Grower Summary

SF 123

Raspberry: Efficacy of novel products for the control of *Phytophthora rubi* root rot

Annual 2012

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.

Further information

If you would like a copy of the full report, please email the HDC office (hdc@hdc.ahdb.org.uk), quoting your HDC number, alternatively contact the HDC at the address below.

HDC
Stoneleigh Park
Kenilworth
Warwickshire
CV8 2TL

Tel – 0247 669 2051

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

Project Number:	SF 123
Project Title:	Raspberry: Efficacy of novel products for the control of *Phytophthora rubi* root rot
Project Leader:	Erika F Wedgwood
Contractor:	ADAS
Industry Representative:	Tim Place, Church Farm
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Project Cost:	£35,500

Headline

- Novel plant protection products for the control of *Phytophthora* spp. on crops other than raspberry have been identified with potential to control raspberry root rot.

Background and expected deliverables

Soil-borne *Phytophthora rubi* (previously known as *Phytophthora fragariae* var. *rubi*) can infect raspberry and cause wilting leading to the death of otherwise long-lived plants. Other species of *Phytophthora* can also cause root rot, but *P. rubi* causes the most common and serious form of rot (Kennedy and Duncan, 1991). Sections of row and their fruit yields are lost for the remainder of the crop's life as the soil contamination means that any replacement plants are also likely to succumb to infection. *Phytophthora ideae* has now also been found causing rotting in *Rubus* spp., but it does not cause a wilt. It is likely that the resting spores of *Phytophthora* spp. survive in land re-used for raspberries, even after a gap of five years or more. The resting spores will be stimulated to germinate when roots grow out through the soil. The motile zoospores produced move in irrigation water. Once a plant becomes infected, the pathogen multiplies and neighbouring plants become affected as zoospores spread. Although some crops are grown in substrate, plant losses still occur through the contamination of the substrate through spore-contaminated irrigation water from open reservoirs. Contamination can also occur from using growing medium that becomes contaminated prior to use, and from rooting-through if pots sit directly on woven ground-cover. The disease can also spread from infected, but initially symptomless plants, introduced to the crop.

Where fruit crops are soil-grown, growers can still (as of March 2012) use the soil fumigants Basamid (97% w/w dazomet) or chloropicrin pre-planting, although the chloropicrin EAMUs expire on 23 June 2013. However, commercial experience suggests that soil fumigation does not totally eliminate the pathogen from the soil. Unlike Verticillium wilt, no diagnostic tool is available to test soils for the presence of this pathogen before planting, so growers are often unsure as to the need to use a soil fumigant before planting.

Instead, growers tend to rely upon two soil applications of a fungicidal drench (spring and autumn) to protect plant roots from infection. An EAMU for SL 567A (44.7% w/w metalaxyl-M) is available (2195 of 2007) but resistance to metalaxyl has been reported in other Phytophthora species such as *Phytophthora infestans* (the cause of potato blight). For several years, an EAMU for the potato blight fungicide Shirlan (fluazinam) has been used with some success in cane fruit. Paraat (500 g/kg dimethomorph) is a locally systemic

product which has also been used more recently in the UK. There is always a greater chance of resistance developing in pathogens where products have only one mode of action, so chemical companies are developing mixtures to avoid this. As none of the currently approved fungicides gain full control of this pathogen, alternative products would be beneficial to the industry.

The aim of this project is to identify new drench treatments that protect raspberries from root infection by *P. rubi.*

Specific objectives are:

- To identify suitable products for the control or suppression of *Phytophthora* root rot in raspberry.
- To test products using inoculated growing media to determine their efficacy in the prevention of *P. rubi* root rot in raspberry.
- To provide information to growers and the relevant chemical companies on any products that have efficacy and to seek co-operation within the industry for work towards the production of EAMUs.

Summary of the project and main conclusions

Objective 1 – Identification of candidate products for root rot control

Five products with potential efficacy against Phytophthora root rot in raspberry were identified, for evaluation in an inoculated trial alongside the industry standard Paraat. The newly identified products are Fenomenal (fenamidone + fosetyl-aluminium), Hortiphyte (potassium phosphite), Ranman Twinpack (cyazofamid), Resplend (ametoctradin + dimethomorph) and Prestop (*Gliocladium catenulatum*). Fenomenal has recently been registered in the UK for use on outdoor strawberries against red core and crown rot, with its efficacy against *Phytophthora cactorum* demonstrated in HDC project SF 99. Ranman Twinpack and Resplend are approved for use against the closely related potato blight pathogen, *Phytophthora infestans*. The fourth candidate, potassium phosphite, a water-soluble fertiliser, has been widely reported to give control of *Phytophthora* spp., with strong evidence of this given in project SF 99. The fifth product, Prestop, is a biopesticide which is approved for use on protected cane fruit crops and has an EAMU for use against root pathogens on outdoor cane fruit.

Objective 2 – Evaluation of products for control of P. rubi in raspberry

Efficacy testing is being carried out in a crop of potted raspberries. It is not possible to use naturally infected existing plantations as the root rot is likely to be in patches/sections of row, and at various stages of development. Planting into an infected field would give similarly patchy infection. Several products will be tested under Experimental Approval, and this requires destruction of the fruit.

In 2011, work was done to develop a method of reliably producing *P. rubi* infection in potted raspberry plants that would mimic the speed and severity of symptom development in commercial crops. Isolates of *P. rubi* from different plantations (with different chemical histories) were sought for use in the inoculation testing. Unfortunately, although a total of 19 stools from 18 crops were processed, and *Phytophthora* spp. were detected in roots from three stools, no *P. rubi* was isolated. Therefore a stored isolate was used instead to develop the inoculation method.

Eight methods of inoculation were examined on container-grown plants using Polka, a variety known to be susceptible. Forty 5 litre pots of raspberries were grown in sphagnum peat compost in a polytunnel at ADAS Boxworth. The pots were drip irrigated to keep them moist and favour the movement of the motile zoospores of the pathogen. Potential inoculation methods were considered and a procedure using 10 mm diameter plugs of agar culture-plate (as used by Scottish raspberry breeders for variety resistance screening) was selected. The optimum depth of inoculum placement and the number of agar plugs required was investigated using permutations of depth and quantity, to give six treatments. Another two treatments used pieces of naturally infected raspberry roots as inoculum. Inoculation was carried out at the end of July 2011 with one pot per treatment in each of four replicate blocks. Although some leaf wilting was recorded, this occurred without any significant differences between the inoculated and uninoculated treatments. When the canes were cut down in January 2012, some staining was recorded under the epidermis in eight pots, but no Phytophthora was isolated.

It is possible that wilt symptoms failed to develop in 2011 because conditions were not favourable for infection. Work elsewhere indicates that infection of raspberry roots is favoured by temperatures below 25°C coupled with high moisture. New cane production in 2012 is being monitored as the disease may have developed slowly in the inoculated stools at temperatures around 10°C over the winter, with either poor emergence, or the development of “crooked” shoots, anticipated in spring 2012. The maximum of eight agar

plugs of *P. rubi* per pot did not cause unnaturally premature wilting of canes, and so this density should be acceptable for future tests.

Financial benefits

Effective treatments will reduce crop loss and extend the life of the plantation. Increasing the range of products available to growers against *Phytophthora* root rot via potential EAMUs would increase the types of active ingredients used and reduce the chance of fungicide resistance developing. This will be particularly important if all soil fumigation products are withdrawn from the industry. Products effective on raspberry are likely to have an effect on other *Phytophthora* species such as those affecting strawberry and many ornamental species. The selected products will probably need to be tested on a field scale before being approved for use. After this, growers will still be advised initially to drench small areas of their varieties in case of phytotoxicity.

The confidence of growers to plant into soil without sterilisation, to save expenditure, will be increased. Growers who might otherwise plant in growing media to avoid *Phytophthora* root rot on a field with a history of this disease might be able to return to soil use with the application of a novel drench directly after planting. This could save growers the need for the materials associated with container production, including for some growers, the expense of having to use mains water because their borehole water has too much chloride.

If the newly available biological control product Prestop proves effective, then this may help the industry comply with the EU Sustainable Use Directive for reduced pesticide use.

Action points for growers

- There are no grower action points at this preliminary stage of the study.