THE OHIO STATE UNIVERSITY EXTENSION

FACT SHEET

Agriculture and Natural Resources

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Sclerotinia Stem Rot (White Mold) of Soybean

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Soybean producers are adopting management practices to maximize yield, and Sclerotinia stem rot (white mold) is a disease of high yield potential soybeans. Wet, moist, cool conditions just prior to and during flowering are essential environmental conditions for infection and disease development. It takes very few sclerotia on or near the soil surface to result in substantial amounts of disease when favorable conditions occur at the time of flowering. Environments that favor white mold development occur in fields that are highly productive, with tall, thick stands of soybeans. The disease is usually most severe in areas of fields where moisture collects due to fogs and extended dew periods. Temperatures greater than 90°F will arrest disease development.

Symptoms

Infected soybean plants first appear wilted, and the leaves and stems turn brown to tan. Dead plants stand erect above the soybean canopy with leaves still on the stem. Dying plants can be found approximately two weeks prior to the time when the crop normally matures. The stems of affected plants are covered with a thick white mold, with dark sclerotia forming both inside and outside of the stem and pods. Data indicate that soybeans can withstand a substantial amount of white mold before significant yield losses occur. The level of yield loss is dependent on the number of plants infected in the field and how early in the season the plants become infected and die. Plants that are infected late will produce some seed.

Figure 1. Stem symptoms of Sclerotinia stem rot (white mold) develop late in the season and begin as fluffy mycelial growth on the stems. The dark, black, irregular-shaped structures are the sclerotia, which can survive for a number of years in the soil *(D. Mills, OSU)*.

The Fungus

The fungus causing white mold is *Sclerotinia sclerotiorum*. It produces a survival structure called a sclerotia, which is hard and black, irregular in shape, and very similar in appearance to rat feces, but white to pink in the interior. Under long periods of wet, moist conditions, the sclerotia germinate directly, forming mycelium, or they produce a small mushroom-like fruiting body called an apothecium. Ascospores are produced in small sacs on the top surface of this apothecium. This fungus is reported to infect many different broadleaf hosts.

Disease Cycle

The sclerotia serve as the survival structure. During harvest the sclerotia are harvested with the seed or returned to the soil surface with crop residues. Burying the

sclerotia in soil appears to enhance their survival ability. In the spring and summer, sclerotia will germinate either directly by forming mycelia or by forming apothecia. Sclerotia will produce apothecia if they are within an inch of the soil surface. The apothecia produce large numbers of ascospores, which are subsequently spread by wind and splashing rain. Once the ascospores germinate, the developing fungus requires a nutrient source prior to infecting plants. On soybeans, the flowers serve as a food source, and subsequently infections occur on the stem near a node where the mycelium colonized dead flowers. Sclerotia developing on diseased soybean plants are returned to the soil during harvest. Sclerotia found in harvested seed can contaminate new fields if seed lots have not been properly cleaned to remove sclerotia prior to planting.

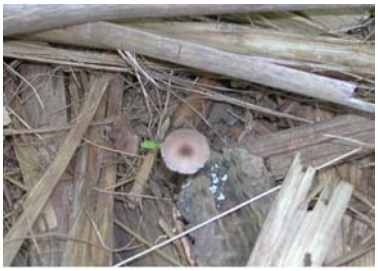

Figure 2. Apothecium in corn stalks *(D. Mills, OSU)*.

Disease Management

1. Avoid introduction of Sclerotinia into the field. Sclerotia are present in soybean stems and debris, which can be carried by the combine at harvest. Seed should be well cleaned to remove sclerotia to avoid introduction of the fungus into the field. A combine cannot completely separate sclerotia from the seed. Seed lots can be cleaned by gravity tables and spiral separators. Recent findings from the University of Illinois and Iowa State University indicate that seed treatments will also be effective against Sclerotinia on infested seed.
2. Plant soybean varieties that are less susceptible to Sclerotinia white mold. Varieties have been identified that develop less Sclerotinia white mold than more susceptible varieties from both field and greenhouse studies. Although no soybean variety is known to be highly resistant, a number of high-yielding varieties with moderate partial resistance are available. Soybean producers should contact seed dealers.
3. Sufficiently long crop rotations with corn and wheat will be effective in minimizing pathogen build-up over time. Although several years will be required to reduce fungal populations, sclerotia will still germinate and produce apothecia during the seasons when the field is planted to non-host crops. Most sclerotia die over a three- to four-year period between soybean crops. Short crop rotations, such as a soybean-corn rotation, will eventually lead to a build-up of sclerotia in the field.
4. Effective weed control is essential. Sclerotinia has a very wide host range, attacking common weeds like lambsquarters and pigweed. It is imperative that good weed management practices are in place to prevent further build-up of Sclerotinia sclerotia in crop production fields.
5. Fungicides are available for use on soybeans for white mold control. Application of fungicides, however, is only recommended for fields where white mold has limited yields in the past and the soybean variety is moderately to highly susceptible. Successful fungicide control requires that the spray application penetrates the canopy and reaches the flowers. Seed producers should consider fungicides to control white mold in susceptible varieties. Other advantages are improved seed quality and reducing movement of the white mold pathogen into clean fields with seed. Current fungicide recommendations for white mold control can be obtained at the Ohio Field Crop Disease web site **http://www.oardc.ohio-state.edu/ohiofieldcropdisease/**.
6. Studies that examined the effects of increased row spacing or reduced seeding rate on white mold development generally resulted in a decrease in the amount of white mold. However, increase in row spacing did not necessarily correspond with an increase in yield. Only varieties that are very susceptible to white mold and that are also produced in fields with a long-standing history of white mold should be planted at wider row spacings.
7. Tillage affects Sclerotinia white mold in several ways. Sclerotia can survive deep in the soil up to seven years; only sclerotia within 2 inches of the soil surface will

Figure 3. Sclerotia in soybean seed cleanings *(P. Lipps, OSU)*.

germinate and produce spores to infect soybeans. Burying infected residues by deep plowing can prevent germination of sclerotia but subsequent tillage brings the sclerotia the surface.

8. In no-till, a large portion of the sclerotia germinate under corn or to other nonhost crops, which reduces the number of viable sclerotia in the soil. Recent research from Iowa State University shows that long-term no-till results in a smaller white mold risk than conventional tillage. Fields where white mold first occurs should be tilled to bury the sclerotia, while reduced tillage is preferred for fields with a long history of white mold.

Links to other useful sources of information on managing white mold:

Ohio Field Crop Disease
http://www.oardc.ohio-state.edu/ohiofieldcropdisease/soybeans/sclerotinia.htm

Soybean Plant Health Initiative
http://www.planthealth.info/whitemold_basics.htm

University of Wisconsin
http://www.plantpath.wisc.edu/soyhealth/cause.htm