

TENNESSEE SOYBEAN PRODUCTION HANDBOOK

CHAPTER 8:

Soybean Disease Management

Heather Kelly, Professor, Department of Entomology and Plant Pathology



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While there are over 15 soybean diseases that can be found in Tennessee, for them to cause economic loss and be a “PEST,” there are four main factors that must be considered. “PEST” can be used to as an acronym to describe these factors.

“P” is for **pathogen presence**, where the causal agent of the disease must be present. This can be influenced by a producer’s cultural practices. Crop rotation to a non-host crop is the best management practice to reduce pathogen populations. Similarly, accurate identification of the disease and pathogen is needed to best guide management options. While some of the most common soybean diseases are discussed here, additional information, images, and specific disease management options can be found in the University of Tennessee (UT) field guide.¹

“E” is for an **environment** conducive for disease development. On average, Tennessee has a favorable environment with warm temperatures and good moisture not only for soybean production, but also for soybean diseases. The main three foliar diseases found in Tennessee, frogeye leaf spot, target spot and Septoria brown spot, are wind and water splashed and can overwinter on previous year’s soybean debris. Disease-specific UT Extension publications can be found at UTCrops.com² to better understand and manage these soybean diseases.

The third factor is one of the most important — “S” is for **susceptible host** or variety. Many varieties provide tolerance or resistance to multiple diseases and can act as the first line of defense against disease development and yield loss from disease. While deciding on which varieties to plant, any diseases that have been identified previously in one’s field should be taken into consideration. Information on variety disease susceptibility can be found from commercial (seed company) resources as well as at the UT variety database.³

Lastly, “T” is for **time** — the previous three factors (pathogen presence, environment conducive for disease development and susceptible host) have to occur at the right time in the season and growth stage of soybean for disease to be a pest and cause economic loss. If disease develops late enough in the season and/or at reproductive growth stage R5 (seed development) or later, it is rare

that yield loss will result. Additionally, late in the season no action will reverse what damage has already been done by disease.

When a disease is identified as one that responds to a fungicide, application and growth stage timing are critical. When needed, a foliar fungicide applied during reproductive growth stages has the best efficacy. Application made around growth stage R3 (beginning pod development) has proven to be the most effective for management of frogeye leaf spot and for general yield protection. Soybean fungicide seed treatment and foliar fungicide efficacy tables⁴ can be found at UTCrops.com, where efficacy of specific active ingredients and products is listed as excellent to poor for multiple diseases. Additionally, with every season being different, in-season insights for field crops can be found at the UT newsletter/blog site.⁵

COMMON SEEDLING DISEASES

There are two main groups of seedling disease pathogens — true fungi, which include *Rhizoctonia solani* and *Fusarium* species, and oomycetes, which include *Phytophthora sojae* and *Pythium* species. Seedling disease symptoms (**Figure 8-1**) include seed- and root-rot, pre- and post-emergence damping off and less vigorous soybean plants overall. To identify the specific pathogen causing disease, samples should be submitted to a diagnostic lab or through county Extension agents. Some planting issues can also result in reduced stands or abnormal looking plants, including but not limited to pre-emergence herbicide injury, non-uniform planting depth, incomplete closure of the seed furrow, soil crusting, frost and/or freeze damage, and these abiotic causes need to be ruled out.

¹See UT Crops. “Disease and Insect Field Guides.” <https://guide.utcrops.com>

²See UTCrops.com

³See UT Crops. “Variety Trials.” <https://search.utcrops.com>

⁴See Kelly, H. M. “Management of Soybean Diseases: Foliar Fungicide Efficacy for Control of Foliar Soybean Diseases.” <https://extension.tennessee.edu/publications/Documents/W343.pdf> and “Management of Soybean Seedling Diseases” <https://extension.tennessee.edu/publications/Documents/W367.pdf>

⁵See UT Crops. “UTCrops News Blog.” <https://news.utcrops.com>



Fig. 8-1. Seedling disease symptoms. **Fig. 8-1a.** Root rot from *Fusarium*. **Fig. 8-1b.** Poor vigor and lesions from *Rhizoctonia*. **Fig. 8-1c.** *Pythium* blight. **Fig. 8-1d.** Post-emergence damping off. Source: Wise, 2020.



Fig. 8-2. Damping off due to *Phytophthora sojae* — showing brown to purpling of stem and plants in “shepherd’s hook” shape. Source: Kelly, 2022.



Fig. 8-3. Interveinal chlorosis/yellowing on leaves from **Fig. 8-3a.** Chemical injury/phytotoxicity. **Fig. 8-3b.** Taproot decline. **Fig. 8-3c.** Stem canker, **Fig. 8-3d.** Sudden death syndrome. Source: Kelly, 2022.

While some varieties may be more tolerant to seedling diseases, fungicide seed treatments (containing at least two active ingredients from different fungicide chemical groups — see soybean fungicide seed treatment efficacy table⁶ at UTCrops.com for more information) and planting into warmer (> 60 F), well-drained soils are best lines of defense. While *Phytophthora sojae* can cause many seedling disease symptoms (i.e., seed rot, pre- and post-emergence damping off/dying and root rot), infection can occur at any stage of development in soybean. Where plants wilt, leaves remained attached to the plant, a brown girdling of the stem can progress up as high as the tenth node, leaving the plant in a “shepherd’s hook” shape (**Figure 8-2**).

Phytophthora disease has been noted after heavy rains during early vegetative stages, and, while nothing can be done during the season to mitigate the disease, fields with the disease should be noted so resistant varieties and seed treatments can be used for future growing seasons.

COMMON SOIL, ROOT, AND STEM DISEASES

While disease symptoms may be observed on soybean leaves, the causal agent may be present in the soil, roots or stem of the plant. Such disease pests include nematodes, fungal pathogens of stem canker, sudden death syndrome, taproot decline, charcoal rot and anthracnose. Variety tolerance or resistance to these pathogens are best management options, as well as rotation to non-host crops when possible and a few seed treatment options. It is critical to correctly identify what is causing the symptoms, especially the symptoms of stem canker, sudden death syndrome, taproot decline and phytotoxicity, which all display very similar foliar symptoms of yellowing (chlorosis) to brown, dead (necrosis) areas between leaf

veins (**Figure 8-3**). While the foliar symptoms are similar, there are other symptoms when examining the whole plant and/or pattern of symptomatic plants in the field that help differentiate the diseases. Sometimes this type of leaf symptom may not be caused by disease. When the newest growth on plants does not also show symptoms, that is indicative of chemical spray injury and not a disease.

Similarly, nematodes, while present in the soil and causing yield loss, many times do not cause visible symptoms on plants. Only a root and/or soil sample can accurately diagnose the type of nematode and the population level. Specifically, the major nematodes affecting soybean production include soybean cyst nematode, root knot nematode and reniform nematode. When possible crop rotation to a non-host is the best management option, with additional options for some nematodes in variety tolerance or resistance and seed treatments.

COMMON FOLIAR DISEASES

There are four common foliar diseases observed in Tennessee most years. Downy mildew and Septoria brown spot can be seen earlier in the season, as early as vegetative growth stages as well as during reproductive growth stages, while frog-eye leaf spot and target spot occur later during reproductive growth stages (**Figure 8-4**). The specific foliar lesions of these diseases can help differentiate them as well as where in the canopy they are seen. Septoria brown spot and target spot may be found in the lower to mid-canopy, while downy mildew and frog-eye leaf spot are usually found throughout the canopy and/or

⁶ See Kelly, H. M. “Management of Soybean Seedling Diseases: Fungicide Efficacy for Control of Soybean Seedling Diseases.” <https://extension.tennessee.edu/publications/Documents/W367.pdf>

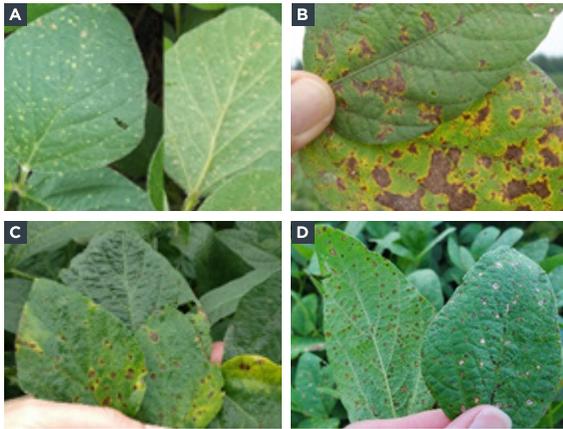


Fig. 8-1. Common foliar diseases seen in Tennessee. **Fig. 8-4a.** Downy mildew. **Fig. 8-4b.** Septoria brown spot. **Fig. 8-4c.** Target spot. **Fig. 8-4d.** Frogeye leaf spot. Source: Kelly and Newman, 2020.

on the newest growth. While all four diseases may respond to fungicide application, treatment may not be necessary depending on when the disease developed, environmental conditions, and variety susceptibility. Specific information and management options for these diseases and others can be found in UT Extension publications⁷ and field guide.⁸

All available management tools should be considered when managing soybean diseases, and it is critical to understand when a disease is a PEST that will cause economic loss. To reduce pathogen inoculum or build-up, rotate to non-host crops and practice conventional to conservation tillage where possible. Additionally, keep good records on each field on the diseases found each year to help plan future disease management decisions. While the weather can't be controlled, some practices can help mitigate diseases becoming pests due to environmental conditions. Avoid cold, wet soils when planting to reduce seedling diseases, and regularly scout during reproductive growth stages for foliar diseases in order to plan fungicide applications ahead of weather that could further promote foliar disease. Variety selection is critical to help manage disease. Plant commercial varieties with some level of resistance or tolerance to the majority of the diseases referenced in this publication. Lastly, correctly identify the soybean growth stage and disease presence to determine if management options are possible or needed for the current season or if plans need to be made for future production seasons.

⁷ See UT Crops. "Soybean Diseases and Nematodes." <https://utcrops.com/soybean/diseases/>

⁸ See UT Crops. "Disease and Insect Field Guides." <https://guide.utcrops.com>

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