W 1002

Lettuce Drop (aka White Mold, Sclerotinia) Management

Tim Siegenthaler, Research Specialist
Zachariah Hansen, Assistant Professor and Extension Specialty Crops Pathologist
Department of Entomology and Plant Pathology

Annette Wszelaki, Professor and Extension Vegetable Specialist, *Department of Plant Sciences*
Brian Leib, Associate Professor and Extension Irrigation Specialist, *Department of Biosystems Engineering and Soil Science*

Disease Overview

Lettuce drop is the common name for a lettuce disease caused by the white mold fungi *Sclerotinia sclerotiorum* and *S. minor* (Figure 1). These pathogens affect a wide range of hosts and can be very destructive resulting in large economic losses if not managed properly. Disease is favored by cool, wet conditions and thrives in crops with dense canopies such as lettuce. These pathogens produce structures that survive through the winter called sclerotia (Figure 2), which need adequate moisture to germinate. Sclerotia are the main source of disease inoculum and can either germinate to release aerial windborne spores that infect foliage or germinate to produce fungal hyphae, which directly infect nearby crowns and roots of lettuce plants. Once infected, these fungi destroy the vascular systems of plants causing them to wilt rapidly. As the season progresses, more sclerotia are formed on diseased tissue allowing the fungi to survive until the following season.

Diagnostics

Symptoms of lettuce drop include sudden wilting of plants, bleaching of leaves (Figures 1 and 3), crown rot and root rot. Under moist conditions, white cottony threadlike strands called fungal mycelia (Figure 3) can be found on the lower stems or upper leaves of infected plants. As the infection progresses, black sclerotia ranging in size from a mustard seed to a bean may start to form around these mycelia. Symptoms of lettuce drop could be confused with another lettuce

Figure 1. Typical lettuce drop symptoms including bleaching and wilting.

Figure 2. Black sclerotia found within the stem of a tomato plant infected with white mold.

disease known as southern blight, caused by the fungus *Sclerotium rolfsii*. Southern blight produces similar white mycelia near the crowns of infected plants and produces sclerotia. The main distinguishing characteristic between these diseases is the shape and color of the sclerotia. Southern blight produces round, tan, uniform sclerotia (Figure 4), while Sclerotinia produces irregularly shaped black sclerotia (Figure 2).

Management

Host Resistance

Currently there are no resistant varieties available.

Cultural Controls

Canopy management to reduce the moisture levels within rows of lettuce is very important to limiting infection from white mold. This is primarily done through proper row spacing to allow for air flow between plants while also maximizing yield. Likewise, removal of any obstructions to good air drainage such as tall grass, grown up fencerows or ditchbanks at the low end of the field is beneficial. Additionally, irrigation can influence incidence of lettuce drop and is an important factor to manage for optimal disease control. Standing water on the surface of plants increases the likelihood of infection, so long periods of leaf wetness should be avoided. This is primarily done through timing irrigation in the early morning and turning off the water near the afternoon to allow enough time for leaves to dry before night. Drip irrigation is generally preferred versus overhead irrigation for disease management and water conservation. However, overhead irrigation may fit certain production systems better than drip. For example, if biodegradable mulch is used then growers may want to avoid using plastic drip lines to reduce plastic waste or the need to remove and discard the lines at the end of the season. In a study conducted at the University of Tennessee, overhead irrigation did not increase occurrence of white mold on lettuce compared to drip irrigation, but disease pressure was very low overall. Under conditions of higher white mold disease pressure, growers should expect increased leaf wetness to increase incidence of disease. It is also worth noting that twice as much water was used in the overhead irrigation compared to the drip irrigation system.

Chemical Controls

Fungicides can be applied as protectants to manage infection from aerial spores and applied to the soil to help manage sclerotia. Applications should be made prior to the thinning stage or at seeding. Subsequent applications of fungicides should be made according to the label. The products Endura, Fontelis and Miravis Prime have shown good efficacy at reducing plant death caused by both *S. sclerotiorum* and *S. minor*.

Biological Controls

Coniothyrium minitans is one of the most effective biological control agents for managing lettuce drop. *C. minitans* parasitizes the sclerotia formed by white mold fungi. Products containing *C. minitans* are applied to crop residue at the end of the growing season or soil surface pre-planting to give enough time for the agent to colonize.

Figure 3. White mycelia found at the base of lettuce affected by lettuce drop.

Crop Rotation

Crop rotation is an effective method for reducing the buildup of sclerotia within a field over many years. By rotating to non-host crops, sclerotia in the soil may lose viability or germinate, although sclerotia can be viable in the soil for up to five years. Additionally, white mold has a large host range, which makes crop rotation challenging. Corn, wheat and sorghum are potential non-host crops to rotate with susceptible crops. Weed management is also important because numerous weeds are known hosts of white mold.

Tillage

Tillage can impact disease pressure, but other factors such as rotation crops can also play a role. Sclerotia left near the soil surface germinate, release ascopores and infect susceptible crops. Therefore, plowing can bury sclerotia and reduce the number of sclerotia present near the soil surface to cause disease. However, buried sclerotia can survive for years and tillage can bring buried sclerotia back to the soil surface to cause disease in subsequent crops. A recommendation for soybean-corn rotations is to follow a white mold-susceptible soybean crop with a no-till corn crop. This leaves the sclerotia formed on the soybean crop on the soil surface to germinate the following season into the non-host corn crop. This reduces the number of sclerotia that survive into the next season's soybean crop. A similar approach may be affective for lettuce drop management, where a lettuce crop is followed by a non-host no-till crop to reduce disease pressure in the field.

Figure 4. White mycelia and tan sclerotia on hemp caused by southern blight (*Sclerotium rolfsii*). Southern blight signs and symptoms may be confused with white mold.

Table 1. Fungicides labeled for managing lettuce drop caused by *Sclerotinia* spp.

Conventional fungicides*				
Product	**Active Ingredient**	**FRAC code****	**REI (days)*****	**PHI (days)******
Endura	Boscalid	7	0.5	14
Botran	Dicloran	14	0.5	14
Cannonball WP	Fludioxonil	12	0.5	0
Kenja	Isofetamid	7	0.5	14
Rovral	Iprodione	2	1	14
Fontelis	Penthiopyrad	7	0.5	3
Miravis Prime	Pydiflumetofen + fludioxonil	7 + 12	0.5	0
Biological fungicides (OMRI listed)*				
Contans WG	*Coniothyrium minitans*	NA	4 hr	0

*An up-to-date list of products available for lettuce drop management can be found in the latest version of the Southeastern U.S. Vegetable Crop Handbook.
** Fungicide Resistance Action Committee (FRAC). Fungicides with different FRAC codes contain active ingredients with different modes of action. More information is available at the following website www.frac.info/.
*** Re-entry interval (REI).
**** Pre-harvest interval (PHI).

References

Heffer Link, V., and Johnson, K. B. 2007. White Mold. *The Plant Health Instructor*. https://www.apsnet.org/edcenter/disandpath/fungalasco/pdlessons/Pages/WhiteMold.aspx

Kemble, J. M., Meadows, I. M., Jennings, K. M., Walgenbach, J. F., Wszelaki, A.L. eds. 2021 Southeastern U.S. 2021 Vegetable Crop Handbook. https://www.growingproduce.com/sponsor/corteva-agriscience/southeastern-u-s-2020-vegetable-crop-handbook/

Matheron, M. E. and Porchas, M. 2019. Evaluation of fungicides for management of Sclerotinia drop. PDMR. 13: V142

Subbarao, K. V. 1998. Progress toward integrated management of lettuce drop. Plant Dis. 82:1068-1078.

Precautionary Statement

To protect people and the environment, pesticides should be used safely. This is everyone's responsibility, especially the user. Read and follow label directions carefully before you buy, mix, apply, store or dispose of a pesticide. According to laws regulating pesticides, they must be used only as directed by the label.

Disclaimer

This publication contains pesticide recommendations that are subject to change at any time. The recommendations in this publication are provided only as a guide. It is always the pesticide applicator's responsibility, by law, to read and follow all current label directions for the specific pesticide being used. The label always takes precedence over the recommendations found in this publication.

Use of trade or brand names in this publication is for clarity and information; it does not imply approval of the product to the exclusion of others that may be of similar, suitable composition, nor does it guarantee or warrant the standard of the product. The author(s), the University of Tennessee Institute of Agriculture and University of Tennessee Extension assume no liability resulting from the use of these recommendations.

UTIA.TENNESSEE.EDU

Real. Life. Solutions.™

W 1002 5/21 21-0207