

Towards understanding the temporal dynamics of *Allium* white rot: factors affecting the infectivity of *Sclerotium cepivorum* sclerotia

John Clarkson*, Anita Scruby and John Whipps

Warwick HRI, University of Warwick, Wellesbourne, Warwick CV35 9EF, UK

email: john.clarkson@warwick.ac.uk

Introduction

- *Allium* white rot (AWR) caused by the fungus *Sclerotium cepivorum* is a major soilborne disease of onion and garlic. Sclerotia of the pathogen can survive for long periods in soil and germinate to produce hyphae which infect roots directly causing wilting and plant death.
- Before germination, sclerotia undergo a period of constitutive dormancy and require a period of 'conditioning' before they can germinate. Survival of sclerotia is also subject to the prevailing soil type and environment.
- The aim of this study is to identify factors affecting germination and survival of *S. cepivorum* sclerotia and hence their potential to infect *Allium* roots over time.



Testing germination and survival of sclerotia

S. cepivorum sclerotia were produced on maize meal-sand and onion bulbs. Survival of sclerotia was assessed by squeezing with forceps. Hard / intact sclerotia were viable; collapsed / degraded sclerotia were non-viable. The ability of viable sclerotia to germinate was assessed in an assay using the artificial germination stimulant diallyl disulphide (DADS).

Drying sclerotia and conditioning enhances germination

- Dry sclerotia from onion bulbs resulted in >80% germination irrespective of whether they were conditioned for 12 weeks in soil at 15°C.
- Unconditioned wet sclerotia germinated poorly but germination in the DADS assay increased after the conditioning period (Fig. 1).

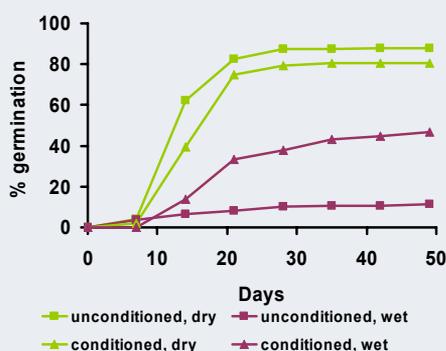


Figure 1: Effect of conditioning at 15°C in soil and drying on germination of *S. cepivorum* sclerotia from onion bulbs.

Survival and conditioning of sclerotia in the field

S. cepivorum sclerotia buried in the field were retrieved at intervals to assess survival and germination. Viable sclerotia were still detected after 1 year. Sclerotia exhibited an increasing ability to germinate over time with maximum germination occurring after 4-12 weeks. Further work will attempt to relate these results to environmental parameters.

Temperature effects on survival and germination of sclerotia

- Viability of sclerotia was unaffected after 18 weeks at 5-25°C in soil but at 30°C, survival was reduced to 52%.
- Final germination levels for viable sclerotia were greater for conditioning temperatures 5-30°C and durations 2-18 week compared to unconditioned sclerotia in the DADS assay (Fig 2).

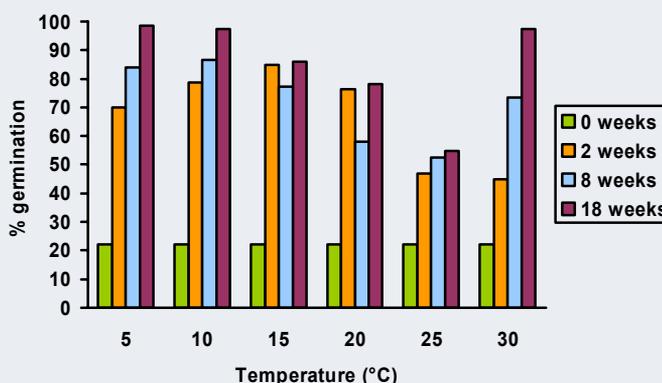


Figure 2: Effect of conditioning temperature and duration on final percentage germination of *S. cepivorum* sclerotia from maize meal-sand.

Germination ability relates to disease

S. cepivorum sclerotia that showed high germination levels in the DADS assay resulted in more AWR on onion plants in glasshouse tests compared with those exhibiting poor germination (Fig. 3).

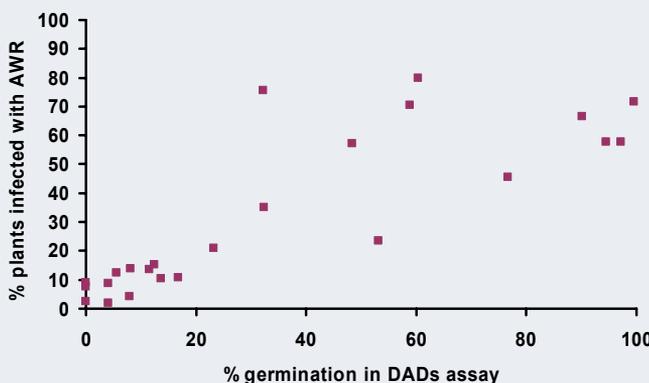


Figure 3: Relationship between germination of *S. cepivorum* sclerotia in DADS assay and ability to cause disease on onion plants.