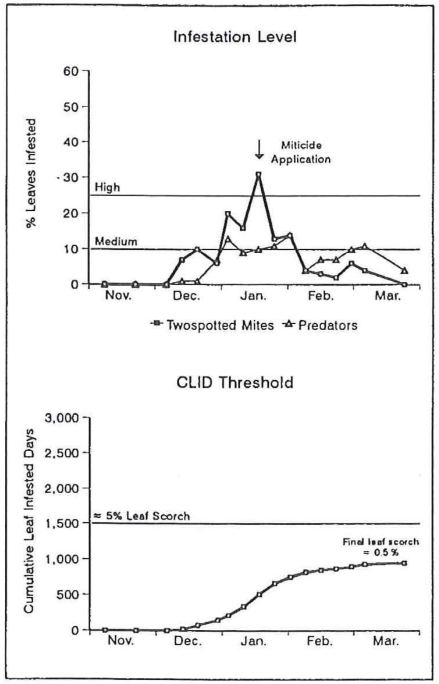


Figure 6. Results of field testing 5% preliminary damage threshold. Infestation level and CLID level reached during the season on a Bartlett block with a moderate TSM infestation.

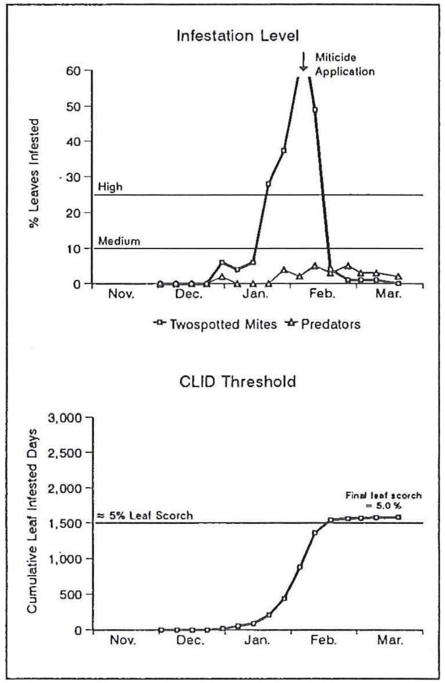


Figure 7. Results of field testing 5% preliminary damage threshold. Infestation level and CLID level reached during the season on a Bartlett bolck with a high TSM infestation.

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McNab SC, Jerie PH, & Williams DG. (1994)
DOI: 10.17660/ActaHortic.1994.367.62

CLIDs for WBC pears

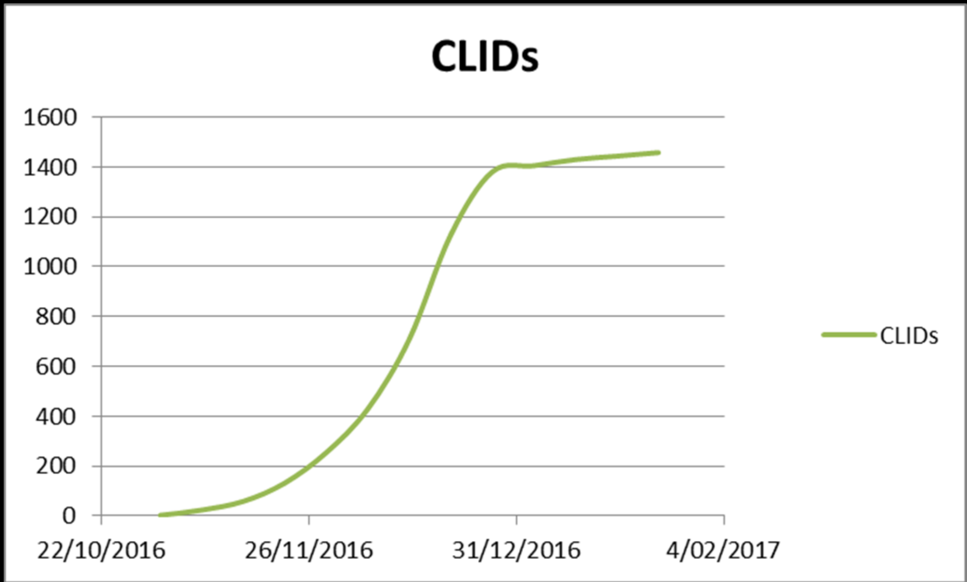
$LIDs = ((\%LI_{D1} + \%LI_{D2})/2) \times (D2-D1)$

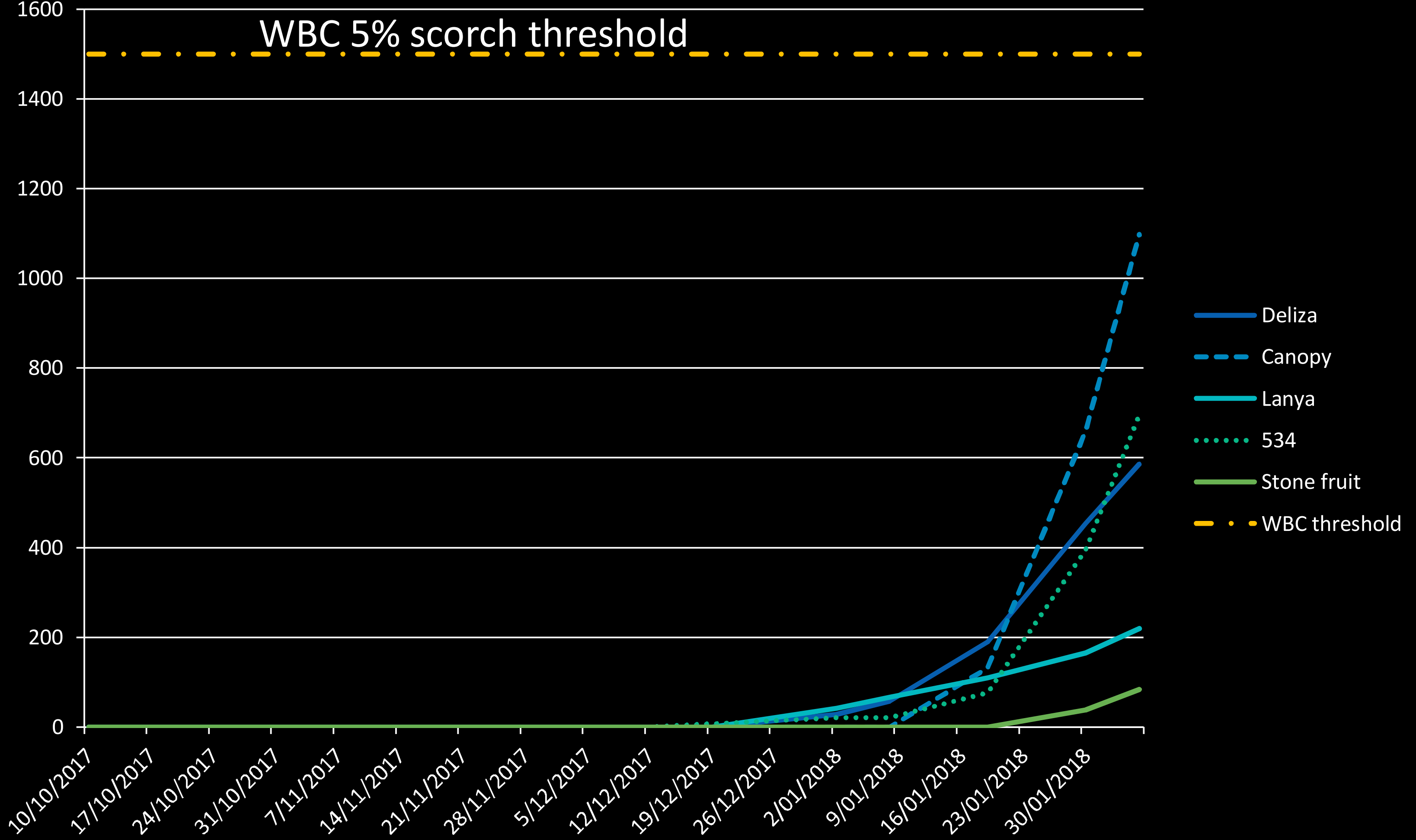
Example
LIDS = ((2+4)/2) x 7= 3x7= 21

$CLIDs = LIDs_{D1} + LIDs_{D2} + \ldots LIDs_{Dn}$
Example 2+21=23 CLIDs

% Scorch	CLIDs
1	1000
5	1500
10	2400
30	3000

date	%LI	LIDs	CLIDs
1/11/2016	2	2	2
8/11/2016	4	21	23
15/11/2016	6	35	58
22/11/2016	15	73.5	131.5
29/11/2016	20	122.5	254
6/12/2016	30	175	429
13/12/2016	50	280	709
20/12/2016	70	420	1129
27/12/2016	2	252	1381
3/01/2017	5	24.5	1405.5
10/01/2017	2	24.5	1430
17/01/2017	2	14	1444
24/01/2017	2	14	1458





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