

The Root Zone: Thrips predators in soil

The most successful pest control strategies involve disadvantaging the pest from several different angles. Understanding the pest life cycle can help when making a multifaceted plan.

Thrips control is definitely an example of a pest needing a multifaceted plan.

We tend to notice thrips when they're on leaves and flowers, as nymphs and adults. These life stages were the focus of a recent predator efficacy test done by Bioeconomy Science Institute, Manaaki Whenua Landcare Research Group (supported by SGNZ, Lighter Touch, and Barkers), which showed the preference of the mite predators and the insect predators for young instar nymphs. The study highlighted that successful thrips-control programs must be focused on early establishment of predators to maintain low reproductive success of thrips, rather than a focus on predating thrips adults. While the minute pirate bug did eat adults, it preferred nymphs.

(<https://www.berryworld.co.nz/blog-posts/thrips-predator-testing-on-strawberries>)

It's easy to forget that that thrips spent 2 of their 6 life stages in the soil--pre-pupa and pupa. Once the nymphs are ready to pupate, they climb down the plant and find a cozy spot in the soil to spend the next two pupal stages of their lives. Thankfully, some predators also make their home in the soil.

Zhi-Qiang Zhang (Bioeconomy Science Institute, Manaaki Whenua Landcare Research Group), along with graduate student Haiyu Chi of The University of Auckland, worked out the appetite of the soil-dwelling predatory mite *Strateolaelaps scimitus* ("Hypermite" trade name when supplied by Bioforce). They found that the more pupae the mites were given, the more they would eat—in a "prey-dense" scenario there will be more predation. The appetite of adult mites ranged from 2-6 thrips pupae per day, with the higher numbers being eaten when there are more pupae on offer.

We can compare the appetite of the soil-dwelling mite predators with the appetite of the leaf-dwelling predatory mites (*N. cucumeris* and *A. limonicus*), which in a similar lab-based feeding test was 6 thrips nymphs per day. That means that in an integrated system with predators both above and below the soil, between 25% and 50% of the thrips predation is happening in the soil. **What's happening underground is quite significant!**

The mantra with biocontrol is to establish a "standing army" before the pest pressure gets high. The puzzle is *how* to establish predators before the pest at damaging levels, given that for predators to survive and reproduce, they must have a food source. What comes first, the predator or the pest?

Thankfully, *Strateolaelaps* mites are generalist predators—they will eat a whole host of insects and other invertebrates such as root nematodes and other soil mites, not just

thrips pupae. One common insect, the fungus gnat, lives its larval life in the soil and makes great food for *Strateolaelaps*. Growers who monitor with sticky traps will be very familiar with fungus gnats, which often make up the majority of the insect bodies caught on those yellow sticky papers. They are a food source for *Strateolaelaps* before thrips become numerous, allowing a soil population of predators to build and be “at the ready” for thrips season.

This is a great time of year to apply the soil-dwelling predatory mites in warmer north-island climates, according to Renata at Bioforce. They don’t do well in the cold winter soils, but when soils warm up to around 10°C in spring, they will survive. Last year we learned through the Landscape Survey work (undertaken by Bioeconomy Science Institute, Manaaki Whenua Landcare Research Group, with funding from SGNZ, Lighter Touch, and Barkers) that by late November in Auckland, the thrips population in strawberries was already high. That means for effective biocontrol, the predators (both soil and leaf dwellers) should have been established well before November. The same principle holds true with *cucumeris*, the commercially available mite predator for thrips juveniles in the flowers.

Soil mites can be applied near the plant crown and they will make their way into the soil. It’s best to release them in the early morning or evening, so they can get under cover before the sun becomes strong.