

# Investigating biological control of mealybugs

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A Skeltons' Viticulture Development Grant 2008 and 2009 recipient, David Reid, a PhD student at Lincoln University, conducted investigations into biological control of mealybugs by modifying insect habitats.

Results showed that where ground cover host plants had been removed, mealybugs either died or moved into adjacent rows that had attracting ground cover. Trials with non-host cover crops are planned for the 2009-10 season and this research is to be supported by further funding from the 2009 Grant.

"Mealybug numbers can be reduced in a vineyard block if you remove their favourite host plants. If you do this in a thorough and progressive way, you can significantly reduce the mealybug population in the vineyard," says David.

## Background

In many established Hawke's Bay vineyards, significant numbers of vines are infected with leafroll viruses. Growers need to replace large numbers of vines or entire vineyard blocks to maintain premium wine quality. Mealybugs are the primary virus vectors, and are difficult to eradicate. Most are protected from chemical sprays and predators because they live underground, on the roots of host-plants such as white clover. Some move into the canopy around veraison and colonise grape bunches.

## Host plants

In the CJ Pask Gimblett Road vineyard, mealybugs live predominantly on the roots of broadleaf plants (e.g. hawksbeard, white and subterranean clovers, dovesfoot, and willow-herb) (Fig. 1) on the vineyard floor. It is difficult to remove clover species and willow-herb from the vineyard as underground stems survive herbicide control with glyphosate.



Figure 1. Mealybugs on hawksbeard taproot.

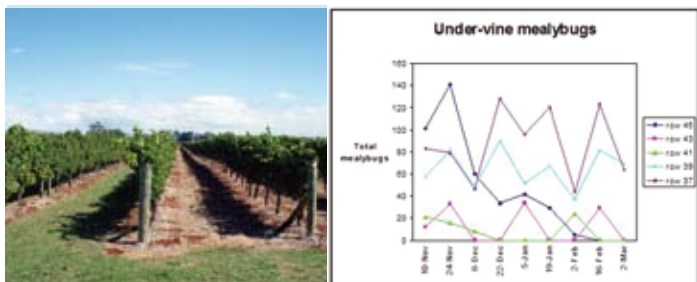


Figure 2. Mealybug host-plants were removed from part of the block by herbicide spray. Rows 41, 43, and 45 are inside the herbicide strip.

Last season, mealybug numbers were significantly reduced in a 10-row strip by multiple herbicide sprays with glyphosate and Buster (glufosinate-ammonium) that killed host plants (Fig. 2).

Mealybug numbers in the marginal row or outside the herbicide zone remained high. Inside the herbicide zone, mealybug numbers decreased, yet mealybugs did not move into the vine canopy. They appear either to have died, or moved to preferred host plants outside the herbicide zone.

Herbicide control is not sustainable, and it will be necessary to plant non-host cover crops and maintain them to ensure that they are free of host weeds. Cover crop trials are planned for next season.

## Ants

Mealybugs produce honeydew, which attracts ants (Fig. 3). Ants "farm" mealybugs, and will defend them from attack by natural enemies.



Figure 3. *Iridomyrmex anceps* and *Ochetellus glaber*: canopy ants.

Last season, canopy ants were controlled in 55 bays by placing bait stations containing boric acid bait, in the canopy. Mealybugs were not found in any bunches in these bays. In the previous season (without bait stations), 12.4 percent of bunches from these bays were infested with mealybugs. A further trial is planned to verify this result.

Biological control of canopy ants may be difficult as they have few natural enemies and several food sources. Under-vine compost mulch reduced canopy ant numbers in this vineyard, but this mechanism is not understood.

## Wasps

Natural enemies of mealybugs in this vineyard include three very small wasps (Fig. 4). They are capable of parasitising significant numbers of mealybugs, but are vulnerable to damage by organophosphate insecticides and to ant attack.



Figure 4. *Tetracnemoidea brevicornis*, *Coccophagus gurneyi* and *Anagyrus fusciventris*; mealybug parasitoids.

To maximise their longevity and fecundity, these parasitoids need food source plants in the vineyard. In an on-going trial, potential nectar source plants are being evaluated. The main difficulty encountered is weed competition. Vigorous species such as alyssum and oregano appear to be better suited in this vineyard than slower-growing native species (Fig. 5).



Figure 5. Clockwise from top left: creeping selliera, alyssum, oregano, pohuehue.

## Harvesting

Grape harvesting machinery moves mealybugs. However in mealybug hotspots, some mealybugs are left attached to bunch rachii. Mealybugs remaining on the rachii are exposed, and move to find shelter, potentially from virus-infected

to uninfected vines. There is an opportunity, immediately post-harvest, to control these, with an oil spray for instance. The value of this type of intervention will be assessed next season.

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