



Our soybean checkoff.
Effective. Efficient. Farmer-Driven.

Plant Disease & Pest Management Guide

2007 Edition



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Introduction



Your soybean checkoff has developed this guide to help you examine soybean plants for soybean rust and other pest and disease risks that pose threats to your yield potential. This guide is designed to easily fit in your pocket, so you can take it in the field and use it as a resource throughout the season to assist in managing your overall soybean plant health.

Though rust is new to the United States, your checkoff has been investing in rust research and education since 2001. As a leader in rust education, your soybean checkoff is committed to helping prepare you for the possibility of rust infection.

Introduction

Based on a study funded by the checkoff, you should also be aware of the following diseases and pests that are the leading causes of yield loss in soybeans:

Soybean Cyst Nematode

Sudden Death Syndrome

Aphids

Phytophthora Rot

Sclerotinia Stem Rot

Stinkbugs

Brown Stem Rot

Charcoal Rot

Frogeye Leaf Spot

Pod and Stem Blight

The checkoff continues to fund research and create tools to help you identify, manage and defend your soybean fields from yield-robbing diseases and pests. Contact your local extension office for the most current soybean plant disease and pest information.



Rust



Overview:

Asian soybean rust was first detected in U.S. soybean fields in 2004. It remains a threat, especially with mild winter conditions. Rust can be controlled with early detection when you scout, monitor and manage your fields.

Facts:

- A rust infection occurs with a combination of the following: a susceptible host, viable spores and the right environmental conditions.
- Rust infected leaves eventually turn yellow and fall off the plant. The premature defoliation and reduction in days to maturity cause infected plants to have lower seed weight and fewer pods and seeds.

Rust

- Microscopic rust spores could be transported by air currents to other soybean plants over long distances.

What you should look for:

- Early rust appears on the leaves as small lesions that turn brown to reddish-brown.
- Using a magnifier reveals tiny bumps or spores inside the lesion, which gives leaves a rusty look.
- Spores are primarily found on the underside of leaves, with fewer and smaller spores forming on the top of the leaf.

How you can manage rust:

- Visit the following web sites to track the spread of the disease:
 - *stopsoybeanrust.com*
 - *usda.gov/soybeanrust*
 - *sbrusa.net*
- Apply fungicide per recommendations, if necessary.

Soybean Cyst Nematode (SCN)



Overview:

Soybean cyst nematode (SCN) injures soybean roots, stunting soybean top growth and reducing yields. Surveys funded by the checkoff indicate that yield losses from SCN can be 100 million to 150 million bushels annually; yield loss in heavily infested fields can be up to 50 percent. SCN infection can worsen other soybean diseases, like sudden death syndrome and brown stem rot. As the leading cause of yield loss in soybeans from disease in the United States, SCN is preventable with proper management.

Facts:

- SCN eggs hatch, releasing juvenile worms that mature in 14-21 days. Several SCN generations occur each season.

Soybean Cyst Nematode (SCN)

- Fifty SCN eggs at the beginning of the growing season can develop into 15,000 eggs by the end.
- SCN eggs can survive in soil in the absence of host soybeans for up to 10 years.
- SCN-infected soybeans may not look sick but may still have significant yield loss.

What you should look for:

- Adult SCN females, lemon-shaped and full of hundreds of eggs, vary from white to brown. Dead females, full of eggs, are cysts.

How you can manage SCN:

- Observe roots carefully for SCN females.
- Collect a soil sample. Send to plant diagnostic clinic for test.
- Select a variety with resistance to the SCN population found in each field, according to SCN soil test.
- Rotate to non-host crops, such as corn.

Sudden Death Syndrome (SDS)



Photo Credit: Dean Malvick,
University of Minnesota

Overview:

Sudden death syndrome (SDS) is caused by a fungus that lives in soil, which rots roots and uses toxins to scorch leaves. Favorable conditions for SDS include poorly drained soils; cool, wet weather early in the growing season; and high-yield fields.

Facts:

- SDS usually begins as “hot spots” in a field and then progresses to infest the remainder of the field.
- Some research shows that fields with SCN are more susceptible to SDS.

What you should look for:

- Symptoms begin as scattered yellow blotches in the interveinal leaf tissue.

Sudden Death Syndrome (SDS)

- As blotches increase in size and merge to affect larger areas of leaf tissue, veins typically remain green. The yellow areas may turn brown and dry out. Severely affected leaflets may drop off the plant, leaving the petiole attached, or they may curl upward and remain attached to the plant.
- Root infection starts right after planting, and internal tissues of the taproot and lower stem often show a light-gray to light-brown discoloration.
- Symptoms get progressively worse until the plants die.

How you can manage SDS:

Treatment options include:

- Selecting SDS – resistant cultivars.
- Late planting of infested fields.
- Deep tilling in compacted areas.

Aphids



Overview:

Aphids were first discovered in the U.S. during the 2000 growing season. They thrive in the Northern states, where summer temperatures are cooler, causing substantial revenue loss due to reduced yields and treatment costs.

Facts:

- Aphids at high numbers (several hundred per plant) when pods are setting can reduce pod set resulting in yield loss that can approach 50 percent. Late-season infestation can lead to fewer seeds per pod and smaller seed size.
- The soybean aphid is also capable of transmitting soybean viruses from plant to plant.

Aphids

What you should look for:

- Aphids are small, lime-green to yellow, soft-bodied insects with long, straw-like mouthparts that they use to pierce stems and the underside of leaves to suck out plant fluids.
- Their feeding can cause leaves to become coated with sticky honeydew, and coated leaves can turn black with “sooty mold.” Aphids cause the most damage on late-planted soybeans.

How you can manage aphids:

- The economic threshold for soybean aphids is 250 aphids per plant when the aphid population is still rising and at least 80 percent of the plants are aphid-infested. The economic threshold provides a seven-day lead time for growers to treat fields before the economic injury level of > 1,000 aphids per plant is reached.

Phytophthora Rot



Photo Credit: Laura E. Sweets,
University of Missouri

Overview:

Phytophthora sojae is a pathogen that can infect soybean plants at all stages of growth, causing seed and seedling decay, root rot and stem rot. *Phytophthora* can infect soybean seed before germination, kill young seedlings before or just after emergence, or affect older plants later in the season.

Facts:

- Damage from *Phytophthora* often results in the replanting of soybeans.

What you should look for:

- Young seedlings or older plants may turn yellow, wilt and die.

Phytophthora Rot

- The stems of these plants may show a brown discoloration that begins at the soil line and extends up the stem.

How you can manage phytophthora rot:

- Use crop rotation.
- Plant resistant varieties.
 - Since many races of phytophthora exist, it is important to walk your fields to look for symptoms of the disease, even if planting a resistant variety. Symptoms can be more easily detected seven to 10 days after a heavy rain. If symptoms of phytophthora exist, next year plant a variety with a different phytophthora resistance gene, if available. Or plant a variety with a very high level of partial resistance.

Sclerotinia Stem Rot (a.k.a. White Mold)



Photo Credit: Dr. Craig Grau,
University of Wisconsin

Overview:

Cool temperatures and soil moisture can combine to create damaging effects from white mold. The level of yield loss from white mold is dependent on the number of plants infected in the field and how early in the season the plants become infected and die. Plants that are infected late will produce some seed.

What you should look for:

- White mold may first be evident as a wilting of leaves in the upper canopy from mid- to late pod fill.
- Cankers may be evident on stems at the nodes. First the cankers are gray-green and water-soaked and then turn bleached white with reddish-brown borders.

Sclerotinia Stem Rot (a.k.a. White Mold)

- Infected stems will remain bleached white at harvest.
- White mold growth may be present on stems and may mat together infected leaves or plants. Later in the season, the black sclerotia (small, hard black bodies of fungal material) may be found on the outside of the stems, in the center pith of stems, in pods or mixed with harvested seed.

How you can manage white mold:

- Select soybean varieties with the highest level of partial resistance (tolerance) for fields with a long-term history of white mold.
- Use a row spacing of not less than 15-20 inches and a seeding rate of less than 180,000 seeds per acre. Increasing row spacing to 30 inches is not recommended.
- Use a crop rotation sequence that includes a small grain.

Stinkbugs



Overview:

Stinkbugs feed on developing soybean seeds by inserting their mouthparts through the podwall. Punctured seeds become abnormally shaped and small at maturity. The species include: southern green stinkbug, brown stinkbug, red-banded stinkbug and green stinkbug. Adults move into fields when soybeans begin to flower.

Facts:

- Stinkbugs reduce yield and quality and delay maturity.
- Feeding may be a factor in “flat pod syndrome,” when pods expand normally but seeds fail to develop. This is observed in fields with high populations during bloom and pod expansion.

Stinkbugs

- Infestations and injury are common along the Louisiana and Texas Gulf Coast. Nearly all Southern U.S. soybean production regions have experienced yield losses.
- Stinkbug-damaged seed has a lower germination rate and greater disease level.

What you should look for:

- Adults measuring 3/4-inch long are located on the pods while feeding.
- Eggs are deposited in clusters on pods or leaves.

How you can manage stinkbugs:

- Carbamate, organophosphate, and pyrethroid insecticides are labeled for stinkbugs attacking soybeans.
- Sample fields weekly from bloom to maturity.
- Control in adjacent crops can help reduce movement into neighboring soybean fields.

Brown Stem Rot (BSR)



Photo Credit: Dr. Alison Robertson,
Iowa State University

Overview:

Brown Stem Rot (BSR) is caused by a fungus that lives in soil. It infects the roots and colonizes the vascular tissue in plant stems and leaves. Favorable BSR conditions are cool weather and good soil moisture early in the growing season.

Facts:

- BSR is misdiagnosed for SDS because both diseases cause similar foliar symptoms.
- Two genotypes of BSR, A and B, cause browning of the pith tissue. Foliar symptoms usually only occur with genotype A.
- High numbers of SCN increase the severity of BSR.

Brown Stem Rot

What you should look for:

- BSR usually occurs as small patches of yellow stunted plants in a soybean field.
- Browning appears on vascular tissue and pith. It begins in the root and advances up the stem as the disease progresses.
- In the early stages of symptom development, browning may be irregular and appear only at nodes throughout the stem.
- Interveinal yellowing and browning of the leaf are contained at high temperatures, but plants die as symptoms progressively worsen.

How you can manage BSR:

- Select cultivars with resistance to BSR and SCN.
- Delay the planting of infested fields.
- Practice crop rotation.

Charcoal Rot (CR)



Photo Credit: Dr. Jason Bond
Southern Illinois University

Overview:

Charcoal Rot (CR) is a soil-borne disease that exists in nearly all areas of the United States. It is common in many fields, but often goes unnoticed. Plants can be infected soon after emergence and throughout the season. When hot and dry conditions persist, the pathogen worsens the effects of drought. CR is well suited for survival on crop residue and in the soil for many years.

Facts:

- CR can infect over 500 plant species, limiting the value of crop rotation for disease management.
- CR has replaced SCN as the primary yield robber in many Southern states. Incidence and severity in the Midwest are on the rise.



Charcoal Rot (CR)

What you should look for:

- Symptoms are not distinct and can be confused with other diseases or stresses.
- Yellowing of the foliage, stunting, poor seed fill and premature aging are associated with CR.
- CR can appear in areas with rainfall late in the season in drought-affected fields.
- Signs of the pathogen, black microsclerotia, are usually visible on stem residue from previous crops. These can also be seen on stems and roots of infected plants prior to maturity.

How you can manage CR:

- Only a handful of moderately resistant varieties have been identified.
- Irrigation to alleviate drought stress and selecting varieties based on maturity to escape the window of disease are possible options.

Frogeye Leaf Spot (FLS)



Overview:

Frogeye leaf spot (FLS) attacks the foliage, stems, pods and seed. The pathogen survives between growing seasons on crop residue in the field. Spores may also be wind borne. Infection and disease spread are greater during warm, humid weather with cloudy days and frequent rain.

Facts:

- The incidence and severity has increased in the Midwest over the past five years.
- Severity is usually greatest in fields where the dew remains on the soybean leaves longer in the morning.



Frogeye Leaf Spot (FLS)

- The pathogen has many races, complicating soybean variety recommendations.

What you should look for:

- Leaf symptoms are noticeable after plants begin to bloom.
- Lesions are irregularly circular, with a light-brown to tan center and a dark-brown to dark-purple border.
- Stem and pod lesions are less common and generally appear late in the season.

How you can manage FLS:

- Choose soybean varieties with FLS resistance labeled Rcs3, which are resistant to all known races.
- Apply a strobilurin fungicide from the R3 to R5 stages of soybean growth.

Pod and Stem Blight



Overview:

Pod and stem blight occurs in almost all soybean-producing areas of the United States. It can attack during the growing season, but symptoms will not appear until plants are mostly mature, pods turn brown and few leaves remain. Most yield damage occurs when the disease moves through the pod and into seed. Seed infection worsens when wet weather delays crop harvest.

Facts:

- Infected seeds either fail to germinate or produce diseased and weak seedlings.

Pod and Stem Blight

- The pathogen survives between growing seasons on infected seed, stems and pods left in the field from the previous soybean crop.

What you should look for:

- Visible black specks in rows on mature soybean stems.
- Infected seeds may be smaller than healthy ones and can appear shriveled with visible patches of white mold and cracked seed coats.

How you can manage pod and stem blight:

- Plant certified seed-which usually ensures the seeds will be mostly healthy.
- Practice frequent crop rotation.
- Use a fungicide from the R3 to R5 stages of soybean growth.
- Harvest fields as soon as possible after the crop matures.



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