



BIOLOGICAL CONTROL OF *SCLEROTINIA SCLEROTIUM*

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Abstract

Research was conducted to evaluate the ability of Contans (commercial product containing *Coniothyrium minitans*) to reduce sclerotial populations of *Sclerotinia sclerotiorum* in fields in New York. The objectives were 1) to quantify decline in populations of sclerotia of *S. sclerotiorum* following a single application of Contans (*C. minitans*), and 2) to determine if applications of Contans results in a reduction in plant disease caused by *S. sclerotiorum*. Using a wet sieving technique to recover sclerotia in soil, we determined baseline levels in soil populations of sclerotia in several naturally infested commercial fields in various cropping systems. We also artificially infested one field at the Geneva Experiment Station with sclerotia of *S. sclerotiorum*. The numbers of sclerotia detected in the unamended soil varied from 0 to 30 per liter of soil. The highest naturally infested field averaged 7.3 sclerotia per liter. This is equivalent to 2.95×10^6 sclerotia per acre to a 4-inch soil depth. Sclerotial populations were reassessed following the application of Contans at 1 to 4 months after application, and in subsequent years in some fields. Populations rapidly declined to below detection levels both with and without application of Contans, but in some fields, the decline was faster following application of Contans. Aggregated distribution of sclerotia in the field made enumeration problematic, but even low levels of sclerotia in the soil represent potentially many infective ascospores. Contans did not decrease sclerotial populations beyond the year of application in these trials, indicating that Contans must be reapplied when susceptible crops are planted. In our trials, disease incidence in subsequent crops following application of Contans was variable. Combining our research results with interactions among product representatives, we generated improved product use recommendations.

Objectives

1. Determine potential ascospore production under conducive environmental conditions from sized sclerotia.
2. Quantify decline in soil populations of sclerotia of *S. sclerotiorum* using a wet sieving technique, following a single application of Contans (*C. minitans*) and demonstrate if less disease resulted.
3. Determine if applications of Contans results in a reduction in plant disease caused by *S. sclerotiorum*.
4. Generate field recommendations for use of Contans.

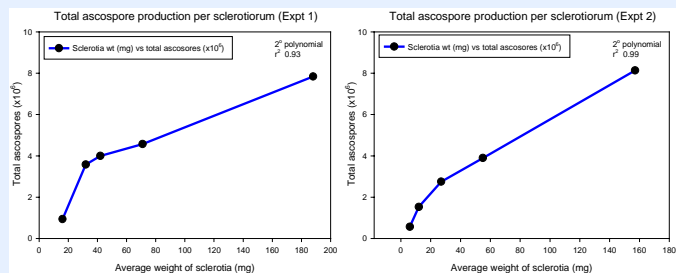
Ascospore production from laboratory-produced, sized sclerotia

Production of ascospores: Sclerotia were grown 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 and placed in a container of 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. Larger sclerotia produced more ascospores.

Ejection of ascospores



Sclerotia producing apothecia.



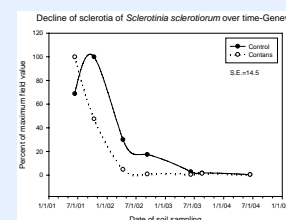
Examples of changes in field populations of sclerotia 2 to 4 months after application of Contans

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.



Year	Season	Treatment	% of sample with sclerotia	Mean # of sclerotia/liter	# sclerotia/acre (to 4 in. depth)
Wolcott					
1	fall	Initial	88	8.60	3,498,539
2	spring	Check	90	6.30	2,562,883
2	spring	Contans	97	8.20	3,335,816
2	fall	Check	73	2.10	854,294
2	fall	Contans	87	2.00	813,614
3	summer	Check	53	0.93	378,330
3	summer	Contans	17	0.30	122,042
3	fall	Check	63	0.87	353,922
3	fall	Contans	27	0.43	174,927
Genesee					
3	summer	Check	67	0.67	272,561
3	summer	Contans	50	1.25	508,509
3	fall	Check	40	0.90	366,126
3	fall	Contans	40	0.70	28,476
Hunt					
3	summer	Check	13	0.13	52,885
3	summer	Contans	3	0.03	12,204
3	fall	Check	10	0.10	40,681
3	fall	Contans	3	0.03	12,204



Apothecia in field



White mold on beans



Conclusions

- Low levels of sclerotia in the soil represent potentially large numbers of 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 2.4×10^{13} .
- Mean numbers 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 results were variable.

Recommendations for effective use of Contans

1. In the fall, apply Contans (at 1 lb/acre) to *Sclerotinia* infested crop debris immediately following harvest, and immediately incorporate the debris into the soil.
2. In the spring/summer, spray Contans (at 2 lb/acre) to soil surface after final fitting. Excellent coverage of infested debris is critical because Contans must be in contact with the sclerotia. It may be tank mixed with many herbicides; must shallow incorporate.
3. Incorporate by mixing into the soil (or irrigating) to about 1 to 2 inch depth.
4. Do not turn soil profile after application of Contans. This will avoid bringing up untreated soil that contains viable sclerotia.
5. Contans needs 3 to 10 weeks depending on temperature and moisture to effectively colonize and destroy sclerotia.
6. Growers need to reapply in subsequent years if sclerotial populations are still high. The recommendation is to apply Contans for at least 3 to 4 years or every year a susceptible crop is grown in the field.
7. *Sclerotinia* spores can blow in from nearby fields, but in-field inoculum probably causes the most disease.

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