EC932

SOYBEAN DISEASES

A Pictorial Guide for South Dakota

South Dakota
Cooperative Extension Service
SDSU

Growing
South Dakota's Future

CONTENTS

Soybean Disease Calendar 1
Damping-Off/Pythium Seed Rot 2
Phytophthora Root/Stem Rot 3
Bacterial Leaf Blight 4
Brown Spot 5
Downy Mildrew 6
Cercospora Leaf Spot 7
Soybean Mosaic Virus 8
Bean Pod Mottle Virus 9
Brown Stem Rot 10
Sudden Death Sydrome 11
Anthracnose 12
Pod and Stem Blight 13
Frogeye Leaf Spot 14
Sclerotinia Stem Rot (White Mold) 15
Northern Stem Canker 16
Charcoal Rot 17
Soybean Cyst Nematode 18
Abiotic Disorders 19
Notes 20–21

This publication was assembled to provide growers and crop managers in South Dakota and nearby states with easy-to-use and handy diagnostic information for a number of major or potentially problematic soybean diseases. It is intended to provide a starting point for management decisions. All management decisions remain the responsibility of the individual grower or crop manager.

Soybean Diseases: A Pictorial Guide for South Dakota

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SOYBEAN DISEASE SCOUTING CALENDAR FOR SOUTH DAKOTA

Disease or Problem	May	June	July	August	Sept	Oct
Damping-Off/Pythium Seed Rot						
Phytophthora Root/Stem Rot						
Bacterial Leaf Blight						
Brown Spot						
Downy Mildrew						
Cercospora Leaf Spot						
Soybean Mosaic Virus						
Bean Pod Mottle Virus						
Brown Stem Rot						
Sudden Death Sydrome						
Anthracnose						
Pod and Stem Blight						
Frogeye Leaf Spot						
Sclerotinia Stem Rot (White Mold)						
Northern Stem Canker						
Charcoal Rot						
Soybean Cyst Nematode						

SOUTH DAKOTA SOYBEAN RESEARCH & PROMOTION COUNCIL

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DAMPING-OFF/PYTHIUM SEED ROT

Caused by: *Pythium, Fusarium, Rhizoctonia,* & *Phytophthora spp.*

Disease Period: up to 2 weeks after planting

Occurrence: widespread

Symptoms: poor emergence or stand establishment; rotten seeds or seedling death shortly after emergence. *Pythium* may show cottony mycelium at base of the plant along with a characteristic fishy odor. *Rhizoctonia* and others often produce brown or reddish lesions on roots and lower stems.

Impact: decreases stand; expected losses are negligible to moderate

Control: plant in well-drained soils; fungicide seed treatments containing a broad-spectrum product targeting *Fusarium* and *Rhizoctonia* (e.g., captan, carboxin, fludioxonil, trifloxystrobin) as well as mefanoxam or metalaxyl to manage *Pythium*. *Phytophthora* may also cause damping-off but requires additional strategies to achieve satisfactory control (see next page).

Photo credit: SDSU Extension Plant Pathology

PHYTOPHTHORA ROOT/STEM ROT

Caused by: *Phytophthora sojae*

Images (L–R): seedling death; field view; stem rot phase with typical dark lesion

Disease Period: check after planting and June 15 through the end of July.

Occurrence: widespread; recurring in areas with history of the disease

Symptoms: may affect large areas or occur sporadically; dark chocolate-brown discoloration of lower stem extending up the stem to about 6 inches; roots may be brown and rotted; plants may yellow and wilt rapidly; infected plants are commonly found in low, poorly drained, wet or compacted soils.

Impact: crop may compensate for early losses; late development and root rot may lead result in moderate to severe losses.

Control: an integrated management approach using genetic resistance (*Rps* genes), high field tolerance, and fungicide seed treatment with high rates of metalaxyl or mefanoxam may enhance protection at the seedling stage. Specific *Rps* genes (e.g., 1a, 1c, 1k) may be overcome by aggressive races of the pathogen.

Photo credits: SDSU Extension Plant Pathology

BACTERIAL LEAF BLIGHT

Caused by: *Pseudomonas syringae* pv. *glycinea*

Disease Period: mid-summer, often in the days following rainfall events

Occurrence: widespread

Symptoms: look for small, angular water-soaked spots on the lower leaves. These spots later turn yellow then brown to black in the center, leaving a yellow border. Gradually, the entire leaf turns yellow. The brown spots may coalesce into blotches that tear and fall out after windy weather, giving the leaves a ragged appearance. Cool (70ºF), rainy weather favors spread of the disease from lower to upper leaves.

Impact: crop compensates for damaged leaf area; expect negligible loss.

Control: rotation and tillage may help reduce this residue-borne disease.

Photo credits (from left): *leaf symptoms*: H. Schwartz, Colorado State University, Bugwood.org; *leaf symptoms*: SDSU Extension Plant Pathology

BROWN SPOT

Caused by: *Septoria glycines*

Images: chlorotic leaves with spots; underside of leaf; foliar symptoms

Disease Period: check May 15 through mid-August.

Occurrence: widespread

Symptoms: look for irregular, light to dark brown, small spots on the lower leaves initially. Leaves often turn yellow and drop off, perhaps due to age and light quality. Spots may form on the main stem, branches, petioles, and pods. During warm, wet weather the disease spreads from lower to upper leaves. Dry weather halts the spread of the disease up the plant.

Impact: when disease is only found on lower leaves, expected loss is negligible; spots on upper canopy and pods may produce minor losses.

Control: rotate crops, practice residue management, and apply foliar fungicides.

Photo credits (from left): *leaf symptoms*: South Dakota State University; *leaf symptoms*: A. Tenuta, OMAFRA

DOWNY MILDEW

Caused by: *Peronospora manshurica*

Images: symptoms on lower canopy; spores produced on underside of leaf; systemic infection produces striking symptoms

Disease Period: May 15 through the end of August

Occurrence: widespread, recurring in fields with history of the disease

Symptoms: look for pale green to light yellow spots on young leaves. Spots enlarge to form irregular yellow blotches that later turn grayish-brown with a yellowish-green border. Systemic infection at the seedling phase produces yellow inter-veinal chlorosis, especially near the leaf-tip. In early morning after heavy dews, white, gray or pale purple tufts of fungal growth can be found on the underside of leaves. Leaves can turn yellow, then brown and drop off. Disease is favored by high humidity and cool temperatures (65–75°F).

Impact: if infection is heavy, losses may be minor to moderate.

Control: plant resistant varieties, rotate crops, and manage residues.

Photo credits (clockwise from top left): *leaf symptoms*: SDSU Extension Plant Pathology; *leaf symptoms*: un-credited; *leaf symptoms*: SDSU Extension Plant Pathology

CERCOSPORA LEAF SPOT

Caused by: *Cercospora kikuchii*

Disease Period: check June through the end of August.

Occurrence: widespread

Symptoms: a purple-brown discoloration, usually near the outer edges or upper leaves. Affected areas often have a leathery texture and may turn light brown or bronze with age. Pods may also be affected; seeds from affected pods will often have a purple stain.

Impact: yield losses range are negligible to minor; seed quality may be affected.

Control: plant certified disease-free seed and practice crop rotation.

Photo credits: SDSU Extension Plant Pathology

SOYBEAN MOSAIC VIRUS

Caused by: soybean mosaic potyvirus

Vectored by: soybean aphid (*Aphis glycines*)

Disease Period: May 15 through early July

Occurrence: widespread

Symptoms: look for weak, spindly seedlings or stunted plants with rugose or crinkled leaves that become mottled and prematurely yellow. The trifoliate leaves may be puckered downward at the margins and slightly narrowed. Early infected plants are stunted, with shortened petioles and internodes. Symptoms are more severe when temperatures have been cool (less than 75°F) and may be masked by warmer conditions. Seeds from infected plants may be mottled brown or black (bleeding hilum) and may be slightly smaller than healthy seeds.

Impact: loss due to SMV depends on variety, co-infection with BPMV, and stress. Losses range from minor to severe.

Control: plant high-quality disease-free seed, rogue out infected plants from seed production fields, control aphid vectors.

Photo credits: *leaf symptoms*, SDSU Extension Plant Pathology; *aphids*, R. Venette, University of Minnesota

BEAN POD MOTTLE VIRUS

Caused by: *bean pod mottle sobemovirus*

Images: typical rugose leaves and mottled appearance; bean leaf beetle (virus vector)

Vectored by: bean leaf beetle

Disease Period: check May through early July.

Occurrence: widespread

Symptoms: mottled, rugose (crinkled) leaves generally express about mid-summer. Leaves may have appearance of growth regulator damage but are generally more mottled and often stunted. Early infected plants are more likely to have mottled seed, though seed transmission is very rare.

Impact: often, infected plants have fewer stems and branches, damaged seed, and minor to severe yield loss.

Control: depends on management of the insect vector beetle.

Photo credits: *leaf symptoms*, M. Langham and C. Strunk; *bean leaf beetle closeup*: USDA-ARS North Central Agricultural Research Lab.

BROWN STEM ROT

Caused by: *Phialophora gregata*

Images: distinct foliar symptoms (inter-veinal necrosis); rotted pith showing distinct brown coloration.

Disease Period: check July 15 through September 15.

Occurrence: occasional in areas of fields with neutral to acid pH

Symptoms: always causes a brown discoloration in the pith of the lower stem. Discoloration often begins at the nodes and eventually fills in the inter-nodal areas. Two strains of the pathogen occur in South Dakota; only one causes inter-veinal necrosis symptoms on the leaves. In dry conditions, leaf symptoms may be suppressed.

Impact: yield losses range from minor to severe depending on severity and affected area.

Control: choose resistant or shorter-season cultivars. Practice crop rotation and bury crop residue. Do not irrigate after flowering.

Photo credits: SDSU Extension Plant Pathology

SUDDEN DEATH SYNDROME

Caused by: *Fusarium virguliforme*

Images: sudden tissue collapse and distinct foliar symptoms; susceptible rows in a resistant background

Disease Period: check July 15 through September.

Occurrence: rare

Symptoms: inter-veinal chlorosis, necrosis resembling brown stem rot symptoms; yellow blotches between the veins progress to large irregular patches. Yellowed patches turn brown and die, while the veins remain green. Symptoms are more pronounced on top leaves. Infected leaves drop, but the petioles remain on the stems. Pod drop may also occur. No stem browning develops as with BSR. SDS conversely may cause a root rot. Infection is favored by cool, moist soils.

Impact: losses may be severe; this disease has not been confirmed in South Dakota.

Control: choose resistant or shorter-season cultivars. Practice crop rotation and bury crop residue. Do not irrigate after flowering.

Photo credits: *leaf symptoms*: SDSU Extension Plant Pathology; *field symptoms*: University of Wisconsin

ANTHRACNOSE

Caused by: *Colletotrichum spp.*

Images: anthracnose lesions on leaf and stems of soybean

Disease Period: July through August

Occurrence: occasional

Symptoms: look for darkened gray-black lesions on leaves, stems, and pods. This disease is favored by humid weather and comes usually from infected crop debris. Veins may appear reddened, and petioles or stems may have dark blotches resembling pod and stem blight. Microscopic evaluation may reveal characteristic acervuli (fruiting bodies).

Impact: losses are usually minor and associated with damaged seed, as the disease is present at later growth stages. Seedlings may also be affected by the fungus, leading to seedling blight stand losses.

Control: rotation and tillage will help reduce this residue-borne disease.

Photo credits: *leaf symptoms*: SDSU Extension Plant Pathology; *stem*: Clemson Univ.–USDA Slide Collection, Bugwood.org

POD AND STEM BLIGHT

Caused by: *Diaporthe phaseolorum*

Disease Period: July 15 through mid-September

Occurrence: widespread

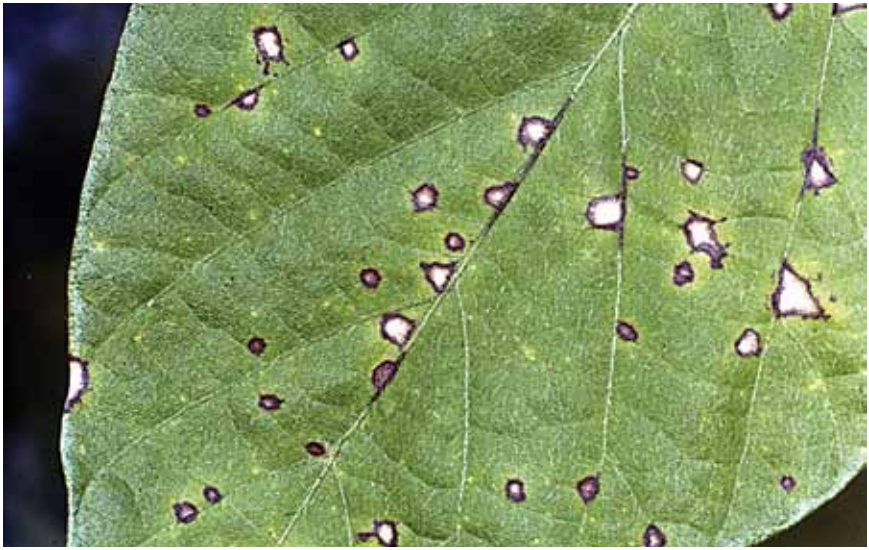
Symptoms: look for small black specks on the main stem, lower branches, and pods. The specks are often aligned in rows up and down the stem. Heavily infected seeds at maturity will be shriveled, cracked, and frequently covered with a white fungal growth. Warm, wet weather at flowering and pod-fill favor the disease.

Control: rotate crops, plow soybean fields, and harvest seed on time.

Photo credit: Clemson University–USDA Cooperative Extension Slide Series, Bugwood.org

FROGEYE LEAF SPOT

Caused by: *Cercospora sojina*



Disease Period: July through August

Occurrence: rare, mainly in southeast parts of state

Symptoms: angular spots with light gray centers and distinct purple to red-brown margins. No chlorotic halos surrounding lesions are present. Leaf spots can coalesce to form large lesions, resulting in premature leaf drop.

Control: plant pathogen-free seed to avoid introducing the disease. Plant resistant varieties. Rotation and residue management are also warranted.

Photo credit: Clemson University–USDA Cooperative Extension Slide Series, Bugwood.org

STEM ROT (WHITE MOLD)

Caused by: *Sclerotinia sclerotiorum*

Images: wilt symptoms; interveinal chlorosis on leaves; rotted pith showing distinct brown coloration (compared to healthy)

Disease Period: check July through August

Occurrence: occasional, recurring in areas with history of the disease

Symptoms: infected tissues are initially covered in white mycelium, progressing to bleached, rhetted and stringy in appearance. Soon after infection, plants often wilt, with a shepherds crook on the top. Lodging may occur as infection progresses.

Impact: losses range from minor to severe; inoculum may last for 10 years or more in affected fields; other broadleaves are alternate economic hosts.

Control: resistant varieties, crop rotation, and increased row spacing are recommended. Boscalid or tetraconazole fungicides are labeled for white mold suppression; soil-applied biocontrol fungi have shown promise in eliminating inoculum from affected fields.

Photo credits: SDSU Extension Plant Pathology

NORTHERN STEM CANKER

Caused by: *Diaporthe phaseolorum* var. *caulivora*

Images: field view; stem symptoms; and variations

Disease Period: check July 15 through September.

Occurrence: common

Symptoms: look for a slightly sunken, reddish-brown to dark brown canker up to 3-inches long on the stem, generally centered at one of the first eight nodes on the stem. Stem tissue above and below the canker remains green. Small black specks are scattered randomly throughout older cankers. Infected plants often die prematurely.

Impact: losses to NSC range from minor to severe.

Control: rotation and residue management

Photo credits: T.E. Chase, South Dakota State University

CHARCOAL ROT

Caused by: *Macrophomina phaseolina*

Images: signs on outer stem - microsclerotia; field overview; and root/ lower stem showing characteristic charcoal-like streaks

Disease Period: check during drought periods in August and September.

Occurrence: occasional; documented to occur on soybeans in extreme southeastern counties; favored by moisture in the spring followed by hot dry summer weather.

Symptoms: irregular areas of wilting or premature death of plants from drought stress. Grayish discoloration of the lower stem due to aggregations of microsclerotia may develop late in the season. When cut, the rot often shows characteristic charcoal-colored streaks and often is steel gray in color.

Impact: during a summer drought, charcoal rot may exacerbate stress and lead to further yield and quality losses; impact is moderate to severe when coupled with drought conditions.

Control: practice crop rotation. Reduce seeding rates. Maintain adequate fertility.

Photo credits (clockwise from top left): *stem symptoms*: P. Bachi, Univ. of Kentucky and Bugwood.org; *field symptoms*: SDSU Extension Plant Pathology; *stem section*: P. Bachi, Univ. of Kentucky and Bugwood.org

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