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Citrus leafminer

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Citrus leafminer (CLM), *Phyllocnistis citrella*, are the only leafminers attacking citrus in Australia. Originating from southeast Asia, the citrus leafminer moth was first found in Western Australia in 1995. Citrus leafminer is present in most citrus producing areas of the world.

Fig. 1. CLM larvae produce characteristic snake-like mines on citrus leaves. Photo C. Freebairn

Damage

- Attacks all citrus varieties.
- Larvae infest the young flushing foliage, producing a snake-like 'mine' as they feed (Fig. 1). This damage causes the attacked leaves to twist and curl (Fig. 2).
- Larvae can also attack fruit and stems, though this damage is rarer.
- Severe infestations can retard growth of young trees. Infestations on older trees (older than 5 years) can cause unsightly damage, but do not normally cause significant yield losses.
- In Western Australia, attacks are most severe in late autumn peaking in April or May, depending on temperature.
- In spring, damage is minor as the leafminer population is smaller. As a result, only a small proportion of the prolific spring flush is attacked.

Fig. 2. Young tree attacked by citrus leaf miner. Photo C. Freebairn

Lifecycle

- Adults are about 2 mm long, silvery white in colour with wings fringed with long hairs (Fig. 3). They are seen and are active in the morning and night.
- Females lay eggs singly under the leaf. Females can lay up to 50 eggs. Newly emerged leaflets (10-20mm) are the preferred egg laying site.
- After 2 - 10 days the larvae hatch; there are 3 larval stages. When they first hatch, larvae are pale-green and difficult to see. As they begin feeding on the leaf, the larvae excrete their faeces into the mine forming a visible central trail.

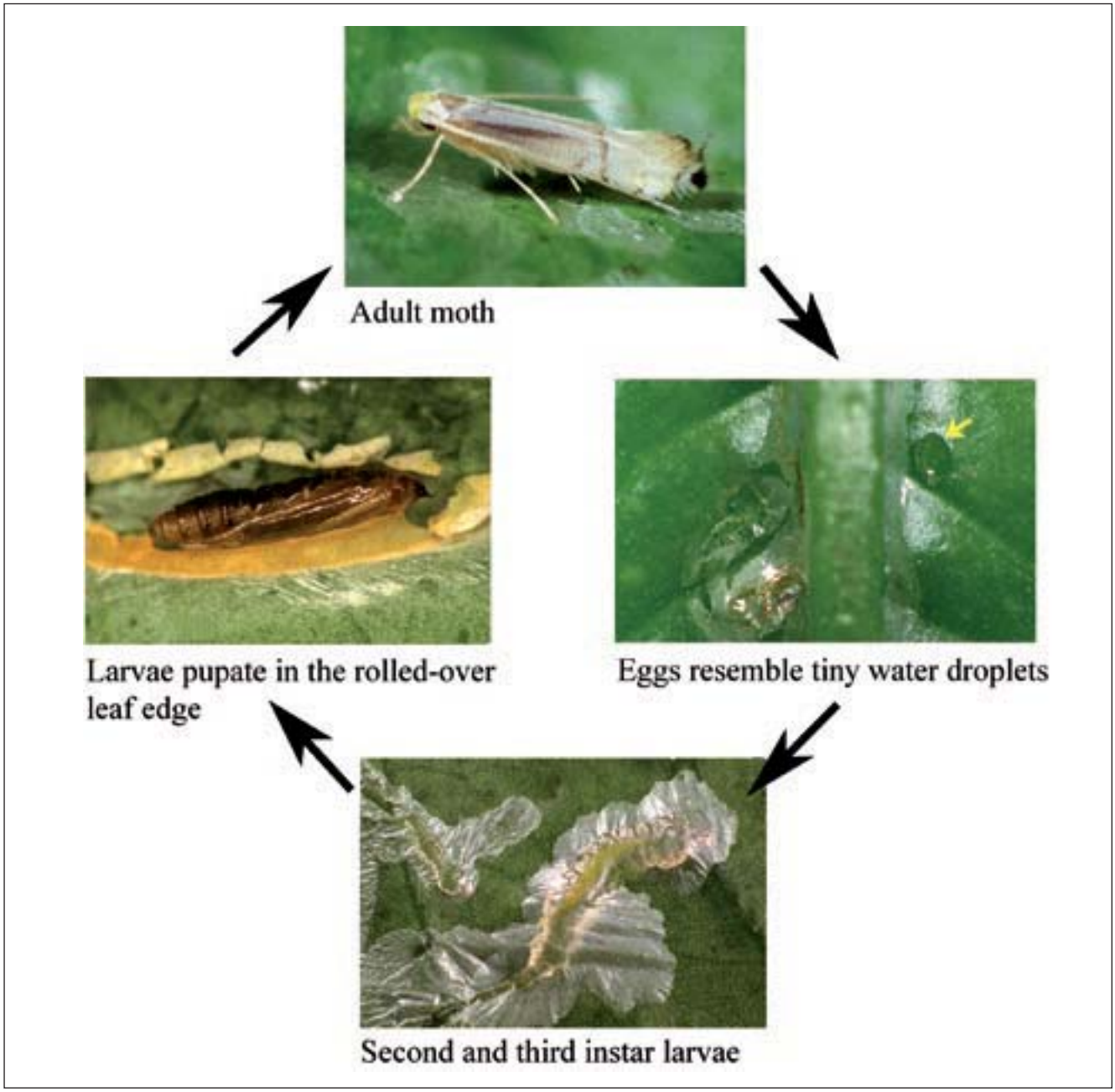

Fig. 3.Citrus leaf miner life cycle. There are up to 15 generations per year, depending on temperature. Photos C. Freebairn

- Larvae cannot move from leaf to leaf or from lower to upper leaf surface, but remain on the same leaf throughout their life. 1-8 larval mines can be found on a single leaf.
- When larval feeding is completed (5-6 days in summer), the third instar mines near the edge of the leaf causing the leaf margin to fold over. The larva moults into the fourth instar or prepupa.
- Pupation occurs in a fold on the edge of the leaf. The pupa remains in the mine until it emerges as an adult. The pupal stage lasts 6 days.

Monitoring and action level

- Monitor production of significant growth flushes (more than 25% of trees flushing) on trees less than 5 years old. Examine at least 20 advanced shoots (shoots that have emerged earlier than most of the other foliage).
- Action needs to be taken if 10% of the more advanced flushes are infested by CLM.

Control

Chemical

- Insecticidal control is difficult to achieve because the larvae are shielded within their mines. The pupal stage is also protected by the rolled leaf margin.
- **Horticultural oil sprays** reduce leafminer numbers by reducing egg lay. The tiny moths avoid surfaces sprayed with oil, so sprays should be applied before too many eggs have been laid.
- Two or more sprays may be required when new leaves are produced over an extended period.
- New growth should be protected as soon as it has formed. Once leaves have hardened, they are resistant to leafminer attack.

Fig. 4. Cirrospilus quadristriatus *adult* (above)*, pupa* (below)*. Photo C Freebairn*

Fig. 5. Native parasite of citrus leafminer, Semielacher petiolatus. Adult and pupa shown.

Cultural control

There are several ways to reduce infestations by limiting the production of new leaves when leafminer numbers are highest:

- Prune growth flushes;
- Fertilise in late winter to promote strong spring growth when CLM is rarer;
- Do not over water or over fertilise in late summer and autumn.

Biological control

Parasites

- Three of the most effective parasites in Asia (*Citrostichus phyllocnistoides*, *Cirrospilus quadristriatus* and *Ageniaspis citricola*) were introduced into Queensland in the 1990's. These species were then released into Western Australia from Queensland. Only one species, *Cirrospilus quadristriatus,* appears to have established in southern WA.
- A native wasp, *Semielacher petiolatus,* is also found in WA. Both species attack the CLM larva, leaving distinct pupal cases (Figs. 4 and 5).
- Parasitism levels are low – usually less than 5% of all larvae appear to be attacked in WA. In Queensland the introduced wasps can parasitise up to 90 per cent of CLM larvae.

Predators

- Predators feed on CLM; these include green and brown lacewings (Fig. 6).

Fig. 6. Green and brown lacewing larvae also prey on citrus leafminer larvae. Photo S. Broughton

Acknowledgements:

photographs were taken by Sonya Broughton and Chris Freebairn (QDPI).

Further reading:

Citrus pests and their natural enemies: integrated pest management in Australia edited by D. Smith, G.A. Beattie & R.H Broadley, published by Queensland Department of Primary Industries, 1997.

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