Grower Summary

SF 012

Biocontrol methods for pest and disease management in blackcurrants

Final Report 2015

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Project title:	Developing biocontrol methods and their integration in sustainable pest and disease management in blackcurrant production
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GROWER SUMMARY

Headline

Key components of an Integrated Pest and Disease Management programme for blackcurrant have been developed

Background and expected deliverables

The overall aim of the proposed project was to develop new management methods for key pests and diseases of blackcurrants, giving priority to alternative, biological methods, and then integrate them into an Integrated Pest and Disease Management (IPDM) programme which was to be evaluated and refined in large scale field experiments in the final two years of the project. Work targeted *Botrytis*, the most important disease of blackcurrants which causes significant losses in fruit quality, and two important pest problems, blackcurrant leaf midge and sawfly which are currently controlled by routine insecticide applications. The aim was to develop appropriate improved management methods for each target to improve control whilst reducing dependence on and unnecessary use of pesticides.

Summary of project and main conclusions

Progress on each objective of the project is summarised below

Objective 1: *Botrytis cinerea*

Further morphological examination of the epidermal characteristics of diverse germplasm was made, focusing on the floral calyx area of the berry, but as previously no correlations were found with the rate or levels of *Botrytis* infection. As a result, the overall conclusion from the series of anatomical investigations and examination of detailed sections taken across a diverse genetic base is that differences in *Botrytis* susceptibility between the genotypes are unlikely to be due to anatomical or morphological differences in berry structure.

In the trial in 2013 the natural product Cropbiolife, based on flavonoids gave comparable control of *Botrytis* rot to the standard fungicide programme on cv. Ben Tirran. The incidence of *Botrytis* on Ben Hope was negligible which it was suggested could have been due to the amount of nitrogen fertilizer applied. In 2014 various programmes of Cropbiolife were compared with a standard fungicide programme on plots which received a high and low nitrogen fertilizer regime on Ben Hope and Ben Tirran for control of *Botrytis* fruit rot. Winter 2013/2014 was relatively mild which resulted in insufficient chilling for blackcurrants especially cv. Ben Tirran. Consequently bush development was very variable and yield also poor. For Ben Hope the standard fungicide programme resulted in significantly less *Botrytis* fruit rot in post-harvest tests compared to the untreated control (9% *Botrytis*). None of the other treatments were effective. The incidence of *Botrytis* in post-harvest tests was higher in Ben Tirran (20% in untreated plots). There were no significant effects of treatments on *Botrytis* fruit

rot. There was no effect of nitrogen on fruit rot in either cultivar. The variable bush development resulting from insufficient winter chilling will have had an effect on the performance of the various treatments. Further trials are needed to properly assess the effect of CropBiolife on fruit rots.

An experiment was conducted to investigate the effects of high nitrogen on fruit susceptibility to *B. cinerea*. A range of genotypes (commercial cultivars and advanced lines) received a standard N or high N (additional top dressing during the flowering period) treatment, and were inoculated with *B. cinerea* about 2-3 weeks after full bloom. Results provided some evidence to suggest that high N may lead to a high incidence of *B. cinerea*; however the incidence of total rotting did not differ much between the nitrogen treatments.

Tests to determine if insect pollination improved the nutritional status of fruit were done. Dry matter in blackcurrant fruit was improved by insect visits; this may be attributable to more effective pollen transfer than wind alone. The analysis of the nutrient levels in pollinated fruits were somewhat difficult to interpret. Fruits not pollinated by insects or by hand tended to be more acidic.

Objective 2: Blackcurrant leaf midge

No work was planned for 2014. It was found in previous year that there was no significant effect of the midge on established crops. This result is being used commercially. The blackcurrant midge pheromone is probably not viable to use as a mating disruption control strategy commercially.

Objective 3: Blackcurrant sawfly

In field trials we demonstrated that it was not necessary to have a window in the delta traps as previously thought. The two-component blend Z7-14iPr+Z7-16iPr was attractive to male blackcurrant sawfly and more attractive than Z7-14iPr alone or the three-component blend of Z7-14iPr + Z5-14iPr + Z7-16iPr tested previously. Addition of Z9-23H to the two-component blend increased the catches of male sawfly further and the blend was more effective if released from a polythene vial compared to a rubber septum.

Commercial benefits

New knowledge obtained in this project will enable growers to manage the important pests and diseases on blackcurrant more effectively with less reliance on pesticides. In particular:

Botrytis

- Identify differences in susceptibility between varieties but not the physical or biochemical basis
- The first three fungicide sprays applied from first flower are the most important treatments

for *Botrytis* control

- If effective fungicide products are used there is no benefit from additional sprays near harvest
- BCAs can reduce *Botrytis* fruit rot significantly but efficacy is inconsistent from year to year
- Plant strengtheners / elicitors (e.g. Cropbiolife) can reduce *Botrytis* fruit rot and offer an alternative to BCAs but more work is needed to establish rates and timing for the best results
- Improved selection for *Botrytis* infection in commercial trials for potential new blackcurrant varieties
- The laboratory screening of surface-sterilised fruit for *Botrytis* infection is now part of the selection process within the breeding programme for blackcurrant funded by LR Suntory (and previously by GSK)

Pollination

- Supplement crops at flowering with bumblebees in poor weather conditions or if there has been a history of poor fruit set
- Wild bees were shown to contribute up to third of fruit set (7.5 tonne/ha, £650/tonne) = contribute up to 2.5 tonnes = £1625 /ha.
- Solitary bees were the main wild insect visitors to blackcurrant so numbers should be sustained and increased when plantations are not in flower, by providing alternative food sources
- Many were nesting in bare earth in the plantations so numbers could be increased by providing more nesting sites; undisturbed, south-facing areas of sparsely vegetated ground
- Bumblebees were also important flower visitors and areas to over winter and nest should be encourages (rotting wood, woodland, tussock grasses)

Midge

- Blackcurrant leaf midge should be controlled in newly planted, establishing or cut down blackcurrant bushes
- Control in established crops is less important and hence sprays targeted against the pest are unnecessary
- Lambda cyhalothrin (Hallmark) should be applied within a few days of threshold catches (>10 midges/trap) for the first and second generation where control is required
- UKA385a is promising new selective insecticide controls larvae in galls

Sawfly

- A new highly effective pheromone trap for sawfly will be made available commercially after calibration in 2015

Action points for growers

Botrytis

- Clear differences in susceptibility between varieties but physical or biochemical basis remains unclear
- The first three fungicide sprays applied from first flower are the most important treatments for *Botrytis* control
- If effective there is no benefit from additional sprays near harvest
- BCAs tested gave inconsistent control of *Botrytis* fruit rot and at present it is difficult to justify their use in blackcurrants for *Botrytis* control
- Plant strengtheners / elicitors gave promising results for rot control in 2013 but more work is needed to understand their possible use

Pollination

- Supplement crops at flowering with bumblebees in poor weather conditions or if there has been a history of poor fruit set
- Sustain and increase wild bee numbers when plantations are not in flower, by providing alternative food sources http://bumblebeeconservation.org/about-bees/habitats/
- Mow alleyways before spraying insecticides
- Provide undisturbed, south-facing areas of sparsely vegetated ground for solitary bees to nest in
- Leave untidy areas of rotting wood, preferably areas of woodland, and tussocky grasses for bumblebees to overwinter and nest

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