Management of giant willow aphid

Photo: Bryce McQuillan

ANNUAL NEWSLETTER ■ JUNE 2019

Scion update

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Biological control update

We have made great progress and achieved excellent results in our programme on the long-term management of the giant willow aphid (GWA), *Tuberolachnus salignus*, which has been causing widespread problems throughout New Zealand since it was first found here in 2013.

We have now completed host specificity trials and behavioural tests examining how our proposed biological control agent interacts with both GWA and other aphid species present in New Zealand. Based on the very favourable results, we have prepared an application to the Environmental Protection Authority for its release.

Back in 2016, we identified a promising biological control candidate for GWA: a Californian parasitoid wasp named *Pauesia nigrovaria* (Figure 1). This wasp is a highly-specific natural enemy of GWA in its native environment, and in December 2017 we successfully brought a small number of these parasitoids into our containment facility at Scion in Rotorua.

In the following eighteen months we undertook host testing trials of *Pauesia nigrovaria* against five non-target aphid species, representing a range of aphid groups present in New Zealand. The cypress aphid

Figure 1. Pauesia nigrovaria *female probing a GWA with its ovipositor.*

Cinara fresai (Lachninae) was chosen as it is in the same subfamily as GWA and comes closest to it in body size. The black peach aphid *Brachycaudus persicae* (Aphidinae: Macrosiphini) represents the largest group of aphids in New Zealand, and the three remaining species represent New Zealand's three native aphid lineages: the Muehlenbeckia aphid *Aphis cottieri* (Aphidinae: Aphidini), the tōtara aphid *Neophyllaphis totarae* (Neophyllaphinae) and the southern beech aphid *Sensoriaphis nothofagi* (Taiwanaphidinae).

Results of the host testing trials were excellent for all non-target aphid species, with zero parasitism recorded on any species other than the target, GWA. In addition to these trials, we also conducted behavioural assessments with *Pauesia nigrovaria* and three aphid species: GWA, the closely-related cypress aphid and the black peach aphid.

These assessments showed that *P. nigrovaria* paid little attention to the non- target species, compared to GWA (Figure 2). Antennal and ovipositor contact on the non-target species were significantly less, though one female wasp did appear to oviposit in two cypress aphids. However, no progeny developed and subsequent dissections revealed no evidence of an egg or a larva. *P. nigrovaria* made no attempt to oviposit in the less closely-related black peach aphid.

With both the host testing results and behavioural assessments indicating very little or no risk to non-target species, we believe that *Pauesia nigrovaria* is safe to release in New Zealand, and that its introduction will be beneficial, leading to a reduction in the damaging effects of giant willow aphids and the problems associated with their feeding activities. These include increased health of trees used for erosion control, improved health of honeybees and improved honey quality, reductions in harmful sooty mould and reduced populations of invasive pest insects such as vespid wasps and harlequin ladybirds, both of which are voracious predators of native and beneficial insects.

Applying to the Environmental Protection Authority to release *Pauesia nigrovaria* is an in-depth process and we are seeking beekeeper participation to support our proposal. You can make an online submission at www.epa.govt.nz/public-consultations, or send a letter of support to us at Scion. If approved, we expect the first releases of *P. nigrovaria* to occur in early 2020.

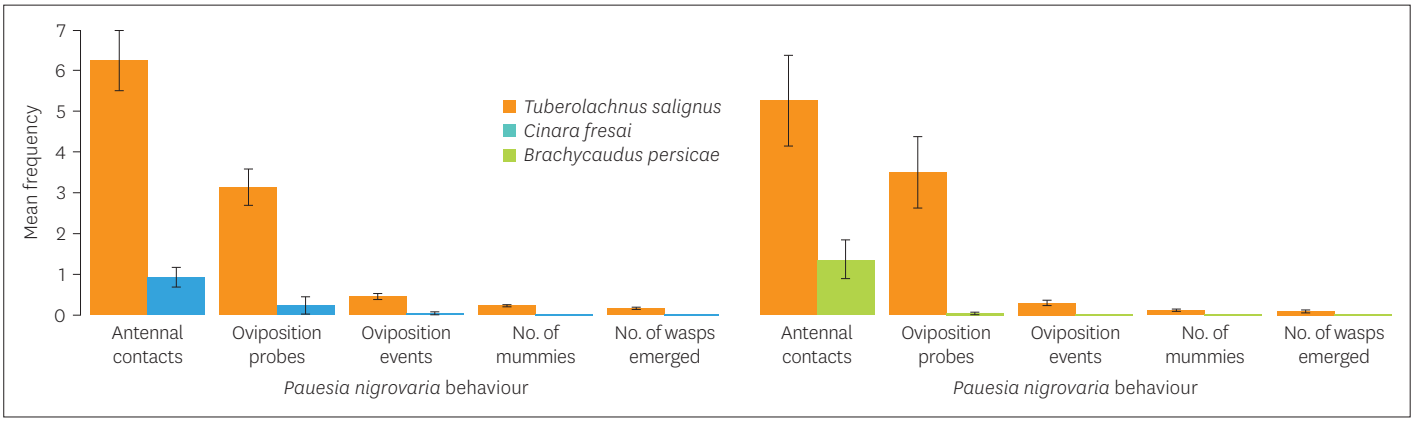

Figure 2. *The mean frequency of observed behaviours (antennal contacts, ovipositor probes, and oviposition) by* Pauesia nigrovaria *towards GWA (orange), the cypress aphid (left, blue), and the black peach aphid (right, green), as well as the number of parasitized mummies produced and the number of wasps that eventually emerged (zero for both non-target species).*

Plant & Food Research update

Trevor Jones, Plant & Food Research

Willow growth trial update

A nursery field trial at Massey University has looked at the effect of the GWA on young willow trees propagated from cuttings.

During the first growing season (2017-2018), the aphids had no effect on the survival and growth of the willow trees. However, in the second growing season (2018-2019), the aphids had a noticeable effect with a reduction in the survival and growth of susceptible willows (Figures 3 and 4).

Tree survival was 62% and 83% for *Salix candida* and *S. viminalis*, with reductions in height growth of 90% and 55% respectively.

For the commercial willows *S. matsudana*, *S. matsudana* x *alba* 'Moutere' and 'Tangoio', *S. schwerinii* 'Kinuyanagi', and *S. purpurea* 'Booth', the tree survival was 100%, but there were reductions in height growth of 25% to 36%.

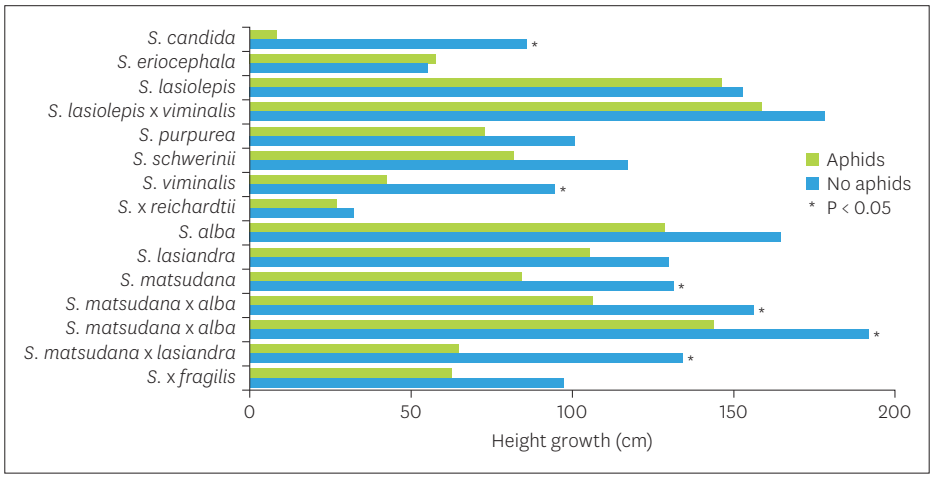

Figure 3. *The height growth of the willows during the second growth season from 2018-2019.*

In the GWA-resistant willows *S. eriocephala*, *S. lasiolepis* and *S. lasiolepis* x *viminalis*, the aphids had no effect on tree survival, and the reductions in height growth were less than 12%.

The GWA-resistant *S. lasiolepis* x *viminalis* is a shrub willow that has recently been released to regional council nurseries. It is an early-flowering male clone, with potential for beekeepers, and has shown good drought tolerance and height growth.

Figure 4. Salix viminalis *trees with aphids (left row) and without aphids (right row) in June 2019.*

'Management of giant willow aphid' is a Ministry for Primary Industries Sustainable Farming Fund project. This work was supported by regional councils and:

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