NSW GOVERNMENT
Department of Primary Industries
primefact

Macadamia lace bug management and control

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Introduction

Macadamia lace bugs (*Ulonemia* spp.) are native to northern NSW and Atherton, Queensland. Macadamia species and other similar Proteaceae plants are their native host. There are at least four macadamia lace bug (MLB) species, with Ulonemia decoris, which is the most damaging, found in NSW. Once established, MLB populations can increase rapidly and become self-sustaining.

Pest identification

Macadamia lace bugs are small insects, approximately 3–4 mm long (Figure 1). This makes them difficult to see with the naked eye, therefore it is important to look for symptoms to identify their presence in your orchard. They are named for the intricate 'lace-type' pattern on their hemelytra and thorax. Adults lay eggs into the plant tissue and nymphs emerge within days to begin feeding. The nymphs go through five instar stages before becoming adults. The adults can fly well and have been reported to disperse to other populations up to 20 km away, making it easy for them to recolonise in areas from which they had previously been eradicated.

Macadamia lace bug lifecycle

1. One adult female lace bug can produce up to 21 nymphs in 6 days.
2. Eggs are laid inside florets (you need to dissect the flower to see them) and at 25 °C, full maturity can be reached within 12–19 days.
3. All five instars (stages of insect growth and development) can damage the flower.
4. Reports of 20–30 nymphs on each raceme in infected orchards are common.
5. Lace bug remains in the orchard throughout the year. During non-flowering periods, they hibernate on the macadamia tree bark until the next flowering occurs.
6. Lace bug populations decline when flowering concludes, but once a food source (e.g. flowers) becomes available, the population increases dramatically.

A Northern rivers grower tracked macadamia lace bug population growth during flowering on his organic macadamia orchard. Using daily misting of trees with pyrethrum (knock down spray), the insects would fall onto a drop sheet where they could then be counted. Figure 2 shows the increase in the number of adult lace bugs per square metre after flowering. It is important to note that 100 lace bug per square metre equates to 1 million lace bugs a hectare.

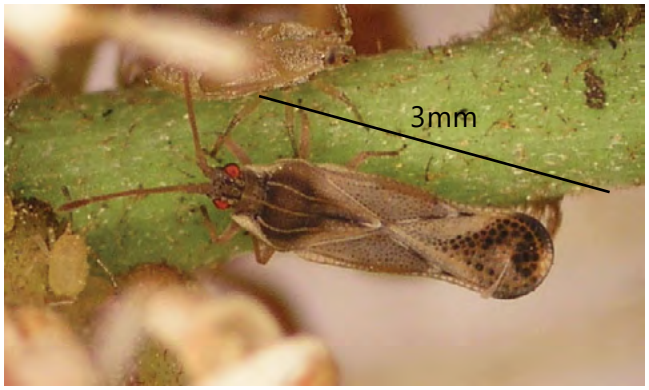

Figure 1. Adult macadamia lace bug (Ulonemia decoris, approximately 3 mm long) on a raceme. Nymphs are also present, directly above and to the left of the adult. Photo: Craig Maddox.

Incidences of macadamia lace bug

Macadamia lace bug has been reported in:

- Far North Queensland
- Glass House Mountains
- Gympie
- Mid North Coast
- Northern Rivers.

Lace bug populations and damage are increasing across the industry. Some possible causes for this include:

- extreme weather such as hail storms or cyclones have knocked crops off the tree and triggered out of season flowering. This has provided a food source for lace bug.
- lace bug damage occurs very quickly i.e. in days not weeks.
- the loss of endosulfan and the use of more broad-spectrum long-lived chemicals.
- timing of control applications might not have been ideal. Late applications allow lace bug populations to increase. This results in widespread damage in a short time. Once the lace bugs have damaged the racemes, the cropping potential for those racemes is lost.
- ineffective spray coverage will result in unsuccessful lace bug control.

This should provide sufficient motivation for macadamia areas without lace bug to ensure their on-farm biosecurity will keep them free from this destructive pest.

Risk period

The peak risk period for macadamia lace bug is from pre-flowering to peak flowering (Figure 2).

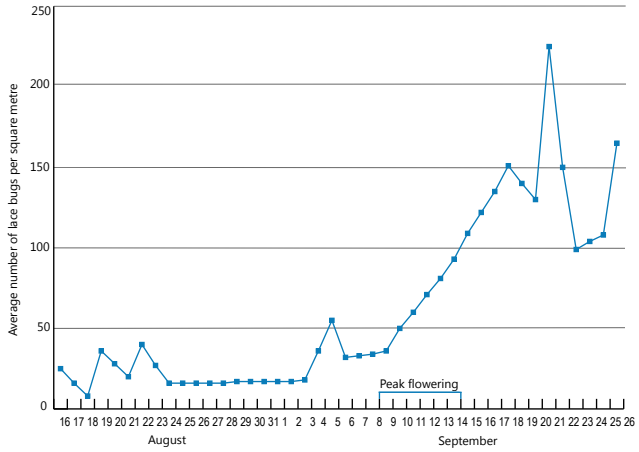

Figure 2. Macadamia lace bug population during the 2013 flowering season.

Damage

MLB pierces the plant tissue to feed on sap, damaging the leaves and flowers, starting at the tips where they appear blackened (Figure 3). Left unchecked, the whole flower blackens and dies (Figure 4). Shaking the head of infested flowers reveals MLB. Nut set is prevented when MLB is not treated, causing > 90% production losses in later varieties. These losses can happen quickly, so monitoring your crop early (e.g. at pre-flowering) and consistently is essential. Look for cast lace bug skins on dead florets and live nymphs on racemes (Figure 5).

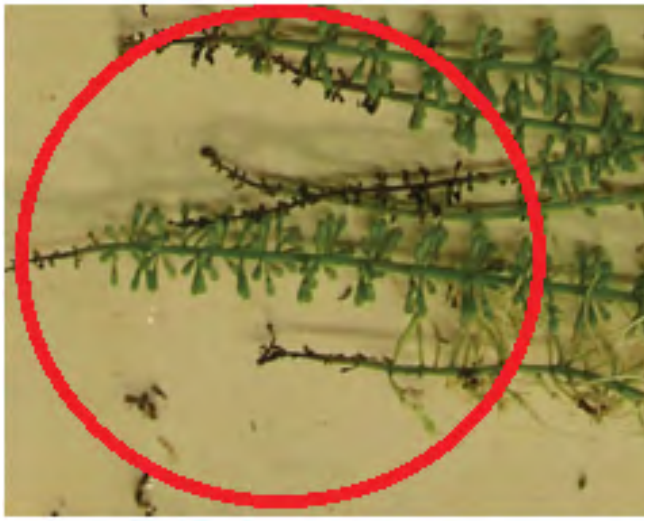

Figure 3. Pre-flowering racemes with lace bug damage highlighted. Photo: Craig Maddox.

Figure 4. Florets damaged by macadamia lace bug. Photo: Craig Maddox.

Figure 5. Cast lace bug skins on dead florets. Photo: Craig Maddox.

Managing macadamia lace bug

MLB numbers build up over successive seasons as they overwinter on the bark of trees. If they were a problem last year, then they will probably be a problem the following year and will most likely radiate from the same location within the orchard. Start monitoring when the flower raceme is green and unopened, especially if MLB was a problem the previous year. Early action now will mean less damage later. MLB damage worsens when multiple flowerings extend throughout the season. MLB can trigger out-of-season flowering when the main flower set is destroyed. Ethephon (e.g. Ethrel®) has been used successfully to promote nut drop and return trees to synchronised flowering where out-of-season flowering has occurred. However, you should be wary of applying Ethrel to stressed trees. Implementing good orchard hygiene is important. Cleaning equipment and clothing when moving between farms is a good way to prevent MLB movement.

Cultural practices

The most important tool to use is a professional pest consultant. These should be engaged early (e.g. at pre-flower) to enable timely detection and control. Generally, what was a 'hotspot' last year will probably be a hotspot this year. Recognising hotspots is an effective early indicator of lace bug movement. Be careful not to spread lace bugs on clothes and equipment from these hotspot areas.

Pruning to open the trees up for light and ensuring adequate, manageable tree height will help. It will also enable more effective spray coverage and improved light penetration to the orchard floor, which will increase the diversity of the plants in the inter-row.

Only adult lace bugs fly. Nymphs are restricted to walking and seem mostly sedentary, not moving from a single raceme until they moult.

Once canopies close within the row and across the rows, a highway has effectively been created for the lace bug to spread within the orchard. Closed canopies increase the spread of lace bugs by decreasing the distance between resource islands.

Reducing lace bug populations as well as limiting their food source (i.e. out of season flowering) is essential. However, this can be difficult as lace bug infestations prevent nut set which triggers out of season flowering (as no crop has been set, the trees produce another flowering).

Minimising the effects of lace bug (a good nut set will limit the amount of out of season flowering) and developing a strategy to minimise out of season flowering is also important.

Biological practices

Macadamia lace bug has many naturally occurring enemies such as predatory bugs, lacewing larvae (Figure 6), ladybird larvae and spiders. While these beneficial species might not appear in sufficient numbers to control a rapid increase in lace bug populations at flowering, their preservation is an essential part of a long term sustainable integrated pest management approach in macadamias.

Figure 6. Lacewing larva (right) versus lace bug nymph. Note the dead bodies on the lacewing's back. Photo: Chris Fuller.

NSW DPI has been conducting preliminary trials incorporating commercial beneficial insects such as lacewings. Results will be provided as soon as they are available.

Chemical practices

Careful consideration is needed when applying control compounds during flowering to ensure minimal effect on honeybees and other beneficial insects (pollinators). Applying crop protection compounds onto open flowers should be avoided where possible. If deemed necessary, then flower sprays using trichlorfon should be applied late in the afternoon after bees have finished foraging. Communication with beekeepers is essential for protecting the crop and pollinators. Early identification of lace bug, e.g. at pre-flowering, means that spraying open flowers will be eliminated, thus preventing any harmful effects to bees.

Pyrethrins are pesticides found naturally in some chrysanthemum flowers. They are a mixture of chemicals that are toxic to insects and are commonly used for domestic pest control. Natural pyrethrum is recognised as organic and will provide effective protection against lace bug. However, it will also disrupt beneficial insect populations. Pyrethrin is toxic to bees but will exhibit a repellent effect.

Effective spray coverage is critical for managing lace bug. Poorly calibrated and set up spray rigs will not control lace bug in the tops of trees. Always undertake annual spray calibration and factor in new growth and tree height. Remember the majority of your crop is in the top third of the canopy of large mature trees. If your spray coverage is not reaching that part of the canopy, engage a professional to help calibrate and set up your machine to deliver the correct dosage over the whole crop.

There are four permitted compounds that are effective against lace bug (Table 1).

Growers that use ethephon to drop the crop early for harvesting efficiencies have noted that the majority of out of season flowers are also dropped. This provides a break in the crop cycle, reducing the food source for lace bug and consequently the population and damage in the coming season. However, using ethephon is an overall management change (harvesting) and careful consideration is needed before its use.

Research to improve lace bug control

NSW DPI is continuing its research and development for the macadamia industry by screening new compounds, trialling potential biological controls (beneficial insects such as lace wings) and gaining a greater understanding of the most suitable timing of various controls.

Additional research by the University of NSW is also continuing (project MC 13008 Biology, species and genetic diversity of macadamia lace bugs).

Other important factors

NSW DPI research has found that all varieties of macadamia are vulnerable to lace bug damage, with A38 the only variety in which a lower impact on nut set has been observed.

Early varieties are good indicator plants for lace bug presence, with later season varieties being heavily affected if populations are allowed to build up.

Warm winters will favour lace bug and enable increased population growth early in the season.

If your orchard has suffered from lace bug previously, there is a high chance it will still have lace bug populations. Research indicates that lace bug live in the orchard all year round, hibernating in the bark of the macadamia tree.

More lace bug information

Click here for the MacSmart video 'Lace bug in macadamia: identification, monitoring and control options' (https://www.youtube.com/watch?v=E6cM85Pv0XE&feature=youtu.be).

Table 1. Chemicals registered for use on macadamia lace bug.

	Spectrum	Timing	Application comments	Permit
Diazinon	• Long lasting broad spectrum compound. • Highly toxic to honeybees for up to 7 days after application.	• Recommended for use at pre-flowering/green raceme and when bees are not present.	• Comply with permit critical use comments. • 7 day toxicity risk to bees after application. • Communication with beekeepers essential.	PER14276, expires 30.11.2022
Sulfoxaflor	• Systemic insecticide. • Highly toxic to bees in spray form for up to 3 hours following application. • Toxicity reduced once droplets dry.	• Apply at first sign of infestation, pre-flowering and immediately before main flower opening.	• Toxic to bees when in wetted formulation. • Less toxic once dry. • Communication with beekeepers essential.	NA
Trichlorfon	• Short lasting non-broad spectrum compound that is safe to honeybees within 12 hours.	• If spraying during peak flowering, ensure the risk to honey bees is minimised.	• Comply with permit critical use comments. • Apply in late afternoon after bees have finished foraging. • Communication with beekeepers essential.	PER13689, expires 30.11.2021

Also refer to AMS fact sheet 11: Successful bee management tips during flowering pest management.

Acknowledgements

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