Pests & Diseases

Which species of Tortricid leafroller do I have in my vineyard?

Leafrollers other than LBAM found in grapevine canopies for the first time

Mary Retallack, from Retallack Viticulture, and **Michael Keller**, from The University of Adelaide's School of Agriculture, Food and Wine, shed new light on the species of leafrollers commonly found in South Australian vineyards. There is more to this story than meets the eye!

Introduction

It is commonly regarded that light brown apple moth, *Epiphyas postvittana* (Lepidoptera: Tortricidae), is the key insect pest that causes economic damage in Australian vineyards. Larval LBAM damage leaves, flower clusters and berry skins. Damaged skins provide infection sites for *Botrytis cinerea* and other bunch moulds, which result in a reduction in fruit quality and yield losses (Ferguson 1995). Annual national losses from LBAM and related bunch rots were estimated to be $70 million per year in Australia (Scholefield and Morison 2010) and is likely to be higher as these figures are nearly a decade old.

Tortricidae (leafrollers)

Tortricidae is a diverse family of moths with a wide range of host plants (Brown *et al.* 2010). The larval stage (Figure 1a and b) are called leafrollers because the caterpillars build protective feeding shelters by folding leaves over their bodies and using silk webbing to secure these structures (Figure 1c). If you look at the rear end of a tortricid larva under a microscope, you can see characteristic anal combs that are used to flick away faecal pellets from their shelters (Figure 1d). The caterpillars of leafrollers have a similar appearance, which makes it impossible to identify them without a laboratory technique such as DNA analysis (Barr *et al.* 2011).

Epiphyas postvittana is an Australian native leafroller (Figure 2a). It is a damaging pest of grapevines in Australia (Buchanan *et al.* 1991, Glenn and Hoffmann 1997). It feeds on a wide range of plants, including broad-leaved weeds often found in vineyards, such as capeweed (*Arctotheca calendula)* and plantain (*Plantago lanceolate).*

Acropolitis rudisana is a native leafroller that is widespread in eastern Australia (Figure 2b). Hosts of *A. rudisana* include weed species such as clover (*Trifolium sp.*), capeweed, and grapevines (*Vitis sp.*), but not specifically *Vitis vinifera* (Brown *et al.* 2008). There is a scarcity of published information about the biology of *A. rudisana*.

The lucerne leafroller (*Merophyas divulsa*) is a native Australian species that is a significant pest of cultivated Lucerne (*Medicago sativa*) (Allsopp *et al.* 1983) (Figure 2c). Hosts of *M. divulsana* include weed species such as plantain, clover, and capeweed (Brown *et al.* 2008).

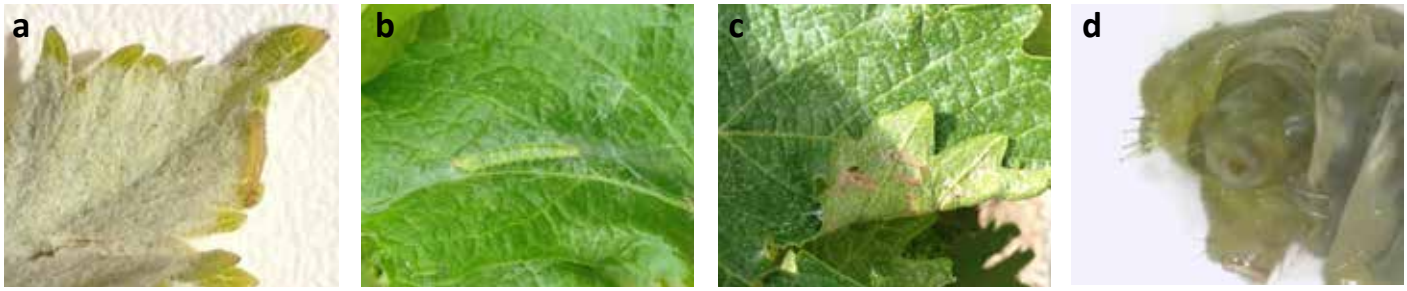

Figure 1. (a) First or second instar tortricid larva, (b) fifth or sixth instar inside a silk refuge, (c) folded grapevine leaf providing shelter, (d) anal combs are used to identify tortricid larvae to family. Photos by Mary Retallack

Figure 2. Tortricid leafroller species (a) light brown apple moth, *Epiphyas postvittana*; (b) *Acropolitis rudisana*; (c) lucerne leafroller, *Merophyas divulsana*; (d) cotton tipworm, *Crocidosema plebejana*.

Images (a) and (c) by Mary Retallack. Image (b) Acropolitis rudisana by Hobern (2008) is licensed under the Creative Commons Attribution 2.0 Generic license. Image (d) by uncredited at http://revtangen.blogspot.com.au/2016/09/

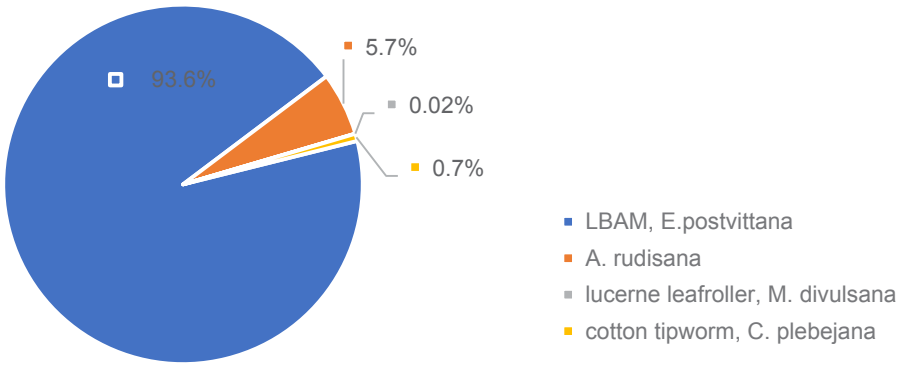

Figure 3. Occurrence of different species of leafrollers in Adelaide Hills and McLaren Vale vineyards.

Little is known about the presence of *M. divulsana* in perennial horticultural crops and grapevines have not previously been regarded as a host species.

The cotton tipworm (*Crocidosema plebejana*) is an introduced pest of cotton in Australia (Bishop and Blood 1978) (Figure 2d). Outbreaks are associated with the growth of marshmallow (*Malva parviflora*) (Hamilton and Zalucki 1993), which can be found in the vicinity of vineyards. *Crocidosema plebejana* has not been found previously on *V. vinifera*.

If species of tortricids other than LBAM are present on grapevines and have different behavioural characteristics, then this may change the management approaches adopted for leafroller control. Molecular identification methods were used in a recent study to determine which species of Tortricidae are present on the canopies of grapevines in Adelaide Hills and McLaren Vale vineyards.

Which species of leafrollers were found in grapevine canopies?

LBAM was the dominant species of Tortricidae found in grapevine canopies with a mean prevalence of nearly 94% (Figure 3), confirming it is the most common leafroller pest found in Adelaide Hills and McLaren Vale vineyards. However, *A. rudisana*, the lucerne leafroller and the cotton tipworm were also found for the first time on grapevine canopies. An unusually high frequency of *A. rudisana* was found in one vineyard, so species other than LBAM may occasionally reach higher densities in vineyards. This indicates that an accurate identification is warranted when pest management is not working effectively. A very small number of moths from other families were also found that did not warrant concern.

Considerations for grapegrowers

Australian vineyard managers often scout broadleaf weeds in the mid-row for the presence of moth larvae to provide an indication of leafroller activity early in the growing season (Brockerhoff *et al.* 2011). Given it is impossible to identify larval tortricids accurately in the field, the abundance of damaging species of tortricids may be overestimated, leading to an unnecessary waste of time and resources. This emphasises the importance of correct identification of leafrollers. If growers wish to determine which species of leafrollers are present in their vineyard, then caterpillars can be placed into a small container along with a leaf from a host plant and some paper towelling or tissue. After a few weeks the larvae will develop and emerge as adult moths (Figure 4, see page 40).

Merophyas divulsana has been found on mid-row cover plants in the vineyard (Feng *et al.* 2016) but has not been previously described on grapevine canopies. Very few lucerne leafroller (*Merophyas divulsana*) and cotton tipworm (*Crocidosema plebejana*) larvae were found on grapevines over the two sampling seasons, suggesting that it is unlikely these leafroller species frequently feed in grapevine canopies. If they are found on grapevines, then it is likely to be in very low abundance and of insignificant impact and risk.

Interestingly, larval lucerne leafroller and cotton tipworm may provide a source of alternative prey or hosts to boost the presence of predators and parasitoids of LBAM when insectary food (nectar and pollen) sources are low early in the growing season (Barnes *et al.* 2010, Gurr *et al.* 2004, Hassell and May 1986). This may potentially result in predators of LBAM being able to colonise and provide natural biological control in vineyards more quickly. Similarly, these other species of leafroller provide diversified host options for parasitoids of LBAM, such as *Dolichogenidea tasmanica*, *Therophilus unimaculatus* and the commercially available *Trichogramma carverae* in vineyards (Feng *et al.* 2016, Yazdani *et al.* 2015).



Figure 4. Growers can rear larvae to determine the species of tortricid moth once it emerges as an adult. Photos by Mary Retallack

Conclusion

This research has confirmed that light brown apple moth (*Epiphyas postvittana*) is the most common tortricid pest of South Australian vineyards. However, low densities of *A. rudisana*, lucerne leafroller and cotton tipworm have also been found on the canopies of grapevines for the first time.

Instead of assuming all larvae are LBAM, we should refer to them as 'tortricids' instead to reflect the diversity of leafrollers that may be present in grapevine canopies.

Better species identification will provide an improved understanding of leafroller activity and the horticultural risk posed by each species to ensure effective IPM control strategies are adopted for all species present.

Acknowledgements

This research was made possible through scholarships to Mary Retallack awarded by the Australian Government Research Training Program Scholarship, The University of Adelaide C.J. Everard Supplementary Scholarship, SARDI Women's Suffrage Centenary Bursary, Wine Australia PhD Supplementary Scholarship. Project operating support was provided via Wine Australia and via the Adelaide Hills Wine Region Post Graduate Biodiversity Study Grant.

We thank managers who allowed us to collect data in their vineyards: Darren Arney, John Good, Anton Groffen, Matt Hatwell, Prue Henschke, Janet and Erinn Klein, Craig Markby, David Paxton, Edd Perkins, and Fiona Wood. We thank Dr. Kelly Hill, and Dr. Fung Yi who assisted with molecular methods in the laboratory and Dr. Linda Thomson for her input and guidance.

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AT A GLANCE

- Light brown apple moth isn't the only leafroller species that feeds on grapevines
- Three other leafroller species have been found in grapevine canopies for the first time in a recent study in South Australian vineyards
- It is not known if these are damaging to grapevines. More research is needed
- Two of the species may provide a source of alternative prey or hosts for predators and parasitoids of LBAM
- Instead of assuming all larvae are LBAM, it is suggested the term 'tortricids' be used instead to reflect the diversity of species
- If tortricids other than LBAM are present this may change the management approach for their control