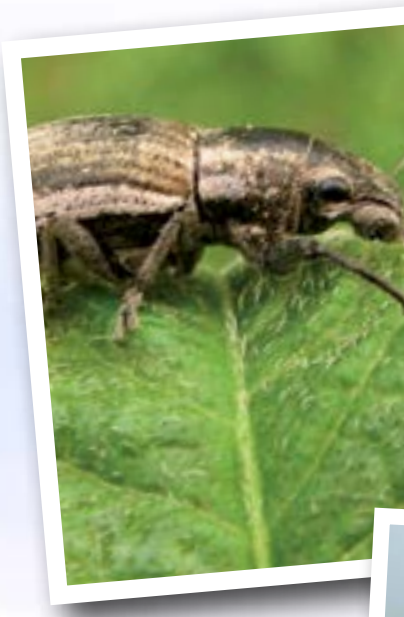
# White-fringed weevils beware



A three-year research project which aims to improve the management of White-fringed weevils in potatoes has made significant progress in determining whether the grubs can detect host plants in the soil, writes Gretel Sneath.

It only takes one White-fringed weevil (WFW) to establish a population in a paddock, and once they take hold, they are extremely difficult to eradicate. While present in all potato growing areas, WFWs have had considerable impact in Tasmania, where they have attacked the roots of several other crops including carrots, poppies, pasture and forage plants.

Horticulture Australia Ltd (HAL), through funding from the processed potato industry levy and matched funds from the Australian Government, is overseeing a three-year project that aims to improve the management of WFW. The project, which is based at the Tasmanian Institute of Agriculture, and led by Associate Professor Geoff Allen, is approaching the end of its second year. Scientists are making significant progress in determining whether the grubs can detect the presence of host plant roots in the soil, or whether they in fact stumble upon them randomly.

## Bioassays

Dr Paul Walker, who is conducting the research, says a series of laboratory bioassays using two-sided soil chambers have been carried out at various stages of grub development.

"We wanted to establish whether the grubs gravitate towards specific compounds released from the roots of their host plants like some other subterranean invertebrates, or whether they randomly choose their target. So we connected one arm of the chamber to a pot containing a plant, and the other arm to a pot with just soil," he explains.

Newly hatched non-feeding WFW grubs (1st instars) which live off a yolk sac inside their body didn't specifically target soil chambers containing host plant roots or tubers (potatoes, lucerne, carrot), but it was a different situation when it came to field-collected late-instar (8th-11th instar) WFW grubs.

"We starved them for a few days before putting them in the chamber to make sure that they were extra hungry, and 90 percent of them went for the plants. This is quite exciting as it suggests that there is something in the soil they are using to orientate towards the food plants," says Dr Walker.

"What we have to do now is try to work out how they make that decision - is it due to a very general, non-host specific cue like CO2 which is given off by all plants, or can the grubs actually discriminate between a preferred (e.g. potato, lucerne) and a non-preferred host plant (e.g. cereals, grasses) using plant-specific root volatiles?"

Bioassays are a slow process, but Dr Walker says it's necessary to give WFW a choice

Two-sided soil chamber.

in order for the research team to make some clear definitions.

"If you can prove that there is some discrimination going on, and root exudates are being used by WFW grubs to detect the presence of host-plants, the next step will be to try to identify what compounds they are using in order to do this. We could then work towards investigating the feasibility of some kind of attractant/deterrent for detecting the presence of grubs in the soil and preventing them from feeding on that crop."

In addition to the success with late-instar WFW, a new bioassay chamber has been devised for testing the response of small grubs (< 5 mm) to host plant roots. It uses a much smaller amount of soil than the original design, allowing a higher success rate in the recovery of small grubs, however, further testing of newly-hatched instars produced the same results of the initial bioassays. There is no evidence that this non-feeding stage orientates to host plants (potatoes, lucerne, carrot) as opposed to chambers containing soil only. The new design is now being used to further test the response of second instar WFW larvae, which have commenced feeding.

## Sampling plans

Project PT09027's other main objective is to increase industry awareness of WFW and promote wider use of an effective sampling plan before growers make a decision on whether or not to spray. Developed by Dr Paul Horne from IPM Technologies, VIC, and WA-based entomologist Stewart Learmonth, the sampling plan involves taking samples of soil with a spade (approximately 20x20x20cm) randomly across the paddock to search for WFW grubs.

"For an average-sized paddock, five spade samples should be taken in each of nine widely separated locations to cover most of the area," explains Dr Walker.

"Sampling is best done well before planting in the winter months when the grubs are easy to identify and readily visible in the soil. If more than one grub per five samples is found, then the grower should consider either not planting potatoes, or treating the soil with an insecticide before planting."

Over the course of sampling for WFW grubs, researchers have spoken to individual growers about the aims of the project and their problems with the pest. They will continue to communicate progress and outcomes to growers, agronomists and industry through articles and field days, posters, brochures, and a grower fact sheet scheduled for release later this year.

## THE BOTTOM LINE

- White-fringed weevils can currently only be controlled by crop rotation, chemical and cultural controls.
- The implementation of an effective sampling plan is critical for determining appropriate control decisions.
- Researchers are closer to identifying how white-fringed weevil grubs locate host plant roots in the soil.

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