Steps to subdue sooty mould

Integrated pest management for passionvine hopper

Jessie Fea, Dermott Sweeney – Zespri and **Nicola Mauchline** – Bioeconomy Science Institute and Plant & Food Research

There is no silver bullet to control passion vine hopper (PVH), which is the main contributor to sooty mould in kiwifruit. Good PVH management requires an integrated approach, and growers now have several proven strategies to reduce crop losses.



Photo 1. Sooty mould on Hayward kiwifruit.

Sooty mould is a significant production challenge for growers, with industry losses amounting to millions of dollars in a bad season. A four-year Zespri Innovation project, led by the Bioeconomy Science Institute (Plant & Food Research), has been recently completed.

Sooty mould *(Photo 1)* consists of several fungal species, all commonly found within an orchard environment. Its presence on fruit results from the growth of these fungi on the sugary excretions of insects. Given its ubiquity, the direct management of sooty mould is very challenging. An alternative approach is to focus on the source of the problem, one of which is the passionvine hopper (PVH).

This article summarises an integrated pest management (IPM) plan for PVH. Three approaches have been confirmed to mitigate the risks associated to PVH *(Figure 1)*. These are to:

- reduce PVH populations at the source, which are usually areas with PVH host plants adjacent to a kiwifruit orchard;
- minimise migration of PVH adults from the source into the orchard; and
- manage PVH populations within blocks.

Reduce PVH populations at the source

Host plant testing in caged trial experiments confirmed kiwifruit is a poor host of PVH and does not support nymphal development. Passionvine hopper tend to originate from sources outside of the orchard. A key aspect of PVH management involves targeting populations at their source, often naturalised gullies bordering orchards. Gullies typically contain a mix of native and exotic vegetation that serves as a breeding ground for PVH. Research has shown that PVH can survive on most plant species, but their suitability as hosts

varies significantly. This variation offers an opportunity to reduce PVH populations by replanting gully areas with plant species that are poor or intermediate hosts.

Extensive surveys have identified several native plant species suitable for this purpose, including kōwhai, putaputawētā, karo, celery pine, rewarewa, tōtara, mānuka, and kanuka and kauri. Conversely, species such as cabbage tree, flax, lacebark, horopito and hebe have been identified as good hosts and should be avoided in replanting efforts *(Photo 2)*. PVH counts at replant sites compared to those in naturalised gullies confirm that replanting with less suitable hosts is a valid strategy for reducing PVH pressure.

As part of the research project, biological control agents were identified in Southeastern Australia, where PVH originated. This included two nymphal and seven egg parasitoids, however the parasitism rates were found to be very low (2–4 percent). Successful control of a target pest population through a classical biocontrol programme would require at least a 30 percent parasitism rate.

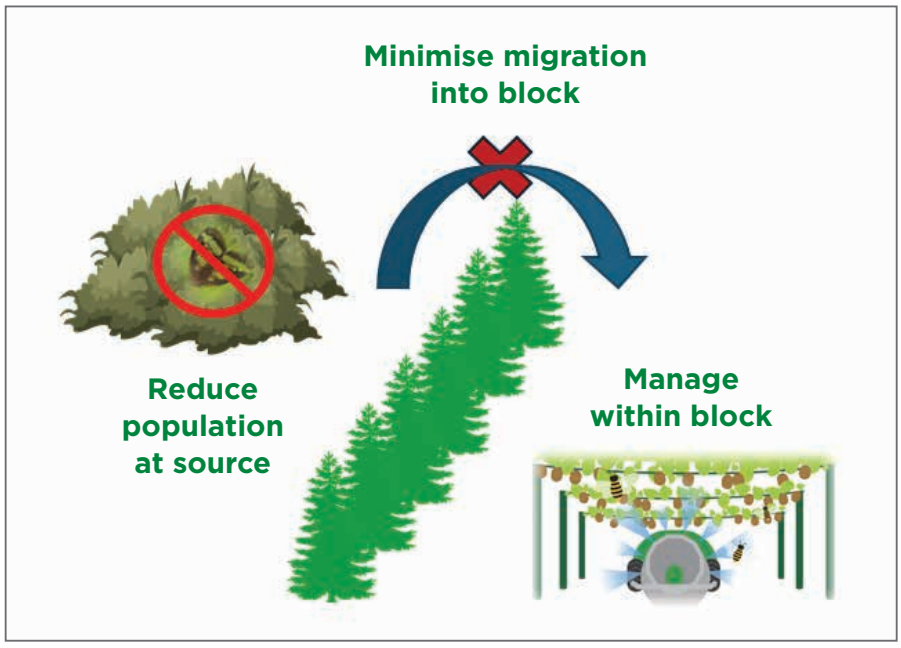
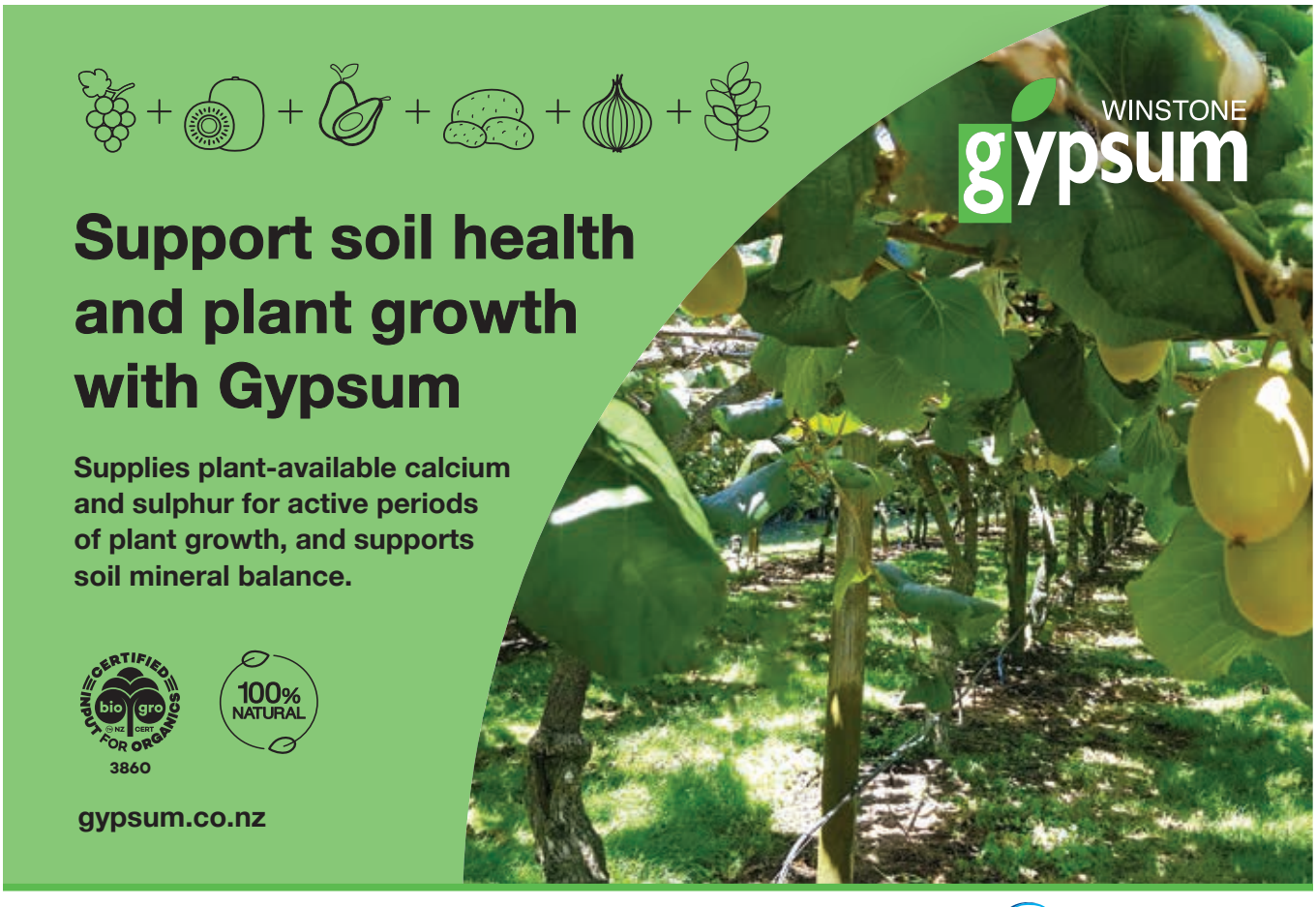
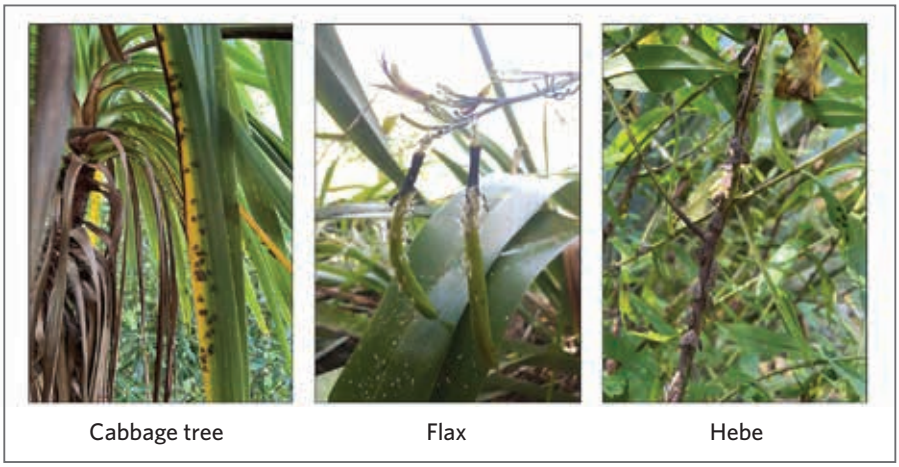


Figure 1. Strategies to manage PVH.

Minimise migration into blocks

Passionvine hopper eggs hatch in spring over 6–12 weeks. In Auckland, this is predominantly in October, and in Te Puke, around mid-October to mid-November. As nymphs develop, they aggregate on shoots to feed *(Photo 3)*, this is soon followed by the migration of PVH adults into nearby kiwifruit blocks.





Cabbage tree Flax Hebe

Photo 2. Example of plant species to avoid in replanting.



Photo 3. PVH nymphs aggregating on a māhoe shoot.

A simple and cost-effective way to monitor PVH nymph activity is to place māhoe plants along the gully edge. If PVH nymphs are present in high numbers, a well-timed spray with an efficacious product, targeted at the gully edge can reduce nymph numbers and delay their migration into kiwifruit blocks.

Of the range of products and product combinations tested for insecticidal activity, an evening spray of PyGanic plus 0.5 percent mineral oil was the most effective at killing PVH nymphs. This should be timed to coincide with nymph aggregation on host plant shoots, which is around late December to early January when PVH egg hatch is complete.

Ongoing monitoring through summer is good practice. A second or third spray at the end of January or February may be necessary for orchards with high PVH pressure. As with any other IPM practice, there is no need to spray the entire gully, and broad-spectrum insecticides should be avoided as these not only kill PVH but also other beneficial insects present.

Clearing of vegetation between the source and the orchard block provides a buffer zone that inhibits PVH adults movement. Unless disturbed, adult PVH typically use short flights between plants to disperse along the edge of vegetated areas and/or within kiwifruit canopies. Monitoring across multiple sites revealed lower PVH numbers in blocks with a border clearance of at least 4 metres, and the greater the cleared space, the less likely it is for PVH adults to reach the kiwifruit orchard.

For those where border clearing is not feasible due to topography of the orchard, having an artificial or dense shelter between the gully and kiwifruit block can provide an effective barrier to PVH migration. Shelter design is important, it must be continuous along the PVH source, securely fastened to the ground and have no gaps in the design *(Photo 4)*. A solid shelter was shown to reduce PVH migration into a kiwifruit block by over 90 percent.

A more future-focused component of the research project investigated herbivore-induced plant volatiles. One volatile was found to have good repellency effect against PVH adults, unfortunately the high volatility means challenges for on-orchard application. Some growers reported citric acid and tea tree oil as repellent against PVH adults but testing showed these were ineffective.

Management within block

For some growers, there may be resident populations of PVH within the orchard. Winter is a good time to check old Hayward fruit stalks or wooden structures

Important notes on pyrethrum products

- Pyrethrum is subject to breakdown and reduced efficacy when exposed to heat and light. It is important to store your pyrethrum products in cool and dark conditions.
- pH can affect the efficacy of pyrethrum products. Always check the pH of your tank solution and buffer to pH 5.5–7.0 as per label.



Photo 4. An artificial shelter and a buffer zone separating the kiwifruit block from a gully with native and exotic plant species.



Photo 5. PVH eggs laid into kiwifruit stalks.

within blocks for signs of PVH eggs, which typically appear as tufts along the egg-laying substrate *(Photo 5)*. If the block is heavily infested, a single spray of bifenthrin plus penetrant during the dormant period, or a single spray of bifenthrin alone applied pre-flower, can be highly effective against PVH eggs. This dormant or pre-flowering spray should not be necessary every year as kiwifruit is not a preferred host for PVH, and an infestation takes time to build up.

For organic growing systems or growers who do not wish to spray, sward mowing could be an alternative. Young PVH nymphs hatching within kiwifruit blocks utilise host plants in the sward, not the kiwifruit canopy. In particular, broadleaf dock has been associated with high numbers of PVH nymphs. Mowing the sward late October or November can

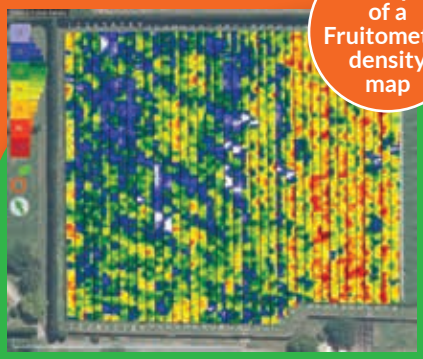
Confident decisions start with accurate scan data.
That's why growers choose Fruitometry.

Measure variability. Optimise your management. Maximise OGR



Get accurate density maps of spring buds and fruitlets for your entire block.

Assess your flowering and pollination to fix overloaded areas early in the season.



Example of a Fruitometry density map

Email to **book your spring buds and fruitlets** scan today.

Growers say our scan results are significantly more accurate.

FRUITOMETRY
Orchard Performance Metrics

fruitometry.com sales@fruitometry.com 0800 437 081

substantially reduce nymph numbers. The physical removal of fruit stalks can also help reduce PVH eggs within blocks, though this practice can be labour intensive.

Key take home message

Effective PVH management will come from a combination of on-orchard activities to reduce PVH numbers both inside and outside of kiwifruit blocks while minimising their migration back into the orchard.

Short-term options could include:

- Monitoring for nymphs using māhoe plants at gully edge from December,
- Well-timed evening spray(s) of PyGanic plus 0.5 percent mineral oil applied to the gully edge from late December to minimise PVH migration into kiwifruit blocks.
- Checking old 'Hayward' fruit stalks or wooden structures within blocks for signs of PVH eggs during dormancy. A single spray of bifenthrin plus penetrant, or a single pre-flower spray of bifenthrin alone can be applied if needed.
- Mowing the sward in late October or November to control resident nymph populations within kiwifruit blocks.

Longer-term options could include:

- Selecting appropriate plant species for gully replanting to reduce PVH populations at the source,
- Clearing and maintaining areas between the shelter and gully,
- Replacing porous shelter with dense or artificial shelter.

Orchards and blocks within can be highly variable and not all options will be suitable for all situations. Where feasible, implementing some or all of these approaches can significantly reduce PVH pressure and protect fruit against sooty mould.

Acknowledgement

This project received co-funding from A Lighter Touch programme which comes under the Sustainable Food and Fibre Futures. We would like to thank all growers who participated in the study, and industry technical representatives who provided input to the PVH research programme.

Find out more

Zespri has partnered with A Lighter Touch as part of its long-term strategic move towards a less chemical-dependent crop protection future. To keep up to date with latest news about finding ways to produce food in a more sustainable way, sign up for In Touch, the monthly newsletter of the A Lighter Touch programme. ■

ABEL TASMAN
Pollen
MALE KIWIFRUIT FLOWER POLLEN



Clean Double Filtered Chieftain and M Series pollen.

All pollen sourced from non-detected PSA-V free South Island.

Market competitive rates.

A product of
THOMAS BROS LTD

For enquiries, contact your local Farmland technical advisor.

Farmlands co-operative