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Post-Sclerotinia Recommendations

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Many growers in the Upper Midwest have become familiar with the cycle of Sclerotinia. The fungus can infect a number of broadleaf crops and in a year with disease, sclerotia (the hard bodies) become deposited in the soil and the cycle continues.

Still, there are key questions in managing the problem:

"What should I be doing with those fields that have a new load of sclerotia?

Do I till?

What crops should I consider the following season?

How long should I keep broadleaf crops off of that field?"

These questions were directed to a panel of expert pathologists at the recent Sclerotinia Initiative annual reporting session, and there appears to be increasing consensus in finding answers to those questions.

Let's review what is known:

- Sclerotia can live in the soil for many years.
- Shade and moisture are required for the sclerotia to germinate and produce spores that will attack the plants.
- Once a sclerotia germinates it degrades and is no longer a disease threat.
- There are natural fungi and bacteria in the soil that attack sclerotia. A biocontrol product like Contans® WG, which is a fungus that attacks sclerotia, can be added to the soil to accelerate the destruction of sclerotia.
- A susceptible crop should be avoided the year following a high incidence of disease. Cereal crops and grasses are not susceptible to the disease.
- Under the right conditions, spores of the fungus can be wind blown for short distances, but the amount decreases with distance.
- The spores are very vulnerable to sunshine.

What about tillage?

Since plows went out of vogue a number of years ago, burying sclerotia via deep plowing simply is not a realistic alternative. Weed scientists and plant pathologists agree that plowing, in certain situations, is an efficient way to decrease weed seeds and fungal spores in the "soil bank," but, with the current emphasis on no-till and minimum tillage, this practice isn't encouraged.

Further, while plowing may decrease the airborne spores, it may not bury the sclerotia deep enough for sunflowers to escape root infection. The choices left are shallow tilling or no tilling. According to past research, there may not be too much difference between the two tillage practices.

In fact, leaving sclerotia close to the soil surface might be a better option than tillage, as it allows for natural weathering. The freezing and thawing can lead to potential cracking of the sclerotia outer surface. Once there are cracks, the sclerotia may be more vulnerable to soil microorganisms that attack the sclerotia. A deeper burial may keep the sclerotia viable for several years until it is brought back to the soil surface. One control option is to get rid of the sclerotia in the soil as soon as possible.

What crops should I consider the following season?

Since it is necessary to avoid a susceptible crop the following year, it may be best to plant a small grain crop early the next season with as little soil disturbance as possible.

Remember that for sclerotia to germinate, shade and moist soils are needed. An early planting of a crop such as wheat, oats, or barley with a heavy canopy should provide the necessary ingredients of moist soil and shade in the spring or early summer. Under these conditions, many of the sclerotia should germinate and send out their destructive spores, which should be confined within the cereal crop or to a nearby host crop that is not yet vulnerable to spore infection. For instance, sunflower is not vulnerable to spores until bloom.

Craig Grau of the University of Wisconsin has conducted studies planting a cereal crop on sclerotia infested soils. Later that same season, he planted soybeans into the cereal crop and then killed off the cereal with a herbicide when the soybeans emerged. The result was extremely low Sclerotinia infection on the soybeans planted into the cereal "cover crop" compared to the check with no initial cover crop.

He concludes that the early shade allowed the sclerotia to germinate at a time in the season when the soybean was not vulnerable to spore infection. Corn, for example, would not be the preferred crop in this scenario, since the canopy develops later in the season when many broadleaf crops are vulnerable to spore

infection.

Paul Porter of the University of Minnesota, Crookston is experimenting with fall planted rye after a broadleaf crop with a high incidence of Sclerotinia. The early and heavy spring cover would provide the same conditions conducive for early sclerotia germination. The rye crop could be harvested or destroyed and replanted to another crop in late spring.

Another tool to consider in eliminating soil sclerotia is Contans® WG. This is a soil-applied commercial product, a living fungus that attacks or parasitizes soil sclerotia. Multiple research sites indicate that the product does indeed accelerate parasitic activity.

Luis del Rio a North Dakota State University pathologist, has run trials in two N.D. locations. Sclerotia were added to each of his plots, and Contans was applied at two different rates either in the fall of 2002 or the spring of 2003 and immediately shallow incorporated. At the end of each growing season, soil samples in the top two inches were taken and analyzed in the laboratory.

Results indicated that over 60% of sclerotia analyzed were being parasitized by the Contans fungi. Soil samples in the untreated checks also had levels of the parasite, but nearby soils without the added sclerotia did not have the parasite.

There was no statistical difference between the two rates of 1 and 2 pounds per acre. Parasitic levels in the following year were significantly lower than the previous season. Del Rio did notice that high soil PH of 8.5 may have an impact on the longevity of the parasite.

Sunflower, dry beans and canola were planted into the plots in both 2002 and 2003. Sunflower wilt (root infection) developed in both locations both years but at a much reduced level in the second year. White mold infection (via the spore) developed only on edible beans in one location.

Helene R. Dillard, plant pathologist at Cornell University, had similar results. Field populations of sclerotia were reduced over time in the Contans treated soil and in the untreated soil. However, "treating with Contans resulted in a more rapid decline and lower final sclerotia populations..." according to Dillard. She further noted that Sclerotinia or white mold disease in vulnerable test crops were "...statistically lower in the Contans-treated versus the nontreated plots."

Using Contans WG obviously requires an investment. But it might be a good investment if the rotation between broadleaf crops is close. For instance, if a farmer has sunflower and soybean or sunflower and peas in the rotation and notices white mold, it might be a reasonable risk management tool to consider.

Many sunflower fields in the northern tier of the production region produced a lot of sclerotia in 2004. According to del Rio, a general approach to take is if your last crop had a white mold incidence of 30% or more, your field might benefit from an application of Contans. This is especially true if you are planting a high value crop like edible beans or confection sunflower. Both of these crops have the potential of

\$400 gross returns. A 10% incidence of white mold can easily lower that return by more than \$40 per acre.

"I would encourage growers, especially those who were hit the hardest by Sclerotinia this past year, to try Contans, even if it is in small areas of the field such as low spots or along tree belts. I am almost sure they will see benefits the next time they plant sunflower in that field," said del Rio.

Tom Gulya of the USDA ARS Sunflower Unit says that most soils have natural levels of soil parasites that attack sclerotia. In fact, most researchers only get about four years out of Sclerotinia disease nurseries. "After four years the buildup of Sclerotinia parasites has eliminated the host sclerotia and we need to move to another site," he says.

By applying Contans, you are upping the numbers of parasites in the soil and hopefully getting the job done quicker. Unfortunately, there is not an easy or fast test to determine the level of sclerotia parasites in the soil. "It is not like testing for pH or nitrogen. You would have to take many soil samples and the lab procedure is time consuming," says Gulya.

According to the manufacturer, Contans should be applied to the infected crop residue in the fall, with a spring application the next best option. Light tillage is recommended but should not be deeper than 2", since this will dilute the Contans. The product web site is www.contanswg.com

It is important to remember that the product works only on sclerotia in the treated field, and does not move into any susceptible plant that is grown in that field. Thus, if sunflowers or dry beans are planted in the Contans treated field, spores produced outside the field may still blow in and cause some disease. The Contans, however, will have a greater impact upon sunflower stalk rot, since that is caused by sclerotia in the ground.

A multi-faceted approach toward research on Sclerotinia continues under the National Sclerotinia Initiative, which recently granted \$287,000 to sunflower researchers. The funding will be used for continuing work on germplasm development for head and stalk rot resistance, field testing of germplasm and existing hybrids at five sites for both head and stalk rot tolerance, fungicide testing under mist sites for head rot efficacy, identifying and mapping Sclerotinia resistant genes for both head and stalk rot, and developing Sclerotinia resistant germplasm using wild sunflower species.

The Initiative is federally funded for intensive research on this significant disease which affects soybean, canola, edible beans, peas, lentils and sunflower. More information on this research effort can be found online at www.sclerotinia.com

More information on Sclerotinia in sunflower can be found online at www.sunflowernsa.com. Click on the link "Sunflower Magazine" then "View archives: and then "Disease." NDSU also has a bulletin on Sclerotinia online at <http://www.ext.nodak.edu/extpubs/plantsci/rowcrops/pp1193w.htm> - Larry Kleingartner

Minimizing Sclerotinia after a severe outbreak of the disease

- Follow with a small grains crop with an early planting and heavy seeding rate to create a “microclimate” of shade and moist soil that is conducive for sclerotia to germinate.
- Consider applying Contans WG that fall after a crop with a high incidence of Sclerotinia.
- Use minimum soil tillage. This will keep the sclerotia near or at the soil surface, giving greater potential for the sclerotia bodies to naturally breakdown from the weather, and allowing soil parasites that attack sclerotia to work more efficiently.
- When planting a susceptible crop like beans, peas, canola or sunflower on a field with Sclerotinia history, cut back on plant populations to allow more air flow between the rows, and avoid excess nitrogen fertilization.
- At planting, choose the most resistant hybrid. Some sunflower companies do rate their hybrids and efforts are underway to rate most hybrids within public/university channels in the near future.

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