

# Macadamia seed weevil

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## Introduction

The macadamia seed weevil (*Kuschelorrhynchus macadamiae*) relies on out-of-season flowering and small soft-shell nuts for egg-laying. After the eggs are laid inside the husk, the nuts will usually fall. These nuts should be mulched and destroyed to break the cycle. If left unchecked, macadamia seed weevil (MSW) can become a major pest for macadamia. Importantly, MSW is so far confined to the Northern Rivers NSW and Mareeba districts in far north Queensland, so strict on-farm biosecurity measures should be enforced when moving any machinery or other equipment from infested areas to non-seed weevil areas.

## Risk period

Table 1. The peak risk period for macadamia seed weevil adults is from pre-flowering to shell hardening.

Pre-flowering	Early flowering	Peak flowering	Nut set	Pea size nut and spring flush	Shell hardening to harvest	Harvest to pre-flowering

## Pest identification

Adult weevils are grey–brown, about 6 mm long (Figure 1) and can be in the orchard all year. During winter they will often be found in groups on the ends of branches. As the weather warms, the weevils will wait until the nuts have reached a vulnerable size, approximately 8 mm in diameter, in which to lay their eggs (Figure 2). The fully grown larva can be up to 10 mm long.

## Damage

The female weevil scarifies an area about 3–4 mm wide on the husk in to which she lays a single egg. This will be obvious as a triangular lay mark at the stem end of the fallen nuts (Figure 3). After egg-laying, the female weevil will chew about halfway through the stem to induce nut drop. When the egg hatches, the larva will consume the whole kernel (Figure 4), then pupate and exit the nut as an adult. Larva development depends on the period before shell hardening because once the shell hardens, the developed weevil is not able to exit. Damage after shell hardening will appear as grazing marks all over the husk, similar to a golf ball appearance (Figure 5).

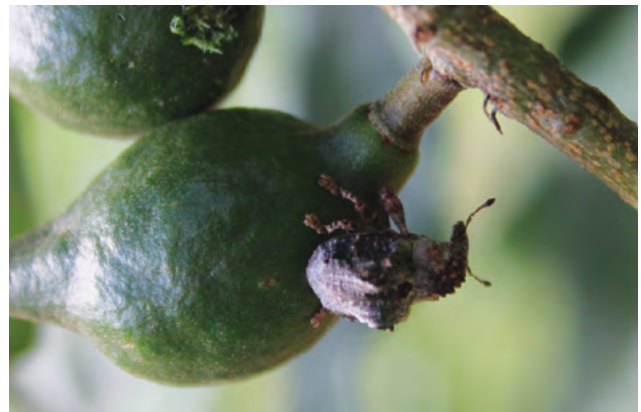


Figure 1. Macadamia seed weevil. Photo: Craig Maddox.



Figure 2. A macadamia seed weevil lays its egg on a chewed patch of husk. Photo: Craig Maddox.



Figure 3. Typical mark left by macadamia seed weevil that indicates egg-laying. Photo: Craig Maddox.



Figure 4. Macadamia seed weevil larvae and pupae overwintering in nuts. Photo: Craig Maddox.



Figure 5. Macadamia seed weevil damage after shell hardening appears as grazing marks all over the husk, leaving a golf ball appearance. Photo: Craig Maddox.

## Management

To prevent MSW from thriving in your orchard:

### Eliminate extended out-of-season flowering and nut set

Out-of-season flowering means that in-season flowering will have high pressure from built-up populations that were supported by the early crop. It is not just the flowering, but the following small, soft shell, out of season nut that allows the weevil to lay its egg and increase in numbers. The MSW life cycle is influenced by degree days; cold, wet weather will slow their progress but diligence at pre-flowering is critical for effective control. Out of season flowering will also not have indoxacarb treatment and therefore will be a good source of future weevil infestations.

Natural disasters (e.g. from extreme weather) can create higher pest pressure from multiple flowerings and nut set. Growers need to be aware that out of season flowering will create a very high base population of not only MSW, but also other insect pests. This means that growers need to ensure their spray coverage and rates are adequate for what will be a very high-pressure season.

Key points to consider include:

- calibrate your sprayer annually
- slow down: place targets in the trees throughout the orchard and check the coverage when travelling at your normal speed. In most cases spray operators are going too fast to achieve adequate coverage
- timing: you need to be protecting your crop at the most efficient time. Delays will cause losses in production.

### Ensure good orchard hygiene

Old, damaged nuts left on the orchard floor will allow weevil populations to develop and increase, resulting in further damage to your crop and income. Case studies showing effective MSW control all included regular orchard floor clean up, nut mulching, and, in some cases, eliminating infested nuts from the orchard altogether.

Clean up generally occurs from January onwards and is especially important for orchards with macadamia seed weevil. If done thoroughly, it will minimise weevil populations. We are seeing positive results where a combination of good

orchard hygiene (removing infested nuts) and targeted spraying during spring effectively manages macadamia seed weevil.

Treatment should be similar to a pre-harvest orchard floor clean up to ensure that developing larva within the dropped nuts are controlled. Start early to avoid pest build up. Before fruit spotting bug causes early nut drop, growers need to make sure that their orchard floor is clean. Generally, growers can concentrate on hotspots in the orchard to maintain a clean floor. Start early to avoid pest build up.

**Good orchard hygiene is key to reducing MSW numbers.**

### **Do not allow infection from neglected orchards**

Neglected areas are ideal breeding grounds for many pests, including MSW. 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.

### **Use strict on-farm biosecurity measures**

Biosecurity measures when moving any machinery or equipment from infested areas to non-seed weevil areas is essential.

### **Biological control**

Kim Khuy Khun and Bree Wilson from the University of Southern Queensland are continuing their work on MSW control using *Metarhizium anisopliae* and *Beauveria bassiana*.

### **Chemical control**

A key outcome from the IPM program for the macadamia industry (MC16008) is the identification of indoxacarb ([PER86827](#), expires 31 March 2026) to control macadamia seed weevil (MSW). When applied to match head-size nutlets, indoxacarb will eliminate egg laying from the adult female weevil for up to 13 weeks, thus avoiding the significant losses suffered previously. It will also help to eliminate several costly control sprays and there will be

less hygiene clean ups required as the nuts will no longer be infected by the weevil and therefore will not be on the ground. Best results for MSW control have been achieved with a combination of good hygiene (removing infested nuts) and targeted spraying with indoxacarb during spring when the nutlets are matchhead size.

### **More information**

Bright J. 2020. *Macadamia plant protection guide*, NSW Department of Primary Industries, <https://www.dpi.nsw.gov.au/agriculture/horticulture/nuts/growing-guides/macadamia-protection-guide>

Maddox C, McLean S, Pretorius J, Pretorius S and Khuy Khun K. 2018. Macadamia seed weevil: monitoring and control video. Queensland Agriculture, <https://www.youtube.com/watch?v=4QcO8oLh9hw>

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