Grower Summary

PE 005

Protected edible crops: biological control of plant diseases using insect pathogenic fungi with dual activity against plant pathogens

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:	PE 005
Project Title:	Protected edible crops: biological control of plant diseases using insect pathogenic fungi with dual activity against plant pathogens
Project Leader:	Dr Dave Chandler
Contractor:	University of Warwick
Industry Representative:	Philip Pearson
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Previous report/(s):	None
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Project Cost:	£112,110

Headline

Three commercially available biological control agents and three novel products have been identified that have the potential to control tomato powdery mildew.

Background

Plant pathogens are a significant constraint on the production of protected edible crops. At the same time, growers are under considerable pressure to reduce their use of synthetic chemical fungicides as a result of new legislation plus the increasing demand from supermarkets for produce with zero detectable pesticide residues. However, alternative control agents are currently in short supply. The overall aim of this project is to investigate commercial biocontrol agents based on insect pathogenic fungi as potential control agents of plant pathogens. Although these agents are normally used against insect pests in Integrated Pest Management (IPM) programmes, research done outside the UK has suggested that some insect pathogenic fungi can also have activity against plant diseases.

Summary

In this first year of the project, a method was developed for measuring the effect of candidate insect pathogenic fungi on tomato powdery mildew. The method involved applying powdery mildew spores to tomato leaflets maintained in a Petri dish, and then applying a known concentration of the control agent. The effect of the agent was measured in terms of its ability to control the growth of the powdery mildew on the leaflet and also to reduce the production of powdery mildew spores. This method allowed a range of agents to be evaluated under controlled and reproducible conditions.

Laboratory experiments were then done to evaluate three commercial “bio-insecticides” against tomato powdery mildew. These were: the fungal species *Lecanicillium muscarium* strain 19.79, which was used as the commercial product Mycotal (Koppert BV), *Beauveria bassiana*, ATCC 74040 which was used as the product Naturalis L (Belchim) and two biological products not yet approved for use on protected tomatoes HDC F122 and HDC F123. In addition, we evaluated three other novel agents: (i) the bacterial biopesticide Serenade (based on *Bacillus subtilis* QST 713, Agraquest Ltd); (ii) HDC F124 (also not yet approved for protected tomatoes); (iii) Thiovit (800 g/kg sulphur, Syngenta). All the agents were used at the manufacturers’ recommended concentrations. Two sets of experiments were done. In the first, Mycotal was evaluated alongside Serenade, HDC F124 and Thiovit. In the second, Mycotal was compared against HDC F123 and Naturalis.

All of the tested agents controlled tomato powdery mildew in the laboratory experiment. For the first set of experiments, the treatments reduced the sporulation of powdery mildew by 77% (Mycotal), 63% (Serenade), 94% (HDC F124) and 98% (Thiovit). In the second set of experiments, the treatments reduced the sporulation of powdery mildew by 94% (Mycotal), 75% (HDC F122), 93% (Naturalis) and 92% (HDC F123).

These are encouraging results, although additional research will be required to evaluate the control agents under conditions that more closely reflect the conditions occurring on a crop scale.

Research was also done to develop a laboratory method to evaluate the effect of insect pathogenic fungi against *Pythium* and *Rhizoctonia*, and in developing a method for coating tomato seed with spores of insect pathogenic fungi. These will be used to quantify the effect of seed applications of *Beauveria bassiana* on *Pythium* and *Rhizoctonia* diseases of tomato later in the project.

Financial Benefits

It is difficult to comment on the financial benefits given the early nature of results. However any new method that would allow growers to reduce their reliance on synthetic chemical fungicides for the control of powdery mildew and damping off diseases would be financially beneficial at a time when the availability of chemical pesticides is declining, and when growers are under increasing pressure to produce crops with zero detectable pesticide residues.

Action Points

No actions are being recommended until the project has been completed.