Effect of Contans on sclerotia populations in the field; inoculum potential of carpogenically germinated sclerotia of *Sclerotinia sclerotiorum*

A.C. Cobb and H.R. Dillard
Department of Plant Pathology, New York State Agricultural Experiment Station, Cornell University, Geneva, NY 14456

Abstract

Under conducive conditions, the sclerotia of *Sclerotinia sclerotiorum* germinate carpogenically to produce apothecia and ascospores that subsequently infect susceptible plant tissue. Reduction of sclerotia populations in the soil may result in lower disease potential. Using a wet sieving technique to recover sclerotia in soil, we determined baseline levels in soil populations of sclerotia in several naturally infested fields and greenhouses, and one artificially infested field. Numbers of sclerotia detected in unamended soil varied from 0 to 30 per liter of soil with the highest naturally infested field averaging 7.3 sclerotia per liter. This is equivalent to 2.95 x 10^6 sclerotia per acre to a 4-inch depth. Sclerotia populations were reassessed following application of Contans, a product containing the mycoparasite (*Coniothyrium minitans*). After 1 to 4 months, sclerotia populations ranged from 0 to 6 sclerotia per liter of soil with highest average count of 2.0 sclerotia per liter. Disease incidence in subsequent crops following the application of Contans was variable.

In order to elucidate inoculum potential as it relates to disease threshold, we estimated the potential number of ascospores our 'field number' of sclerotia might represent. We estimated potential ascospore release from field sclerotia using laboratory produced and conditioned sclerotia. Comparison was made of the ascospore producing ability of specifically sized and weighed sclerotia. The numbers of apothecia and ascospores produced per sclerotium were measured. The sclerotia were maintained at ideal condition for ascospore production. The entire production of ascospores for each size class was collected 14 times over 29 days. Total ascospore production (average of two experiments) ranged from 0.8 to 8.0 million ascospores per sclerotium, a tenfold difference that increased with size. This translates to 0.24 to 2.4 x 10^{13} potential ascospores per acre using the highest natural level of sclerotia we detected or 0.55 to 5.50 x 10^8 ascospores/sq ft of surface area.

Objectives

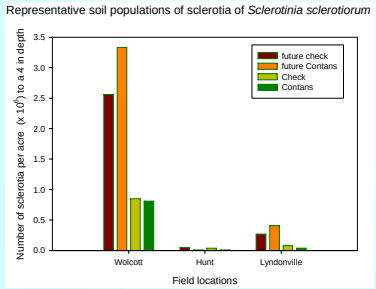
1. Conduct a field survey of numbers of sclerotia in commercial field soils using a wet sieving technique.
2. Determine if application of Contans resulted in decreased soil sclerotia populations and less disease.
3. Estimate potential ascospore production under conducive environmental conditions from sized sclerotia.

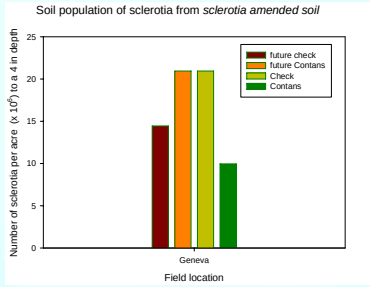
Materials and Methods

Enumeration of populations of sclerotia: One liter soil samples were collected, the apothecia counted, and plants rated for disease from areas designated with GPS coordinates to facilitate subsequent collection of data from the same location. Samples were wet screened through U.S.A. Standard Testing Sieves #10 and #20 mesh. The debris collected on the screens was examined with a binocular microscope for sclerotia.

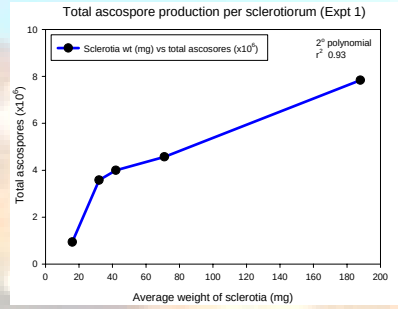
Ascospore production: Sclerotia were produced in the laboratory using the cornmeal-vermiculite method of Nelson et al., with modifications. After separating from the substrate, the sclerotia were wrapped in cheesecloth bags in distilled water with aeration at 7°C until stipes were formed. Sclerotia were separated and captured on five different sizes of USA standard testing sieves. Twenty sized and weighed sclerotia were embedded in sand in each petri dish with two replications. All ascospores were collected and washed into a flask using the vacuum method of Steadman. Ascospores were counted using a hemacytometer.

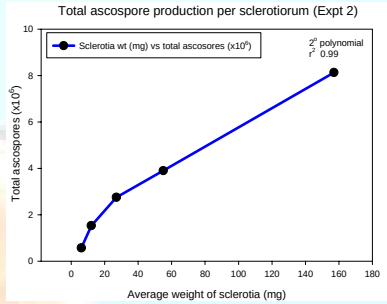
Results





Future check and future Contans designate the defined plot areas that were planted and soil sampled prior to or at the time of Contans application. Check and Contans indicate levels of sclerotia 2 to 4 months post application.





Conclusions

- Populations of sclerotia were low (0-7.3/liter of soil) and rapidly declined to below detection level both with and without application of Contans but generally declined faster with Contans. Aggregated distribution of sclerotia in the field made enumeration problematic.
- Reduced sclerotia populations may result in reduced disease incidence, but our results were variable in previous experiments.
- Low levels of sclerotia in the soil represent potentially many ascospores.
- The total number of ascospores produced per sclerotia increased with increasing size and weight of the sclerotia.
- Potential maximum ascospores per acre based on the number of sclerotia found ranged from 0.24 to 2.4 x 10^{13}.

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Cornell University