



Grower Summary

SF 147

New bio-control agents
for Western Flower
Thrips on protected strawberry

Final 2017

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The results and conclusions in this report may be based on an investigation conducted over one year. Therefore, care must be taken with the interpretation of the results.

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Before using all pesticides check the approval status and conditions of use.

Read the label before use: use pesticides safely.

Further information

If you would like a copy of the full report, please email the AHDB Horticulture office (hort.info.@ahdb.org.uk), quoting your AHDB Horticulture number, alternatively contact AHDB Horticulture at the address below.

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Project title: New bio-control agents for Western Flower Thrips on protected strawberry

Project number: SF 146

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Report: Final report, May 2017

Previous report: Annual report March 2016

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Date project commenced: 1 April 2014

Date project completed 31 May 2017
(or expected completion date):

GROWER SUMMARY

Headline

- The predatory mites *Stratiolaelaps scimitus* (previously known as *Hypoaspis miles*) and *Macrocheles robustulus* reduced resultant numbers of WFT adults in the coir substrate in controlled temperature experiments. The nematode *Steinernema feltiae* was also effective on occasion.

Background and expected deliverables

Western flower thrips (WFT), *Frankliniella occidentalis*, is a devastating pest of protected strawberries and recent experiences have suggested that existing biocontrol agents sometimes provide inadequate control in hot conditions. WFT feeding on the flowers and developing berries lead to bronzing of the fruit, which can cause downgrading to Class 2 or, in severe cases, to crop losses.

This project aimed to identify alternative predators, not currently being exploited for WFT control, which could be incorporated into a biocontrol programme to replace or supplement *Neoseiulus cucumeris* for control of WFT on protected strawberry.

Summary of the project and main conclusions

In year 1 of the project, the efficacy of a range of commercially available biocontrol predators was assessed when applied both to strawberry plants to control WFT larvae and to the coir substrate to control pupal stages of WFT.

The predatory mites *Amblyseius montdorensis*, *Amblyseius swirskii*, *Amblydromalus limonicus* and the commercial standard *Neoseiulus cucumeris* were all effective at reducing numbers of WFT at 30/20°C day/night temperatures (Light/Dark ratio of 14:10 h).

Additional information was also gathered on alternative species. The predatory mites *Stratiolaelaps scimitus* (*Hypoaspis miles*) and *Macrocheles robustulus* were both found to reduce numbers of adult thrips through pupal predation in the substrate. *M. robustulus* was particularly effective at 30/20°C day/night temperatures.

The effect of predation by the rove beetle *Dalotia coriaria* (formerly known as *Atheta coriaria*) on pupae did not reduce thrips numbers significantly. The anthocorid bug *Anthocoris nemoralis* was also tested as a predator but was not as effective as *Orius spp.*

The results from Year 1 concluded that the predatory mites *A. montdorensis*, *A. swirskii*, *A. limonicus* and the commercial standard *N. cucumeris* are all effective predators of WFT. However, these alternative three species are not currently registered in the UK for use in field/polytunnel grown crops and are unlikely to be registered for this use in the near future. The commercial standard *N. cucumeris* therefore remains the most practicable predatory mite species for growers to use in field grown polytunnel crops.

Because the alternative species are unlikely to be registered for field use, work in Year 2 focussed on the two Neoseiulus species *N. cucumeris* and *Neoseiulus californicus* along with the predatory mites, used in the substrate, *S. scimitus* and *M. robustulus*.

It was decided to explore the relationship between *N. cucumeris* and *N. californicus* and their role in WFT control. *N. californicus* is not native to the UK and is not licenced for release in field grown crops. However, it has regularly been found in field crops for some years. Growers and agronomists find it difficult to distinguish between the two species using a hand lens and incorrect identification may lead to fewer *N. cucumeris* introductions which might lead to reduced control of WFT. Any competition between species may also adversely affect control.

Work was done using small Perspex boxes in controlled temperature cabinets. When used alone, both species reduced the number of thrips. When used in combination, there was a similar level of control to that achieved by either of the mites individually, showing that there was no interspecific competition between the adult mites. *N. californicus* is recommended in glasshouse structures for two-spotted spider mite control, so if alternative prey is available, the resulting WFT control may be different and agronomists may overestimate the populations of predators present which will effectively control WFT. Growers and agronomists are therefore advised to seek specialist identification of the Neoseiulus species which are naturally occurring in a crop, a task which can only be done by trained entomologists under the microscope.

The use of the substrate mites *S. scimitus* and *M. robustulus* was further explored in combination with either predatory nematodes (*Steinernema feltiae*) or *N. cucumeris*. As in year 1, the mites controlled WFT in a coir substrate in small pot units (8 cm x 8 cm) in controlled temperature cabinets. However, there was an indication of an interaction between the nematode *S. feltiae* and *M. robustulus*.

In the third year of the project, work continued to investigate the use of the substrate mites and predatory nematodes in small pot unit experiments. *M. robustulus* was used at two rates, both alone and in combination with *S. feltiae*. *S. feltiae* was also assessed alone. All treatments were compared to an untreated control. All treatments reduced WFT numbers to some extent. There was a statistical interaction, showing that the two species in combination were less effective than the sum of the two species alone. However, the two species in combination, still gave higher control than either species individually. When using predatory substrate mites in combination with other substrate biocontrol agents, timings may need to be considered to avoid an interaction. WFT larvae may not remain in grow bags to pupate and can fall to the ground. Therefore control systems need to consider application timings for best effect.

The successful use of substrate mites in this work supports the report by Clare Sampson in 2014, who found that many growers who had achieved good control of WFT had made one release of *S. scimitus* between March and May, in addition to other biocontrol agents such as *N. cucumeris*.

Financial benefits

The majority (>80%) of strawberries sold by multiple retailers are grown under protection and late season production using everbearer varieties has expanded. WFT is a major pest of strawberries, and when conditions are favourable pest numbers can increase rapidly. On some farms, WFT damage to everbearer fruit has been so severe following failure of Tracer (spinosad) to control the pest, that total crop loss has occurred for the latter third of the season, equating to a loss of £18,000 per ha. More typically, on some farms 20% of the fruit has been downgraded to Class 2 for half of the picking season.

The biocontrol options currently available do not always control thrips effectively. Although biocontrol agents such as *N. cucumeris* are regularly released, they have not worked effectively for every grower. Some growers use them early in the season as a preventive rather than a curative measure. As a result, they are not able to suppress thrips populations once they have increased later in the season. In seasons when conditions have been hot and humid and optimal for WFT development, *N. cucumeris* has not always provided adequate control on some sites, leading to enormous crop losses. Problems with this pest continue in glasshouse and polytunnel crops.

Conditions under tunnels can fluctuate widely throughout the season and different biological control agents may perform better at different temperature/humidity levels. This project compared the efficacy of different biological control agents both alone and in combination

with *N. cucumeris* to enable different solutions to be selected as the season progresses. The project determined the efficacy of commercially produced bio-control agents applied to the substrate, which should not compete with *N. cucumeris* in the plant, and have an additive effect.

If growers can effectively complement the use of *N. cucumeris* with substrate predators such as *S. scimitus*, *M. robustulus* and the predatory nematode *S. feltiae*, the financial losses listed above will be avoided.

Action points for growers

- Continue to use AHDB recommendations for western flower thrips control as described by Sampson (2014) such as preventive introduction of *Neoseiulus cucumeris* early in the season for polytunnel grown strawberries.
- Follow the guidelines laid out in the new AHDB Factsheet 14/15 'Western flower thrips control in strawberry'.
- Consider the use of the substrate predatory mites *S. scimitus* and *M. robustulus* and the predatory nematode *S. feltiae* to complement introduction of *N. cucumeris*, as part of integrated WFT control strategy.
- Where *N. cucumeris* is thought to already exist in a crop, arrange to have the species verified by a specialist entomologist as it can be confused with *N. californicus* which, if present rather than *N. cucumeris*, may offer less effective control of WFT as it also preys on other pests.
- Discuss the timings of applications with your crop advisor particularly when using biocontrol agents that may have an interaction (such as *N. cucumeris* and *N. californicus*)

