Citricola Scale Biology and Management

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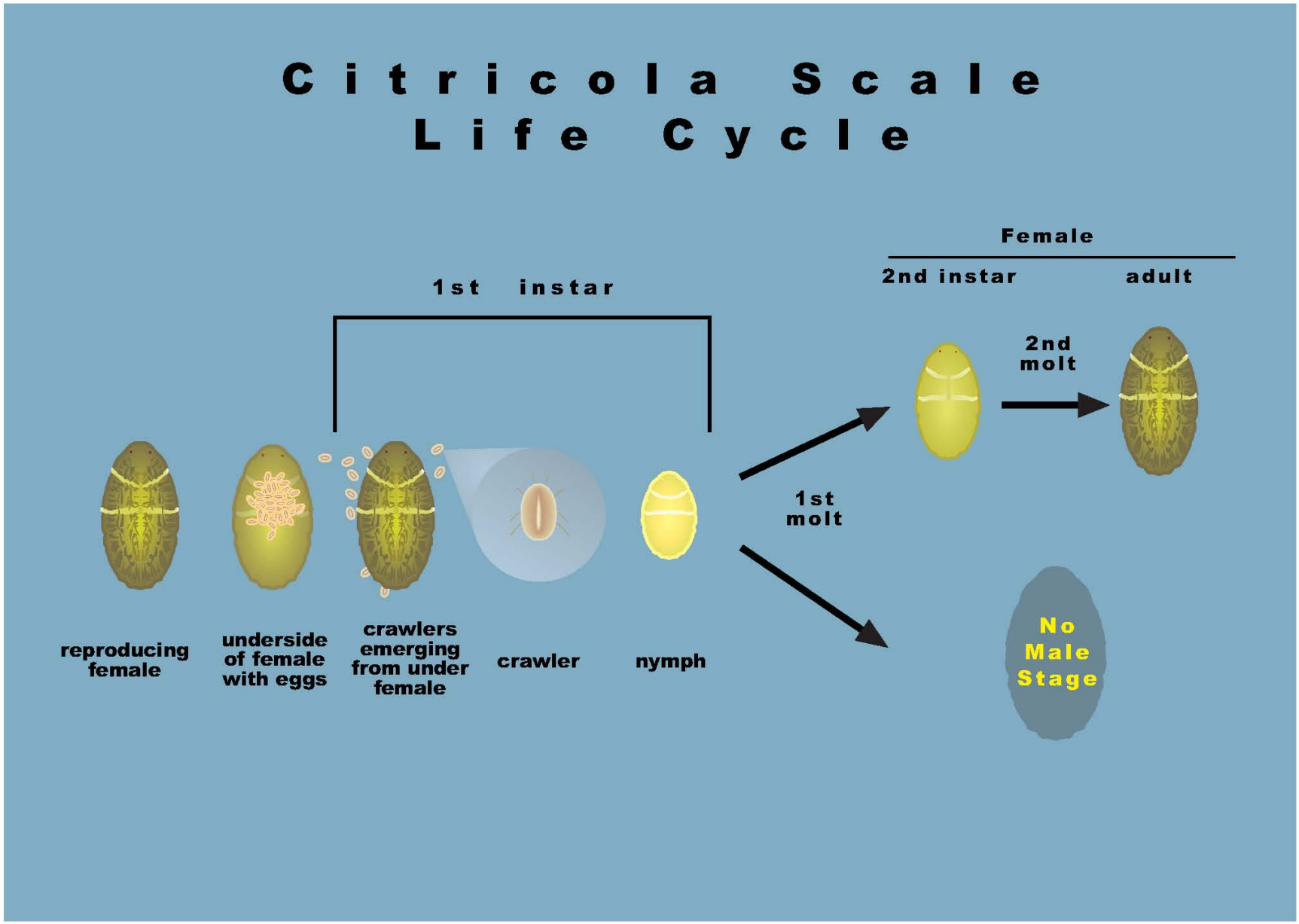
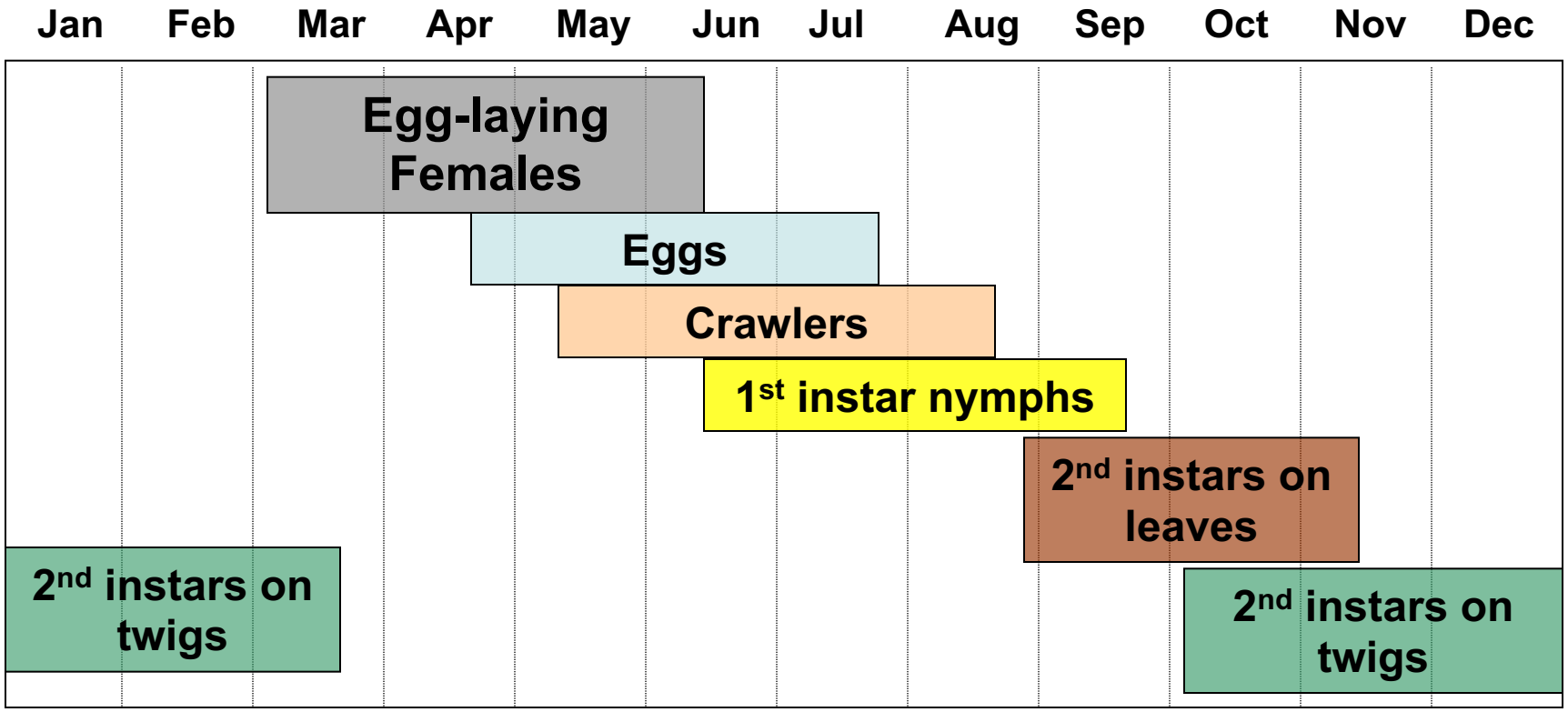


Citricola scales only molt twice a year, there are no males and each female can produce up to 1000 eggs!

Citricola Scale Lifecycle – San Joaquin Valley



Because there is only one generation/year, eggs, 1st instar nymphs, 2nd instar nymphs and adult females occur at different times of the year. This affects the timing of sampling and treatments.

April (Females on wood move to the ends of twigs)

Citricola scale females move from woody twigs to green wood at the ends of twigs and they get very plump as they ready themselves to lay eggs.

May-July (Adult females lay eggs & eggs hatch into crawlers)

In May the females begin laying eggs that hatch into crawlers through early July. The crawlers move out from under the females onto the leaves.

Late July-October (1st instar nymphs on leaves)

By late July, all of the female scales have died and the population consists just of 1st instar nymphs on leaves. The 1st instar nymph is the stage most susceptible to insecticides. BEST TIME TO TREAT IS LATE JULY-AUG WHEN ALL THE SCALES HAVE HATCHED AND MOVED OUT ONTO THE LEAVES.

Dead females on twigs

Live 1st instar nymphs on leaves

Nov-Mar (scales molt into 2nd instars that migrate to wood)

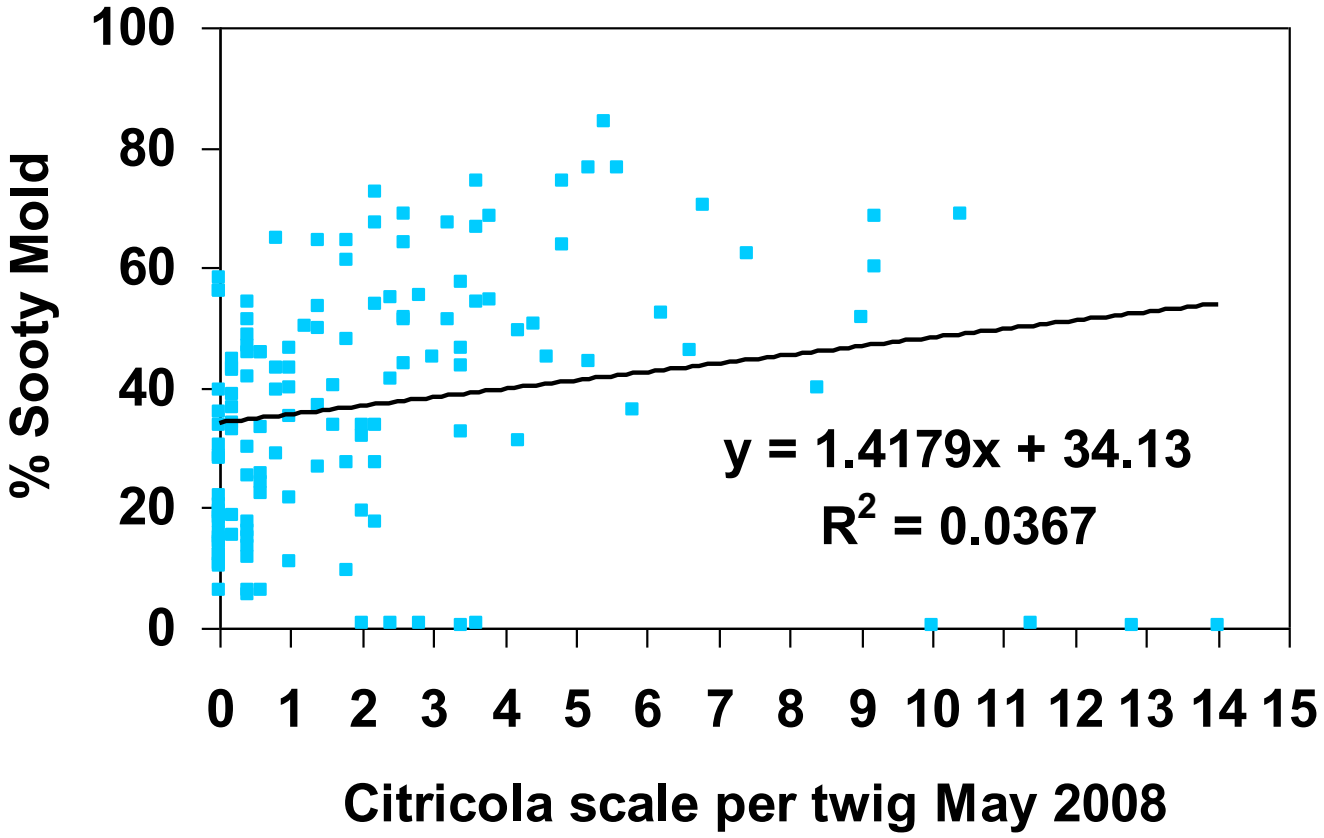
In November, the scales molt into 2nd instar nymphs and move back to the wood Where they spend the winter. In November the

April (scales molt into females)

In April, the scales molt into adults and produce lots of sooty mold

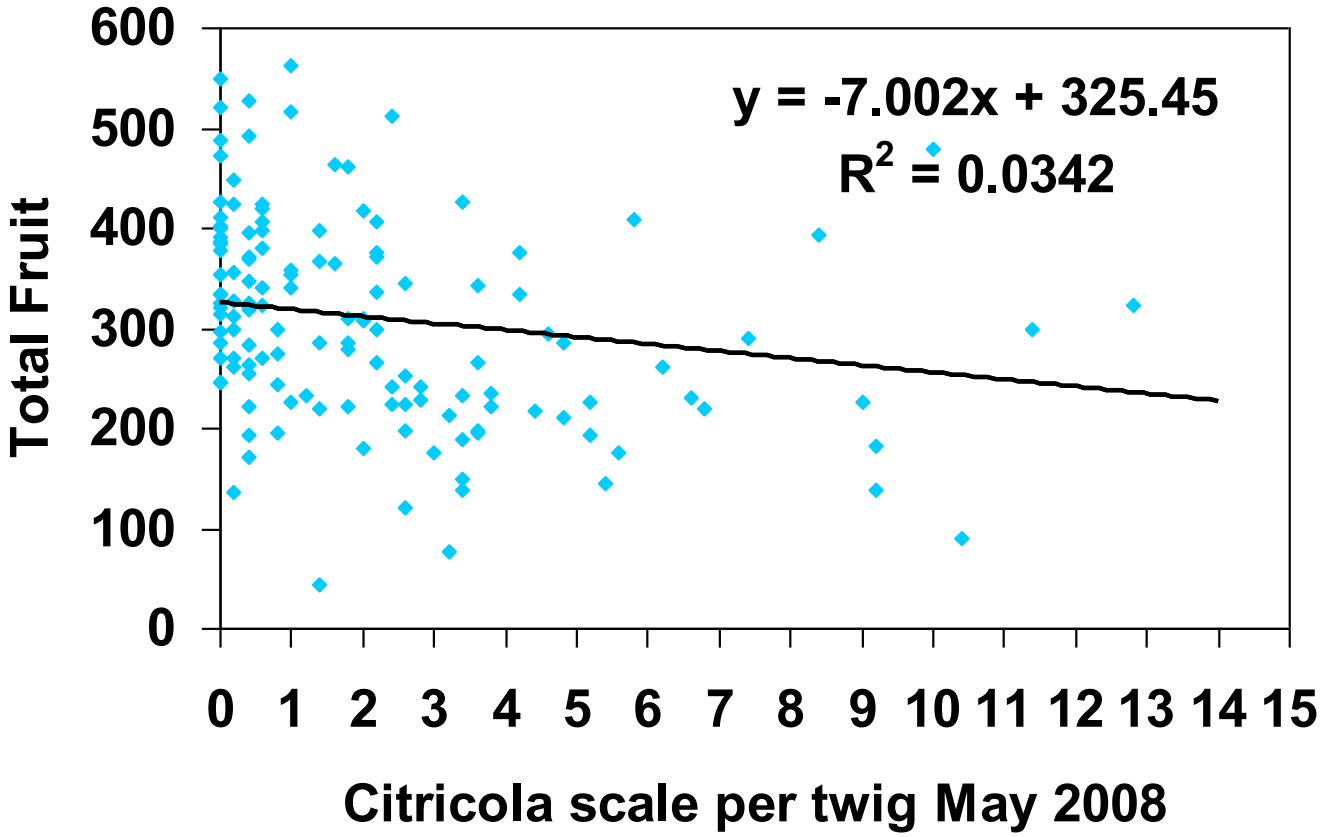
Citricola scale create sooty mold on the trees

The more citricola scale in the spring, the more sooty mold



Citricola scale reduce the yield of trees the year after

This is why the thresholds are so low (1 female/twig in spring and 0.5 nymphs/leaf in summer)



Valencia Harvest August 2009

Citricola scale nymph identification

Why is citricola scale such a problem in some years but not others?

Weather:

A wet cool spring and mild summer allows the females to create many eggs (1,000 per female), maximizes egg hatch, and helps the nymphs to survive

Sampling for nymphs in Jul-Aug

- Collect leaves from the NE corner of the tree.
- Choose fully expanded leaves in the shade
- Collect one leaf per tree and progress down the row till you have 25 leaves
- Count the number of scales per leaf (threshold is 0.5 scales/leaf)
  OR count the number of infested leaves (presence/absence)
- Repeat this procedure in four evenly spaced rows in the orchard

Citricola scale presence-absence sampling

0-4 leaves infested (no), 5-12 (?), >12 (yes)

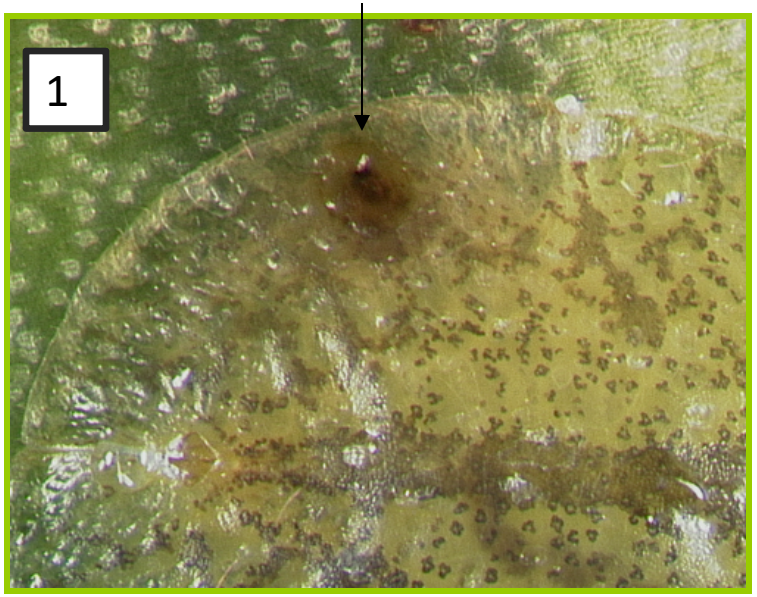
	Site 1	Site 2	Site 3	Site 4
Row 1	2/25 (no)	14 (yes)	18 (yes)	5 (?)
Row 2	1 (no)	15 (yes)	7 (?)	8 (?)
Row 3	0 (no)	24 (yes)	3 (no)	12 (?)
Row 4	0 (no)	22 (yes)	1 (no)	7 (?)

1 leaf from the NE corner of 25 trees in a row
Repeat this sample in four evenly spaced rows in the block

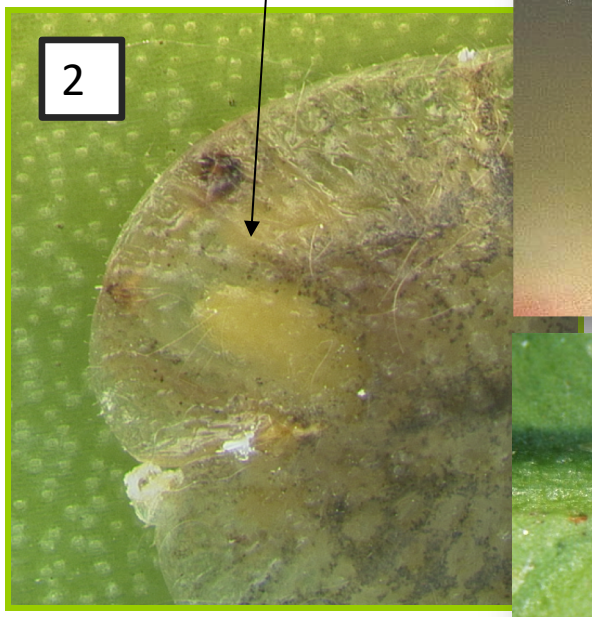
1st set of quiz questions (Q1-Q5)

Biocontrol: *Metaphycus helvolus* parasite of citricola scale

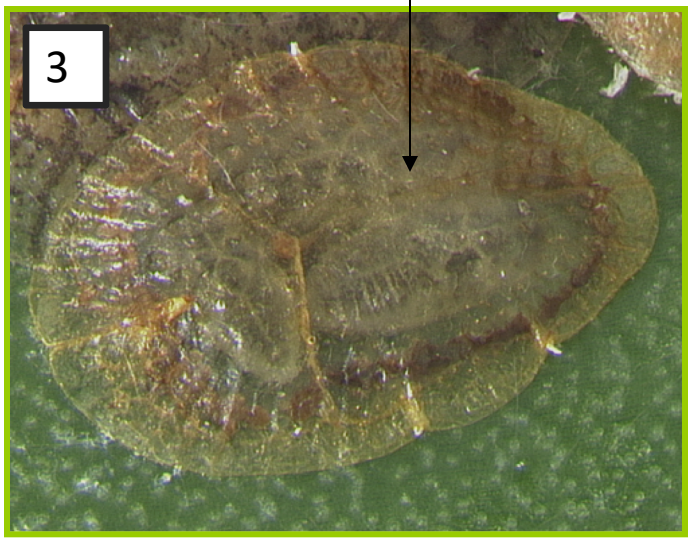
Egg



Larva



Pupae



Emergence Holes

Photos by Apostolis Kapranas

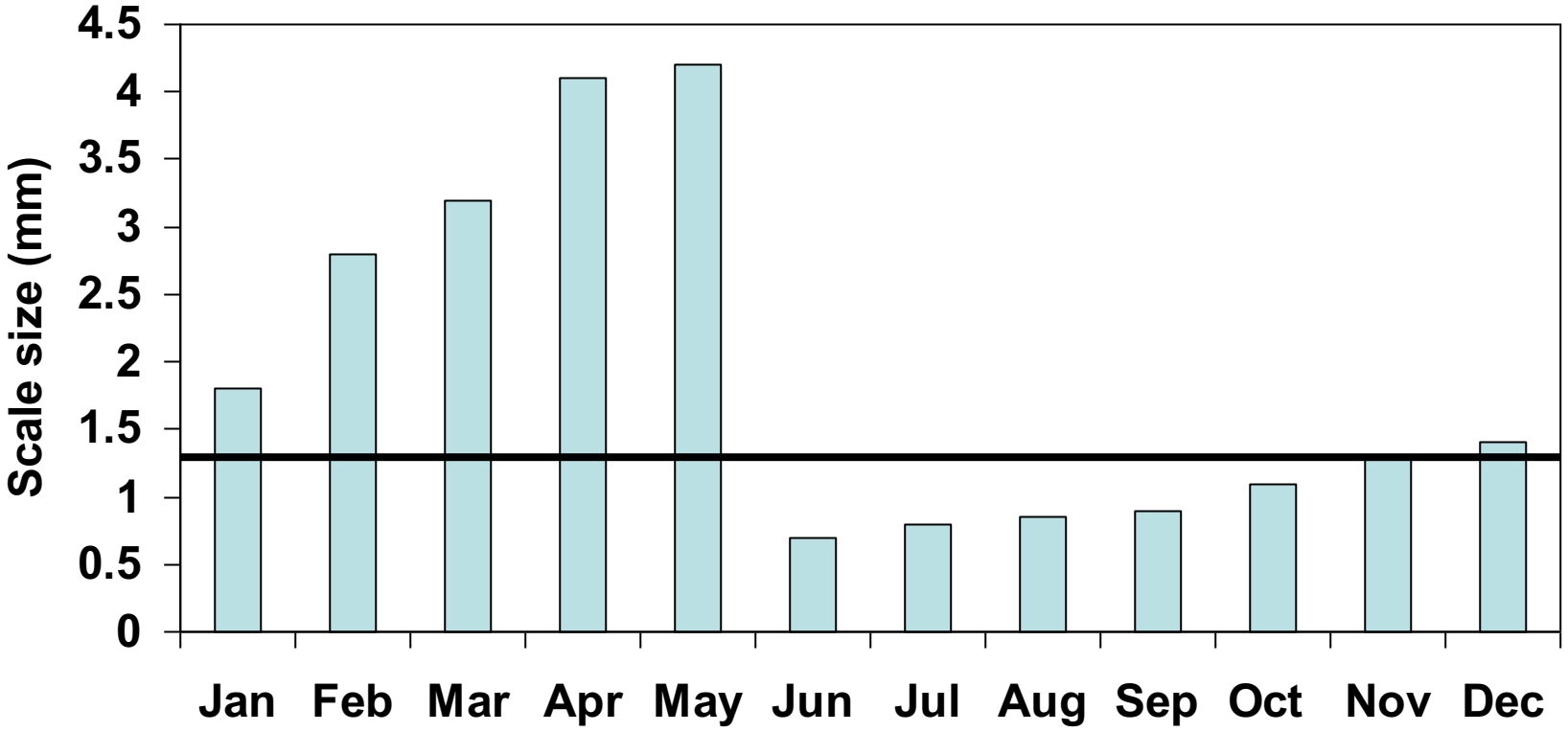
Biocontrol: *Coccophagus lycimnia*

Parasite of citricola scale

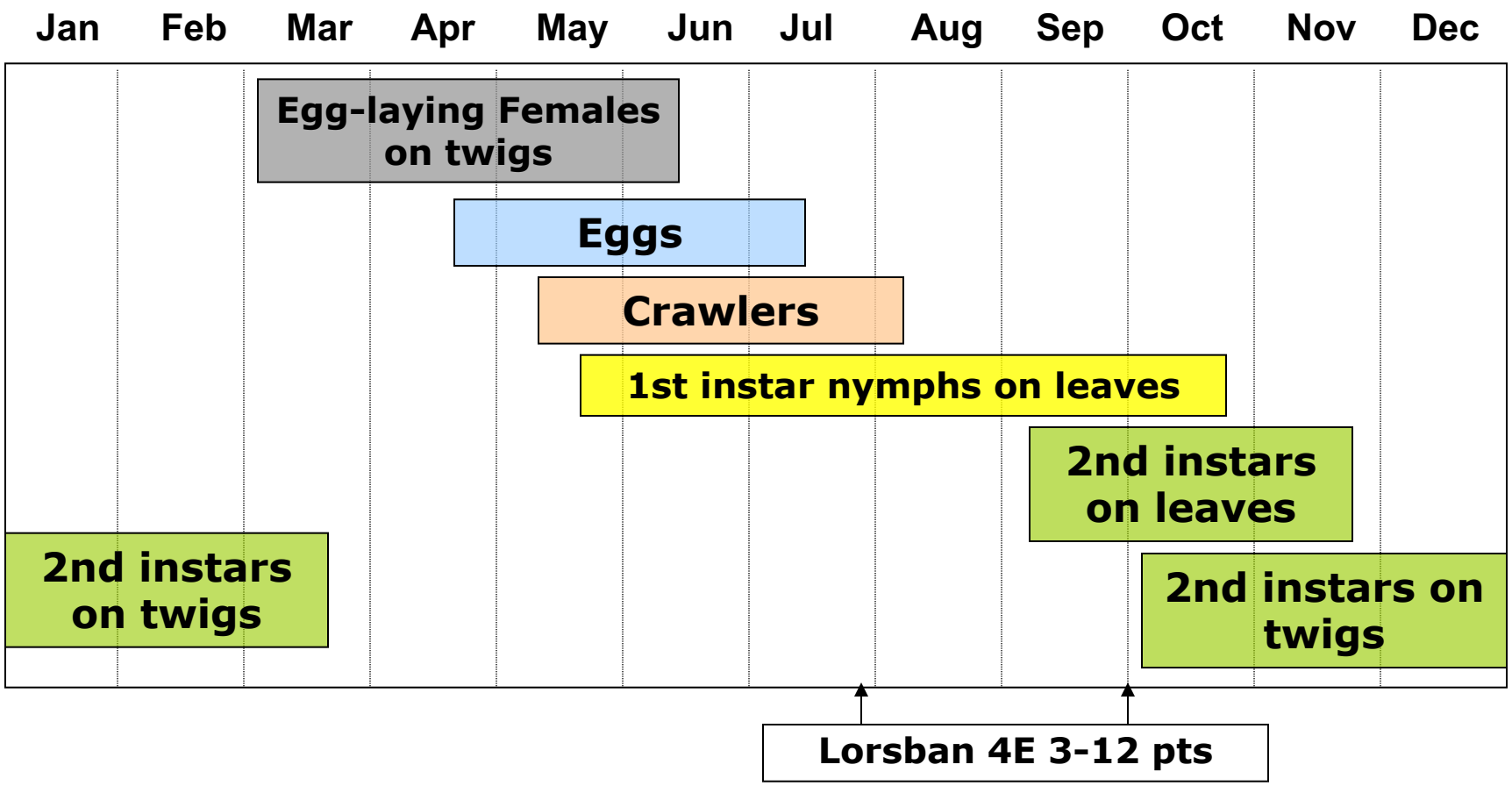
Photos by Lisa Forster

Biocontrol struggles in the San Joaquin Valley because:

- Parasites lay their eggs in scales that are ≥ 1.3 mm
- Those scale stages are only available 6 months of the year
- Alternative hosts are not common (brown soft scale, black scale)



Citricola Scale Lifecycle – San Joaquin Valley



While no longer registered for this use in citrus, for many years Lorsban was the main insecticide used to control citricola scale. It was applied in late July-early September to target the most susceptible stage – 1st instars.

Bioassay Method

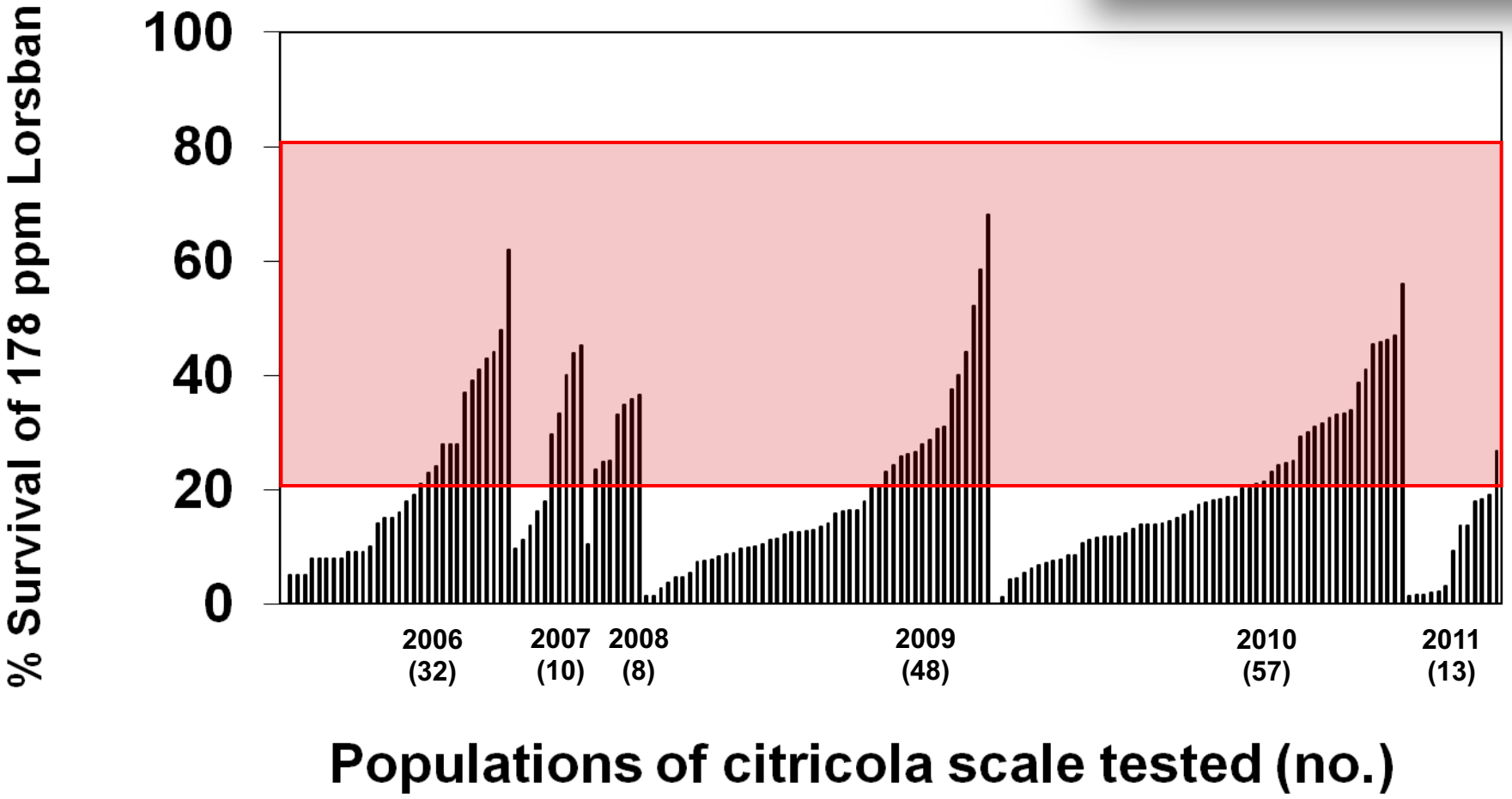
Collect leaves infested with nymphs (July-September)
Dip leaves for 3 seconds in 178 ppm of chlorpyrifos (Lorsban)
Place leaf on moist cotton pads, with stickem and cellucotton barrier
Wait 5 days to assess mortality

Citricola scale – Resistance Monitoring

40% of populations have organophosphate resistance

>50 years of exposure to Ops

Lorsban treatments only last 1-2 years



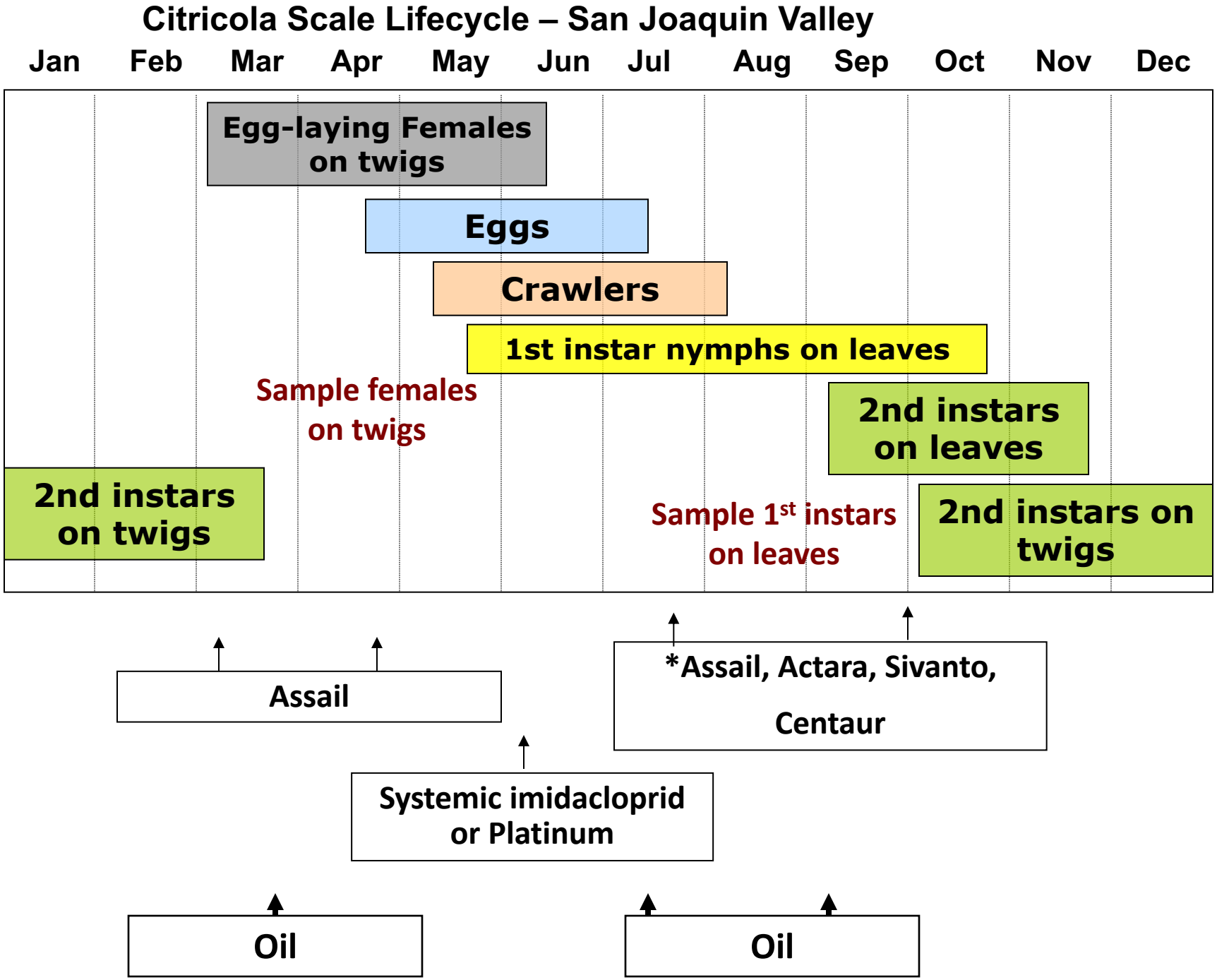
For resistance management, know your pesticide groupings

Mode of action	Group	Insecticides
1	Carb, OP	Sevin, Malathion (resistance)
4a	Neonic	Assail, Actara, Platinum, Systemic Admire and generics,
4d	Butenolide	Sivanto
16	IGR	Centaur (Applaud)
		Oil

Citricola scale develops resistance slowly

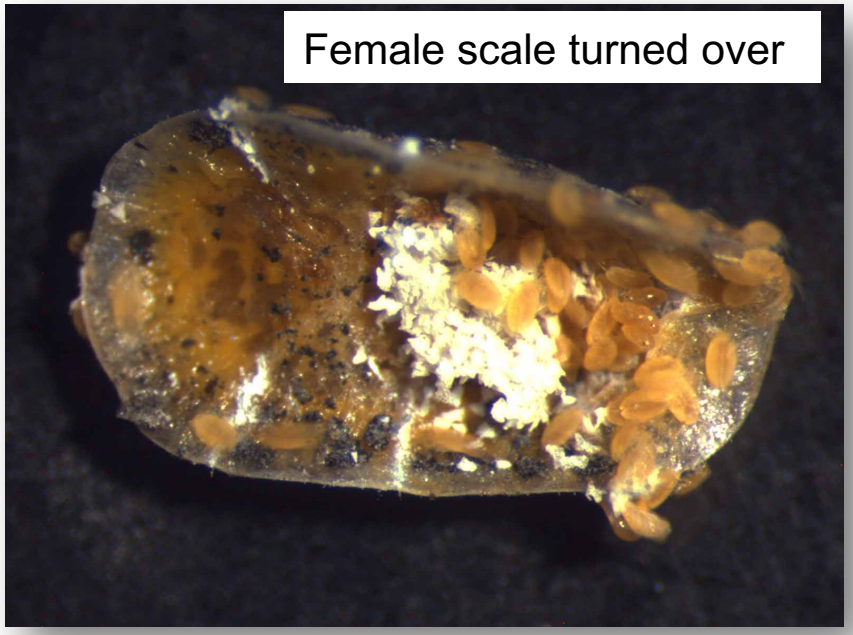
Organophosphate resistance:

citrus thrips (1980s) – California red scale (1990s) – citricola scale (2000s)

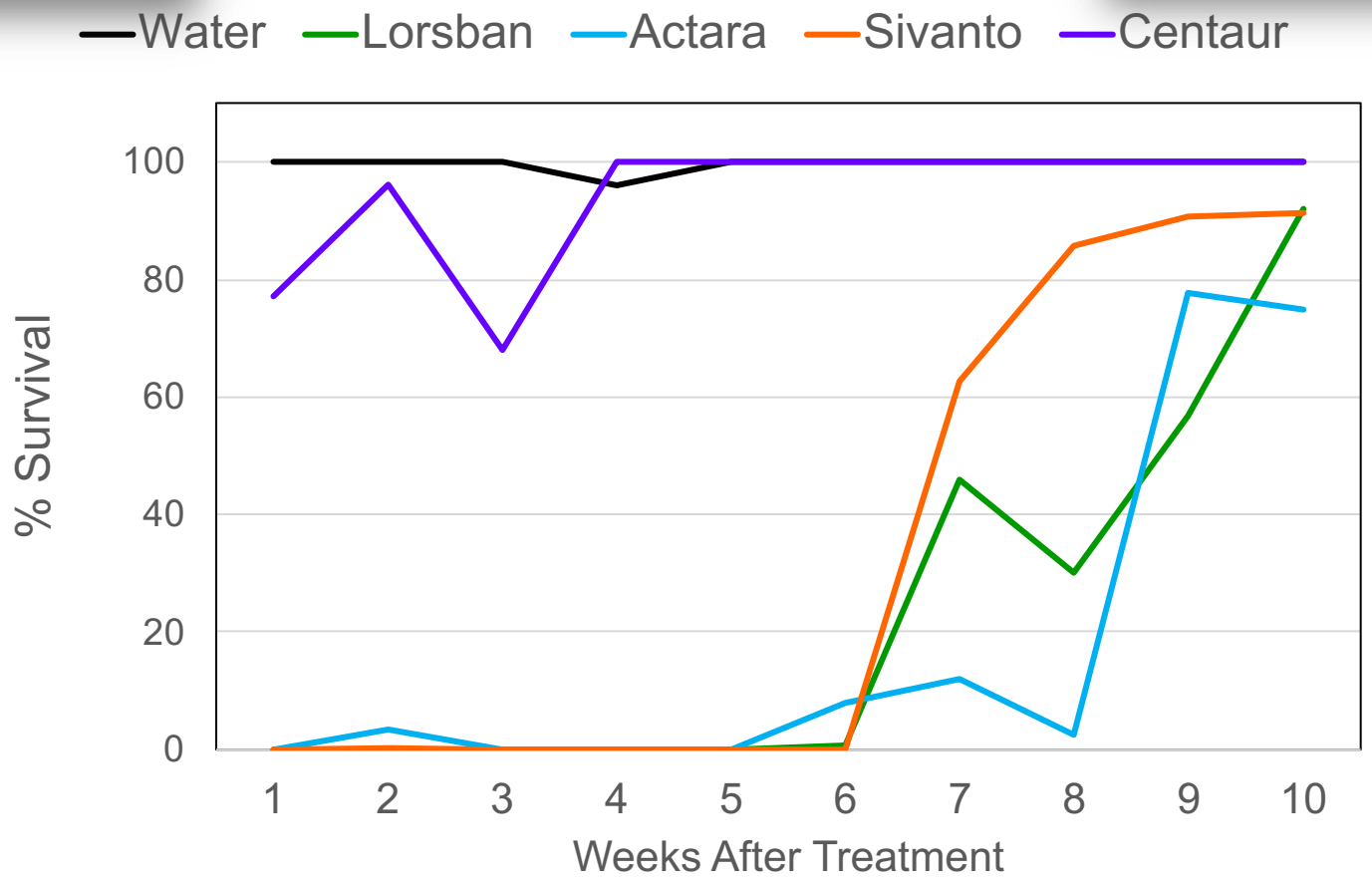

Citricola Scale Lifecycle – San Joaquin Valley
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Egg-laying Females on twigs
Eggs
Crawlers
1st instar nymphs on leaves
Sample females on twigs
2nd instars on leaves
2nd instars on twigs
Sample 1st instars on leaves
2nd instars on twigs
Assail
*Assail, Actara, Sivanto, Centaur
Systemic imidacloprid or Platinum
Oil
Oil

Best Management Practices

- Treat as soon as the eggs have completely hatched and the crawlers moved out on the leaves.
- Coverage is critical because the insecticide must contact the insect. Slow down the speed of the rig to get better coverage. (≥500 gpa at ≤1.5 mph)
- Adjuvants to improve coverage are helpful
- Assail, Sivanto > Actara, Centaur > Admire, Oil
- Low populations are well-controlled by anything



Impact of Insecticides on *Aphytis melinus* wasp parasites needed for California red scale control



Take Home Messages for Citricola Scale Control

- It's a numbers game, do not let populations get large before you begin to take care of them
- Timing for nymphs is late July - August: nymphs are easier to kill than adults for most insecticides
- Timing for adults is just prior to bloom
- Coverage: no matter what water volume, drive slowly (1-1.5 mph) because all of the newer insecticides require contact with the insect
- Centaur and oil are the only insecticides soft on natural enemies
- Adjuvants improve efficacy for most insecticides
- Don't keep using the same insecticide class or you will select for resistance

2nd set of quiz questions (Q6-Q10)

Which scale is alive?