TAMARIXIA TRIOZAE

A small parasitoid with a big future | **Sally Anderson**, NZ Market Access Solutionz

POTATO R&D FORUM 2021

The detection of tomato potato psyllid (TPP) in Western Australia in February 2017 was a major blow to the local industry, and an alarm call to all Australian growers of *Solanaceae.*

The psyllid itself is a tiny, sap sucking insect that causes mainly superficial damage. The real problem comes from the *Candidatus* Liberibacter solanacearum (CLso) bacterium that it can carry, which causes 'zebra chip' disease. Zebra chip can cause stem cankers and stunt growth in the plant itself. But in the tubers damage is severe, causing dark splotches and stripes strongly visible after cooking (Figure 2).

Figure 1. TPP adult and eggs.
- *Tasmanian Institute of Agriculture*

So far, WA, and Australia generally, have dodged a bullet. Despite extensive sampling, no 'hot' psyllids - carrying the bacterium - have been found. However, this may not always be the case as there is always the possibility of another biosecurity breach. For example, in 2015 both the psyllid and the CLso bacteria were found on Norfolk Island.

Figure 2. Zebra chip affected potato

THE NZ SOLUTION - KILLER WASPS!

New Zealand, unfortunately, has had both the psyllid and its unwelcome companion since 2006. Enter

Figure 3. Tamarixia adult and TPP nymphs
- *R. Lamberts*

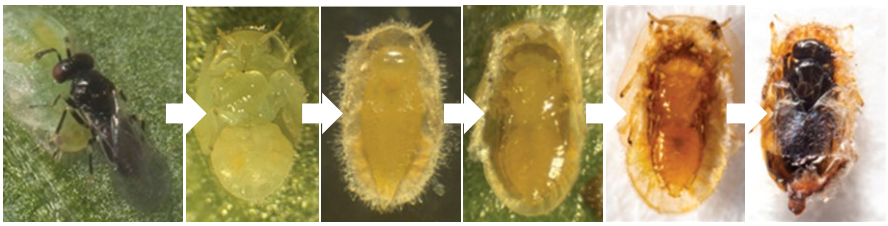

Figure 4. Lifecycle of *Tamarixia triozae*: The female lays a single egg on a psyllid nymph. The wasp larvae burrows into the psyllid, devouring it from the inside. Eventually, the larvae pupates inside the eaten-out cadaver, emerging as an adult wasp. – *R. Lamberts*

Tamarixia triozae. This tiny wasp delivers a double whammy, being both a parasitoid and a predator of TPP.

Like something from the movie Alien, the adult lays a single egg on the underside of the psyllid nymph. After 12 days an adult wasp emerges from the eaten-out cadaver (Figure 4).

Females then go in search of prey. She uses her ovipositor to stab a hole in psyllid nymphs, then feeds on their hemolymph (blood). Like Dracula but with an ice-pick.

A female can lay up to 165 eggs during her lifespan, so that's a lot of dead psyllids.

As Sally explained, "Introducing an exotic insect (from Mexico) to New Zealand involves a lot of hoops. It took around four years to get approval to import this parasitoid into New Zealand. This involved host range testing, an economic analysis and a risk analysis. Approval was granted in 2016 and, following additional quarantine screening, the first releases occurred two years later."

"Our releases ramped up from a modest 1,900 in year one, to a more organised 7,400 in year two and then an all-out effort in year three with more than 20,000 *Tamarixia* released (Figure 5). One of the really encouraging things about the program

Figure 5. Releasing a vial of adult *Tamarixia* into a boxthorn hedge (boxthorn is an alternative host for TPP) - *S. Anderson*

Figure 6. Parasitised TPP nymph, showing the wasp's exit hole. - *R. Lamberts*

was not just the interest shown by growers, but also the enthusiasm from home gardeners, who released more than 10,000 *Tamarixia* in the 2020-21 season," said Sally.

Early observations showed that the psyllid survived over winter, spread significantly from the initial release sites and could achieve up to 40% parasitism of psyllid nymphs (Figure 6).

COULD *TAMARIXIA* BE A SOLUTION FOR AUSTRALIA AS WELL?

While *Tamarixia* is now commercially available in New Zealand, introducing it to Australia would require at least a similar number of hoops as encountered by the Wellington researchers.

Critically, it would need to be shown to be host specific to TPP; nobody wants another cane toad! *Tamarixia* was found to predate on a NZ psyllid, although it was non-preferred compared to TPP. Given the large number of Australian psyllid species, this is likely to prove a challenging task as well as a potential barrier to introduction.

However, even the best biosecurity cannot guarantee Australia will be free of 'hot psyllids' forever. Starting the process sooner rather than later, to determine if *Tamarixia*, or a local species, is a potential control option, may be worthwhile insurance.

NEW SMARTPHONE TECHNOLOGIES FOR PATHOGEN DETECTION

POTATO R&D FORUM 2021

Dr Jean Ristaino, Director of the Emerging Plant Disease and Global Food Security cluster at North Carolina State University

Figure 7. Dr Jean Ristaino, a pathologist and distinguished professor in North Carolina University's Department of Entomology and Plant Pathology

Imagine if you could detect disease even before symptoms develop in the field... and you could do it using your smartphone!

This is what a project run out of North Carolina State University is seeking to achieve.

They are investigating two methods.

One is detection of release of volatile organic compounds (VOCs). A sample of plant leaf is placed in a small glass container for around 15 minutes, then the atmosphere is pumped through a chamber containing a test strip (Figure 8). Chemicals on the strip