Searching for New Approaches to Control Sclerotinia in Vegetables

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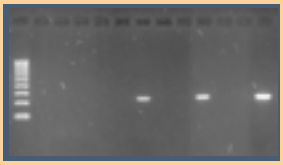
Aims of national HAL Project VG07126 (2007-2010):

New approaches to solve Sclerotinia disease are being evaluated alone and integrated with conventional methods (e.g. fungicides) to identify the most effective and economical strategies that provide durable disease control and increased productivity and sustainability of vegetable production.

Reduction of inoculum carry-over using pre-plant soil treatments that reduce number of sclerotia survival in soil:

- economic soil disinfestation methods (e.g. biological, novel volatiles of sulphur compounds)
- biofumigation (e.g. novel volatiles from endophytes).
- biocontrols with proven ability to kill sclerotia in soil (e.g. *C. minitans*).
- cultural practices that reduce risk of disease outbreaks (e.g. suitable crop rotations).



Better understand lettuce drop epidemiology to improve disease management:

- identify variables in cropping systems associated with high infection risk and disease prevalence.
- use predictive modelling to investigate strategies that reduce disease and improve status of production systems.

Protect against below (*S. minor, S. sclerotiorum*) and above-ground (*S. sclerotiorum*) infection:

- improve efficacy of Filan™ (a.i. boscalid).
- identify alternative fungicides to boscalid.
- identify alternatives to fungicides: 'soft' chemical and non-chemical treatments.
- identify effective strategies that combine boscalid with other treatments.

Strengthen host crop resistance against infection:

- plant self-defence mechanisms (e.g. natural resistance)
- induced resistance (e.g. using natural or synthetic elicitors).
- modify cropping systems to reduce conditions favourable for infection (e.g. short flowering periods, less dense canopies, etc).

Disrupt the infection process:

- soil surface modifications to disrupt the infection process of sclerotia of *S. minor* (e.g. mulches, pH).
- soil surface modifications to inhibit development of apothecia of *S. sclerotiorum* (e.g. soil amendments).
- manipulation of plant surfaces to reduce conditions favourable for germination and/or infection by ascospores of *S. sclerotiorum* (e.g. foliar sprays with micronutrients).

Better understand white mould epidemiology to develop methods to forecast infection risk and improve disease management:

- develop methods for predicting apothecial development and ascospore release (*S. sclerotiorum*) based on weather conditions.
- develop methods for monitoring release of ascospores (e.g. molecular or PCR based) to predict infection risk and optimise time of fungicide sprays.
- identify site-specific factors associated with high infection risk and disease prevalence.

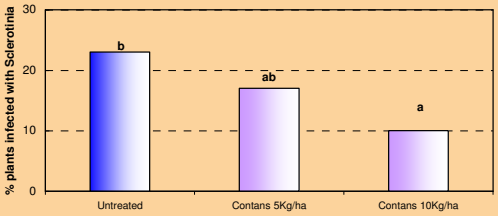
Economic analysis and extension activities:

- surveys and 'expert workshops' to determine effectiveness of current management practices.
- economic analysis to identify strategies that increase grower profit.
- results delivered via grower workshops and publications.

Progress Towards Development of an Integrated Control Strategy for Sclerotinia in Vegetables Crops

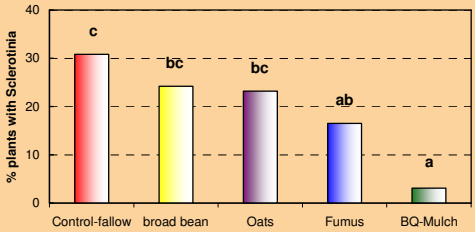
The new project VG07126 (see overleaf) is investigating new approaches to developing short term (during crop period) and long term (between crops) strategies to solve the Sclerotinia disease problem for vegetable growers. Some of the short term strategies include optimising chemical control and reducing conditions that favour or promote disease. Long term strategies include the use of pre-plant soil treatments and cultural practices (e.g. crop rotations, biofumigant crops) that reduce inoculum levels in soil, break the disease cycle and improve soil health to make soils suppressive to soilborne diseases. Some key strategies described below for managing Sclerotinia have been identified in a previous HAL project (VG00048).

Coniothyrium minitans

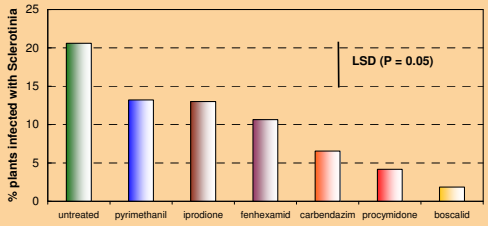


Effect of *C. minitans* (Contans®) on lettuce drop incidence

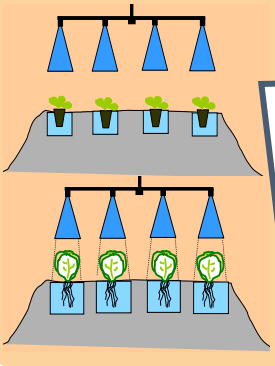
BQ Mulch incorporation into a sandy soil



Effect of green manure crops on lettuce drop incidence



Effect of fungicide treatments on lettuce drop incidence



Fungicides have different modes of action therefore proper coverage of plant tissues (e.g. bean, *S. sclerotiorum*) and below or at ground level (e.g. lettuce, *S. minor*) with the right volume of water is required for fungicides to provide effective disease control.

Potential of biological control for integrated control of Sclerotinia diseases:

- Biocontrol agents, such as *Coniothyrium minitans*, have the ability to parasitise and kill sclerotia of *Sclerotinia sclerotiorum* and *S. minor* in soils.
- Efficient biocontrol agents can reduce the levels of sclerotia in soils and therefore represent an important element in the integrated control of Sclerotinia diseases.
- Their use has to be optimised to ensure they survive in soils at levels required for effective biocontrol.

Potential of biofumigant crops for integrated control of Sclerotinia diseases:

- Biofumigant green manure crops, such as BQ Mulch, can be effective at reducing the incidence of Sclerotinia.
- Biofumigant crops with high levels of 'biofumigant compounds' play a key role in the integrated control of Sclerotinia diseases.
- Residues from biofumigant crops release 'biofumigant compounds' and increase organic matter in soil which make conditions is soils less favourable for sclerotia survival.

Optimising protection against below, at (*S. minor*, *S. sclerotiorum*) or above-ground (*S. sclerotiorum*) infection:

- Several studies have demonstrated that Filan™ (a.i. boscalid), applied properly and at the right time, is the most effective chemical available for controlling Sclerotinia diseases in Australia.
- However, under conditions of high 'disease pressure' this fungicide and others with minor use permits, in many cases, do not provide commercially acceptable levels of disease control.
- For fungicide control to be effective at high disease sites, inoculum levels in soil should be reduced and conditions favouring high infection rates modified.
- Alternatives to Filan™, including other 'soft chemicals' and non-chemical treatments, should be used in rotation with Filan™ to ensure its efficacy is not lost too soon due to overuse.

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