Reducing the impact of Sclerotinia disease on arable rotations, vegetable crops and land use

Project number	RD-2008-3579 HDC: FV 361		
Start date	1 October 2009	**End date**	31 March 2013

Project aim and objectives

Aim: to improve the control of Sclerotinia disease for susceptible crops in the rotation.
Objective 1: Improve timing of fungicide applications, based on inoculum detection and/or weather
Objective 2: Quantify the effect of crop rotation and soil management on Sclerotinia disease.
Objective 3: Industry partner experiments to evaluate forecasting and soil management treatments

Key messages emerging from the project

- Forecasting models can help control Sclerotinia disease, but additional use of risk assessment factors is important, for example, measuring petal infection.
- The forecasting model based on SkleroPro infection criteria is useful for timing sprays during oilseed rape flowering, up to 2 days ahead.
- The germination model is useful for predicting regional risk. It cannot target specific spray dates but it correctly predicts the regional risk for sclerotial germination.
- Burkard spore traps show that airborne Sclerotinia inoculum is sometimes present before sclerotial germination is observed locally.
- In most years, at least one spray is needed on oilseed rape. But forecasting and risk assessment can inform whether a delay is possible, which may save sprays.
- For peas & beans, flowering duration is short, so using models to time sprays effectively is unnecessary; the models are useful as a decision tool for whether to spray or not.
- Key risk assessment factors by region are: germination predictions, germination in depots, regional Burkard spore trap data, and weather forecasts.
- Key risk assessment factors within field are: proportion of petals infected (subject to development of a quicker diagnostic test), stage of petal fall, forecast temperature and rain.
- Contans (biological control agent) did not give a significant reduction in sclerotial viability when applied at drilling with oilseed rape.
- The number of and size of sclerotia produced is different for various crops, and larger sclerotia tend to produce multiple apothecia. These could impact on rotation decisions.
- Rotation gives the greatest financial benefits when Sclerotinia pressure is higher, but it is also a good financial strategy for land with low Sclerotinia.

Summary of results from the reporting year

Objective 1, improve timing of fungicide applications

Two models for timing fungicide applications were tested in 3 oilseed rape (OSR) experiments at

ADAS sites: [1] sclerotial germination, based on temperature and rain, & [2] SkleroPro, based on temperature and %RH. Germination predictions were generally later than observed apothecia germination and did not trigger sprays during flower. There were SkleroPro alerts at all OSR sites, but stem rot by harvest was ≤6% at most sites except Rosemaund (35%). Heavy rain events are being analysed to determine whether these explain low infection. PCR tests on daily samples from within-field spore traps showed peaks of Sclerotinia DNA which occurred at the same times as those detected with traps sited approx. 40km away. This suggests that use of regional spore traps to detect inoculum onset is possible. Agar plate tests on yellow bud or early sampled petals are a useful predictor of stem rot.

Objective 2: quantify effects of crop rotations and soil management

The short and long term effects of Sclerotinia on cropping decisions and economics are being modelled by SRUC to determine the financial outcomes for crop rotation scenarios using different disease pressures. The model shows that continuous cropping of susceptible crops will always lead to financial loss, but one break crop will prevent both long term build up of sclerotia and major financial loss. The model shows that rotation gives the largest financial benefits when Sclerotinia disease pressure is high, but also gives a good financial outcome for land with low Sclerotinia.

In an ADAS tillage experiment, inoculum (measured by petal infection) was not significantly different in minimum-tillage and ploughed areas. In polytunnel experiments on oilseed rape, beans, peas, and lettuce, the greatest weight of sclerotia (and the largest) were produced on OSR, but the most sclerotia (small) were produced on carrots. Sclerotial size may relate to inoculum production. The results were comparable to those from field samples for the same crops.

Objective 3: Evaluate disease prediction systems and fungicide timing across a range of varieties and locations in England (industry partner in-kind contributions to link project).

SkleroPro alerts, petal infection and levels of Sclerotinia stem rot were measured for field sites run by: (i) Velcourt in Lincolnshire and Kent on OSR, (ii) Belchim, six sites on carrots, and (iii) PGRO, in Norfolk on green beans and in Lincolnshire on vining peas. There was a good range of variation between sites in SkleroPro alerts (from nil to several alerts during flowering) and petal infection. Stem rot incidence varied between sites, but was generally at low incidence. Heavy rain was common. The relationships between risk factors and stem rot incidence are being analysed.

Key issues to be addressed in the next year
Complete the analysis of field data from autumn 2012, write final report by 31 March 2013

Lead partner	ADAS UK Ltd
Scientific partners	Rothamsted Research, Warwick University Crop Centre, SRUC
Industry partners	BASF, Belchim, Burkard, Microzone, Velcourt R&D, PGRO, HDC, Potato Council, NPARU
Government sponsor	Sponsored by Defra and Scottish Government through the Sustainable Arable LINK programme.

Has your project featured in any of the following in the last year?

Events	***Press articles***
• AAB Crop Protection in Southern Britain, November 2012 • ADAS Boxworth Open day • PGRO trials day June 2012 • Cereals 2012 – Rothamsted stand • SAC/HGCA farm monitor presentations • Presented at HGCA agronomy workshops / conferences at: • Carfraemill – 11 January 2012 • Perth – 12 January 2012 • Inverurie – 19 January 2012	• Reducing Sclerotinia in the rotation, *Research in Focus* – July 2012 • Research project has Sclerotinia in its sights, *Agronomist & Arable Farmer* - Summer 2012 • *Sclerotinia subarctica* press release by Warwick Crop Centre • Research suggests increased Sclerotinia risk for crops this year, *Farmers Guardian* - May 2012
Conference presentations, papers or posters	***Scientific papers***
• Components for disease management decisions of *Sclerotinia sclerotiorum* in winter oilseed rape (2012). *Aspects of applied biology*, Vol. 117, pp. 73-78 • ICPP article Aug 2012 • Krakow Conference abstract Sept 2012	

Other

- BASF OSR bulletins
- BASF carrot bulletins
- Coniothyrium launches Sclerotinia counter-attack in carrots. *Vegetable Farmer*, pp. 24-2
- Biocontrol battle to protect carrot crops (2012). *The Horticulturist*, vol. 21 (3), pp. 7-9
- Biological control of Sclerotinia in vegetables (2012). *Organic Grower*, vol.19, pp 18-20
- The case for Contans (2012). *Commercial Greenhouse Grower,* March, pp 27-28
- SAC farm advisory notes spring 2012
- Carrot article in HDC news