Grower Summary

FV 366

Parsnip: An Improved understanding of root blemishes and their prevention

Annual 2012

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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.

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Project Number:	FV 366
Project Title:	Parsnip: An Improved understanding of root blemishes and their prevention
Project Leader:	Dr G. M. McPherson
Contractor:	Stockbridge Technology Centre
Industry Representative:	John Bilsland, Kettle Produce Ltd
Report:	Annual Report 2012
Publication Date:	28 January 2013
Previous report/(s):	Annual Report 2011
Start Date:	01 January 2010
End Date:	01 April 2013
Project Cost:	£129,020

Headline

This project is helping to identify what pathogens are causing root blemishes in parsnips to allow growers to instigate early and preventative control measures.

Background and expected deliverables

Various root blemishes continue to downgrade the quality of parsnip crops and cause economic damage in some seasons though the incidence in any particular crop can be extremely variable depending on many factors including the cultivar grown, the cropping history of the site, previous incidence of disease and the prevailing weather conditions. In some crops losses can be very significant and for example, in the 2009/10 season crops losses of up to 80% were reported in a few crops. The primary cause(s) of some of these root blemishes were identified in work carried out in Year 1 as being caused by fungal pathogens such as *Fusarium* spp., *Cylindrocarpon* spp., *Itersonilia* sp., and *Phoma* sp. although other blemishes detected were not found to be linked to fungal pathogens.

Black cankers are generally considered to be a result of infection by *Itersonilia pastinaceae* or possibly *Mycocentrospora acerina* (Davis & Raid, 2002). *Phoma complanata* has been associated with brown cankers previously though *Cylindrocarpon destructans,* a relatively common soil-inhabiting fungus, may also be involved in some situations. The orange-brown cankers which have been reported more recently have not been fully investigated and hence a primary cause has not been established. Also, the 'cavity spot'-like symptoms which occur in this crop, unlike in carrots, have not been formally confirmed as due to *Pythium* spp. or other specific pathogens (Gladders,1998).

The identification of the various root blemish symptoms in the field is not entirely reliable, especially using visual inspection alone. Detailed laboratory examination is therefore required to help identify and elucidate primary causal organisms or other factors involved. Hopefully at the end of the project we will have gained sufficient new knowledge to produce a Factsheet to help growers and their advisors quickly identify the primary cause of root blemish in this crop and hence instigate early and preventative control measures.

Summary of the project and main conclusions

A series of pot studies were carried out during the 2nd year of the project with the following outcomes:

- Significant differences in cultivar susceptibility to a range of pathogens was observed.

- Increasing inoculum from the soil-borne pathogens such as *Cylindrocarpon, Fusarium, Pythium* and *Phoma* could be expected to increase the incidence and severity of blemish development, reduce crop vigour and potentially result in increased fanging in crops. This was demonstrated in pathogenicity tests in the project.

- Some pathogens resulted in decreased germination and increased damping-off of seedlings post-emergence.

- A range of conventional fungicides and biological products performed well in laboratory agar-plate tests and showed activity against the key pathogens responsible for blemishes on parsnips.

- In artificially inoculated pot studies no significant reduction in symptom development was observed following application of the experimental fungicides and biological control products. However, it is important to note though that symptom expression was low and did not provide a strong test. Treatment application methods and frequency may be important factors and these will be examined when testing performance under field conditions,

- Significant increases in average root weight were observed following application of several of the experimental products.

During the first year of this study both ADAS and STC monitored field crops and carried out sampling throughout the autumn period following tap-root formation. Each crop sample was assessed and, where possible, the primary cause of any lesions present was identified. We also collected many samples from pack-houses and growers via the STC Plant Clinic which were also tested and these helped us build a catalogue of blemishes symptoms to which we were able to match to a number of fungal pathogens. Pathogenicity tests were carried out with all of the isolates collected and this provided us with a range of fungal pathogens in culture for use in the work carried out in Year 2.

Work carried out in year 2 of the study took the form of testing the efficacy of a range of chemical and biological control products for control of the primary organisms detected in Year 1 in small-scale *in-vitro* and *in-vivo* studies.

Work carried out by ADAS focused on a series of pot-studies with the following outcomes.

1. Potential differences in the susceptibility of cultivars to each of the pathogens identified as being responsible for the majority of blemishes in Year 1 was investigated. The results indicated that there were significant differences in susceptibility, particularly at higher levels of pathogen inoculum. Choice of cultivar in field sites with a history of high blemish incidence may therefore well be an important consideration for growers.

2. The potential efficacy of a range of biopesticides for controlling the known pathogens was investigated. Red flecking symptoms developed on the roots of about 30% of plants in the inoculated and untreated pots and few positive effects following treatment application were observed.

3. ADAS also investigated the efficacy of a range of conventional fungicides applied as a single treatment to the soil surface to control the pathogens and reduce blemish development. Few symptoms developed in this experiment and no significant differences following treatment application were observed in these studies.

STC carried out an *in-vitro* study to test the efficacy of a range of fungicides and biopesticides to inhibit the fungal growth of *Cylindrocarpon, Fusarium* and *Pythium* sp. We identified a number of products that appeared to be very effective against 1, 2 or all of the pathogens.

- Products such as Amistar, Plover, Vivid, Folicur, Beret Gold, and an experimental product all inhibited growth of *Cylindrocarpon* by more than 50% even when used at low concentrations (2ppm of active ingredient). Prestop, HDC F79 and Serenade also showed some activity.

- Vivid, Folicur and the 3 biopesticides also showed good inhibition of *Fusarium* sp. at all concentrations, whilst products such as Amistar, Topsin, Beret Gold and Corbel were effective at the higher concentrations.

- Fewer products tested were effective against *Pythium* sp., Amistar, Vivid and SL567A were the only ones which appeared to be effective.

STC also carried out pot-studies to investigate product efficacy for reduction of blemish development in inoculated pots. However, once again symptom expression was very low and few conclusions could be drawn from the results.

Those products which showed signs of potential activity in the *in-vivo* work, and other products are being taken forward into larger scale field trials at STC (including an existing disease nursery developed for this work and in a commercial crop) and ADAS (in a commercial crop) in year 3 where it is hoped they will result in a reduction in skin blemish problems.

Financial Benefits

Careful consideration of cultivar for field sites with a history of a high incidence of blemishes may be worthwhile and may help to extend the parsnip-growing life of sites. Although a number of products, conventional and biological, showed good activity against the pathogens in laboratory tests, further field testing is required before firm conclusions can be drawn and recommendations made therefore it is too early to judge the full economic benefit from this project.

Action Points

- Where possible less susceptible parsnip cultivars should be used for sites with a history of high blemish incidence or severity. In this project there were differences in susceptibility between Javelin and Palace.
- Growers should regularly monitor crops for blemish development during the early growth stages and apply already approved products which showed good potential efficacy if required.