Research results from strawberry pest control project

AHDB is funding Project SF 156 to investigate some key pests of strawberry and develop novel approaches to controlling these where appropriate. The project has been running for four years and enters its final year in the 2019 season. Here we summarise some of the key findings for growers to date, some of which growers can adopt in the 2019 season. These findings are heavily abbreviated summaries with no scientific background or detail included in this document. The higher level of detail can be found in the latest reports of SF 156 on the AHDB Horticulture website.

Western flower thrips – monitoring, sampling and control

Populations of *N. cucumeris* predatory mites are best assessed by examining young button fruits (fruits which have just set and the petals have just withered). Populations of WFT adults are best assessed on mid and old aged flowers. Thrips larvae are found on both button fruits and flowers. The solvent, methyl isobutyl ketone (MIK) can be used to extract *N. cucumeris* and thrips adults and larvae from flowers and button fruits.

A prototype extraction device has been designed by NIAB EMR and uses MIK to extract pests and predators from flowers and fruits. In field tests, it recovered 27% of predatory mites from fruit and 5% from flowers. It recovered 68% of WFT from button fruit and 81% from flowers. The MIK dispenser can be used at least 60 times, before it needs replacing. The device helps in the detection of pests in the crop and improves the detection of predators, including *N. cucumeris* and Orius, giving confidence that controls are working. The device requires further commercial development before it is available for growers to use.

In distribution trials, it was found that where WFT are present, significantly more *N. cucumeris* are found on flowers and fruits. Where WFT is not present, the predators, which had been introduced, were spread more evenly across the plant. The distribution trials showed that as temperatures increase, numbers of *N. cucumeris* and WFT larvae, generally, decline in the device. Conversely, the numbers of WFT adults and Orius adults increase. When sampling, if *N. cucumeris* or WFT larvae numbers are low, it is worth trying again when temperatures have decreased.

In trials to assess Met 52 as a control agent for WFT, bioassays showed that Met 52 sprays killed up to 60% adult WFT in lab trials. Further lab assays showed that Met 52 had minimal effect on natural enemies.

Key results so far:

- There is new guidance on how to assess strawberry crops for the presence of western flower thrips
- An extraction device has been designed to record the presence and levels of pest and predator
- We better understand the distribution of *N. cucumeris* when WFT is present
- Early lab studies show that *Metarhizium anisopiliae* (Met 52) can kill adult WFT and has little effect on natural enemies

Investigating other thrips species being found in strawberry crops

Increasing numbers of different thrips species are appearing in strawberry, notably *Frankliniella occidentalis* (WFT), *Frankliniella intonsa*, *Thrips tabaci* (onion thrips) and *Thrips major* (rubus thrips). Orius offers good control of all of these species, but doesn't establish well every year, depending on weather and temperatures. It is speculated that the predatory banded wing thrips also offers some control of these thrips species. *N. cucumeris* continues to be used by growers and provides successful control of WFT when used with spray programmes that are compatible with the predator.

Key results so far:

- In addition to WFT, some other species of thrips are regularly being found in commercial strawberry crops but we are not yet sure that they are causing damage to the development of flowers and fruits in the same way that WFT does.
- In addition, we need to establish whether they breed in the flowers and whether *N. cucumeris* or other non-pesticide measures can help in the management of these more transient crop invaders.

Side effects of crop spraying on *N. cucumeris*

Early trials showed that a number of fungicide mixes have adverse effects on the populations of *N. cucumeris*. Nimrod/Teldor, Signum/Systhane and Aphox/Rovral all reduced *N. cucumeris* after the third sequential application. In the second year's trials, Calypso and Potassium bicarbonate + Activator 90 were tested over several applications and compared to Nimrod/Teldor but there was no evidence that any of these products/mixes had an adverse effect in that year of the trials.

Key results so far:

- In some years, certain crop protection product mixes can have an adverse effect on *N. cucumeris*, but only after several sequential applications.
- Growers should carefully consider the timing of tank mixes and the application of *N. cucumeris* in the crop.

Aphid control

Early work to find improved control methods for potato aphid showed that the use of Hallmark with or without Silwet in tunnel covered field grown crops gave 100% control when applied by knapsack sprayer. Calypso gave moderate control initially, but aphid numbers increased after a few days. Chess with or without Silwet gave no difference to a water control. Better results were achieved when these products were applied to aphids on leaf tissue in controlled cabinet experiments. The scientists concluded that growers need to achieve better coverage and penetration of the plant in commercial control. It is worth growers adopting one of a range of techniques which assess the level of coverage they are achieving in their own crops.

Studies were done on naturally occurring predators for the level of aphid control they achieve. *Aphidius ervi* and *Praon volucre* were assessed in typical weather conditions experienced in early spring. *A. ervi* needs temperatures >8^{o}C and *P. volucre* needs temperatures >12^{o}C to be effective. Both will work early in the season at the part of the day when these temperatures are achieved. At lower temperatures, both are less effective and aphid control slows down.

A survey of aphids and their natural predators was undertaken on commercial farms. Potato aphid and the melon and cotton aphid were found to predominate in the season when it was assessed. The predators found included green lacewing, hoverfly larvae, *Aphidius* and *Praon* species. Aphid numbers peaked in early June with predators peaking in early July, so the predator numbers caught up with the pest population and suppressed aphid numbers in July. It was concluded that natural predators could be relied upon to gain control by late summer but other control measures would be required early in the season, for example boosting numbers of parasitoids with early releases of commercially available products.

In a screening trial to assess aphicides for the control of the melon and cotton aphid, three coded products gave excellent control as did Batavia, but Batavia worked more slowly.

Trials were done using garlic planted into bag grown strawberry crops under tunnels. The leaves were cut regularly and placed in the strawberry crop canopy. The strong scent given off is thought to act as a repellent to a number of pests. In these trials, strawberry aphid numbers were reduced, but not thrips numbers. There was no effect on numbers of predatory mites. These trials have only run for one year, so it is too early to make bold recommendations on these results.

Key results so far:

- Hallmark and Calypso offered control of potato aphid in the spring when applied by knapsack sprayer. Growers should assess the crop coverage of their spray if they are not achieving good control.
- The naturally occurring aphid parasitoids *Aphidus ervi* and *Praon volucre* provide natural control but require the correct temperatures to be effective.
- Natural predators provide control of aphid populations by mid/late summer, but additional control is required early in the season.
- The use of leaf cutting garlic grown within the crop might contribute to reductions in aphid populations.