AHDB HORTICULTURE

Grower Summary

FV 449a

Integrated control of Allium white rot

Annual report, March 2019

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 the full 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 title:	Integrated control of Allium white rot
Project number:	FV 449a
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Report:	Annual report, March 2019
Previous report:	N/A
Key staff:	Alexander McCormack, University of Warwick James Howell, VCS Erika Wedgewood, ADAS
Location of project:	University of Warwick, Wellesbourne Campus, Warwick.
Industry Representative:	Phil Langley, G's Growers
Date project commenced:	01/03/2018
Date project completed (or expected completion date):	28/02/2021

GROWER SUMMARY

Headline

Allium white rot disease incidence was significantly reduced by succinate dehydrogenase inhibitor (SDHI) and demethylation inhibitor (DMI) fungicides in a field trial while biological and seed treatments had no significant effect. Commercial germination stimulants based on *Allium* extracts were effective in stimulating germination of *Sclerotium cepivorum* sclerotia *in vitro*.

Background

Sclerotium cepivorum is the causal agent of *Allium* white rot (AWR) an economically important disease of onion (*A. cepa*), garlic (*A. sativum*) and other *Allium* spp. worldwide (Entwistle, 1990). The bulb onion and salad onion sectors in the UK with areas of 8,762 ha and 1571 ha respectively, were worth £134M and £25M in 2017 respectively (Defra Horticultural Statistics, 2017) and with a minimum of 2-3% bulb onions and 10-15% salad onions affected by AWR annually, this equates to losses of up to £4M for each crop. In addition to this, the heavy infestation of some sites has led growers to abandon onion growing in areas of the East and South East of England with production moved to less infested, but lower yielding areas.

The pathogen infects the root systems of plants from soil-borne sclerotia (resting structures), causing roots to collapse and decay, leading to reduced crop vigour, chlorosis and often plant death. This can result in high levels of physical and marketable yield loss, with the production of further sclerotia allowing the pathogen to proliferate and persist in soil between crops. Relatively small quantities of sclerotia are required for disease to develop with densities as low as 0.1 sclerotia L^{-1} soil leading to economic loss, whilst higher levels such as 10 sclerotia L^{-1} soil can lead to total crop loss (Crowe *et al*., 1980; Davis *et al*., 2007). In addition, sclerotia are able to survive for periods of up to 20 years in soil (Coley-Smith *et al*., 1990).

Currently management options for AWR are limited. Cultural control approaches aim to prevent infestation through practicing good equipment/field hygiene measures (although due to the small and persistent nature of sclerotia, this is challenging), whilst the use of wide rotations aims to prevent inoculum build up. Chemical control is limited in the UK to off label approvals under the HSE Extension of Authorisation for Minor Use (EAMU) scheme. At the time of writing only Signum® (Boscalid and Pyraclostrobin) and Tebuconazole are registered for use against AWR in the outdoor production of bulb/salad onion, onion sets, garlic and shallots. However other products/active substances (a.s) have shown promise elsewhere (Villata *et al*., 2004; 2005; Ferry-Abee, 2014) and were reviewed by Clarkson *et al*., 2016 in AHDB project FV 499.

Other alternative methods of AWR disease management have also been explored, such as biopesticides (Clarkson *et al*., 2002; 2004), biofumigation (Smolinska, 2000), solarisation (McLean *et al*., 2001) and sclerotial germinants (Coventry *et al*., 2006; Coley-smith *et al*., 1969) but few of these are currently practiced commercially.

Consequently, the aim of this project was to identify and test a range of treatments for the integrated control of AWR in bulb and salad onions, and generate preliminary data for the effect of selected treatments on Fusarium basal rot caused by *F. oxysporum* f.sp *cepae*. Two objectives were carried out in the current year;

1) Test fungicides and biological control agents for their effect on *Allium* white rot disease.
2) Test *Allium* products for their effect on the germination of *S. cepivorum* sclerotia *in vitro*.

Summary

Objective 1: Test fungicides and biological control agents for their effect on *Allium* white rot disease.

- A good level of AWR disease control was observed for some fungicide treatments in a field trial carried out at an inoculated site at Wellesbourne (Warwickshire) but not at two commercial field sites in Cambridgeshire and Lincolnshire because of low levels of disease (<10% incidence).
- Fungicides based on SHDI and DMI chemistry gave the best levels of AWR control, with single or double applications proving to be similarly effective except for HDC 246 where two applications significantly improved control.
- Biological products were not effective in reducing AWR disease incidence at any of the sites, nor was a DMI fungicide seed treatment.
- Applications were made using a banded application and high water volume (1,000 L ha^{-1}) which likely contributed to their efficacy.

Objective 2: Test *Allium* products for their effect on the germination of *S. cepivorum* sclerotia *in vitro*.

- An *in vitro* (laboratory based) assay was developed and used to examine commercially developed and unformulated *Allium* extracts for their ability to stimulate germination of *S. cepivorum* sclerotia.
- Use of pure diallyl sulphide (DAS), previously identified as a germination stimulant, promoted germination of laboratory-produced *S. cepivorum* sclerotia which had been 'conditioned' in soil, while little to no germination was observed in untreated sclerotia.
- Commercially formulated *Allium* products generally resulted in high levels of sclerotial germination, with product HDC F264 resulting in 90% germination.
- Unformulated products derived from food grade garlic granules resulted in 64-74% sclerotial germination.

Objective 3: Test biofumigants for their ability to reduce viability of *S. cepivorum* sclerotia and reduce *Fusarium* inoculum.

- A preliminary *in vitro* experiment showed that biofumigants were able to partially inhibit the mycelial growth of *S. cepivorum* on agar.
- Biofumigants which contained the glucosinolate sinigrin where generally more effective against *S. cepivorum* than those containing glucoraphanin or glucoerucin.
- Effects of biofumigants on *F. oxysporum* f.sp *cepae* will be tested in year 2.

Financial Benefits

None to report at this time.

Action Points

None to report at this time.