Grower Summary

SF 120

Biological, semiochemical and selective chemical management methods for insecticide resistant western flower thrips on protected strawberry

Annual Report 2011

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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.

Use of pesticides

Only officially approved pesticides may be used in the UK. Approvals are normally granted only in relation to individual products and for specified uses. It is an offence to use non-approved products or to use approved products in a manner that does not comply with the statutory conditions of use, except where the crop or situation is the subject of an off-label extension of use.

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 HDC office (hdc@hdc.ahdb.org.uk), quoting your HDC number, alternatively contact the HDC at the address below.

HDC
Stoneleigh Park
Kenilworth
Warwickshire
CV8 2TL

Tel – 0247 669 2051

Headline

- Early season introductions of *Neoseiulus (=Amblyseius) cucumeris* predators are vital to help to prevent WFT damage in everbearer strawberries.

- *Orius laevigatus* predatory bugs have potential for improving biological control of WFT and using flowering alyssum to support predator populations between flower flushes is a potential strategy for helping them to establish in everbearer crops.

Background and expected deliverables

The development and spread of pesticide resistant strains of western flower thrips (WFT) which cannot be controlled with pesticides, seriously threatens the viability of the UK strawberry industry. In 2009 serious outbreaks occurred in several high value crops in southern and central England causing serious losses. The aim of the proposed project is to develop a comprehensive range of new effective methods for managing insecticide resistant western flower thrips (WFT) on tunnel-grown strawberry in the UK. The methods will include an improved semiochemical monitoring trap with attendant damage thresholds, a computer-based population and risk forecasting model, new selective pesticide treatments, new biopesticides and novel, more cost-effective strategies for using existing predators. These components will be integrated into a comprehensive management strategy for the pest which will be tested on a commercial scale in the later stages of the project.

Summary of project and main conclusions

Progress on each objective of the project is summarised below

Objective 1 (Pheromone)

Measurements of the natural release rate of pheromone from WFT adults and the relative amounts of the two components have been made previously and have been confirmed using improved methodology. The ratio of production of the two components is variable, but is most frequently about 5:1. Enantiomers of the two potential pheromone components of WFT have been synthesised for laboratory bioassay and field studies. Release rates of the two pheromone components from rubber septa and polyethylene vial dispensers have been measured and the latter are recommended for use in field trials as they release a more

consistent blend of the two components. Polyethylene sachets give uniform release of methyl isonicotinate, a potential attractant for WFT, over a sustained period.

The attractiveness of rubber septa versus polythene vial dispensers with different release rates of the WFT major pheromone component, neryl (*S*)-2-methylbutanoate, were tested in everbearer strawberry crops. There was no evidence to suggest that either of the dispenser types or any of the pheromone loadings used in these experiments increased numbers of WFT adults caught on blue sticky traps. Further research and development of the trap design is therefore needed before this technique can be used by strawberry growers.

An excellent PhD student has been recruited at Keele and she will start field trials using a range of trap designs and blends of semiochemicals in April 2011.

Objective 2 (Model)

A model that predicts population development of WFT has been developed, using biological data primarily from chrysanthemum. Experiments are being conducted under constant and fluctuating temperature conditions to obtain WFT development data specific to strawberry in order to adapt the model for use on strawberry. In parallel, samples from field crops have been collected to estimate WFT population development over time for model validation.

Objective 3 (Predators)

Experiments were set up to assess the rate of emergence of *Neoseiulus (=Amblyseius) cucumeris* from abs sachets early in the season; *N. cucumeris* emerged from the sachets over a five week period.

Field experiments were set up to determine the effects of different *N. cucumeris* release strategies on WFT population development and subsequent fruit damage. Releases of *N. cucumeris* before flowering reduced WFT numbers in flowers at the beginning of the season and reduced early fruit damage. However, none of the release treatments were able to prevent WFT population increases through the season. Other strategies are needed that can be integrated with releases of predatory mites to reduce pest populations and fruit damage.

An experiment on commercial everbearers was conducted to test early season establishment of *Orius laevigatus*. Adult predators were released on 22 April and 20 May. *O. laevigatus* nymphs were recorded in very low numbers in flowers and on white fruit in May and June,

demonstrating that the predators had bred on the crop but establishment was poor. Sub-optimal temperatures and food supply (very low thrips numbers and low numbers of flowers providing pollen) are likely to have inhibited predator reproduction.

A further experiment in research glasshouses was done to test flowering 60-day strawberry, alyssum, *Impatiens* and *Tagetes* as potential 'banker' plants for *O. laevigatus*. Alyssum cv. Clear Crystal proved to be attractive to WFT and the best host plant for *O. laevigatus*. Once established on the alyssum, *O. laevigatus* quickly dispersed to and established on flowering everbearer plants and rapidly reduced numbers of WFT. Alyssum has a long flowering period and has the potential for use as a combined 'trap' plant for WFT and 'banker' plant to support *O. laevigatus* populations in everbearer strawberry for improved biological control of thrips within an IPM programme.

Objective 4 (Pesticides and biopesticides)

Seven products, including four fungal biopesticides, two novel insecticides and a botanical insecticide were evaluated in a small plot replicated experiment in a commercial polytunnel everbearer crop for control of WFT in strawberry flowers in comparison with a standard treatment (Tracer) and a water treated control. All the treatments were applied 3 times at 7 day intervals and the products were tested in admixture with the adjuvant Attracker (Koppert BV), which is considered to stimulate thrips activity. None of the treatments significantly reduced WFT populations. However, there was a significant reduction in fruit damage with one of the coded products and with Tracer. The product showed the greatest potential for further investigation and also the biopesticide Met 52 requires further study.

Financial benefits

Strawberry production in the UK is intensive and the crop is of high value, the UK industry being amongst the most effective in Europe. In 2007, 50,739 tonnes of strawberries, worth approximately £212 million were produced from approximately 2,922 ha grown in Britain. A further estimated 41,126 tonnes, worth approximately £174 million, were imported.

The development and spread of pesticide resistant strains of WFT which cannot be controlled with pesticides seriously threatens the viability of the UK strawberry industry. In 2009 serious outbreaks occurred in several high value crops in southern and central England causing serious loss. The average everbearer crop yields 20,000 kg/ha of class 1 fruit over one season with a current value of £2.70 per kg (£54,000 per ha). On some farms in 2009,

WFT damage to everbearer fruit was so severe following failure of spinosad to control the pest that total crop loss occurred for the latter third of the season, i.e. a loss of £18,000 per ha. Even on farms where spinosad is still effective, WFT damage can lead to at least 20% of the fruit being downgraded to class 2 for half of the picking season. The value of class 2 fruit is less than £1.50 per kg. Thus, WFT currently causes minimum estimated financial losses of approximately £3,000 per ha per season. There is great concern that UK everbearer crop losses will escalate with the further spread of spinosad-resistant strains of WFT. Furthermore, WFT is favoured by hot summer weather conditions. If the 2009 summer weather had been hot it is possible that losses would have been much more extensive.

This project will deliver a new sustainable cost-effective IPM strategy for management of WFT on tunnel-grown everbearer crops which is vital to the survival of the UK strawberry industry. The development of a reliable IPM strategy for successful control of WFT would benefit growers by preventing crop losses and fruit downgrading due to WFT damage. In this project we aim to develop a range of complementary methods for managing WFT. For instance, using WFT predators which may include two releases of *Amblyseius cucumeris* in sachets (costing up to £325 per ha) and two releases of *Orius laevigatus (*costing up to £600 per ha). If this strategy prevented fruit downgrading due to WFT damage for the whole everbearer season, use of the two predators could give a minimum potential 324% return on investment. On farms with spinosad resistance the benefit of investing in a reliable IPM strategy would be much greater as it could prevent entire crop losses.

Action points for growers

- Be aware that strains of western flower thrips (WFT) resistant to spinosad (Tracer) are now widespread on strawberries in the UK. Where WFT populations are resistant the product will be ineffective against this thrips species although control of other thrips species that may be present should still occur.

- Where Tracer is still effective, it should be used wisely, to minimise the chance of resistance developing. This means using Tracer within an IPM programme and following Resistance Management Guidelines, taking care not to exceed the recommended rate or the maximum of four applications per crop per year.

- Biological thrips control methods (see below) should be used routinely and preventively to minimise the need for use of spinosad.

- Growers of everbearer strawberries should make routine preventive introductions of *Amblyseius cucumeris* predators for WFT. Do not delay release of the predators until thrips are seen and do not rely on the rates recommended for tarsonemid mite control. Research results to date indicate that the most effective release method for use on everbearers is using the sachet system before flowering and repeating this after 5-6 weeks.

- Consider releasing the predatory bug *Orius laevigatus* once the crop is in flower and if thrips are present. Current research in this project is investigating how successfully these can be used together with *A. cucumeris* on everbearers.

- If using predators for thrips, plan and manage these carefully within an IPM programme, including biological control agents for other pests. If necessary, seek the help of an IPM consultant.

- Monitor regularly for pests and diseases. If a pesticide is needed, select one that is safest to any biological control agents being used.