

## A MULTI-FACETED APPROACH TO SOIL BORNE DISEASE MANAGEMENT

Australia's vegetable growers face many challenges, including the threat of soil borne diseases. Researchers Dr Doris Blaesing, Donna Lucas, Kelvin Montagu, Len Tesoriero and Dr Gordon Rogers provide an update on a vegetable levy-funded project that will assist growers in managing each of the major soil borne diseases.

Vegetable growers and their advisers have identified soil borne diseases as one of their main challenges for soil management and crop protection. Soil borne diseases cost Australia's \$4 billion vegetable industry an estimated \$120 million each year.

Project VG15010, *A multi-faceted approach to soil borne disease management*, is a vegetable levy funded research and extension project. Extension outputs for this project are delivered by the Soil Wealth and Integrated Crop Protection projects (VG13076 and VG13078).

The project has already undertaken a range of activities since it was established in November 2016. The first was to prioritise the main soil borne disease threats facing growers and then work out what the project would do to improve their management.

Generally, soil borne disease management has become more challenging due to fewer crop protection options, more intensive production systems and consumers demanding perfect-looking produce, while at the same time wanting growers to minimise the use of pesticides. Growers and advisers also said that they are interested in integrated control methods and looking after soil health.

The latest techniques for managing these diseases was reviewed, and the information is now being translated into a suite of new grower-oriented best practice materials to communicate this information in an effective way. Other project activities include demonstration sites, field walks, webinars and master classes.

Several of the high priority diseases still need more research. For these, focused field and glasshouse research is being undertaken to provide effective management solutions to growers and advisers.

A key output for the project will be a comprehensive best practice guide for the management of economically important soil borne diseases in vegetables in Australia.

### DISEASE PRIORITISATION

The project conducted a comprehensive gap analysis and prioritisation of soil borne diseases, hosts and regions using a process that built on previous projects and research in the area. The key components of the process included:

- A review of previous Australian soil borne disease projects and disease priority lists.
- Consideration of the Strategic Agri-chemical Review Process (SARF) priorities.
- Consultation with pathologists, nematologists, advisers and agronomists.
- Targeted survey of representative Australian vegetable growers.
- Input from the project reference group.
- Consideration of the value of production.

This process resulted in identifying the following disease and crop combinations as being worthy of attention by the project (see Figure 1).

Many of the diseases identified in the prioritisation process have already been the subject of a great deal of research, and relevant

information can be accessed via [soilwealth.com.au](http://soilwealth.com.au). The website and an associated bulletin provide information on upcoming events. Please visit the website to subscribe to the bulletin.

### NEW RESEARCH

The project has a focused research component, which investigates new methods for managing Damping off complex in baby leaf spinach, *Sclerotium rolfsii* and Damping off in capsicums and Cavity spot in carrots. To date, field trials on new fungicide chemistry have been established in Tasmania and Bundaberg, and the impact of improved soil management, including cover crops, biofumigation and compost additions is being evaluated in Tasmania and Western Australia.

### LINK TO OTHER PROJECTS

The project links closely with the Adelaide-based South Australian Research and Development Institute (SARDI) on a project that is developing DNA testing methods to quantify disease inoculum in vegetable soils (VG15009). The current focus is on developing soil tests for Club root in brassicas and Cavity spot/forking in carrots.

The soil borne disease project is also engaging with the National Vegetable Extension Network (VegNET) in each state to bring regionally topical information to growers.

FIGURE 1: DISEASE AND CROP COMBINATIONS

CROP	SOIL BORNE DISEASE FOCUS
BRASSICAS	Clubroot ( <i>Plasmodiophora brassicae</i> ) Sclerotinia ( <i>S. sclerotiorum</i> )
CARROTS	Damping off ( <i>Rhizoctonia</i> spp.) Cavity spot and forking ( <i>Pythium sulcatum</i> and <i>P. violae</i> )
BABY LEAF SPINACH	Damping off complex ( <i>Rhizoctonia</i> spp./ <i>Pythium</i> spp.)
LETTUCE	Root knot nematodes ( <i>Meloidogyne</i> spp.) Damping off complex ( <i>Rhizoctonia</i> spp./ <i>Pythium</i> spp./ <i>Fusarium oxysporum</i> )
CAPSICUMS AND CHILLIES	Sclerotinia ( <i>S. sclerotiorum</i> and <i>S. minor</i> ) Damping off complex ( <i>Rhizoctonia solani</i> / <i>Pythium</i> spp., <i>Fusarium oxysporum</i> )
FRENCH BEANS	Sclerotium stem rot ( <i>Sclerotium rolfsii</i> ) Damping off complex ( <i>Rhizoctonia</i> spp., <i>Pythium</i> spp., <i>Fusarium oxysporum</i> , <i>Phytophthora</i> spp.)
LEEKES AND CELERY	Root knot nematodes ( <i>Meloidogyne</i> spp.) Sclerotinia ( <i>S. sclerotiorum</i> ) Damping off ( <i>Rhizoctonia</i> spp.) Sclerotium rolfsii Basal plate rot ( <i>Fusarium</i> ) Pink root ( <i>Pyrenochaeta terrestris</i> )

R&D Farm Productivity, Resource Use & Management

### INFO

For more information, please refer to [soilwealth.com.au](http://soilwealth.com.au) or contact Dr Doris Blaesing ([ids@arrmcc.com.au](mailto:ids@arrmcc.com.au)) or Dr Gordon Rogers ([gordon@ahr.com.au](mailto:gordon@ahr.com.au)).

This project has been funded by Horticulture Innovation Australia Limited, the Department of Environment, National Vegetable Levy and funds from the Australian Government.

Project Number: VG15010

Horticulture Australia

## SOIL BORNE DISEASE MANAGEMENT: WHAT WE ALREADY KNOW

Some key management practices apply to all the key soil borne diseases and vegetable crops and are therefore a focus of the project's extension and demonstration activities. They are:

### Understanding risks

- Pre-plant soil tests and seed tests.
- Crop histories and monitoring of diseases in previous crops to guide site selection and crop choices.
- Weather monitoring and disease forecasting to help with managing risks identified by, for example, soil and seed tests and to target pesticide applications.
- Understanding the relationship between soil borne disease and soil conditions/soil health (suppressive soils).
- The abovementioned risk assessments are not yet used a lot for commercial crops because R&D gaps still exist. The project team will cooperate with parallel research projects that address R&D gaps in this area.

### Managing risks

It is important for growers to consider the following in an attempt to prevent soil borne diseases:

- Site selection, knowledge of paddock conditions and disease history.
- Rotation with non-hosts.
- Selection of optimal planting times (especially for susceptible varieties or 'risky' paddocks).
- Soil health management, especially biological diversity and soil structure (minimum tillage or controlled traffic) and suitable organic amendments (suppressive soils).
- Enabling good surface drainage and soil structure.
- Microclimate manipulation for irrigation (minimise foliage wet periods, use drip irrigation) and humidity (row direction and plant spacing, canopy type).
- Use of tolerant or resistant cultivars.
- Biofumigation/cover crops.
- Avoiding excess nitrogen and ensuring good overall nutrient/fertility management.
- Good weed control and controlling hosts.
- Roguing infected plants early.
- Minimising soil, water and equipment movement from infested fields to clean sites and implementing hygiene and sanitation practices.
- Optimising fungicide types, application methods and timing, as well as pesticide resistance management.
- Fumigation for protected and high value crops such as seed (this a last resort).

For all damping off fungi (e.g. *Pythium* spp., *Fusarium* spp., *Rhizoctonia* spp.) additional risk management approaches are:

- "Clean" seed and transplants and good nursery practices.
- Minimisation of plant stress via good overall crop management.
- Monitor water source (especially for hydroponic crops) to ensure there are no pathogens.
- Support quick emergence from soil and good early root growth.