

Cultural and biological control of passionvine hopper in Bay of Plenty kiwifruit orchards – Year One results.

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Passionvine hopper (PVH), *Scolytopa australis* (Walker) is the most significant production pest of kiwifruit and estimated to cost the industry at least \$77M per annum.

Since the 1990s multiple attempts have been made to develop tools or test ideas for managing the PVH problem including chemical control of all life stages, border management and honeydew or sooty mould removal. However, these attempts have been largely unsuccessful, partly due to the lack of understanding of PVH biology and ecology at the time, and partly because of the ad hoc approach that has exemplified previous research into PVH management.

Across the horticultural sector, PVH is also a pest in feijoa and passionfruit, and while biological control agents are present, they do not provide sufficient control in these crops or kiwifruit.

In 2021, Zespri and research partner, Plant and Food Research, began a four year on-orchard research programme investigating PVH control with co-funding by -A Lighter Touch Programme.

The aim of the programme is to develop an integrated pest management plan for use against PVH by:

- Reducing PVH at the source through border management practices and potentially introducing new biological control agents from Australia
- Minimising migration of PVH into blocks through shelter barriers and investigating host plant volatiles as new tools
- Testing and implementing a novel automatic trap as an alternative monitoring tool to current labour-intensive methods
- Identifying best options and timing for within block management of PVH eggs and nymphs
- Understanding sooty mould complex on kiwifruit

The development of new tools for PVH will also provide proof of concept and new areas of future research for other insect pests across the horticultural sector.

Year one of the PVH project is complete and key findings of interest to ALT stakeholders are summarised below.

Survey to assess the effects of shelter and border management on numbers of PVH in kiwifruit vines

A survey of 34 sites on 25 commercial orchards was undertaken in order to measure numbers of PVH on kiwifruit vines on orchards with different border management practices (e.g. spraying, clearing) and different shelter types. Sites were selected to have a range of border management practices against PVH (mechanical or chemical border clearing, insecticide application and replanted with pasture or native trees) and shelter types (no shelter, part or porous shelter, dense shelter, and artificial shelter).

Yellow sticky traps were used to capture PVH on the edge of kiwifruit orchard blocks for 9–10 weeks from late January or early February through to late March or early April 2022.

The strongest trend observed in the survey data was that PVH numbers in kiwifruit were lowest where more of the adjoining areas were cleared of vegetation. Unless disturbed, adult PVH typically use short flights between plants resulting in a tendency to spread slowly along the edge of vegetated areas or within kiwifruit canopies. Large open spaces with few host plants may thus inhibit dispersal.

Artificial shelter was associated with relatively few PVH in kiwifruit. Although based on only two orchards, artificial shelter is a more complete barrier to many PVH dispersing into kiwifruit than tree shelters. Further data is required to confirm this observation.

Application of insecticides, and the active ingredient used, did not appear to influence numbers of PVH in kiwifruit vines. Indeed, sites where no insecticides were applied may have had fewer PVH. One explanation is that growers are spraying in response to high numbers of PVH so that the causal relationship is reversed: high PVH leads to more spraying, low PVH leads to no spraying.

At three orchards, a comparison was made between numbers of PVH captured on sticky traps in kiwifruit blocks and near the border vegetation (traps secured to fence posts or to wooden stakes). Significantly higher densities of PVH occurred on traps on the gully edge than in kiwifruit. This reflects their proximity to source areas of non-crop vegetation and is consistent with slow dispersal over relatively short distances.

Survey to identify host plants along or near the boundaries of kiwifruit orchards

PVH is a polyphagous species, however its feeding preferences, immature survival and reproduction can differ widely between plant species. The host plant status of many plant species used as shelter, in replanting projects, and those that occur along the boundaries of kiwifruit orchards, is not well known. Further data on host plant relationships are needed to avoid planting species that may support large populations of PVH near crops.

A survey to identify host plants along or near the boundaries of kiwifruit orchards was undertaken on 13 orchards (60 sites) and two roadside verges with native and introduced plants. PVH was recorded as nil, some (1 to <15/plant) and many (>+15/plant). The survey was undertaken over two time periods to identify two different stages of PVH life cycle; 9-21 December 2021 nymphs and 12-14 January 2022 nymphs and young adults.

131 plant species were identified (1190 plants belonging to 118 species in December 2021 and 1242 plants belonging to 116 species in January 2022). PVH occurred on most plant species although often at low numbers. Only 18% (n=21) and 19% (n=22) of plant species had no PVH in December and January respectively. Some plant species consistently hosted large numbers of both nymphs and

Key points from the survey of shelter and border management

- Increased clearing of border vegetation may be associated with reduced numbers of PVH in adjacent kiwifruit.
- Shelter type may also have some influence on numbers of PVH, although further data are needed particularly for artificial shelter.
- Frequency of insecticide application and active ingredient applied did not appear to affect PVH numbers captured on the edge of commercial blocks.

adult PVH. Most of these species have previously been reported or are known to be preferred hosts and included mahoe, blackberry and privet.

Plant hosts with few PVH tended to be trees with needle-like leaves or small narrow leaves (e.g. cryptomeria, totara and casuarina) or had narrow stems (e.g. great bindweed and nipplewort).

Further surveys of selected sites will be carried out during the next three years.