

SUGGESTIONS FOR DISEASE CONTROL ON SOYBEANS

Quick Guide to Soybean Diseases

Disease (causal agent)	Symptoms	Control
Root (soilborne) diseases		
Seed rot (<i>Pythium</i> spp., <i>Rhizoctonia solani</i> , <i>Phytophthora sojae</i> , <i>Fusarium</i> spp.)	Seeds rot and fail to emerge from the soil resulting in poor stand establishment. Usually a problem resulting from poor quality (low germ or moldy) seed, planting too deep, or from wet and cold soils after planting	Plant high quality seed (>85% germ) when warm soil temperatures favor rapid seed germination and seedling growth. Use a fungicide seed treatment when seed quality or planting conditions are not ideal (See Table 1 below).
Seedling disease – damping off (<i>Pythium</i> spp., <i>Phytophthora sojae</i> , <i>Rhizoctonia solani</i> , <i>Fusarium</i> spp.)	Plants wither and die after emergence or are stunted and grow slowly. Dark and firm or watery and soft decay of the roots and stem at or below the soil line.	Plant high quality seed (>85% germ) when warm soil temperatures favor rapid seed germination and seedling growth. Use a fungicide seed treatment when seed quality or planting conditions are not ideal (See Table 1 below).
Phytophthora root rot (<i>Phytophthora sojae</i>)	Occurs in heavy, poorly drained soils or in low spots in fields. Wet decay of stem and lower branches near the soil line that turns brown. Plants yellow and wilt. Roots are dark brown and rotted. Infection may occur at any stage of growth but is more common on young plants.	Plant resistant varieties and subsoil to break hard pans and promote drainage. Treat seed and/or soil with products containing metalaxyl or mefenoxam (See Tables 1 and 3 below).
Southern blight (<i>Sclerotium rolfsii</i>)	Generally a minor problem on scattered or localized patches of plants in mid to late season. Plants wilt and die. Base of stems covered with white, stringy mold that may extend onto the surrounding soil. Small, mustard seed-like reproductive structures (sclerotia) develop on the white mold.	Crop rotation with non hosts such as corn, sorghum, and cotton will reduce disease levels.
Charcoal rot (<i>Macrophomina phaseolina</i>)	Disease associated with hot dry weather in mid to late season. Plants loose vigor, yellow, wilt, and die with leaves remaining attached. Internal discoloration of tap root and upper stem is silver to gray in color. Numerous black, pepper-like sclerotia form under the bark of lower stem and roots.	Maintain adequate soil fertility and irrigate to reduce moisture stress. Avoid excessive seeding rates.
Soybean cyst nematode (<i>Heterodera glycines</i>) Root-knot nematode (<i>Meloidogyne</i> spp.)	Yield loss is the first symptom of a nematode problem. Above-ground symptoms consisting of stunting, poor growth, yellowing, general decline, and early maturity may or may not appear after several years. Symptoms may mimic N or K deficiency. Root systems may be stunted or deformed. Symptoms are often irregularly distributed, occurring in patches.	Crop rotation with corn, sorghum and grassy forages should be considered. Nematicides provide control (See Table 3 below) but may not be cost effective. The most efficient control incorporates resistant varieties in a crop rotation. (See Soybean cyst nematode and Root-knot nematode below)

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Quick Guide to Soybean Diseases (Cont'd)

Disease (causal agent)	Symptoms	Control
Foliar (leaf, stem, and pod) diseases		
Bacterial blight (<i>Pseudomonas glycines</i>)	Small, angular, water-soaked spots that later turn yellow and then brown as tissue dies. Brown central area of diseased spot is surrounded by a yellow border. Spots fall out and leaf becomes ragged. Infected seed may be shriveled, slightly discolored or may not show any symptoms at all.	Plant resistant varieties, use high quality seed, practice crop rotation to avoid disease build-up, and use tillage to bury diseased crop residue.
Bacterial pustule (<i>Xanthomonas phaseoli</i>)	Symptoms are similar to bacterial blight (See above) except that tiny pustules (pimples) may form inside spots on the underside of the leaf.	Plant resistant varieties, use high quality seed of resistant varieties, practice crop rotation to avoid disease build-up, and use tillage to bury diseased crop residue.
Anthracnose (<i>Colletotrichum dematium</i> and/or <i>Glomerella glycines</i>)	Stem and pod lesions are indefinite brown areas causing premature death of leaves and pods. Dark streaks develop on petioles and leaves prematurely roll and die. Numerous minute black fruiting structures develop on the infected parts. Seed may be stained brown and appear moldy.	Practice crop rotation, incorporate diseased crop residue into soil, and use fungicide seed treatments to prevent seed transmission. Application of a foliar fungicide may provide an economic return (see Foliar diseases below).
Brown spot (<i>Septoria glycines</i>)	Most commonly leaf disease in Oklahoma. Most severe on early (April) planted soybeans. Cotyledon, unifoliate, and lower trifoliate leaves develop pinpoint brown spots that may enlarge to ¼ inch in diameter and be surrounded by a yellow border. Heavily spotted leaves turn yellow and drop, leading to significant defoliation in the lower and mid-canopy. Easily confused with soybean rust, but the underside of the spots are flat with no raised pustules (pimples).	Practice crop rotation, incorporate diseased crop residue into soil, and use fungicide seed treatments to prevent seed transmission. Application of a foliar fungicide may provide an economic return (see Foliar diseases below).
Downy mildew (<i>Peronospora manshurica</i>)	Symptoms appear on younger (upper) leaves as pale green and then yellow spots. Spots enlarge to up to ½ inch in diameter; the centers die and turn tan colored with a yellow or light green border. In humid weather, tufts of tan colored moldy growth are visible through a hand lens on the undersides of developing spots.	Plant resistant varieties, practice crop rotation, incorporate diseased crop residue into soil, and use fungicide seed treatments to prevent seed transmission.
Frogeye leaf spot (<i>Cercospora sojina</i>)	Sporadic disease that may reduce yield. Reddish brown, circular to angular leaf spots are up to 1/4" diameter. The center of the spots turns gray as spots age, but the borders remain dark.	Plant resistant varieties, practice crop rotation, use fungicide seed treatments to prevent seed transmission, and incorporate diseased crop residue into soil. Application of a foliar fungicide may provide an economic return (see Foliar diseases below).

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Disease (causal agent)	Symptoms	Control
Foliar (leaf, stem, and pod) diseases (cont'd)		
Cercospora blight/Purple Seed Stain (<i>Cercospora kikuchii</i>)	At beginning pod fill, upper leaves exposed to the sun have a light purple, leathery appearance. Affected leaves may drop prematurely. Small sunken, reddish purple spots may develop on pods causing pink to dark purple staining of seeds.	Practice crop rotation, plant high quality seed, use a fungicide seed treatment, harvest promptly, and incorporate disease crop residue into soil. Application of a foliar fungicide may provide an economic return (see Foliar diseases below).
Pod and stem blight, seed decay (<i>Phomopsis longicolla</i>)	Plants are infected early in the growing season, but symptoms on the pods and stems do not appear until the plants are mature. Small black reproductive structures (pycnidia) develop in linear rows on mature stems or scattered on the pods. Affected seed may be covered with white mold or may be dull, cracked, or shriveled.	Practice crop rotation, plant high quality seed, use a fungicide seed treatment, harvest promptly, and incorporate disease crop residue into soil. Application of a foliar fungicide may provide an economic return (see Foliar diseases below).
Soybean rust (<i>Phakospora pachyrhizi</i>)	Faint pale green to yellow flecks appear on leaves in low and mid canopy during reproductive stages. Spots become angular and brown or reddish brown in color. Spots remain small but become numerous. Rust can easily be confused with brown spot and bacterial leaf spots. Key feature are the raised pustules (pimples) on the undersides of spots visible through a hand lens. Tufts of tan colored spores may also be present.	In 2007, rust was found for the first time in OK. Rust has the potential to cause yield loss. Leaf samples suspected to have rust should be submitted for identification to the local county extension office. A fungicide program for rust control may be economical during reproductive stages in fields where the disease has been identified or threatens. (See Foliar diseases below)
Stem canker (<i>Diaporthae phaseolorum var. caulivora</i>)	Reddish brown spots appear at nodes of the main stem during reproductive stages. Spots enlarge into elongated cankers that girdle plants. Leaves develop interveinal yellowing and browning, curl inward, die, and remain attached to stems. Yield losses occur when plants are killed prior to pod fill.	Not a common disease in Oklahoma. Practice crop rotation, incorporate diseased crop residue into soil, and plant resistant varieties.
Soybean mosaic (soybean mosaic virus)	Spread on seed and by aphids. Infected seed may not germinate or produce weak, spindly plants with crinkled unifoliate leaves. Infected older plants are stunted with crinkled or mottled leaves. Seed may be distinctly discolored brown or black as the hilum color bleeds out over the seed.	Yields may be reduced up to 25%. Plant high quality seed or seed from fields free of the virus. Plant resistant varieties.
Bud blight (tobacco ringspot virus or tobacco streak virus)	Spread on seed and by thrips and nematodes. Before flowering, terminal buds and shoots turns brown, curve down, and becomes dry and brittle. Younger leaves often develop a rusty flecking. Plants are dwarfed and produce little seed. After flowering, infection results in poorly filled pods or pods may be shed. Plants may remain green late at the end of growing season.	Plant high quality seed to help avoid seed transmission.

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Seed Treatment

Fungicide seed treatment can be beneficial under Oklahoma conditions, especially with low seeding rates, use of seed with poor germination (85% or lower), under cool and wet conditions associated with early (April) planting dates, and where *Phytophthora* root rot is a problem. However, yield responses to seed treatments are unlikely to provide an economic return when conditions favor rapid seed germination and seedling growth. In addition, soybean plants are innately able to compensate for a wide range of plant populations, so much so that for some varieties, a field with 50% of a desired plant population may yield as well as a field with a full plant stand. However, early maturing varieties (MG III and IV) tend to branch less than full season varieties (MG V and VI) and yield better where higher plant populations are achieved. Registered seed treatment fungicides for prevention of seed rot and seedling diseases are listed below (Table 1). Pre-treated seed can be ordered, or seed treatment fungicides can be purchased for use with slurry or mist-type equipment, auger systems, or planter box applications. Thorough and uniform application to seed is essential for maximum performance. Metalaxyl and mefenoxam provide enhanced (systemic) control of water molds such as *Pythium* and *Phytophthora*. However, they do not have activity against other seedling disease pathogens and should be applied in combination with another seed treatment fungicide such as captan, thiram, carboxin, or fludioxanil to provide broad-spectrum disease control.

Table 1. Seed treatment fungicides for soybeans.

Disease (Causal Agent)	Common name (MOA Group): Formulation and rate /100 lb Seed	Remarks
Seed rot Seedling disease Damping off <i>Phytophthora</i> root rot	azoxystrobin (11) Protégé-FL 0.2 to 0.27 fl oz Dynasty 0.8F 0.15 to 0.46 fl oz	Slurry or mist type treatment. Slurry or mist type treatment.
	<i>Bacillus subtilis</i> : Kodiak HB 0.3D 4 to 8 oz Integral 0.136 fl oz Subtilex NG 0.05 to 0.01 oz	Biological treatment. Planter box treatment. Slurry or mist type treatment. Slurry or mist type treatment.
	captan (M): Captan 400 4F 1.5 to 2.5 fl oz Dyna Shield Captan 4F 1.5 to 2.5 fl oz Captan Moly 50D 3.5 oz Hi Moly/Captan-D 50D 3.3 oz	Slurry or mist type treatment. Slurry or mist type treatment. Planter box treatment. Planter box treatment.
	captan (M) + carboxin (7) + metalaxyl(4) Bean Guard/Allegiance 41.25D 3.3 oz	Dry planter box treatment.
	captan (M) + carboxin (7): Enhance 40D 5 oz	Dry planter box treatment.
	carboxin (7) + thiram (M): RTU Vitavax Thiram 6.8 fl oz Vitavax CT Flowable 12 fl oz Vitavax M 12 fl oz Vitavax 200 3.34F 4 fl oz Vitaflo 280 4 fl oz	Slurry or mist type treatment. Slurry, mist type, or planter box treatment. Slurry, mist type, or planter box treatment. Slurry or mist type treatment. Slurry or mist type treatment.
	cloroneb (14) + mefenoxam (4): Catapult XL 3.09F 5.5 to 7 fl oz	Slurry, mist type, or planter box treatment.
	fludioxanil (12): Maxim 4FS 0.08 to 0.16 fl oz	<i>Rhizoctonia</i> and <i>Fusarium</i> only. Slurry or mist type treatment.
	ipconazole (3): Rancona 3.8FS 0.085 fl oz	<i>Rhizoctonia</i> , <i>Fusarium</i> , and <i>Phomopsis</i> only. Slurry or mist type treatment.

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Table 1. Seed treatment fungicides for soybeans. (Cont'd)

Disease (Causal Agent)	Common name (MOA Group): Formulation and rate /100 lb Seed	Remarks
Seed rot Seedling disease Damping off Phytophthora root rot cont'd	metalaxyl or mefenoxam (4): (cont'd) Acquire 2.6F 0.75 to 1.5 fl oz Acceleron DX309 2.6F 0.75 to 1.5 fl oz Allegiance FL 2.6F 0.75 to 1.5 fl oz Allegiance Dry 12.5D 1.5 to 2 oz Apron XL 3F 0.16 to 0.64 fl oz Belmont 2.7FS 0.75, Sebring 2.65ST or 318FS, Metastar ST 2.6F, or Dynashield Metalaxyl 2.54F 0.75 to 1.5 fl oz Sebring 480FS 4F 2 oz	<i>Pythium</i> and <i>Phytophthora</i> only. Slurry or mist type treatment. Slurry or mist type treatment. Slurry or mist type treatment. Planter box or dry seed treatment. Slurry or mist type treatment. Slurry or mist type treatment.
	metalaxyl (4) + azoxystrobin (11): Soygard 0.32 to 0.43 fl oz	Slurry or mist type treatment.
	metalaxyl (4) + ipconazole (3): Rancona Summit 0.2F 4 fl oz Rancona Xtra 0.24F 3.5 fl oz	Slurry or mist type treatment. Slurry or mist type treatment.
	metalaxyl (4) + PCNB (14) + carboxin (7): Prevail 33.1D 3.3 to 6.7 oz	Planter box or dry seed treatment.
	metalaxyl (4) + PCNB (14) + <i>Bacillus subtilis</i> ; System 3 3.3D to 6.7 oz	Planter box or dry seed treatment.
	metalaxyl (4) + thiram (M): Protector L/Allegiance 6.7 fl oz	Planter box or dry seed treatment.
	pyraclostrobin (11): Diamir 1.67F 0.4 to 1.5 fl oz Acceleron DX109 1.67F 0.4 to 0.15 fl oz	Slurry or mist type treatment. Slurry or mist type treatment.
	mefenoxam (4) + fludioxonil (12): ApronMaxx RFC 0.52F 1.5 fl oz ApronMaxx RTA 5 fl oz Maxim XL 2.7F 0.17 to 0.33 fl oz Warden RTA 5 fl oz	Slurry or mist type treatment. Slurry or mist type treatment. Slurry or mist type treatment. Slurry or mist type treatment.
	thiabendazole (1): Mertect 340F 0.08 to 0.16 fl oz	Slurry or mist treatment for Phomopsis seed rot and damping off. Apply with another fungicide for broad-spectrum control.
	thiram (M): Flosan 4F 2 fl oz 42S Thiram 4F 2 fl oz Signet 480FS 2 fl oz Thiram Granuflo 75WDG 2.2 oz Protector-D 35D 3.3 oz	Slurry or mist type treatment. Slurry or mist type treatment. Slurry or mist type treatment. Slurry or mist type treatment. Planter box treatment.
	trifloxystrobin (11): Trilex Flowable 0.32 fl oz	Slurry or mist type treatment.
	trifloxystrobin (11) + metalaxyl (4): Trilex AL 5.7 fl oz Trilex 2000 1.15F 1.0 fl oz	Slurry or mist type treatment. Slurry or mist type treatment.

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Soilborne Diseases and Nematodes

Crop rotation with non-host plants should be considered for preventing the build-up of soil-borne diseases and nematodes problems in soybeans, and for reducing pathogen populations in problem fields. Resistant varieties are also available for soilborne problems such as Phytophthora root rot, soybean cyst nematode, and root knot nematode. However, single gene resistance is commonly employed in soybean breeding programs. While single gene resistance initially provides a high level of disease control, repeating cropping of the same resistance gene may lead to a new strain or “race” capable of damaging previously resistant varieties. Nematodes are frequent problems in soybean fields, but often overlooked as a cause of low yield. When nematode problems are suspected, samples should be submitted for analysis to the OSU Plant Disease and Insect Diagnostic Lab through a local OSU County Extension office. Refer to OSU Fact Sheet #7610 "Soil and Plant Sampling for Nematode Analysis" for information on how to sample for nematodes.

Phytophthora root rot: Phytophthora root rot is a problem on finely textured (clay) soils with poor drainage, in fields with hardpans, or in low areas of fields that collect water. The seed rot and damping off phases of Phytophthora root rot may be mistaken for Pythium damping-off. The fungus is highly variable and numerous races have developed in response to the planting of varieties with single-gene (specific) resistance. Once a Phytophthora problem is identified, crop rotation is of little value because the fungus survives indefinitely in soil. Ideally, varieties with single gene (race specific) should be matched to the prevailing race in a problem field. However, race identification is not available in Oklahoma. Variety selection must be based on local variety performance or the selection of varieties with a high probability of success, i.e. the Rps1-c or Rps1-k genes in a high-yielding variety. Tolerant (partially resistant) varieties are also available that are not race specific. However, tolerance is not effective against the disease at the seedling stages and their use should be combined with a seed treatment containing metalaxyl or mefenoxam (See Table 1 above). Mefenoxam can also be applied to soil or in-furrow at planting (See Table 3).

Soybean Cyst Nematode: Soybean cyst nematode (SCN) is a significant problem in some old soybean fields. The nematode is probably more widespread than thought, because above ground symptoms are usually not distinct. SCN should be suspected where yields have declined for no other obvious reasons. SCN is best managed by planting resistant varieties in a crop rotation program with non-host crops to limit nematode reproduction. The goal is to reduce nematode numbers below damaging levels. Rotational crops should be summer crops that are grown during periods where nematodes are active. Non-host crops include alfalfa, corn, cotton, forage grasses, and sorghum. Avoid other legumes such as southern peas, beans, and forage legumes. Resistant soybean varieties use mainly two sources of resistance genes, one from “Peking” the other from “PI 88788”. Most SCN-resistant varieties use PI 88788 as source of resistance. A third source of resistance, from PI 437654 contained in the public variety “Hartwig” (some are marketed with a CsyX, trademark), is available in a few varieties and may be effective in more fields. Cyst nematode populations are highly variable and a particular source of resistance may perform better in one area than another. Seed dealers can recommend varieties that perform best in a particular area. However, repeated cropping of a resistant variety with the same source of resistance can lead to development of new races of the nematode for which the resistance is no longer effective. A certain percentage of cyst nematodes will reproduce on resistant varieties. If sources of resistance are not rotated, these individuals will increase and produce a race shift. The same SCN-resistant variety should not be planted in the same field for two consecutive years. If possible, rotate sources of resistance. Inclusion of susceptible varieties may also be beneficial for countering race shifts. Table 1 lists some rotation sequences recommended for growing soybeans where SCN is a problem. A listing of the sources of the resistance used in SCN-resistant varieties has been maintained at <http://www.ag.uiuc.edu/%7Ewardt/cover.htm> by the University of Illinois.

Table 2. Some suggested crop rotation sequences for soybean cyst nematode using resistant (R) and susceptible (S) soybean varieties.

Year	Rotation A	Rotation B	Rotation C
1	Non-host crop	Non-host crop	Non-host crop
2	Soybean (R)	Soybean (R)	Non-host crop
3	Non-host crop	Non-host crop	Soybean (S)*
4	Soybean (R) – different source from year 2	Soybean (S)*	Non-host crop
5	Non-host crop	Repeat cycle	Non-host crop
6	Soybean (R) – different source from year 4 or (S)*		Soybean (S)*
7	Repeat cycle		Repeat cycle

* A soil test should be done to ensure egg counts are below damaging levels (300 eggs per 100 cc soil for sandy soils; 1,200 eggs/100 cc soil for clay soils) before planting a susceptible variety.

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Root-knot nematode: Root-knot nematode (RKN) may not be as widely distributed as SCN, but can cause very severe yield losses where it occurs. It is generally found at damaging levels in sandy soils. Selection of resistant varieties to manage RKN is the simplest method of control. There are several well-adapted varieties available that have high levels of RKN resistance. Growing a RKN-resistant variety for one to three years usually lowers the RKN population significantly. It should be noted that growing the same RKN resistant variety continuously for several years might result in a RKN population capable of damaging the resistant variety. Rotation to non-host crops is a good method of control, but because southern, northern, and peanut root-knot nematodes occur in Oklahoma, it is difficult to select a non-host crop where the species of nematode is not known. Only grass crops such as corn, grain sorghum, and forage grasses are non-hosts for the southern RKN. In fields with northern and peanut RKN, cotton or the grass crops are suggested.

Table 3. Fungicides for control of soilborne diseases of soybeans.

Disease	Common name (MOA group): Formulation and rate/ 1000 ft row	Remarks
Phytophthora root rot Pythium damping off	mefenoxam or metalaxyl (4): Ridomil Gold 4E or SL 0.08 to 0.28 fl oz Ridomil Gold 2.5G 1.5 to 6 oz Metastar 2E 0.3 to 1.1 fl oz Twist 2E 0.16 to 0.56 fl oz	At planting treatment. Apply the high rate as a surface application in a 7-inch band and incorporate or water into soil, or apply any of the rates in furrow.
Phytophthora root rot Pythium damping off Rhizoctonia seedling blight Southern blight	mefenoxam (4) + azoxystrobin (11): Uniform 3.72F 0.34 to 0.62 fl oz	Spray in furrow at planting.

Foliar Diseases

Foliar diseases are generally a minor problem except for frogeye leaf spot and soybean rust. Frogeye leaf spot is a sporadic disease that can reduce yields significantly. Soybean rust was identified in Oklahoma for the first time in 2007 and has the potential to reduce yields by up to 50%. Other foliar diseases such as anthracnose, pod and stem blight, and Cercospora blight have adverse effects on seed quality and may reduce yields when rainfall and humidity are high during reproductive stages, and where harvest is delayed by wet weather. Consider a foliar fungicide program when yield potential is high, soybeans are grown under irrigation, soybeans are grown for seed, and when early maturing varieties are grown (Group III and IV). Use the point system for forecasting the need for a fungicide program on soybeans (See OSU Extension Facts no. 7632). The expected price of soybeans should also be considered in making a decision on whether or not to use foliar fungicides. Generally a single application from growth stage R3 to R5 is sufficient for control of diseases that affect seed quality. Rust is potentially damaging and a fungicide program should be beneficial for high yielding soybeans when rust becomes severe. Because rust will not overwinter in Oklahoma, it will likely be a sporadic problem affecting soybeans in years where airborne spores move into the state and weather is favorable for rust development. Currently Oklahoma and surrounding states are part of a national network for monitoring rust development and spread. The current status of rust development in Oklahoma and other soybean growing states can be followed at <http://sbr.ipmpipe.org/>. Consider a fungicide application for soybean rust when soybeans are at growth stages R1 to R5, yield potential is good (>25 bu/A) and when rust threatens or is identified in the field.

Table 4. Fungicides for control of foliar diseases of soybeans

Disease	Common name (MOA group): Formulation and rate/A	Remarks
Anthracnose Brown spot Frogeye leaf spot Pod and stem blight Cercospora blight Seed quality diseases Soybean rust	azoxystrobin (11): Quadris 2.08F 6.0 to 15.4 fl oz	Apply at growth stages R3 to R5 for seed quality protection, or when soybean rust or frogeye leaf spot threaten. A second application may be made from 14 to 21 d after the first.
	cyproconazole (3): Alto 100SL 0.83F- 4 to 5.5 fl oz	Apply at growth stages R3 to R5 for seed quality protection, or when soybean rust or frogeye leaf spot threaten. A second application may be made from 14 to 21 d after the first.

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Table 4. Fungicides for control of foliar diseases of soybeans (cont'd)

Disease	Common name (MOA group): Formulation and rate/A	Remarks
Anthracnose Brown spot Frogeye leaf spot Pod and stem blight Cercospora blight Seed quality diseases Soybean rust (cont'd)	azoxystrobin (11) + cyproconazole (3): Quadris Xtra 2.34F 4 to 6.8 fl oz	Apply at growth stages R3 to R5 for seed quality protection, or when soybean rust or frogeye leaf spot threaten. A second application may be made from 14 to 21d after the first.
	fluoxastrobin (11): Evito 480SC 2 to 5.7 fl oz Aftershock 4F 2 to 5.7 fl oz	Apply at growth stages R3 to R5 for seed quality protection, or when soybean rust or frogeye leaf spot threaten. A second application may be made from 14 to 21d after the first.
	fluoxastrobin (11) + tebuconazole (4): Evito T 4F 4 to 6 fl oz	Apply at growth stages R3 to R5 for seed quality protection, or when soybean rust or frogeye leaf spot threaten. A second application may be made from 14 to 21d after the first.
	myclobutanil (3): Laredo EC 2E 4 to 8 fl oz Laredo EW 1.67E 4.8 to 9.6 fl oz	For soybean rust, apply at growth stages R3+ to R5 when rust threatens. A second application may be made from 14 to 21d after the first.
	propiconazole (3): Tilt, Bumper, Propiconazole, or Propi-Star 3.6E 4 to 6 fl oz	Apply at growth stages R3 to R5 for seed quality protection, or when soybean rust or frogeye leaf spot threaten. A second application may be made from 14 to 21d after the first.
	propiconazole (3) + azoxystrobin (11): Quilt 1.66F 14 to 20.5 fl oz Quilt Xcel 2.2F 14 to 21 fl oz Avaris 1.66F 14 to 20.5 fl oz	Apply at growth stages R3 to R5 for seed quality protection, or when soybean rust or frogeye leaf spot threaten. A second application may be made from 14 to 21d after the first.
	propiconazole (3) + trifloxystrobin (11): Stratego 2.08E 7 to 10 fl oz	Apply at growth stages R3 to R5 for seed quality protection, or when soybean rust or frogeye leaf spot threaten. A second application may be made from 14 to 21d after the first.
	pyraclostrobin (11): Headline 2.08E or SC 6 to 12 fl oz	Apply at growth stages R3 to R5 for seed quality protection, or when soybean rust or frogeye leaf spot threaten. A second application may be made from 14 to 21d after the first.
	prothioconazole (3): Proline 480SC 2.5 to 3 fl oz	For soybean rust, apply at growth stages R3 to R5 when rust threatens. A second application may be made from 14 to 21d after the first.
	prothioconazole (3) + trifloxystrobin (11): Stratego YLD 4.13F 4 to 4.65 fl oz	Apply at growth stages R3 to R5 for seed quality protection, or when soybean rust or frogeye leaf spot threaten. A second application may be made from 14 to 21d after the first.
	tebuconazole (3): Folicur, Monsoon, Onset, Orius, Tebuconazole, Tebusha, TebuStar, Tebuzol, Toledo, and Uppercut 3.6F -3 to 4 fl oz	For soybean rust, apply at growth stages R3 to R5 when rust threatens. A second application may be made from 14 to 21d after the first.

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Table 4. Fungicides for control of foliar diseases of soybeans (cont'd)

Disease	Common name (MOA group): Formulation and rate/A	Remarks
Anthracnose Brown spot Frogeye leaf spot Pod and stem blight Cercospora blight Seed quality diseases Soybean rust (cont'd)	tetraconazole (3): Domark 230 ME 1.9E 4 to 5 fl oz	Apply at growth stages R3 to R5 for seed quality protection, or when soybean rust or frogeye leaf spot threaten. A second application may be made from 14 to 21d after the first.
	thiophanate-methyl (1): Topsin or T-Methyl 70W 0.5 to 1.0 lb Thiophanate Methyl or Incognito 85WDG 0.4 to 0.8 lb Topsin, Incognito, or T-Methyl 4.5F 10 to 20 fl oz	Apply at growth stages R3 to R5 for seed quality protection, or when frogeye leaf spot threaten. A second application may be made from 14 to 21d after the first. Not for soybean rust.
	thiophanate-methyl (1) + tebuconazole (3): Topsin XTR 4.3F 16 to 20 fl oz	Apply at growth stages R3 to R5 for seed quality protection, or when soybean rust or frogeye leaf spot threaten. A second application may be made from 14 to 21d after the first.