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# Development of phenology models and a timing guide for the management of red scale in Australian citrus

## NSW DPI Citrus roadshow 2017

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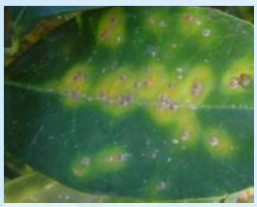
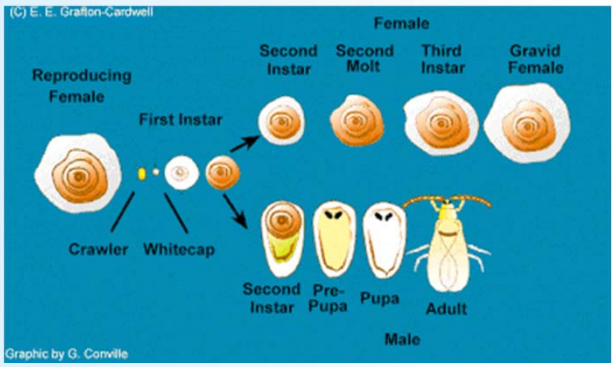
## Lifecycle



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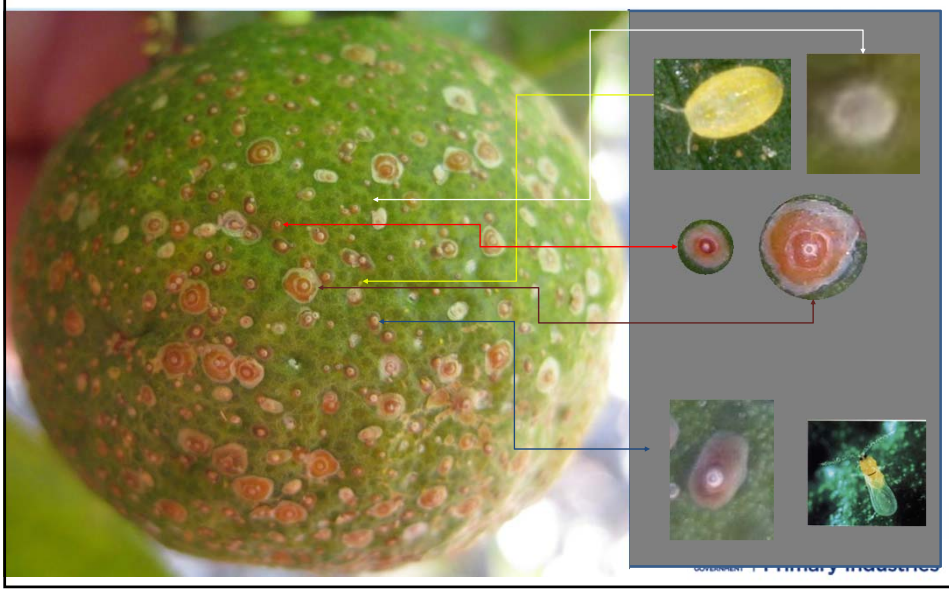
## Overlapping stages



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## Management

Biological

Chemical

Mating disruption

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## Biological control

- *Aphytis* wasps, *Comperiella* wasps, and *Rhyzobius* ladybird are common in the southern citrus regions.
- *Aphytis* wasps and *Chilocorus* ladybird are commercially available.

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## Chemical control

- OPs (e.g. Lorsban) and carbamates (e.g. methomyl)
  - High impacts on beneficials
  - Only effective against first instar (crawlers, white-caps)
- Systemic insecticides
  - Imidacloprid (Confidor Guard), Spirotetrmat(Moveno), sulfoxaflor (Transform)
  - Imidacloprid may have negative effect on bees
  - Movento targets young scales. Timing is less critical for Confidor.

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## Chemical control

- IGRs
  - Pyriproxyfen (Admiral), buprofezin (Applaud)
  - More IPM compatible but adverse effects on some ladybird beetles
  - Only effective against first instar (crawlers, white-caps)
- Oils
  - No residual activity against beneficials
  - Best used during peak crawler abundance
  - Good results but need excellent coverage

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## Chemical Control

- Red scale distribution is patchy. Usually there is no need to spray the whole orchard
- Red scale populations are usually kept at below damaging levels by natural enemies.
- Use of broad-spectrum insecticides may decimate natural enemy populations resulting in an increase of red scale populations.

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## Mating disruption

- Red scale females need to mate before reproducing.
- Overseas studies have shown potential of mating disruption in red scale control.
- Not yet trialed in Australia

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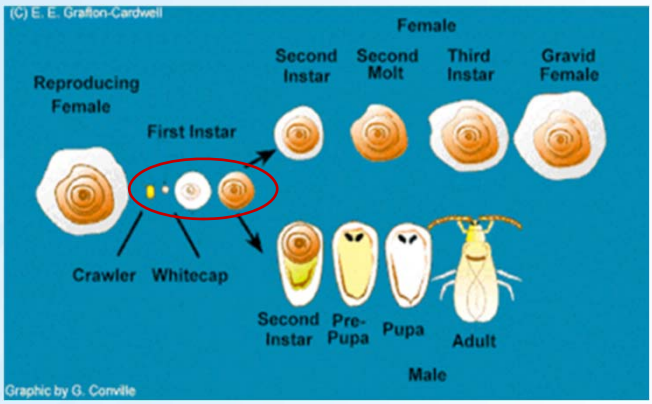
## Vulnerable stages

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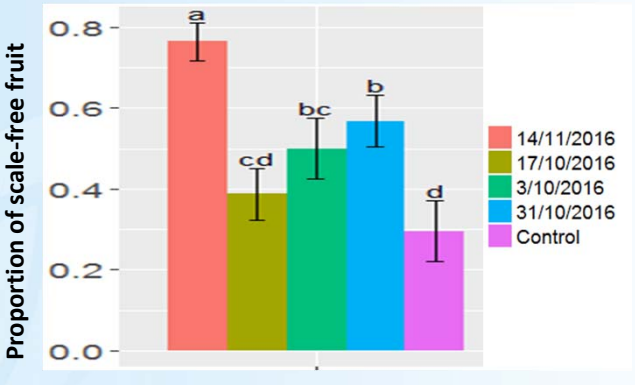
## Timing trials
## (Oil + half rate chlorpyriphos)




**November timing better than other timings**

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## Predict timing of target stages

- Male red scale flights can be monitored with pheromone traps to predict crawler emergence
- Prediction tools have been developed in Spain and California

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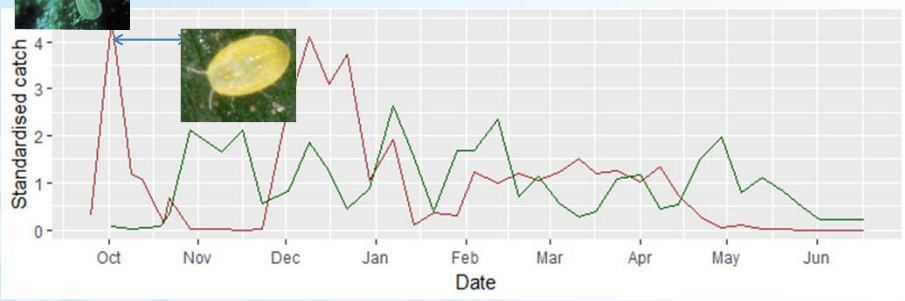
## Male flights and crawler peaks - Riverina




A time-lag of of 27-50 days between the 1st male flight peak (mid Sep – early Oct) and the 1st crawler peak (late Oct- mid Nov)

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## Take Home Message

- Biological control is the key to successful red scale management. Avoid the use of broad-spectrum insecticides where possible.
- Red scale populations are patchy. There is usually no need to spray the whole orchard.
- Oil and growth regulators are best timed to target crawlers, white-caps and first instar.
- Red scale females need to mate to reproduce. Males seek out virgin females by sex pheromone.
- Work is in progress to develop a timing guide for red scale control using pheromone trapping data.

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## Acknowledgements

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Hort Innovation Strategic levy investment | CITRUS FUND

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