Grower Summary

SF 147

Development of a Sex Pheromone Monitoring Trap for Gooseberry Sawfly

Final 2017

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Further information

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Project title:	Development of a Sex Pheromone Monitoring Trap for Gooseberry Sawfly
Project number:	SF 147
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Report:	Year 3 Final Report
Previous report:	Years 1 and 2 Annual Reports
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Location of project:	EMR, NRI
Industry Representative:	Richard Stanley
Date project commenced:	April 2014
Date project completed (or expected completion date):	March 2017

GROWER SUMMARY

Headline

- A potential component of the female sex pheromone of the gooseberry sawfly has been identified and synthesised and shown to be attractive to male gooseberry sawfly in gooseberry crops.

Background and expected deliverables

The common gooseberry sawfly, *Nematus ribesii*, is a sporadic, localised and unpredictable pest of gooseberry, as well as, red- and white-currants. If not detected and controlled in a timely manner, the feeding larvae are able to defoliate whole gooseberry bushes. The monitoring of the pest relies on the detection of the eggs on the underside of leaves in the centre of the bushes. Larval damage begins in the centre of the plants, low down, and radiates outwards to the leafy areas of the bush. Crop scouting in plantations for eggs and larvae is not always the most reliable method as an adequate search is time-consuming.

This project aimed to identify the gooseberry sex pheromone which would lead to the development of a sex pheromone monitoring trap, a more sensitive and rapid monitoring method. The production of a sex pheromone attractive to males by virgin female gooseberry sawfly has been reported by other scientists but never identified. In other work by NRI and NIAB EMR potential components of the female sex pheromone of the closely-related blackcurrant sawfly, *N. olfaciens,* have already been identified and synthesised.

Summary of the project and main conclusions

In the first year of the project (2014), larvae of common gooseberry sawfly, *N. ribesii*, were collected by growers and reared through to adults in the laboratory at NIAB EMR. Volatiles were collected from unmated males and females and analysed by gas chromatography (GC) with flame ionisation detection (FID) or linked to a mass spectrometer (MS). Collections from both males and females contained large amounts of long-chain hydrocarbons, probably derived from the cuticle, but the pattern of these was identical in male and female gooseberry sawfly and very similar to those in collections from male and female blackcurrant sawfly.

There were no obvious differences in the composition of volatiles from female or male gooseberry sawfly that might be attributable to potential components of a female sex pheromone. However, after fractionation of the collections to remove the hydrocarbons and analysis by GC-MS with selective ion monitoring to maximise sensitivity, traces of a mono-unsaturated, 16-carbon isopropyl ester, similar to one of the compounds proposed to be a component of the pheromone of the blackcurrant sawfly could be detected.

In the second year of the project, gooseberry sawfly larvae were again collected by growers and reared through to adults at NIAB EMR. Collections of volatiles were made from virgin females and analysed by gas chromatography coupled to mass spectrometry (GC-MS) at NRI. Similar results were obtained to those in the first year, and again there were indications of the presence of a mono-unsaturated, 16-carbon isopropyl ester. The collections were also analysed by gas chromatography coupled to electroantennographic recording (GC-EAG) from antennae of male gooseberry sawfly. Strong EAG responses were obtained to the isopropyl esters previously identified as components of the sex pheromone of female blackcurrant sawfly. However, in analyses of volatile collections from female gooseberry sawfly no EAG responses were observed at the retention times corresponding to these compounds. Instead a single EAG response was observed at a later retention time on the polar GC column. This seemed to be associated with one of the hydrocarbon components, ZZ6,9-23:H, but neither the synthetic compound nor the purified natural compound elicited an EAG response. Unfortunately, no EAG response was observed in GC-EAG analyses of volatile collections on a non-polar GC column.

In the third year collections of volatiles from virgin female gooseberry sawfly were analysed by GC-EAG on both polar and non-polar GC columns. The previous results were confirmed and extended to show that the EAG response was due to a very minor component co-chromatographing with the hydrocarbon on the polar GC column. On the basis of its mass spectrum, GC retention time and product after hydrogenation, this EAG-active compound was shown to be a 16-carbon isopropyl ester with three double bonds, and proposed to be isopropyl (*Z,Z,Z*)-7,10,13-hexadecatrienoate. This was synthesised and provided to growers for evaluation in traps. Although it was late in the season, significant numbers of male gooseberry sawfly were trapped, and, although further testing is required, it is proposed that this compound is the major, if not the only, component of the sex pheromone of female gooseberry sawfly.

Financial benefits

Gooseberry sawfly is a devastating pest of gooseberry which is difficult to predict and may lead to unnecessary plant protection products being applied for control. A trap and lure designed to accurately time and target sprays would decrease or even eliminate the use of unnecessary spray applications. Most growers apply at least one prophylactic spray at the beginning of the season regardless. Targeting products better, usually thiacloprid, lambda-cyhalothrin or pyrethrins, would protect crops from defoliation and the related fruit losses.

‘Invicta’ and ‘Careless’ are the two principal varieties grown and it is estimated that there are at least 600 pick-your-own and farm shop growers (39% and 50% of fruit respectively), and

116 commercial growers registered with the AHDB growing gooseberries in the UK. At least three growers supply to supermarkets and 11% of fruit is grown for processing. Around 238 hectares of gooseberries are grown in the United Kingdom. In 2013, the price for gooseberry was ~£3.79/kg, and approximately 4,000 kg of fruit was produced per ha making the UK gooseberry industry worth over £3.5 million revenue per annum (238 ha x 4000 kg x £3.79).

Action points for growers

- It is planned to produce a monitoring trap for gooseberry sawfly using a lure containing isopropyl (*Z,Z,Z*)-7,10,13-hexadecatrienoate. Growers should use this as soon as it becomes commercially available.
- Look or monitor for adults flying in April and May and target with approved products to prevent egg laying.
- Check for eggs on the underside of leaves in the centre of the bush.
- Check for larval damage low down in the centre of the bush.
- Consult with your agronomist on the latest product approvals for gooseberry.