Grower Summary

HNS/PO 190

Evaluation of fungicides and novel treatments for the control of black root rot, Thielaviopsis basicola, in bedding and hardy nursery stock plants

Annual 2014

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 this report, please email the AHDB Horticulture office (hort.info.@ahdb.org.uk), quoting your AHDB Horticulture number, alternatively contact AHDB Horticulture at the address below.

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Project Number:	HNS/PO 190
Project Title:	Evaluation of fungicides and novel treatments for the control of black root rot, Thielaviopsis basicola, in bedding and hardy nursery stock plants
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GROWER SUMMARY

Headline

- A number of novel chemical and microbial plant protection products have been shown to be effective in reducing the incidence and severity of black root rot, *Thielaviopsis basicola,* on *Viola cornuta*

Background

Black root rot (*Thielaviopsis basicola*, syn. *Chalara elegans*) causes root damage leading to reduced nutrient and water uptake, consequent leaf yellowing and potentially plant loss. Losses in *Viola* spp. production can be substantial and black root rot is frequently implicated in losses of susceptible hardy nursery stock species such as *Choisya*, *Skimmia* and *Ilex*.

Growers of plants which are susceptible to black root rot often apply preventative treatments of thiophanate-methyl (Cercobin WG). Approval is for only one application per glasshouse grown crop and can provide adequate protection in bedding plants (which may only be on the nursery for eight weeks), but hardy nursery stock requires a longer programme of treatment. There is a need for products with alternative modes of action to reduce the probability of development of *T. basicola* resistance to thiophanate-methyl. Earlier projects investigated cultural controls and recorded the efficacy of products then available to growers (Scrace, 1993; Jackson, 2000). A review was carried out prior to this project to determine if there were active ingredients currently in use on other crops, or pre-registration as a plant protection product that might give effective control of black root rot (Wedgwood, 2013).

The current project seeks to identify novel treatments, including non-conventional elicitors and microbial products, and to test their efficacy as preventative and curative drenches against black root rot in inoculated plants. The workplan involves screening experiments using *Viola* sp., to select a number of products for testing in programmes. Subsequently, products safe and effective on *Viola* sp. will be tested on *Choisya* sp..

Jackson, A.J. (2000). Bedding plants: evaluation of fungicides for the control of black root rot and downy mildew. HDC report for project PC 143.

Scrace, J.M. (1993). The effect of pH, plug nutrition and fungicide timing on control of black root rot in autumn pansy. HDC Final Report for project PC38b.

Wedgwood, E. F. (2013). Black root rot in containerised subjects-chemical and biological options for control. HDC report for project PO 14.

Project aim:

To improve control of black root rot (*T. basicola*) and increase the quality of container-grown ornamentals through the use of plant protection products and plant stimulants.

Project objectives:

1. To determine the efficacy against black root rot and plant safety of some chemical plant protection products to *Viola* sp.
2. To determine the efficacy against black root rot and plant safety of some biological plant protection products and plant stimulants to *Viola* sp.
3. To utilise the results from work carried out under objectives 1 and 2 to select products for application to *Choisya* sp. to protect against black root rot
4. To communicate the research outputs in a form for immediate uptake by the industry

This report covers objectives 1, 2 on single product treatments, but does not report on the ongoing work on treatment programmes for *Viola* sp., nor on the work to be started on *Choisya* sp. for Objective 3.

Summary

Plant protection treatments were applied to *Viola cornuta* before and in most cases also after inoculation with black root rot, *T. basicola,* spores. Products tested were selected on the basis of their potential for control and their current or likely future availability for use on ornamentals under protection. Conventional and non-conventional products were compared in separate concurrent experiments arranged in replicate blocks with 15 plants assessed per plot. Six conventional products were compared against the standard Cercobin WG (thiophanate-methyl) applied over the plants at the two leaf stage a week before inoculation. Each of the test products was used preventatively, but in some cases a second batch of plants were also treated again a week after inoculation of the growing media. Dose rates were as on the labels, or as advised as being most suitable. The products tested were Signum (boscalid + pyraclostrobin) and Switch (cyprodonil + fludioxonil) with authorisation for use on protected ornamentals plus novel products HDC codes F173, F174, F175 and F176. Seven non-conventional products were tested; Prestop (containing the fungus *Gliocladium catenulatum* strain J1446), Serenade ASO (containing the bacteria *Bacillus subtilis*, strain QST713), T34 (containing *Trichoderma asperellum* strain T34), HortiPhyte (a foliar feed containing potassium phosphite), microbial products Trianum G, HDC code F179 and a chemical, HDC F178. All except Cercobin WG, T34 and Trianum G were used curatively as well as preventatively in separate treatments.

No foliar phytotoxicity arose with any of the products, either from the preventative use of T34 or Trianum G at sowing, or from use of all other products at the two-leaf stage, or where in addition used curatively a fortnight later.

Roots were assessed nine weeks after sowing, four weeks after inoculation of the growing media with a spore suspension of *T. basicola*. Infection causing a pale brown discolouration of the roots was confirmed by microscopic examination and recording of condiospore production. Root staining was recorded in all treatments, including the uninoculated, but the incidence and severity was significantly greater in the inoculated untreated plots. No other pathogens were isolated from inside damaged roots. Some root desiccation was seen.

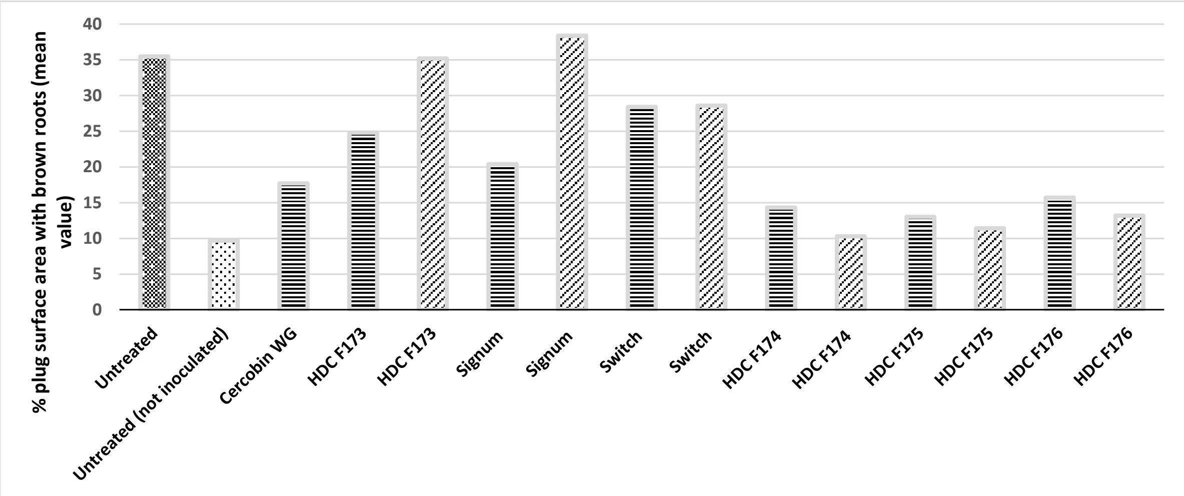

Figure 1: Experiment 1; conventional products. Mean % root area brown on the surface of *Viola* sp. plugs on 11 July 2014 nine weeks after sowing. (P<0.001, L.s.d. 13.964). All treatments with below 24% root browning differ significantly from the untreated inoculated.

Key: **Horizontal lines = product application before inoculation (preventative)** **Diagonal lines = product applications before and after inoculation (preventative + curative)**

In the conventional treatment experiment, although there was no foliar phytotoxicity to *Viola* sp., plants which received a double application of Signum had as high a proportion of brown roots as the untreated inoculated suggesting phytotoxicity. Root rot had caused a mean 36% rotting of the root plug surface area in untreated inoculated plants while Cercobin WG treated plants had 18% (**Figure 1**). Compared with the inoculated untreated plants, seven products gave highly significantly (P<0.001; **Figure 1**) less root damage, with a mean 14% area affected. After use of HDC F174, F175 and F176 as either preventative alone or with curative application the lower root damage was similar to the 9.7% of uninoculated plants. Signum preventative use also gave some benefit, but with 20% damage. Plants in five of the treatment programmes were no healthier than untreated inoculated plants, with most plugs having rotted roots. Only preventative plus curative treatment by either HDC F175 or F176 significantly (P<0.002) increased the proportion of plants remaining healthy to a mean 26%; 58% of uninoculated plants remained healthy compared with 2.5% for inoculated untreated.

When non-conventional treatments were used, three products (HDC F178, Trianum G and Prestop) resulted in less root rot compared with 18% in the inoculated untreated plots (**Figure 2**), but the only significant (P<0.001) difference was seen following the use of the chemical HDC F178 in preventative plus curative drenches when only 6% root rot developed. Preventative use of HDC F178 alone also reduced mean damage severity, but two applications kept 37% plugs without any root damage (P<0.001) compared with 12% from the single application and 5% incidence in the untreated inoculated. Incorporation of Trianum G before sowing reduced root rotting by half to 9% rot, with 35% of plant plugs having no browning. Fungal product Prestop re-applied with a fortnight's interval after preventative application at the two leaf stage allowed 11% root rot, a slight reduction compared with the untreated, with significantly (P<0.001) more, 41% of plugs, having no rot. The other products had no benefit, with high volume sprays by two microbial products, Serenade ASO bacteria (preventative) and HDC F179 fungi (preventative plus curative) having more (although not significantly) of their root plug surfaces browned (a mean 24%) than the 18% in the untreated inoculated plots.

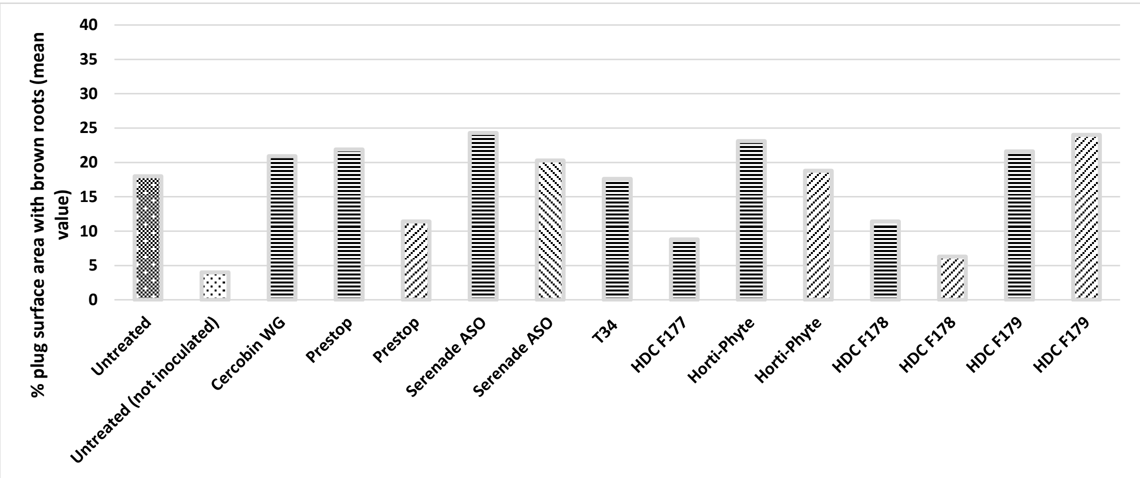

Figure 2: Experiment 2; non- conventional products. Mean % root area brown on the surface of *Viola* sp. plugs on 10 & 14 July 2014 nine weeks after sowing. (P<0.05, L.s.d. 5.84). Only treatments with 6.3% or less root browning (only HDC F178 applied twice) differ significantly from the untreated inoculated. NOTE: In this Figure, code HDC F177 is given to Trianum G

Key:
Horizontal lines = product application before inoculation (preventative)
Diagonal lines = product applications before and after inoculation (preventative + curative)

Financial Benefits

Effective treatments will improve crop quality through maintaining a healthy root system, improving crop establishment and reducing crop losses. Improved root system performance will be particularly important for hardy nursery stock where plants are sold by pot size.

Increasing the range of products available to growers which are potentially effective in the control of black root rot using the EAMU approval system would increase the range of active ingredients available and reduce the chance of fungicide resistance developing. The cost of disease management could be reduced by the use of some of the products tested, because when used for black root rot control they will also be effective against other pathogens such as *Pythium* spp. so saving separate applications.

The use of biological products to suppress black root rot will help the industry meet the requirement to be using integrated crop management in order to comply with the EU Sustainable Use Directive for reduced pesticide use. This will ensure that suppliers can secure the business of clients anxious to source plants grown with minimal adverse environmental impact.

Action Points

- Ensure that propagation trays for re-use have as much growing-media and root debris removed from them as possible before disinfection so that most material potentially infected with resting spores is removed and the disinfectant in the washing water can gain contact with the infested tray surface
- Be aware that water-splash and run-off between plants can contain conidiospores of black root rot that infect to produce further spores within a few weeks
- Try to avoid stressing plants by e.g. inadequate ventilation in hot weather as this can reduce their resistance to pathogens such as black root rot
- Consider the preventative use of biopesticides as these can produce a root-zone environment which has increased resistance to infection by a number of pathogens and potentially a systemic, protectant, benefit for the whole plant
- To avoid the build-up of resistance to active ingredients select a range of products with different modes of action when using conventional products on the nursery.