White Mold Management in Soybean

Sclerotinia stem rot, or white mold, is a disease that can infect soybeans. It thrives under moist conditions, below average temperatures, and under high yield management systems.

What to Consider

White mold is a relatively easy fungal disease to identify as it produces white, fluffy, cottony mycelial growth on the outside of stems and on pods (Figure 1). Other symptoms include-

- Wilted leaves
- Stems that appear "bleached"
- Shredding of stem tissues.
- Sclerotia, small black structures resembling mouse or rat droppings, can be found on and inside plants infected by white mold.[1,2]

Table 1. Seasonal and long-term risk factors associated with the development of white mold.

Season Risk Factors	Long-term Risk Factors
Weather: cool temperatures (<85°F), normal or above normal soil moisture, leaf wetness during flowering, and early pod development.[2]	Field history: other host crops are grown in rotation with soybean, one to two years interval between soybean crops, and susceptible products are grown.
Early canopy closure: due to early planting, high plant populations, narrow rows, and excessive plant nutrition.	Weed management: poor control of broadleaf weeds that are also hosts of white mold.
History of white mold: density and distribution of pathogen, and presence of apothecia at flowering.	Field topography: low areas, tree lines, and other barriers that impede air movement.
Soybean product: reaction to white mold depends on plant structure, and physiological functions.	Pathogen introduction: contaminated and infected seed, movement of infested soil, and wind-borne spores.

Management Options

Crop Rotation. Short crop rotations, such as a soybean-corn rotation, can eventually lead to a buildup of sclerotia. Most sclerotia die over a three-to four-year period between soybean crops. Thus crop rotation to non-host crops like small grains and cereals can be effective in minimizing pathogen buildup over time.[2]

Tillage. Sclerotia, within the top two inches of soil, germinate and produce spores to infect plants. Deep tillage to bury infected residue can prevent germination of sclerotia, but additional tillage brings sclerotia to the surface where they can germinate.[1] In no-till fields, sclerotia remain on the surface and a large number germinate during other rotational crop years. Viable sclerotia germination is reduced; therefore, in no-till fields, sclerotia may remain confined to hot spots. If white mold occurs for the first time in soybean fields, tillage can bury the initial sclerotia, and subsequent tillage in the following years should be avoided. Reduced tillage and no-till are preferred in fields with a history of white mold infestation.[2]

Figure 1. Soybean stem affected by white mold, also known as Sclerotinia stem rot.

Product Selection. No soybean products are completely resistant to white mold, but tolerant products can be effective in managing white mold. Planting highly susceptible products should be avoided in—

White Mold Management in Soybean

- fields with white mold history,
- low-laying areas,
- fields with natural barriers to wind (tree lines).

Row spacing. In low to moderate disease pressure environments, white mold increases as row spacing narrows. Under high disease pressure, white mold severity is similar between wide and narrow rows. Increased row spacing generally decreases white mold, but does not necessarily correspond with an increase in yield potential.

Plant population. High plant populations contribute to dense, closed canopies. Higher populations (175,000 plants per acre or greater) have been associated with increased white mold incidence.[2] In fields with a history of white mold, consider maintaining yield potential with a slightly lower plant population.

Weed Control. Broadleaf weeds such as lambsquarters, pigweed, velvetleaf, ragweed, field pennycress, Canada thistle, and mustard are hosts white mold. It is important to control these weeds, especially in crops grown in rotation with soybeans.[2]

Chemical Control Options. Especially in fields where white mold has been an issue previously, it is critical to use management options such as product selection, crop rotation, and reduced tillage. However, several options exist for combating white mold in-crop.

Outbreaks may be reduced by applying fungicide during flowering.[4] This requires accurate application timing and prediction of disease onset. Fungicides are most effective if applied as preventative measure; results have been inconsistent when applications are made after symptoms have already developed. Table 2 lists pesticides currently registered for suppression or control of white mold.

There is some evidence herbicides can shorten plant height and thin plant canopies which is associated with a lower incidence of white mold, especially in environments favoring white mold. Applications of lactofen (Cobra®) herbicide at 6 fl oz/acre just prior to R1 has been shown to suppress white mold in moderately susceptible soybean products (Figure 2). A 2009 multi-location study by Valent in Ohio showed an average yield increase of 13.6 bu/acre with Cobra applications.[3,5]

Table 2. Products currently registered for suppression or control of white mold on soybean.

Product Type	Active Ingredient	Product Name
Fungicide	**Picoxystrobin**	***Aproach®**
Fungicide	**Boscalid**	**Endura®**
Fungicide	**Fluazinam**	***Omega® 500F**
Herbicide	**Lactofen**	**Cobra®, Phoenix™**
Biocontrol	***Coniothyrium minitans***	**Contans® WG**

* Fungicide products rated as Good to Very Good on the Foliar Fungicide Efficacy for Control of Foliar Soybean Diseases by the North Central Regional Committee on Soybean Diseases—January 2017.

Other Management Tools. Sporecaster, the white mold forecaster developed by the University of Wisconsin, has been developed to help predict the probability of white mold apothecial present in a soybean field. Growers can download the Sporecaster app and input site-specific information into the app, which combines field information with the research-based models to predict the best timing for white mold treatment in that field.[6]

In summary, fields with high disease pressure and ideal environmental conditions, such as cool and wet weather during flowering, can lead to the development of white mold in soybean. Symptoms include white, fluffy, cotton growth on the outside of stems. Management tools include product selection, weed management, crop rotation, reduced tillage, and fungicide applications.

Sources: [1] Dorrance, A. and Novakowiski, J. 2017. Sclerotinia stem rot (white mold) of soybean. The Ohio State University Extension. PLPATH-SOY-3.
[2] 2015. Soybean disease management. CPN-1005. Crop Protection Network.
[3] White Mold. Iowa State Extension. https://crops.extension.iastate.edu/white-mold
[4] Smith, D., Wise, K., Chilvers, M., Bradley, C., and Mueller, D. 2014. Managing white mold in soybean. Wisconsin Field Crops Pathology. University of Wisconsin Extension. http:\\fyi.uwex.edu.
[5] Valent. 2017. Cost effective herbicide solution for white mold suppression. https://www.valent.com/agriculture/products/cobra/upload/2017-COB-8008-Cobra-Herbicide-Soybeans-White-Mold-Quickhseet-12-8-17.pd
[6] Sporecaster, the white mold forecaster. Integrated Pest and Crop Management. The University of Wisconsin. http://ipcm.wisc.edu/apps/sporecaster/
[6] Westphal, A., Abney, T.S., and Shaner, G. 2015. Diseases of soybean: white mold. Purdue University Extension. BP-43-W.