Redberry mite unpacked

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RB17000: Integrated Pest Management of redberry mite, Acalitus essigi, on blackberries

In the last three years blackberry production has catapulted into the Australian berry category, more than quadrupling production to over 1,400 tonnes. Running alongside this fast-growing industry is the redberry mite project undertaken by the Tasmanian Institute of Agriculture (TIA). The research is helping growers understand and manage this mighty little pest of blackberries.

Redberry mite (RBM) is so tiny it can easily escape detection until it really starts to cause problems. It feeds on unripe blackberry fruit, causing uneven ripening. Part of the fruit stays hard and red whilst the rest is black and ready to eat, making the fruit unmarketable.

At the start of the RBM project the research team set out to answer some key questions:

- What is currently known about RBM?
- Does RBM occur in all Australian production regions and if so, on which varieties?
- What is the impact of RBM in commercial blackberry production?
- How do growers currently manage pest and disease in blackberries?

Gathering this fundamental information formed the basis of the project with the aim of developing both a monitoring program and integrated pest management (IPM) strategies for RBM.

TIA project lead, Dr Stephen Quarrell emphasised that managing a pest such as redberry mite requires a whole system approach.

"There's quite a lot of detective work involved. It's critical to understand not just the pest but also how other farm management practices could affect the mite's predators, both the native species that are already there and the ones we deliberately introduce," he said.

RBM impact

In 2017, Simon Dornauf of Hillwood Berries in Tasmania described the level of impact RBM could have.

"We have experienced crop losses of up to 20 per cent due to redberry mite. It not only compromises our yield of first grade fruit but impacts on our harvest costs. Harvest is slower and more costly when there is redberry mite present," Mr Dornauf said.

This was a common theme which came out in a survey of growers at the start of the project with others reporting up to 60 per cent crop loss depending on the variety.

Distribution of RBM around Australia in 2018

A grower survey in early 2018 found the bulk of production of blackberries occurred in Tasmania and Victoria with small inputs from New South Wales, Queensland and Western Australia.

At this time, production came from 81 ha, 11 different varieties with a little over half of all blackberries grown in protected cultivation or tunnels.

The three years of fruit and bud surveys has only detected RBM in blackberry samples from Tasmania and Victoria, which most likely reflects the perennial growing system used in these states and possibly an environmental preference.

Which varieties?

Of the 11 different varieties tested, the public variety 'Chester' and Driscoll variety 'BL454' proved to be highly susceptible to RBM. Numbers in other varieties were low, however there were new varieties in the pipeline to keep the research team on their toes! Primocane varieties appeared safe with the production system not favouring the RBM lifecycle. However, the newly introduced Driscoll floricane variety 'Victoria' raised some concerns when high RBM levels were found in dormant winter buds in 2019.

To date, this variety remains symptom free, but will remain under the vigilant eye of growers in the coming season. The early nature of this variety means dormancy is short-lived which might prove to create a less than favourable home for RBM.

Integrated Pest Management (IPM) of RBM

A good IPM program relies on knowing when and where your pest and predators are present (monitoring), using appropriate management practices and timing that may include cultural, biological and chemical options.

Monitoring for RBM – a grower friendly method

In 2018, University of Tasmania Agricultural Science Honours student, Hui Law, developed a new strategy for monitoring RBM in both buds and fruit. This overcame the old, laborious technique of using 'sticky traps' and incubators and replaced it with the rapid 'shake and wash' method. Ms Law also determined that sampling around 30 red fruit per block or 10 buds per block will allow you to reliably detect RBM if it is present in your crop.

For details of the method and to download a guide to RBM symptoms, visit the TIA redberry mite webpage (www.utas.edu.au/tia) or on YouTube (www.youtube.com/tasinstituteofag).

Cultural practices — Wild blackberries

One of the key questions around wild blackberry management proved to be very revealing. 75 per cent of growers reported having blackberries on or near their farms. University of Tasmania Honours student, Hui Law found the relationship between wild blackberries and RBM incidence on farms to be very strong. She found that a commercial blackberry crop was more likely to be infested when wild blackberries were within 30 metres of the crop. Removal of wild blackberries, whilst not always an easy task, is a primary strategy to reduce RBM infestation.

Chemical management – softly, softly

Dr Quarrell's interest in chemical management extends beyond what growers are using for redberry mite.

"Every chemical that is applied to a crop, whether it is a broad-spectrum fungicide or a highly targeted insecticide can impact on the whole dynamics of the system and timing can be critical. I was particularly interested in those chemicals with known negative impact on mite predators, such as the miticides and mancozeb and when they were being applied," he said.

The most recent research at Costa Group's Bengeo farm allowed the team to study what happens under a reduced spray program, limiting miticides and mancozeb to pre flowering. This was backed up by studies in four other commercial crops, some with very low chemical inputs and others with full programs.

Key findings

- Applying a full spray program that includes miticides and/or mancozeb post flowering is bad news for predatory mites. Whilst this program is effective at keeping RBM numbers low, it impacts on the management of other pests such as two spotted mite, broad mite and aphid by knocking out naturally occurring and introduced predators.
- A reduced spray program that uses no miticides or mancozeb after flowering, supplemented with the predatory mite *T. doreenae*, provided a similar level of RBM control as the full spray program. It also allowed predatory mites to persist over the winter period, indicating the mite was happy to reproduce in the crop.
- In a 'Chester' crop with a long history of low chemical inputs, RBM numbers remained low throughout the project's three production seasons.
- The window highlighted for successful RBM control is between the end of winter and flowering.

The registration of sulfur (Apparent Sulfur 800 WG) for use in Rubus crops offers an alternative softer chemical management option from bud burst to flowering. Combining this with end of winter management using winter oils is a 'softer' option for growers that has low impact on beneficial species.

Redberry mite symptoms on fruit. Photo credit: TIA

Dr Steve Quarrell. Photo credit: Peter Mathew

Biological control – 'Doreen' the mightiest mite

The project looked at three potential commercial biological control agents for RBM based on success in other crops on similar mite species and recommendations from Paul Horne from IPM Technologies and James Altman from Biological Services.

1. *Typhlodromus occidentalis* (2018/19) "Occi"
2. *Typhlodromalus lailae* (2018/19 and 2019/20) "Lailae"
3. Typhlodromus doreenae (2019/20) "Doreen"

Each season predators were released in multiple crops in both Tasmania and Victoria, in open field and polytunnel systems in known RBM sensitive cultivars 'BL454', 'Chester' and 'Victoria'.

Over three years the team collected and counted all the mites found in over 7,000 fruit and 2,000 winter buds. A selection of the mites extracted were then identified to species level by Entomologist Dr Jamie Davies from the Tasmanian Government's Department of Primary Industries, Parks, Water and Environment (DPIPWE).

Key findings

Of the predators that we assessed, *T. doreenae* or "Doreen" was the only predator to offer control against RBM. In the multiple crops in Tasmanian and Victoria where "Doreen" was released, we recorded reduced RBM numbers.

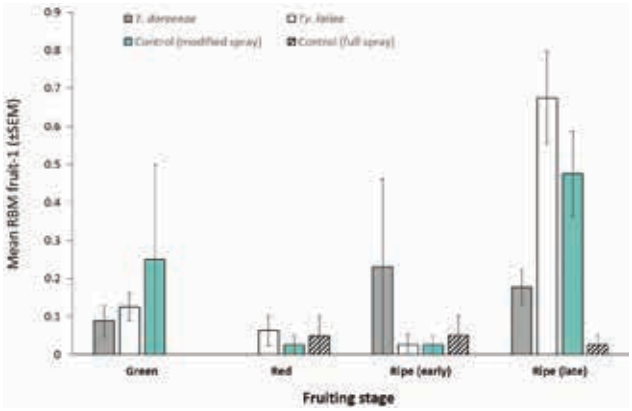

Figure 1 shows the results of the spray reduction trial, where RBM numbers stayed low in both the "Doreen" rows and the full spray program rows.

Lending further weight to the potential of "Doreen" was the fact it was also identified from dormant buds eight months after its release, providing additional promise that this mite is producing multiple generations and may persistence in the crop between seasons.

Does RBM cause redberry disease and how many is too many?

Redberry disease is the damage attributed to redberry mite infestation. This link has been questioned over the years due to cases of mistaken identity where similar symptoms to RBM infestation have not coincided with an infestation. However, using wild blackberries as a model, the project was able to demonstrate a strong positive relationship between RBM numbers and the level of fruit damage. However, this may not be true for all varieties and is an area that needs further research.

What's next?

Talking to growers is the best way to understand where to head next with research. The overwhelming response to date has been 'we really need to better manage sucking bugs, mirids and green vegetable bugs' in both blackberries and raspberries.

These pests are being recognised as a barrier by growers wanting to take the plunge into both IPM and investing in biological control options like "Doreen", as only non-selective chemical options are available to control these pests, but can have a detrimental impact on predatory mites.

With the hugely positive outcomes from the RBM program, and the strong desire of growers to implement IPM, sucking pests are sure to be next in their sights.

Acknowledgements

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