Grower Summary

SF 012 (GSK223)

Branch dieback in blackcurrant: identification and control of potential pathogens, including the fungus *Phomopsis*

Final 2011

Disclaimer

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.

HDC is a division of the Agriculture and Horticulture Development Board.

Project Number:	SF 012 (GSK223)
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Further information

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GROWER SUMMARY

Headline

Diaporthe strumella (also known as *Phomopsis ribicola*) has been recovered consistently from plants suffering from the severe branch dieback problem currently affecting some blackcurrant varieties. In host inoculation tests it has been shown to be a primary pathogen and to reproduce some of the symptoms of the problem.

Background and expected deliverables

Branch dieback in commercial blackcurrant plantations, particularly of the varieties Ben Avon and Ben Tirran, has been a significant problem in the last three years. The severity of the problem and its speed of spread through the plantation have varied between sites, but in the worst affected plantation 80% of plants became affected within the space of one year, leading to very significant yield loss.

In 2009, samples of affected Ben Avon plants from this plantation were sent to the Plant Clinic at Fera. The main symptoms seen in the affected branches were decay of the wood and pith at the base. Root rotting was also noted.

Tests on the sample resulted in the recovery from the branches of a species of the fungus *Phomopsis*. Fungi from this genus are found commonly in association with branch dieback on a range of woody plants, but whilst some are aggressive primary causes of disease others are regarded as weak pathogens, colonising plants already stressed, damaged or dying back due to other factors (including infection by other diseases).

It was not known at this time whether the precise symptoms seen in this first sample were present at other affected sites, or whether the problem differed between plantations. It was also not known if the *Phomopsis* recovered from the sample was the primary cause of the problem, if other pathogens might be involved, or whether the cause itself also varied between affected sites.

The aim of this project was therefore to gain an improved understanding into the cause or causes of blackcurrant dieback, including the precise symptoms of the problem and the role

played in it by *Phomopsis* and any other potential pathogens. This would be done by visiting affected sites and examining samples of affected plants. The symptoms would be recorded and tests carried out to see which potential pathogens were recovered with consistency from the plants. Any candidate pathogens would be inoculated into healthy plants to see if they reproduced the symptoms of the problem.

Whilst no symptoms of the dieback problem had been seen on stoolbed plants at the time the project started, visits would also be made to stoolbeds (once the stems to be harvested for cuttings had matured) to check for evidence of pathogens.

Preliminary fungicide screens (using laboratory-based *in vitro* methods) would also be carried out against any potential pathogen recovered.

Summary of the project and main conclusions

Visits to plantations affected by the branch dieback problem, and subsequent laboratory examination, revealed that the symptoms of the problem were consistent between sites. The symptoms seen most commonly are:

External Symptoms

In spring / early summer:

- Failure of some branches to leaf out
- Production of leaves of reduced size on some branches
- One or both of these symptoms may be present on a bush, often together with healthy-looking branches
- In extreme cases all of the branches on an affected plant may fail to produce leaves

As summer progresses, the above symptoms may still be seen, but additionally:

- Wilting of leaves may develop on some branches
- Affected leaves turn yellow and then brown, and dead leaves remain attached to the branches for a considerable time
- The wilting symptom may develop on branches that had produced leaves of reduced size in spring, or on branches that had previously appeared healthy

Tiny, black fungal fruiting bodies (visible with a hand lens) may occasionally be found, particularly if a branch has been dead for some time. They are most often found in the lenticels (air pores).

Internal Symptoms

- A firm, brown decay of the wood within affected branches, particularly at the base, with an associated brown decay of the pith
- The decay of the pith often extends beyond the limits of the wood decay
- Fungal mycelium (usually only visible with a low-power microscope) is present within the decayed pith
- Parts of the crown may be affected by a brown decay, usually closely linked to the affected branches
- The tops of some of the main roots, immediately below affected parts of the crown, may also be decayed

In laboratory tests, a *Phomopsis/Diaporthe* species (these are two different stages of the same fungus) was recovered consistently from affected branches. It was also sometimes found within the rotting crowns and roots. No other potential pathogens were found with any consistency.

Identification of the species of *Phomopsis/Diaporthe* proved difficult. Sequencing of the fungal DNA did not provide a precise species identification, but showed that the same unknown species was present at all of the plantation sites visited. From the morphology (appearance) of the various fruiting body and spore types produced by the fungus, it was finally identified as *Diaporthe strumella* (also known as *Phomopsis ribicola*). This has been found previously on dead blackcurrant branches, but there was no information as to whether it was likely to be the primary cause of the dieback.

In tests in which the *D. strumella* has been inoculated into the branches of healthy, potted blackcurrant plants, and also into healthy detached branch sections, it has been possible to reproduce the internal symptoms of wood and pith decay and to recover the fungus again from these symptoms. This confirms that *D. strumella* is capable of causing the symptoms found in affected plantations, and satisfies the requirements of a test called Koch's Postulates that proves the pathogenicity of a potential disease-causing organism. The

inoculation work also suggested that strains of the fungus may exist, some of which could be more aggressive than others.

Visits were also made to stoolbed sites supplying cutting material for use in fruiting plantations. It was possible to find low levels of *D. strumella* at the majority of these sites. In some cases the stoolbed stems from which the fungus was recovered showed internal symptoms of wood and pith decay identical to those found in the affected plantations, but in others the fungus was found on stems that had appeared healthy at the time of sampling.

Tests to determine the minimum, maximum and optimum temperatures for growth of *D. strumella* showed that the fungus is well-adapted to the conditions likely to be experienced in UK blackcurrant plantations.

Preliminary *in vitro* screening of fungicides showed that the products Switch (cyprodonil + fludioxonil), Bravo 500 (chlorothalonil), Signum (pyraclostrobin + boscalid) and Systhane (myclobutanil) may be worth evaluating in the field. These products are already used at some of the affected plantations in programmes to control other diseases of blackcurrant, but it is possible that a critical timing for the control of *D. strumella* is missed in these programmes.

At present the sources of the fungus, and the methods by which it spreads in plantations, are still poorly understood. Detailed further work is required into both the epidemiology and the control of the disease.

Financial benefits

It is not currently possible to give an accurate estimate of the financial benefits, given that the majority of the work carried out so far has been diagnostic work aimed at determining the cause of the problem. Only very limited work (preliminary *in vitro* screening of fungicides) has so far been conducted into the control of the problem.

During the course of this project close links have been made with researchers in Europe carrying out on work on diseases caused by *Phomopsis/Diaporthe.* This has already led to the possibility of developing a screening method for blackcurrant planting material, based on a serological test developed by researchers in Germany. It is likely that these links will result in other benefits, not just for this project but for other crops where problems are caused by *Phomopsis/Diaporthe* (e.g. blueberries, grapevines).

Action points for growers

Based on the findings in this project, and knowledge of diseases of other crops caused by *Phomopsis/Diaporthe* species, it is possible to give some general recommendations to reduce the likelihood of outbreaks of blackcurrant dieback, or to reduce the impact of an outbreak where it does occur:

- Recognise that *Diaporthe strumella* is a primary fungal pathogen capable of causing serious dieback.

- Aim to provide the best possible growing conditions so that plants do not come under stress. Avoid planting the varieties most prone to attack (Ben Avon and Ben Tirran) on all but the most suitable sites (for example, avoid sites prone to drought, waterlogging or desiccating winds).

- Avoid, where possible, physical damage to the bushes during cultural operations – this will reduce the number of wound sites through which *D. strumella* may be able to infect branches.

- If symptoms develop, remove branches affected by dieback, and clear up and dispose of all dead branch material at the bases of the plants. This should reduce the likelihood of production of fruiting bodies and spores by *D. strumella*.