Mealybug management

Mealybugs are sap-sucking insects that live on a wide range of host plants. They can infest vines and affect grapes, producing honeydew, which encourages the growth of sooty moulds. Mealybugs have also been associated with the transmission of grapevine viruses.

They are generally kept below economic thresholds by various beneficial species but significant outbreaks in recent seasons have required targeted application of insecticides. Detailed field monitoring is integral to the effective management of mealybugs in grapevines.

Identification of mealybugs

Adult mealybugs are soft-bodied, segmented insects covered in white powdery wax. Adults are around 5 mm in length, with characteristic filaments around the edges of their bodies. They live in colonies composed of adult females, eggs, and nymphs (juveniles), and secrete honeydew as a by-product of their feeding activities.

Various species of mealybug can be found in Australian vineyards; the colour of the body contents of mealybugs can assist in their identification:

- The citrophilous mealybug (*Pseudococcus calceolariae*) has deep dark-red body contents, and short, thick tail filaments (Figure 1).
- The long-tailed mealybug (*Pseudococcus longispinus*) has pale yellow body contents and long tail filaments (Figure 2).
- The obscure mealybug (*Pseudococcus viburni*) has orange body contents and short, thin tail filaments.

Impacts of mealybugs

Sap sucking by mealybugs can cause serious crop damage and crop loss. The principal damage associated with mealybugs arises from their secretion of honeydew, or vine sap, which encourages the growth of sooty moulds such as *Aspergillus* spp. (Figure 3). Heavy infestations of mealybugs can result in premature leaf fall, which may affect the ability of a canopy to mature a crop or store carbohydrates prior to dormancy.

Mealybugs have also been identified as vectors for the transmission of grapevine leafroll-associated viruses. Some of these viruses can reduce vine vegetative growth, yield and fruit quality, as well as being associated with graft incompatibilities.

Figure 1: Various life stages of the citrophilous mealybug (see Table 1) on the underside of a leaf. (Photo courtesy Shane Coster, Research and Development Solutions)

Figure 2: Adult long-tailed mealybugs within a bunch. (Photo courtesy Shane Coster, Research and Development Solutions)
Mealybug lifecycle

Mealybugs can survive over winter under bark (Figure 4) and in cracks in trellis posts. In spring, the overwintering generation moves out onto vines soon after budburst.

Adult female long-tailed mealybugs lay up to 200 single eggs, which hatch almost immediately. The first-instar nymphs, or crawlers, spend several days sheltering under the female before moving out to feed. Adult females of the citrophilous and obscure mealybug species lay eggs into silky or cottony egg sacs; the eggs hatch after several days.

The duration of each generation for these mealybug species varies from one to four months, so that three or four generations can occur per year, depending on temperature. As a result, mealybug numbers can increase very rapidly in seasons where conditions are favourable and levels of natural predation and parasitism are limited.

Favourable conditions

Weather conditions

Mealybugs prefer mild warm conditions with temperatures around 25°C and high humidity. While hot dry conditions can reduce mealybug infestation pressure into the latter part of the season, populations can rebuild rapidly if conditions become favourable as conditions cool into autumn.

Low predator numbers

The mealybug has commonly been considered a ‘secondary pest’ in the viticultural industry, with outbreaks often associated with lower numbers of beneficial species.

Association with ants

High ant numbers are commonly found in association with mealybug infestation. The ants effectively ‘farm’ the mealybugs, feeding off their secretions of honeydew and, in return, protecting them from predators.

Vine canopy and bunch distribution

As mealybugs are favoured by humid conditions, vine training and trellising systems that restrict airflow and promote leaf and bunch congestion around the cordon and crown will be more likely to have a problem. Spur-pruned vines are often more vulnerable to mealybug infestation than cane-pruned varieties, as bunches are close to sheltering sites and mealybugs appear to be somewhat mobile during the season, moving between foliage and bunches, and sheltering underneath the bark around crowns and cordons.
Monitoring and thresholds

While spraying is not generally required for control of mealybugs on winegrapes, significant variations in seasonal pressure make it critical to implement a monitoring program targeted at detection and evaluation of mealybug populations. Systematic monitoring over a number of seasons will also enable thresholds to be developed for a particular site and region.

Monitoring for mealybugs requires targeted examination of likely sites for overwintering and sheltering, and is critical in determining if and/or when any controls should be applied. Emerging crawlers can be very difficult to spot and a 10 x hand lens is needed to identify them conclusively (Table 1).

Monitoring beneficials

In winter, assessments can be made of the numbers of viable adults that may be overwintering under the bark around the vine trunk, crown and cordon. Examine any mealybugs detected to assess potential natural levels of parasitism by beneficials. Exit holes will be evident in the ‘mummies’ of parasitised mealybugs.

During the growing season, beneficial species should be identified, and observations made about their numbers and distribution in the vineyard recorded.

Thresholds

If infestation levels exceed a threshold of 10% in a sample of 100 leaves or bunches, it may be necessary to apply chemical; however, the decision should be balanced against any potential for hot weather and natural predators to decrease the mealybug population.

Management strategies

Chemicals

Due to the significant seasonal variation in mealybug populations and the important role of beneficial species in keeping numbers low, it is recommended that chemical controls only be applied when and where required.
Dormancy treatments
Applications of winter oils have not proven to be effective in controlling mealybugs. A number of vineyards have had some success with the application of a mix comprising an oil and a registered broad-spectrum insecticide in late winter, but this may impact on some of the beneficial species present. Spray application techniques also need to enable thorough wetting of the bark around the crown, cordon and trunk, where the mealybugs are overwintering.

During the season
Adult mealybugs are protected by their waxy coatings, so spraying when numbers of adults are high is ineffective. Younger mealybugs are more vulnerable and therefore if chemical applications are required, they should target the peak emergence of young crawlers.

Using broad-spectrum insecticides to control mealybugs may affect other pest populations in the vineyard, and may actually increase existing mealybug populations later in the season, or in subsequent seasons, by removing their natural enemies.

New chemistry that is less disruptive to beneficial species is now available, including:
- Buprofezin (e.g. Applaud®), which affects the moulting of young mealybugs and needs to be timed to the peak emergence of crawlers
- Clothianidin (e.g. Samurai®), which is available as a soil-applied treatment for delivery either through the drip irrigation system or with a herbicide unit. This needs to be applied at budburst to a ‘clean’ undervine strip and incorporated with rain or irrigation. While this chemical has some broad-spectrum activity, its application via the soil reduces any potential disruptive impacts on beneficial species.

Broad-spectrum insecticides are not recommended because they can significantly reduce beneficial insect populations, often resulting in increased mealybug problems.

Biological control
Natural beneficial insects can help keep mealybug numbers below damaging levels, so it is important to identify species that can control mealybugs, and to ensure that other vineyard management practices (including agrochemical programs for other pests and diseases) protect and enhance their numbers. Key mealybug predators include the green and brown lacewings (Mallada signata and Micromus tasmaniae), ladybirds such as Cryptolaemus spp., and various fly and wasp parasitoids.

Cryptolaemus ladybirds and green lacewings are commercially available to boost background populations or to target the peak emergence of mealybugs. For further information, visit www.goodbugs.org.au

Cultural practices
Controlling ants
Ideally, ants should be discouraged around grapevines, as some ant species will actively ‘farm’ and protect mealybugs from predators in order to feed on the mealybugs’ honeydew secretions. Options for controlling ants are limited, but the best are those that contain an attractant and a low concentration of toxicant so that foraging ants deliver the toxicant to the ant nest. It is important to assess whether high ant numbers are associated with mealybugs, as many species of ants will be present in the vineyard and some may actually be beneficial for the control of other vineyard pests. For example, some ants may predate light brown apple moth eggs.

Vineyard floor management
Cover crop plants between and under vine rows, which provide alternative habitats and hosts, and pollen and nectar as alternative food sources for parasites and predators, may help maintain these beneficial populations when mealybug numbers are low.

Vine management
Consider any vine management practices that improve airflow in the vine canopy and that promote and minimise the number of bunches in contact with the vine crown and cordon.
References


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