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Grower Summary

SF 162

Development of a Pheromone Trap for Monitoring Blackcurrant Sawfly

Final report 2018

Project title:	Development of a Pheromone Trap for Monitoring Blackcurrant Sawfly
Project number:	SF 162
Project leader:	Dr Michelle Fountain NIAB EMR
Report:	Final Report (Year 3) 2017
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Key staff:	Dr Michelle Fountain Maddie Cannon, Bo Li (NIAB EMR) Prof David Hall, Dudley Farman (NRI)
Location of project:	NIAB EMR, NRI, Grower sites
Industry Representative:	Harriet Prosser, Lucozade Ribena Suntory LTD, harriet.prosser@lrsuntory.com
Date project commenced:	April 2015
Date project completed (or expected completion date):	March 2018

The results and conclusions in this report are based on an investigation conducted over a one-year period. The conditions under which the experiments were carried out and the results have been reported in detail and with accuracy. However, because of the biological nature of the work it must be borne in mind that different circumstances and conditions could produce different results. Therefore, care must be taken with interpretation of the results, especially if they are used as the basis for commercial product recommendations.

AUTHENTICATION

We declare that this work was done under our supervision according to the procedures described herein and that the report represents a true and accurate record of the results obtained.

Madeleine Cannon

Senior research assistant

NIAB EMR, New Road, East Malling, Kent, ME19 6BJ

Signature ..... Date 22 Mar 18.

Prof David Hall

Research Leader in Chemical Ecology

Natural Resources Institute, University of Greenwich

Signature ..... Date 22 Mar 18.

Report authorised by:

Dr Michelle Fountain

Deputy Head of Pest and Pathogen Ecology

NIAB EMR, New Road, East Malling, Kent, ME19 6BJ

Signature ..... Date .22 Mar 18.

[Name]

[Position]

[Organisation]

Signature ..... Date .....

GROWER SUMMARY

Headline

- In trials to test the efficacy of a blackcurrant sawfly sex pheromone, the diversity of natural enemies appeared to reduce populations of sawfly to uneconomically damaging levels.

Background and expected deliverables

Blackcurrant sawfly (*Nematus olfaciens*) is a common and frequently damaging pest of blackcurrant, present to varying degrees in most UK blackcurrant plantations. Larvae feed on foliage in May-June (1st generation) and July-August (2nd generation) making irregular holes in leaves and causing defoliation which weakens the bushes and causes substantial losses in yield. Larvae may also contaminate harvested fruit so good control prior to harvest is important.

Infestation is sporadic and localised and damage can occur rapidly. Frequent crop inspection is needed for first signs of eggs, larvae and damage. Current grower practice is to spray for control as soon as eggs, larvae or damage is detected by crop scouting. No practical systematic sampling methods or attendant crop damage thresholds have been developed and it is believed that there is widespread prophylactic treatment. Adequate crop scouting is time-consuming and expensive, so a more sensitive and rapid monitoring method is needed. Pheromone traps could offer a solution.

Non-UV reflective white sticky traps are used for monitoring various other Tenthredinid sawfly pests of fruit trees including apple sawfly (*Hoplocampa testudinea*). Female gooseberry sawfly (*Nematus* ribesii), have been shown to produce a sex pheromone that attracts conspecific males, but, until recently, nothing was known about the chemical ecology of blackcurrant sawfly.

Development of a pheromone trap for blackcurrant sawfly was one of the objectives of the Defra Horticulture LINK project HL01105 ‘Developing Biocontrol Methods and their Integration in Sustainable Pest and Disease Management in Blackcurrant Production’ which ended in 2015. In this project, it was shown that male blackcurrant sawfly were attracted to virgin females, confirming the existence of a sex pheromone. Four potential pheromone components were detected, identified and synthesised. Three of these were produced only by females. They had structures unrelated to those of compounds reported as pheromone components in other sawfly species, but they caused very strong electroantennogram (EAG)

responses from blackcurrant sawfly males. The fourth compound was produced in large quantities by both females and males and did not elicit an EAG response.

Trapping tests were carried out with blends of these compounds on several growers' farms during 2013 and 2014. A blend of two of the three EAG-active compounds was shown to be highly attractive to male blackcurrant sawfly, whilst the addition of the fourth component seemed to increase attractiveness even further. The trapping experiments also confirmed the sporadic nature of this pest in that few or no sawfly were caught on several of the farms.

Blackcurrant growers differ in their approach to sawfly control. Some spray prophylactically, and others apply no sprays for the pest. In trials in the previous Defra Horticulture LINK project it was noted that one of the latter growers had sawfly adults in the crop, detected using pheromone traps. Eggs and young larvae were found in the bushes, but no older larvae were observed and no significant damage occurred. This may be because growers using fewer broad spectrum control products have a higher diversity of natural enemies, particularly earwigs which are known to feed on a range of pest species in tree fruits – see AHDB project TF 220 'Further development of earwig-safe spray programmes for apple and pear orchards'. However, this was not explored in the Defra Horticulture LINK project. In addition, *Drosophila suzukii* (SWD) could become an increasing pest of blackcurrant meaning that control sprays used against this pest may disrupt natural enemy numbers in the crop near to harvest. These factors have obvious implications for spray programmes and targeting of spray applications for sawfly control.

Summary of the project and main conclusions

In 2015, field trials of pheromone trapping of blackcurrant sawfly were carried out in growers' blackcurrant fields. A replicated trial confirmed previous results that a three-component blend of two isopropyl esters, isopropyl (*Z*)-7-tetradecenoate (Z714iPr) and isopropyl (*Z*)-7-hexadecenoate (Z7-16iPr), and the unsaturated hydrocarbon, (*Z*)-9-tricosene (Z9-23H), is attractive to male blackcurrant sawfly. New results found that reducing the pheromone loading from 1 mg Z7-14iPr to 0.1 mg reduced catches. In addition, more sawfly were caught in red delta traps than green, at least for the most attractive blend. In a further trial to optimise the relative amount of Z7-16iPr in the blend, few blackcurrant sawfly were caught and no conclusions could be drawn. The different blends and traps were also tested in three other growers' fields but catches were low and overall the results illustrated the sporadic and localised nature of this pest.

In 2016 and 2017 we aimed to relate catches of blackcurrant sawfly with this optimised pheromone blend and trap to infestations by blackcurrant sawfly. The influence of natural enemies on this relationship was investigated.

Thirty eight red delta traps with the optimised three component blend released from a polythene vial were hung from the bushes throughout a plantation in Kent in 2016 and in East Anglia in 2017.

In 2016 natural enemies, sawfly adults, eggs, larvae and damage levels were assessed for 20 weeks from 13 May – 22 September. Low adult sawfly catches (18 in total) were found. In this crop the first presence of eggs and larvae in the plantation coincided with a mean trap catch of 4.28 per trap. There were only 15 sawfly eggs, 12 larvae and very low levels of foliar damage detected. Low damage was found after observations of eggs and early stage larvae were made, and this potentially suggested that predation could be occurring before significant damage could take place. The adult blackcurrant sawfly catch was not significantly affected by the row in which the trap was deployed. A survey of earwig abundance in blackcurrant plantations in five regions across the UK in 2016 (SF 168) showed earwig numbers varied significantly between plantations and farms.

In 2017, the study was repeated in East Anglia and demonstrated much higher numbers of male sawfly in the pheromone traps (75, 789). However, no significant foliage damage was observed from larval feeding. In addition the numbers of adult sawfly in each trap location in the field did not correlate with the numbers of sawfly eggs or larvae in the same location. In this crop the first presence of eggs and larvae in the plantation coincided with a mean trap catch of 8.6 and 612 per trap, respectively.

There were numerous and diverse natural enemies in the studied plantations and it is likely that these are keeping the sawfly egg and larvae numbers in check. Earwigs contained with sawfly eggs and larvae in Petri dishes were observed to feed on the immature stages of the pest.

Hence, currently the pheromone trap, whilst useful to detect sawfly in blackcurrant crops has not been calibrated to provide a spray threshold.

Financial benefits

Blackcurrant sawfly is a common and frequently damaging pest of blackcurrant, present to varying degrees in all UK blackcurrant plantations. Larvae feed on foliage causing defoliation which weakens the bushes and causes substantial losses in yield. Larvae may also contaminate harvested fruit so good control prior to harvest is important.

Adequate crop scouting is time-consuming and expensive, and a more sensitive and rapid monitoring method is needed. More effective monitoring would help to make more cost-effective use of insecticides currently available with a likely reduction in their use. Monitoring

will be vital for effective use of any more benign, biological approaches developed in the future.

Pheromone traps could provide such a tool. Growers are generally familiar with this technology providing it is made readily available through commercial suppliers with adequate supporting information and protocols.

An improved understanding of the interaction between natural enemies and pests within blackcurrant plantations may allow for a reduction in the use of plant protection products.

Action points for growers

- Look 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.
- Monitor predator populations (earwigs) in plantations by tap sampling using a white tray and beating stick.
- Purchase traps for monitoring from Agralan.