Vine borer moth: an emerging pest of Riverina wine grapes

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Introduction

Vine borer moth appears to be a native Australian moth species that has shifted food hosts from the woody branches of *Acacia* wattles to the spurs and cordons of wine grapes. The moth is yet to be formally identified, but DNA analyses indicate that the moth is likely to be a species in the genus *Echiomima* or *Maroga*. Other species of *Echiomima* and *Maroga* are native moths that have been recorded feeding on several native shrubs and trees, ornamental hosts like elm, plane and maple trees, and horticultural crops like prunes and pecans.

Pest problem

In recent years vine borer moth incidence and damage have increased in the Riverina, and several growers and wine companies in the region are now affected. The distribution of vine borer moth is also clearly spreading into new blocks and adjacent vineyards. Vine borer moth does bore into the cordon and around the spur and base of shoots, but its main feeding activity is concentrated in the bark and sapwood around the spur and cordon. The pest can be easily spotted by the presence of larval frass (faeces), which is pushed to the surface and webbed together with silk to form a protective covering for the larva.

Vine borer moth has been found feeding on a range of red and white wine grape varieties in the Riverina, but the pest shows a clear preference for the varieties Merlot, Ruby Cabernet and Pinot Noir. In some grapevine blocks in the Riverina up to 90% of vines can be infested with vine borer moth, with some vines recording up to 35 borers per vine.

Characteristic frass of vine borer moth larvae around the spurs and cordon. *Photo: A. Loch*

Life cycle

Adult moths

The life cycle of vine borer moth takes 1 year to complete in the Riverina and is more or less synchronous, with only marginal overlap of the different life stages. Adult moths are about 10 to 15 mm long and creamy white to light brown. They have a thick tuft of white hairs under the head, and they often have a distinct black dot on each of the forewings. Moths are active at night and emerge during November and December. Female moths emerge with well developed eggs, so mating probably occurs soon after emergence. Like females of the lightbrown apple moth, adult females of vine borer moth use sex pheromones to attract male moths for mating.

Eggs

After successful mating, female moths lay eggs singly or in small groups in bark crevices around the dormant buds on spurs near the cordon. Eggs are white, cylindrical

Adults of vine borer moth, showing variation in appearance and size. Note the thick tuft of white hairs under the head of the moth on the lower right. *Photo: A Loch*

Vine borer moth eggs laid in a bark crevice. Each egg is approximately 0.9 mm long. *Photo: A Loch*

and very small (about 0.9 × 0.4 mm). It is not known how long it takes the eggs to hatch, but the duration of egg development is probably about 10 to 14 days.

Larvae

Larval development occurs over about 10 months between December and October. The larva feeds on the surface of the bark or dormant bud after hatching, before tunnelling into the wood. A key entry point for the larvae appears to be the soft dormant bud tissue. Although larvae bore short tunnels of up to 5 cm in the heartwood, most feeding occurs on the sapwood and bark. Larvae grow to about 2.5 cm long; as they increase in size their feeding and levels of damage also increase. As the larvae increase in size they moult, shedding their exoskeletons.

Vine borer moth larva. *Photo: A Loch*

Initial feeding damage around and within a dormant bud by a newly hatched vine borer moth larva. *Photo: A Loch*

Feeding damage by vine borer moth to bark and sapwood around the spur. The frass has been partly removed to show the damage. *Photo: A Loch*

Pupae

Larvae pupate in about September or October, with pupation lasting approximately 1 month. Pupation occurs in the borer tunnel, and the pupae are about 8 to 15 mm long.

Vine borer moth pupa. *Photo: A Loch*

Damage

A field research trial conducted in Merlot showed that the damage caused by vine borer moth can lead to significant reductions in shoot numbers, shoot growth, cane dry weight, bunch numbers per shoot, and yield. Vine borer moth damage caused reductions of 43% for yield, 26% for bunch numbers per shoot, 46% for shoot length, and 58% for cane dry weight. Feeding damage around vine spurs and dormant buds can also lead to

Difference in Merlot growth and yield from an uninfested spur (left) versus a vine borer moth infested spur (right). Note the reduction in shoot number, shoot length and fruit yield. *Photos: A Loch*

stunted shoot growth and even death of buds or entire spurs. Sustained and repeated feeding damage by vine borer moth over several seasons could potentially lead to loss of vigour, crop losses through loss of fruiting spurs, and dieback.

Another symptom of vine borer moth feeding damage is shoot stunting and death of buds and spurs. *Photo: A Loch*

Serious feeding damage to the bark and sapwood around the vine spur and cordon can lead to weakening and eventual death of the vine spur. *Photo: A Loch*

Management

Research is currently investigating ways of effectively managing this pest problem. A major difficulty in managing this pest is the larva's habit of concealing itself within the vine and under the protective cover of frass. This aspect of the pest's biology and behaviour means that typical contact insecticides will not be effective. However, there are several insecticides with greater residual activity that may be effective because they remain active on the vine for longer. Because the larval stage feeds on bark and sapwood during vine dormancy, insecticides applied to the cordon during dormancy and after pruning may be effective via contact or ingestion. A research trial evaluating several potential insecticides will be conducted during winter 2009 with the aim of having an insecticide registered for use against vine borer moth by 2010.

Another promising control method involves entomopathogenic nematodes, which eat insects. There are several species of entomopathogenic nematodes that attack moth larvae and may be effective against vine borer moth. These nematodes can be mixed with water and sprayed onto the cordon. The nematodes need warm and moist conditions; when they contact the cordon they actively seek out host larvae to attack and kill. A research trial is planned for early spring 2009 to test several entomopathogenic nematodes against vine borer moth.

Natural enemies of vine borer moth do exist in Riverina vineyards, but none appears effective. There is an unidentified parasitic wasp that attacks the larval stage of the pest, but it causes only low levels of parasitism. Vine borer moth eggs are parasitised by *Trichogramma* wasps, which are tiny (less than 1 mm long). Natural *Trichogramma* parasitism levels are very low in the Riverina but, as for the treatment of lightbrown apple moth, *Trichogramma* wasps can be purchased and released on a weekly basis over a month during the period of egg laying in November and December. A trial conducted in 2008 with releases of *Trichogramma carverae* did not show promising results, with vine borer moth numbers increasing in the area of release. However, *Trichogramma* wasps have been used

Unidentified parasitic wasp of vine borer moth. *Photo: A Loch*

Typical-sized emergence hole of the vine borer moth. *Photo: A Loch*

successfully against related boring moth pests like pecan stem girdler and may still be an effective option for vine borer moth.

Other borers

Vine borer damage can be mistaken for fig longicorn borer damage because of the external presence of frass. However, vine borer damage is largely confined to the spurs and cordon, whereas the fig longicorn beetle causes damage mainly in the trunk. The emergence holes of vine borer moth are also much smaller, at only around 3 mm diameter. Elephant weevil is another borer pest of wine grapes, but its emergence holes are much larger (5 to 6 mm) and frass is not present around the damage.

Acknowledgements

We are grateful to the Riverina Wine Grape Marketing Board for providing research funding.