Grower Summary

The incidence, pathogenicity, and management of UK raspberry *Phytophthora*

SF/TF 170: CTP_FCR_2019_9

Annual report 2021

AHDB Horticulture

Project title:	The incidence, pathogenicity, and management of UK raspberry *Phytophthora*
Project number:	SF/TF 170: CTP_FCR_2019_9
Project leader:	Charlotte Nellist, NIAB-EMR
Report:	Annual report, 2021
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Location of project:	NIAB-EMR, East Malling, Kent
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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.

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GROWER SUMMARY

Headline

Phytophthora may not be the only culprit in raspberry root rot.

Background

Root rot of the European red raspberry (*Rubus idaeus*), caused by a yet-unknown consortium of *Phytophthora* species, is a recurring and destructive disease of this commodity fruit. The disease is most frequently observed during persistent periods of high rainfall and humidity and when the crop is in high productivity. This timing corresponds with the most economically important stage of raspberry growing, thus severely impacting a grower's ability to profit from this work-intensive crop. As such, root rot is a significantly limiting factor in UK raspberry production. Current control strategies rely on cultural practices due to the lack of fungicide efficacy. Infection prevention is employed through securing clean planting material, maintenance of freely draining soil and sterilising irrigation lines. Infection risks have led to ~70% of UK raspberry growers moving from field to pot-based cultivation which involves more consumables and labour, increasing the costs involved in raspberry production.

Raspberry root rot is an understudied field of research. Much is to be gained from further understanding the species involved in the disease.

This project seeks to investigate whether factors such as location, agronomy, and variety affect the diversity of root rot-causing pathogens and whether *Phytophthora* is not the only pathogen causing root rot symptoms. Additionally, in the upcoming years of this project, the potential of meristem culture to eradicate *Phytophthora* from raspberry plants will be investigated. This method could potentially reduce the spread of root rot from propagator to grower.

Summary

<u>Surveys and Sampling</u>

In the first year of this project, 13 UK raspberry grower sites were sampled across England and Scotland. Root and cane tissue were taken from healthy plants and plants exhibiting root rot symptoms i.e., wilting, chlorosis, cane lesions. Additionally, a questionnaire was distributed which collected information agronomy details and the Raspberry root rot experiences of individual growers.

<u>Root and cane isolations</u>

Diseased cane and roots taken from grower sites was plated onto *Phytophthora*-specific media using a protocol adapted from Stewart et al. (2014) which consisted of cornmeal agar

amended with antibiotics (rifampicin and ampicillin) and fungicides (pimaricin PCNB and hymexazol) which reduced the growth of fast-growing fungi and bacteria. Isolates were sub-cultured onto fresh agar plates and grown in the dark at 18°C for 14 days. DNA was extracted from the isolates and they were sequenced to determine their identity. Over 300 samples of roots and canes were plated out, from which 24 isolates were obtained which had similar characteristics to *Phytophthora*. Sequencing results showed the isolates were a consortium of fungal species, mainly beneficial soil fungi such as *Morteriella* and *Trichoderma*. Notably; two of the isolates were known pathogens of other soft fruit plants; *Diaporthe eres* (a.k.a *Phomopsis*) - associated with dieback and fruit rot in other Rosaceae species, and *Cadophora luteo-olivacea* - a vascular pathogen of grapevine (Gramaje et al., 2014). Pathogenicity testing of these isolates on a range of commercially relevant cultivars is ongoing. Further tests will be conducted using these pathogens to investigate how they affect plants and if they cause visible symptoms and reduce productivity.

Financial Benefits

Over 16 thousand tonnes and 146.8 million pounds worth of raspberries were produced in the UK in 2019, a figure which is steadily growing with the popularity of the fruit (DEFRA, 2020). However, root rot can have a devastating financial impact on raspberry growers due to the cost of replacing diseased canes and lost fruit crop. This project seeks to increase our understanding of root rot in raspberry and the effects of emerging pathogens on the crop. Through extensive pathogenicity screening and sampling, we hope to reduce the financial loss associated with raspberry root rot and improve upon rapid screening processes for new varieties and develop a new method of irradicating *Phytophthora* from meristem cultured plants.

Action Points

At this early stage of the project, recommendations to change-of-practice cannot be given.