

# Macadamia seed weevil (*Kuschelorhynchus macadamiae*) orchard management

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Jeremy Bright, Macadamia Development Officer, Horticulture Unit, Wollongbar Primary Industries Institute

An integrated approach to Macadamia seed weevil (previously referred to as *Sigastus* weevil) control is the most effective way to manage the pest in the long term. The timely use of cultural controls to minimise the population at the beginning of the season can reduce the reliance on chemicals at a later stage. Also important is understanding the key factors that contribute to high Macadamia seed weevil populations. At least five have been identified, as follows:

- out-of-season flowering and nut set
- inadequate spray coverage
- neglected orchards
- poor management of orchard floor
- alternate host (not yet known).

While growers do not have control over all of these factors, it is important to identify and implement any actions that can help reduce the potential for high Macadamia seed weevil populations developing. Key actions are as follows:

## **Out-of-season flowering and nut set (*limited control*)**

Macadamia seed weevil populations appear to become high when flowering season is extended, resulting in out-of-season nut set. Small, soft shell, out-of-season nuts allow the weevil to lay its eggs and build up in numbers. Continual out-of-season flowering can create a very high base population of Macadamia seed weevil. While growers have limited control over lace bugs, they can help by reducing out-of-season flower and not allowing nut to reach the minimal 10 mm for Macadamia seed weevil larvae development.

## **Inadequate spray coverage (*can control*)**

Growers have total control over ensuring that spray coverage, application and rates are appropriate by doing the following:

- calibrating your sprayer annually
- slowing down when applying chemicals
- timing your spray for maximum impact.

Coverage is essential to eliminate adult populations and stop egg laying. However, larvae in the fallen nut will not be totally eliminated. Therefore, the next step is to remove and destroy fallen nuts to significantly reduce pressure for the season. Remember, control of Macadamia seed weevil is about population reduction as elimination is almost impossible. We strongly recommend that when spraying, growers incorporate a wetter to achieve better coverage.



**Figure 1. Macadamia seed weevil larvae and pupae overwinter in nuts.**

*Image: Craig Maddox NSW DPI.*

### **Neglected orchards (*limited control*)**

While you have control over managing your own orchard to reduce the potential for Macadamia seed weevil numbers to build up, you do not have control over neighbouring orchards which might be neglected. Neglected orchards are breeding grounds for the Macadamia seed weevil. While the crop is there for the weevil, there is no reason for it to move into neighbouring orchards, however, when the crop is limited, the weevil will migrate to other areas to sustain reproduction and this could include your orchard. Ideally growers should talk to their neighbours about the neglected orchard and work towards a solution such as removing trees. Again, the lace bug can help by reducing out-of-season flowering and not allowing nuts to reach the minimum 10 mm required for Macadamia seed weevil larvae development.

### **Poor management of the orchard floor (*can control*)**

This is where we need to consider the weevil's life cycle. After spraying, removing and destroying fallen nuts will significantly reduce population pressure. If your spray coverage is effective, you will only need to do this clean up twice; after each time you spray for Macadamia seed weevil (see Figure 2 in the life cycle factsheet). Remember that 100% clean-up of the orchard floor is rarely achievable so aim to reduce the population to reduce the damage.

### **Alternate host (*no control known yet*)**

An alternate host has not yet been identified. Work is continuing on developing biological controls for this pest. The Hort Innovation funded Macadamia IPM Program is working towards developing an attractant lure and further development of methods to control out-of-season nuts. Biological controls such as the fungus *Beauveria bassiana* are also being investigated.

### Orchard calendar: what to do and when to do it

Combining good hygiene (removing infested nuts) with targeted spraying during spring with the registered minor use permit chemical acephate should effectively manage Macadamia seed weevil. The calendar is a guide to what to do when in the orchard.

**Table 1. A guide on what to do and when to do it for control of Macadamia seed weevil.**

Time	Task	Comments
July to October: Pre-flowering to flowering Harvest to postharvest	Observe	Pre-flower. Be aware of out-of-season flowering, which builds up populations for on-season flowering
September: Flowering to postharvest	Postharvest clean up to reduce latent population	Diligence at pre-flowering for effective control is critical
November: Nut set to pea size	Spray/mulch program Before fruit spotting bug nut drop, make sure the orchard floor is clean	November to February especially are months when floor management is crucial. Ensure the larva developing in nut is controlled by doing a clean-up of the floor that is similar to the pre-harvest orchard floor clean up.
Late December to early January: Pea size to marble	Spray and removal of infested nut program	Use a mulcher, mower and, in some cases, harvesters to remove infested small nut.
January to February: Oil accumulation	Pre-harvest clean up to reduce residual population from current season passing over the next season	



**Figure 2. Golf ball husk as a result of Macadamia seed weevil feeding on the green nut.**

*Image: Craig Maddox NSW DPI.*

### Stopping the spread of Macadamia seed weevil

This year (July 2017) Macadamia seed weevil has only been found in:

- NSW Northern Rivers
- Atherton area of Far North Queensland.

If you see Macadamia seed weevil on other vegetation it would be useful to take a photograph, record the GPS location and report it to NSW DPI Development Officer Jeremy Bright (Phone: 0427 213 059). So far, there have been no reports of Macadamia seed weevil breeding in any crop other than macadamia.

## Biosecurity on farm for regions that do not have Macadamia seed weevil

Farm biosecurity helps with more than just limiting the chances of Macadamia seed weevil incursion, it ensures better protection for your property against pests and disease. If you do not have Macadamia seed weevil, steps you can take to stay free from it include:

- Prevent unnecessary entry of vehicles on to your farm from other areas.
- If vehicles such as contract hedgers, sprayers and harvesters are entering your property from other regions, ensure that the operator has done a thorough wash-down off-site. This process is a standard biosecurity procedure enforced to avoid foreign contamination.
- Follow recommended control programs.
- The APVMA has issued a permit for acephate ([PER81463](#)) for Macadamia seed weevil in macadamias.
- It is important that growers use acephate at a time when it is most effective against fruit spotting bug and Macadamia seed weevil when nuts have developed to pea size (10 mm in diameter).
- Before this, it is crucial that you have completed an orchard floor clean up. Once the orchard floor is cleaned and spray applied, it will be about 40 days until the next spray is required. After this time, the shell has hardened and the weevil can no longer enter the shell.

### More information

For information about on-farm biosecurity, refer to the [NSW DPI Macadamia plant protection guide](#) or visit the Farm Biosecurity website [www.farmbiosecurity.com.au](http://www.farmbiosecurity.com.au).

For updates go to [www.dpi.nsw.gov.au/factsheets](http://www.dpi.nsw.gov.au/factsheets).

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