

Commercial Crop Production

Field Crops - Soybeans

Table 1. Symptoms, source of inoculum and management of soybean diseases.	
Disease	
<p>Seedling Disease (<i>Rhizoctonia solani</i>, <i>Phytophthora</i> spp., <i>Pythium</i> spp., etc.)</p>	<p>Symptoms: Seed decay and postemergence “damping off.” Roots and basal portion of stem may deteriorate or be killed.</p> <p>Source of Inoculum: Most of these organisms are soil-borne and persist in crop residue.</p> <p>Management: Fungicide seed treatment or in-furrow sprays are effective.</p>
<p>Charcoal Rot (<i>Macrophomina phaseolina</i>)</p>	<p>Symptoms: Seedling infections result in a discoloration at the soil line. Seedlings may die if hot, dry conditions exist, or they may survive in wet weather with disease symptoms reappearing during hot, dry spells. In older plants, a light brown discoloration of internal tissue occurs. Plants turn yellow and “mature very early.” Below the epidermis, at the soil line, small black bodies appear, giving the tissue a grayish-black “charcoal” appearance.</p> <p>Source of Inoculum: The pathogen is soil- and debris-borne.</p> <p>Management: Avoid excessive seeding rates. Maintaining fertility will reduce the incidence of this disease. Avoid drought stress as much as possible.</p>
<p>Phytophthora Root Rot (<i>Phytophthora</i> spp.)</p>	<p>Symptoms: Destroys roots and tender stems of infected seedlings, resulting in rapid death. Older plants turn yellow and leaves wilt. A brown discoloration develops within the stem.</p> <p>Source of Inoculum: The pathogen is soil-borne.</p> <p>Management: Damage is most severe in heavy clay soils or in poorly drained soils. Avoid planting susceptible varieties on poorly drained soils. Improve drainage. Rotate.</p>
<p>Red Crown Rot (<i>Calonectria illucicola</i>)</p>	<p>Symptoms: First symptoms appear as an interveinal chlorosis followed by necrosis in leaves during R5 to R6 followed by defoliation. On the stems, reddish-orange fruiting structures appear at the soil surface and up to 3 inches above. Stem tissue may appear reddish.</p> <p>Source of Inoculum: The pathogen is soil-borne.</p> <p>Management: Research and field observations indicate differences in varieties, but exact ratings are difficult to achieve. Delayed planting until the later recommended planting time may reduce incidence.</p>
<p>Southern Blight (<i>Sclerotium rolfsii</i>)</p>	<p>Symptoms: Scattered plants wilt suddenly and die. White mold appears at the base of the plant and girdles the stem. Tan-to-brown sclerotia (resting bodies) about the size of mustard seeds appear in the mold.</p> <p>Source of Inoculum: The fungus is soil-borne and occurs widely in many soils. It is capable of persisting on almost any type of organic matter.</p> <p>Management: Losses to this disease usually are minimal and do not warrant control measures.</p>

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<p>Taproot Decline (<i>Xylaria</i> spp.)</p>	<p>Symptoms: Symptoms of taproot decline and plant death may occur at any point during the growing season. On seedlings, cotyledons are characterized by an interveinal mottling. Infection is indicated by a mild interveinal chlorosis on vegetative and early reproductive stage plants. During pod fill foliar symptoms appear more severe and interveinal necrosis may occur. When affected plants are pulled, they will usually break at the soil line. When excavated, affected tap and lateral roots will have a blackened appearance, and when stems are split at the crown, a white, cottony growth is apparent in the pith. Soybean debris from previous seasons is usually found in close proximity to affected roots.</p> <p>Source of Inoculum: The fungus survives in soybean debris from previous seasons.</p> <p>Management: Rotation to the non-host and/or tillage may reduce disease incidence and severity. Resistant varieties may be available.</p>
<p>Aerial Blight (<i>Rhizoctonia solani</i>)</p>	<p>Symptoms: Infection typically involves the lower third of one or more of the three leaflets. necrotic areas vary in shape from circular to irregular varying in color from brown to reddish-brown to tan. Defoliation may occur as a result of the disease. In most cases several leaflets will be stuck together with a cottony growth (fungus). Occasionally, the fungus will produce small, white balls (survival structures) that later turn dark brown. Petioles, stems, and young pods also may be affected.</p> <p>Source of Inoculum: The fungus may survive on weed hosts, soybean debris, and in soil. Rice serves as an alternative host.</p> <p>Control: Fall cultivation, good seedbed preparation and weed control may reduce disease incidence. Research and field observations indicate that some varieties may be tolerant. Resistance to strobilurin fungicides may exist in some areas; use an SDHI compound instead. See product label for suggested fungicide rates (Table 2). Strobilurin resistance has been identified in this pathogen population.</p>
<p>Brown Spot (<i>Septoria glycines</i>)</p>	<p>Symptoms: Angular brown to reddish-brown spots appear first on lower leaves, causing yellowing and later defoliation. Symptoms usually are seen first on young plants during cool weather. Sizes of spots vary from a pinpoint to ¼ inch diameter.</p> <p>Source of Inoculum: The fungus overwinters in crop residue and on infected seed.</p> <p>Management: Plant disease-free seed. Crop rotation and/or tillage may reduce disease incidence and severity. Development of the disease is limited by hot weather. Fungicides are effective and may be economically beneficial in severe cases. Resistant varieties may be available.</p>

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Cercospora Leaf Blight (<i>Cercospora</i> spp.)	<p>Symptoms: Beginning near R5, petioles will develop elongated purplish lesions, usually near the leaflets at first. Leaves in the upper canopy will exhibit a leathery, bronze to purple appearance. Blighting of leaves will follow, and a grayish cast is usually apparent and indicative of sporulation of the pathogen. Premature defoliation may occur.</p> <p>Source of Inoculum: The pathogens are seed-borne and survive on soybean debris. Some alternative hosts are suspected.</p> <p>Management: Choose tolerant varieties based on variety trial information that has been generated nearest to your farm. Crop rotation and tillage may reduce disease severity. Earlier planted soybean may avoid the disease. Fungicide efficacy has been inconsistent with this disease as there is strobilurin and thiophanate-methyl fungicide resistance in this pathogen population (see Table 2).</p>
Downy Mildew (<i>Peronospora manshurica</i>)	<p>Symptoms: Indefinite yellowish-green areas on upper leaf surface. Grayish tufts of mold growth on lower leaf surface beneath chlorotic spots. Older lesions may have a reddish tinge.</p> <p>Source of Inoculum: The fungus overwinters in soil, on seed and in soybean residue.</p> <p>Management: Manage of downy mildew is not considered necessary as the disease does not cause economic losses.</p>
Frogeye Leaf Spot (<i>Cercospora sojina</i>)	<p>Symptoms: Lesions are usually less than ¼ of an inch in diameter with gray to tan center and reddish-brown borders. The disease usually occurs in the upper half of the canopy causing premature defoliation. In severe cases frogeye leaf spot will occur on pods, petioles, and stems. Light purple to grayish discoloration will occur in the case of seed infections.</p> <p>Source of Inoculum: The fungus is seed, debris, and airborne.</p> <p>Management: Use resistant varieties. Apply foliar fungicides, if necessary, to susceptible varieties (see Table 2). Strobilurin resistance has been identified in this pathogen population.</p>
Purple Seed Stain (<i>Cercospora</i> spp.)	<p>Symptoms: Dark purple discoloration of seed that is usually not apparent until maturity. Cracks may occur in discolored areas. Reddish-brown angular lesions, about 1/16 inch diameter, may occur on leaves, stems or pods late in the growing season.</p> <p>Source of Inoculum: The pathogens overwinter in crop residue, are seed-borne, and may be airborne.</p> <p>Control: Resistant varieties may be available. Planting disease-free seed or seed treated with fungicides may reduce incidence and severity.</p>
Anthracnose (<i>Colletotrichum</i> spp.)	<p>Symptoms: Symptoms appear as irregular brown areas most frequently on stems and pods. In advanced stages, affected tissues are covered with</p>

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	<p>black fruiting bodies. The disease may cause serious losses, especially during rainy periods. Seed may fail to form or be wrinkled and moldy. Control: Plant disease-free seed. Some benefit may be derived from seed treatment. Plow under crop residue. Fungicides may be effective (see Table 2).</p>
<p>Soybean Rust <i>(Phakopsora pachyrhizi)</i></p>	<p>Symptoms: Rust pustules can be found on the underside of lower leaves when conditions are right for disease development. Pustules are tiny and raised with spore masses resembling sand grains requiring magnification to see. Severe infections will cause premature defoliation. Successive mild winters may increase soybean rust incidence and severity. Source of Inoculum: The fungus requires a living host to survive and may overwinter on kudzu or volunteer soybeans. Management: Most fungicides are effective on soybean rust (see Table 2). Periods of hot, dry weather will slow disease development.</p>
<p>Pod and Stem Blight <i>(Diaporthe phaseolorum var. sojae</i> <i>= Phomopsis sojae)</i></p>	<p>Symptoms: Numerous small, black fruiting bodies appear in linear rows on the pods and stems of mature plants. During periods of warm and wet weather, white mycelial growth may occur on seed. Source of Inoculum: The fungus is seed-borne and overwinters on infested soybean debris in the field. Management: Planting disease-free seed and using fungicide seed treatment may be effective. Resistant varieties may be available. Foliar fungicides may be effective (see Table 2).</p>
<p>Southern Stem Canker <i>(Diaporthe phaseolorum var. meridionalis)</i></p>	<p>Symptoms: Small reddish-brown lesions may occur on one or both cotyledons. Later in the season, interveinal chlorosis may be evident on leaflets (similar to foliar symptoms of red crown rot) and plants may die leaving dried attached leaves. Infection usually starts as a small lesion at the base of a main-stem node enlarging rapidly to form a slightly sunken, reddish-brown canker. Plants may be brittle and break at the canker. Source of Inoculum: The fungus is seed-borne and overwinters on infested soybean debris in the field. There may be alternative hosts. Management: Resistant varieties may be available. Delayed planting to the later recommended planting time, avoiding stress, and maintaining fertility may reduce incidence and severity.</p>

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<p>Reniform Nematodes (<i>Rotylenchulus reniformis</i>)</p>	<p>Symptoms: Severely infected plants are stunted and may be chlorotic. Severe yield reductions may occur when nematode populations are relatively high.</p> <p>Source of Inoculum: The nematode overwinters in the soil.</p> <p>Management: Planting resistant varieties and rotation with nonhost crops may reduce populations. Nematicides are effective and may be economical if precision application methods are used. Use sanitation with equipment that may spread nematode-infested soil.</p>
<p>Root Knot Nematodes (<i>Meloidogyne incognita</i> group)</p>	<p>Symptoms: Aboveground symptoms are poor pod set with wilting and stunting in more-or-less circular patches on lighter soil types. Below ground symptoms appear as knots or galls on the roots. These swellings are a part of the root and are not removeable like bacterial nodules.</p> <p>Source of Inoculum: The nematode overwinters in the soil as eggs or larvae.</p> <p>Management: Resistant varieties may be available, and rotation to less susceptible crops may reduce populations. Precision applied nematicides may be economically beneficial. Use sanitation with equipment that may spread nematode infested soil.</p>
<p>Soybean Cyst Nematodes (<i>Heterodera glycines</i>)</p>	<p>Symptoms: Stunting and various stages of yellowing occur in roughly circular spots. Symptoms vary depending on nematode population, soil type, fertility, and environmental conditions. Symptoms are most pronounced on sandy soils.</p> <p>Source of Inoculum: Nematodes overwinter in soil, primarily inside resistant cysts. They may be spread to new locations by any means that spread soil.</p> <p>Management: Practice 2- to 4-year rotation with cotton, corn, or sorghum. Use sanitation with equipment that may spread nematode infested soil.</p>
<p>Other Nematodes (Spiral, Lance, Ring, Lesion, Stubby-root)</p>	<p>Symptoms: Stunting, stand loss, and reduced yields are associated with high populations of single or mixed populations of these nematodes. Symptoms will vary depending on nematode type and population levels.</p> <p>Management: Rotate with other crops. If populations are high at planting, a nematicide may be used. Use sanitation with equipment that may spread nematode infested soil.</p>

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Management of Soybean Diseases Using Fungicides

The North Central Regional Committee on Soybean Diseases and the Regional Committee for Soybean Rust Pathology (NCERA 137), **which also includes numerous members from the Mid-South**, have developed the following information on foliar fungicide efficacy for control of major foliar soybean diseases in the United States. **Ratings in this table have been modified by LSU AgCenter Pathologists to more accurately reflect observations in Louisiana.** Efficacy ratings for each fungicide listed in the table were determined by field-testing the materials over multiple years and locations by the members of the committee. Efficacy ratings are based upon level of disease control achieved by product and are not necessarily reflective of yield increases obtained from product application. Efficacy depends upon proper application timing, rate, and application method to achieve optimum effectiveness of the fungicide as determined by labeled instructions and overall level of disease in the field at the time of application. Differences in efficacy among fungicide products were determined by direct comparisons among products in field tests and are based on a single application of the labeled rate as listed in the table, unless otherwise noted. **Table includes systemic fungicides available that have been tested over multiple years and locations. The table is not intended to be a list of all labeled products.** Efficacy categories: NR=Not Recommended; P=Poor; F=Fair; G=Good; VG=Very Good; E=Excellent; NL = Not Labeled for use against this disease; U = Unknown efficacy or insufficient data to rank product efficacy.

Table 2. Efficacy of fungicides in managing foliar soybean diseases.										
Fungicide Information				Diseases: AB=Aerial blight; AN=Anthracnose; BS=Brown spot; CB=Cercospora leaf blight, FE=Frogeye leaf spot, SBR=Soybean rust.						
Class and Mode of Action Group	Active Ingredient	Product	Rate (fl oz)	AB¹	AN	BS	CB²	FE³	SBR	Harvest Restrictions⁴
QoI Strobilurins Group 11	azoxystrobin	Quadris 2.08 SC ⁶	6-15.5	VG	VG	G	P	P	G-VG	14 days
	fluoxastrobin	Aftershock 480 SC Evito 480 SC	2-5.7	VG	G	G	P	P	U	R5, beginning seed, 30 days
	picoxystrobin	Aproach 2.08 SC	6-12	VG	G	G	P	P	G	14 days
	pyraclostrobin	Headline 2.09 EC/SC	6-12	VG	VG	G	P	P	VG	21 days
DMI Triazoles Group 3	cyproconazole	Alto 100SL	2.8-5.5	U	U	VG	P	F	VG	30 days
	flutriafol	Topguard 1.04SC	7-14	U	VG	VG	P-G ⁵	VG	VG-E	21 days

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Class and Mode of Action Group	Active Ingredient	Product	Rate (fl oz)	AB¹	AN	BS	CB²	FE³	SBR	Harvest Restrictions⁴
	propiconazole	Tilt 3.6 EC ⁶	4-6	P	VG	G	P	F	VG	R5, beginning seed
	prothioconazole	Proline 480 SC	2.5-5.0	NL	NL	NL	NL	G-VG	VG	21 days
	tetraconazole	Domark 230 ME ⁶	4-5	NL	VG	VG	P-G ⁵	G-VG	VG-E	R5, beginning seed
MBC Thiophanates Group 1	thiophanate-methyl	Topsin-M ⁶	10-20	U	U	U	P	VG	NL	21 days
SDHI Carboximides Group 7	boscalid	Endura 0.7 DF	3.5-11	U	NL	VG	U	P	NL	21 days
Mixed classes	azoxystrobin + difenconazole	Quadris Top 2.72 SC, Quadris Top SBX 3.76 SC	8- 14	U	U	G-VG	P-G ⁵	VG	VG	14 days
	azoxystrobin + propiconazole	Quilt 1.66 SC ⁶ , Quilt Xcel 2.2 SE	14-20.5 10.5-21	VG	VG	G	P	F	VG	21 days R6
	azoxystrobin + tetraconazole	Affiance 1.5SC	10-14	U	VG	VG	U	VG	U	R5 14 days
	bensovindiflupyr + azoxystrobin + propiconazole	Trivapro 2.21SC	13.7	E	U	VG	U	G	U	14 days or R6, whichever is longest
	flutriafol +	Fortix, Preemptor	4-6	U	U	G	U	VG	U	R5

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Class and Mode of Action Group	Active Ingredient	Product	Rate (fl oz)	AB¹	AN	BS	CB²	FE³	SBR	Harvest Restrictions⁴
	fluoxastrobin	SC								
	picoxystrobin + cyproconazole	Aproach Prima 2.34SC	5-6.8	U	U	VG	P-G ⁵	G	VG	21 days
	pyraclostrobin + fluxapyroxad	Priaxor 4.17 SC	4-8	E	VG	E	P-G ⁵	G-VG	VG	30 days
	pyraclostrobin + fluxapyroxad + tetraconazole	Priaxor D 4.17SC 1.9SC	4 (each)	U	U	G	U	VG	U	21 days R5
	trifloxystrobin + prothioconazole	Stratego YLD 4.18SC	4-4.65	VG	VG	VG	P	G	VG	21 days
<p>¹In areas where strobilurin resistance has been found, efficacy of products containing strobilurins may be reduced.</p> <p>²Fungicides with a solo or mixed QoI or MBC mode of action may not be effective in areas where QoI or MBC resistance exists in the fungal population that causes Cercospora leaf blight.</p> <p>³Fungicides with a solo or mixed QoI mode of action may not be effective in areas where QoI-resistance exists in the fungal population that causes frogeye leaf spot.</p> <p>⁴Harvest restrictions are listed for soybean harvested for grain.</p> <p>⁵Efficacy of this product has been inconsistent across locations and years.</p> <p>⁶Generics or other brands containing the same active ingredient may be available.</p>										

The soybean section was revised September 2017 by Dr. Trey Price.