

Management Strategies For Soybean Diseases In Reduced Tillage Production Systems

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Soybean is plagued by numerous diseases that impact yield and quality. To circumvent losses associated with diseases, an effective plan should be in place prior to the onset of disease epidemics. An effective disease management strategy incorporates the following components: disease identification, cultural practices, genetic resistance, and fungicides. Proper disease identification is crucial for effective management. This will determine which cultural practices should be implemented, variety selection, and the choice of fungicide application and timing.

The major diseases in Louisiana soybean include aerial blight, anthracnose, *Cercospora* leaf blight, charcoal rot, frogeye leaf spot, pod & stem blight, and purple seed stain. Other diseases of less importance are bacterial pustule, downy mildew, *Phytophthora*, powdery mildew, red crown rot, and rust. A basic understanding of pathogen biology will enable an individual to develop an effective management strategy.

DISEASE IDENTIFICATION AND DEVELOPMENT OF THE MAJOR DISEASES AFFECTING LOUISIANA SOYBEAN

Aerial blight can spread rapidly in soybean if not properly managed. The disease is caused by the fungus *Rhizoctonia solani* and is favored by warm overcast days and extended periods of leaf wetness. Initial symptoms appear as water-soaked greasy blotches on leaves (usually in the lower to mid canopy). As the disease progresses, white cottony fungal mycelium may cause adjacent leaflets to adhere together. The foliage becomes brown, blighted, and pods may have reddish-brown lesions. When the disease is severe, pods may be aborted. The disease is usually evident during the early reproductive stages of growth and later. The potential for risk is increased when soybean is rotated with rice.

***Cercospora* blight/purple seed stain** is caused by the fungus *Cercospora kikuchii*. Seedling infection can result in plant death. Foliar symptoms are usually not evident until soybean is in the mid to late reproductive growth stages. Initial symptoms appear as small chocolate brown lesions on the petioles near the base of the leaflet. Advanced foliar symptoms appear as reddish brown to tan discoloration on the upper leaf surface in the upper canopy. Leaves have a leathery appearance. The fungus can sporulate (ash colored) in older lesions. Severe disease results in premature defoliation, discolored pods, and reduced seed quality. The seed phase of this disease is evidenced by purple-stained seed at harvest. Infection is favored by moderate temperatures (70 to 80oF) and extended periods of leaf wetness (8-16 hours). The pathogen may be seedborne and survives on plant debris in the soil. The fungus also has been reported to be isolated from some weeds.

Frogeye leaf spot is caused by the fungus *Cercospora sojina*. Symptoms are found predominately on the leaves, but may also appear on the petioles, stems, and pods. Initially, small chocolate brown spots appear on the leaflets. Mature lesions are light brown to gray centers with a reddish brown margin. Stem lesions are rare and are elliptical with red centers and dark brown to black margins. Pod lesions are circular to elliptical, sunken, and light gray to brown. Disease development is favored by warm, humid weather. The pathogen can survive on seeds and in infected plant debris.

Anthracnose is caused by the fungus *Colletotrichum truncatum*. Early infections by the fungus can result in pre- and postemergence damping-off. Foliar symptoms include petiole cankers, leaf rolling, necrosis of the laminar veins, and premature defoliation. The fungus produces acervilli (fruiting bodies that resemble black specks) on the stems and pods that are randomly distributed. This disease can compromise yield and seed quality. The disease is favored by periods of high relative humidity. Infection occurs throughout the growing season, and the fungus overwinters in crop debris and infected seed.

Charcoal rot is caused by the fungus *Macrophomina phaseolina*. Infected seed may not germinate or seedlings may die soon after emergence. Symptoms from plants with latent infections or mid to late season infections die prematurely during hot, dry weather. Symptoms can be associated with dry spots (sandy areas) in the field. The roots and lower stems are deteriorated, and the epidermal and sub-epidermal tissue will be silvery in color and dotted with black pepper-like sclerotia (survival structures). Disease development is favored by hot, dry weather (82 – 95oF). The fungus can survive in the seed coat, host residue, or soil.

Pod and stem blight occurs predominately on the stems and pods, and is caused by the fungus *Diaporthe phaseolorum* var. *sojae*. Infection may occur early in the season; however, signs of the disease are not evident until late season (R7). Pycnidia (fruiting bodies that resemble black specks) occur in linear rows on the stems and pods. If favorable conditions persist, seed quality will be compromised. This disease is favored by warm, wet weather and can overwinter in crop residue or infected seed.

CULTURAL PRACTICES, GENETIC RESISTANCE, AND FUNGICIDES

A healthy plant is the first step toward optimizing yields and preventing disease. Plant when conditions favor rapid germination and seedling establishment. Provide adequate drainage within the field to reduce the risk from some soilborne diseases. Practices that promote air movement within the canopy will reduce the leaf wetness period and lessen the risk from some foliar diseases.

Genetic resistance should be the foundation of any disease management strategy. Use high-yielding, disease-resistant varieties when available. Variety information is usually available from most land grant universities in soybean-producing states.

When genetic resistance is not available, fungicides can be utilized for managing diseases. There are several fungicide classes to choose from (strobilurins, benzimidazoles, and triazoles). The diseases present will dictate which class is needed; therefore, consult the label before applying.

Factors to consider when making a fungicide application are timing and sprayer setup. Most applications should be made when soybean are between the R3 (pod initiation) and R5 (seed initiation) growth stages. Early applications (R3) have provided better efficacy against *Cercospora* leaf blight and later applications (R5) have provided better efficacy against pod diseases. Ideally, sprays should be made in 15 gallons of solution per acre by ground and 5 gallons of solution per acre by air. Δ

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