White Mold and Potatoes

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Figure 1. Sclerotia of the white mold fungus in a dying potato stem.

Crops	Weeds
Alfalfa	Canada thistle
Canola	Cocklebur
Carrots	Common chickweed
Clover	Crabgrass
Dry beans	Dandelion
Garlic	Field pennycress
Hops	Lambsquarters
Onion	Marshelder
Pea	Milkweed
Peppermint	Mullein
Potato	Nightshade
Tomato	Pigweed
Sunflower	Prickly lettuce
Winter barley	Purslane
	Shepherd's purse
	Sow thistle
	Vetch (common and hairy)
	Wild mustards

Table 1. A partial list of crop and weed hosts of *Sclerotinia sclerotiorum* in Idaho.

Introduction

White mold, also called Sclerotinia stem rot, is caused by the soil-borne fungus *Sclerotinia sclerotiorum*. The list of host plants for this fungus is extensive and includes not only potatoes but more than 400 different species of plants. Host plants in Idaho include beans, peas, canola, and some common weeds associated with potato production like lambsquarters and pigweed (table 1). Planting non-susceptible or poor hosts, such as corn or small grains, in rotation can help break the white mold disease cycle. Unfortunately, the white mold fungus forms hard, black survival structures called sclerotia (singular sclerotium). Sclerotia are durable structures that can survive for several years in the soil making the disease a difficult and perennial problem to manage (Fig. 1). Because of prolific sclerotia production on susceptible hosts and long-term soil survival, white mold can build up in fields over time. This fungus can produce lesions on any part of the potato vine and leads to infections that can girdle potato stems causing all the tissue above the lesion to die. When these lesions form near the soil the entire vine dies prematurely. This decrease in crop canopy is a concern for potato yield potential, size, and quality.

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Disease Cycle

The white mold fungus survives in the soil as hard, black survival structures called sclerotia (Fig. 1). Sclerotia are an eighth to a quarter inch in diameter, and may be up to an inch in length but generally are much shorter. These structures can overwinter in both the soil and in crop residue. Sclerotia in the top 1 to 2 inches of the soil surface can germinate and produce small, orange to red colored mushroom-like discs called apothecia (singular apothecium, Fig. 2). Periods of cold temperatures and high soil moisture condition sclerotia so they can germinate. Sclerotia germinate by producing apothecia or mycelia (masses of small, white threadlike fungal strands). The best conditions for germination usually occur after row closure and may last for a period of 2 to 8 weeks. Under favorable conditions, apothecia eject ascospores (spores) that are carried on air currents and land on nearby plants. Ascospores can be dispersed by wind throughout an entire field or to adjacent fields. Up to 8 million ascospores can be produced by a single apothecium. Cooler temperatures (55 to 70ºF) and high humidity (95 to 100%) favor ascospore germination, and like many fungi, white mold is favored by wet soils and wet foliage. The fungus essentially stops growing at 85ºF and above, but Idaho nighttime temperatures frequently drop down into the favorable temperature range.

Ascospores are similar in size to pollen, and when traveling in the wind may be caught particularly well by potato flowers. When flowers or other plant parts, such as petioles, covered with ascospores fall to the ground, the ascospores can infect the decaying plant matter (Fig. 3). Hyphae (singular hypha), small, threadlike strands of the white mold fungus, then grow from senescing or damaged plant parts onto healthy stems and leaves in the lower parts of the canopy. A mass of hyphae growing on potato tissue appears white and cottony. Infections may also occur by direct contact between a germinating sclerotium and a potato plant or decaying plant material, but this is thought to be less common.

The first symptoms of white mold are water-soaked lesions that quickly become covered by a white, cottony, fungal growth (Fig. 4) that can wilt or girdle the stems of a potato plant (Fig. 5). Sclerotia then form inside and/or outside the infected stem (Figs. 1 and 4), and on rare occasions may form inside tubers. When infected stems dry out and the host plant dies, sclerotia are returned to the soil. The disease cycle is repeated (Fig. 6) when a susceptible host grows in close proximity to the sclerotia.

Figure 2a. Apothecia produced from white mold sclerotia.

Figure 2b.

Figure 3. Apothecium next to a senesced potato flower that has been colonized by the white mold fungus.

Figure 4. White mold lesion with water-soaked appearance and white-cottony growth of the white mold fungus.

Figure 5. Wilting of potato plant caused by white mold lesions near the soil line.

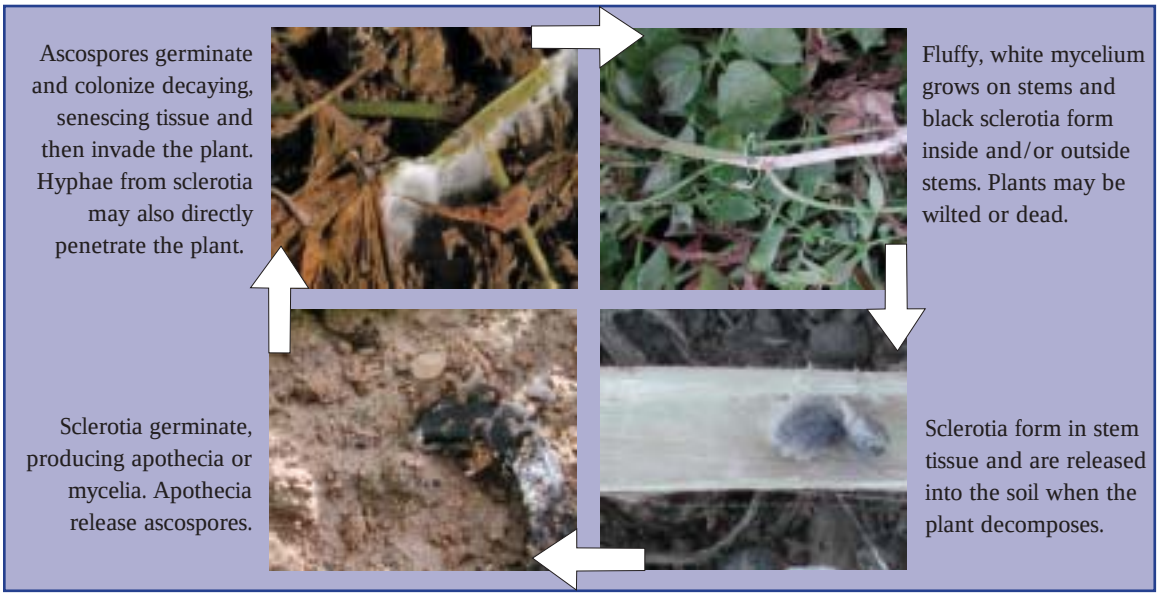

Figure 6. Life cycle of white mold in potato production.

White Mold Management

Cultural Practices

To manage white mold in potatoes, it is best to utilize an integrated approach to reduce inoculum in the field. Crop rotations with non-susceptible hosts such as corn, or weak hosts such as small grains, will help minimize white mold in succeeding potato crops. Growing non-susceptible hosts in long rotations will help reduce inoculum levels in the soil. With these rotations, the sclerotia will germinate, but the fungus will not be able to infect and continue its life cycle. If a field has a history of white mold, avoid rotating into susceptible hosts such as beans, alfalfa, or canola.

Good fertility management that reduces excessive vine growth will also suppress white mold. Cultivars that produce a thick, dense canopy are at a higher risk of white mold than cultivars that produce a sparser canopy.

Proper irrigation management is a critical factor in dealing with potential white mold problems. Reduce canopy wetness and avoid excessive irrigation whenever possible. In general, anything that reduces humidity and wetness in the canopy and allows the soil surface to dry will help decrease white mold. Cultural practices that help to avoid favorable field conditions for late blight development will also help in white mold management.

Control of weeds that are hosts to *Sclerotinia* is an important part of managing white mold. Since many common weeds that are found in potato fields and rotational crops are susceptible hosts to white mold, weed populations must be managed. Some susceptible weed hosts are listed in table 1.

Because white mold is primarily a soil-borne problem, tillage practices have been suggested as possible control methods. Unfortunately, the effects of various tillage practices have not been thoroughly investigated and it is unknown whether or not tillage practices can be used to manage white mold. Sclerotia are degraded over time primarily by soil microbes. Fluctuations in temperature and soil moisture can also reduce sclerotia survival. As a result, burying sclerotia deeper in the soil via tillage may actually increase survival. However, burying sclerotia via tillage restricts apothecium formation, thus preventing the fungus from coming into contact with potential hosts. Overall, the positive and negative effects of tillage practices on white mold management are still unclear.

Chemical Control

If the decision to use chemicals to help manage white mold has been made, fungicides must be applied before white mold appears in the field. Contact

university extension personnel or the Idaho Department of Agriculture for the most recent list of registered products and recommendations. Always read and follow the labels for proper rates, timings, and application methods. Since white mold is more prevalent in the lower portion of the canopy, good fungicide coverage throughout the canopy is desirable. Fumigation is not a recommended method for managing white mold.

Summary

Integrating cultural practices such as the use of non-susceptible hosts in rotation, weed management, proper irrigation practices, tillage practices, and avoiding excessive vine growth can be useful in reducing white mold problems. Timely fungicide applications can also be a valuable tool in this integrated approach to reducing the impact of white mold on a potato crop. Keeping track of disease history will help in estimating the potential problem in a field, and aid in developing the best integrated disease management program. Understanding and monitoring the white mold disease cycle will help in producing individual on-farm programs to reduce the impact of this disease.

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500, 05--03 Produced by Ag Communications $2.50

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