FACTSHEET
SEPTEMBER 2012

Mealybug management

Mr David Braybrook
Viti Solutions

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 transmition 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)

Australian Government
Grape and Wine Research and Development Corporation

gwrdc
GRAPE AND WINE RESEARCH AND DEVELOPMENT CORPORATION

www.gwrdc.com.au

Figure 3: Signs of wax and sooty mould in a Chardonnay bunch. (Photo courtesy Shane Coster, Research and Development Solutions)

Figure 4: Mealybugs under loose bark on a spur. (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.

Figure 5: Mealybugs on the underside of a leaf. (Photo courtesy Shane Coster, Research and Development Solutions)

Figure 6: Mealybug adult and crawler. (Photo courtesy Shane Coster, Research and Development Solutions)

When	What	Where	How
Dormancy	Overwintering adults	Parts of the vineyard where mealybugs have been found before Under bark on vine trunk, crown and cordons	Use a 10× hand lens to confirm the presence of live adult mealybugs. White waxy residue from previous infestations remains on the vine for a few seasons and sooty mould may be present on cordons. Monitoring can be based on a time search of, say, 1 minute per vine, and check at least 25 vines/block to cover the block.
Late September to November	Crawlers, young nymphs (Figures 5 & 6)	Undersides of leaves	Use a 10× hand lens. Sample leaves in risk areas or areas previously infested. Select leaves near vine crown. Record the percentage of infested leaves from, say, a 100-leaf sample, taken as 25 leaf samples from each of 4 double rows within a block.
November to harvest	Egg sacs, crawlers, older nymphs, adult mealybugs	Sheltered sites inside dense canopies where humidity is higher Undersides of leaves and inside bunches (Figure 7) Where vines are 'matted' around trellis wires and cordons Where bunches contact the cordon	Leaf sampling as above for all stages of mealybugs. Also select 25 bunches randomly from the same rows as for leaf sampling (100 in total) and examine for mealybugs. Tag infested vines for future monitoring and for spot treatment if that becomes necessary.

Table 1: Monitoring for life stages of the citrophilous mealybug.

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.

When deciding when and where to spray, it is important to survey the vineyard to assess the distribution of mealybugs and identify sections where threshold levels are exceeded. Early detection of high numbers of crawlers may justify the application of controls, as there are limited chemical options beyond flowering for grapes destined for export wine markets. High numbers of mealybugs in one season do not always carry over to the following season, so it is important to assess the numbers of viable adults overwintering under bark. If high numbers are observed, controls may commence in dormancy, and early-season monitoring programs should be implemented.

Monitoring tip

As ants are commonly associated with sap-sucking insects, examine any vines or sections where high numbers of ants are observed. Field staff should be encouraged to keep an eye out for ant activity, as mealybugs can be very 'patchy' in a vineyard. While signs of honeydew and sooty mould on leaves and bunches may also indicate the presence of mealybugs, they appear too late to be useful as triggers for control options.

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.

Figure 7a: A tight bunch of Pinot Noir grapes.

Figure 7b: Berries removed to reveal mealybugs feeding in the centre of the bunch, making them difficult to identify. (Photo courtesy Shane Coster, Research and Development Solutions)

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
- Clothiandin (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

Bernard M, Horne PA, Papacek D, Jacometti MA, Wratten SD, Evans KJ, Herbert KS, Powell KS, Rakimov A, Weppler R, Kourmouzis T & Yen AL (2007) Guidelines for environmentally sustainable wine grape production in Australia: IPM adoption self-assessment guide for growers. *Australian & New Zealand Grapegrower & Winemaker* 518: 24–35.

Constable F & Rodoni B (2011) Grapevine leafroll-associated viruses. Grape and Wine Research and Development Corporation Factsheet. Available at www.gwrdc.com.au/webdata/resources/files/GWR_079_Leafroll_Disease_Fact_Sheet_PAGES_FINAL.pdf

Emmett RW, Magarey PA & Magarey RD (1994). Mealybug. In Nicholas P, Magarey P & Wachtel M (eds) (1994, reprinted 2011) *Diseases and Pests*, Grape Production Series No. 1, Winetitles: Adelaide, ISBN 9781875130153, pp. 54–55.

Magarey PA, MacGregor AM, Wachtel MF & Kelly MC (2006) *Field Guide for Diseases, Pests and Disorders of Grapes for Australia and New Zealand*, Winetitles: Adelaide, ISBN 9781875130337, 108 pp. (A companion to Nicholas P, Magarey P & Wachtel M (eds) (1994, reprinted 2011) *Diseases and Pests*, Winetitles: Adelaide, ISBN 9781875130153, 106 pp.)

Grape and Wine Research and Development Corporation (GWRDC)
Industry House, Cnr Botanic and Hackney Roads, Adelaide SA 5000
PO Box 610, Kent Town SA 5071
Telephone: (08) 8273 0500
Facsimile: (08) 8373 6608
Email: gwrdc@gwrdc.com.au
Website: www.gwrdc.com.au

Disclaimer

In publishing this factsheet, The Grape and Wine Research and Development Corporation (GWRDC) is engaged in disseminating information, not rendering professional advice or services. The GWRDC and the author expressly disclaim any form of liability to any person in respect of anything included or omitted that is based on the whole or any part of the contents of this factsheet.