Commercial Crop Production: Field Crops

Corn

Disease

Symptoms, source of inoculum and management of corn diseases.

Disease	Symptoms	Source of Inoculum	Management
Charcoal Rot (*Macrophomina phaseolina*)	Injury from this disease usually does not become evident until plants approach maturity. Diseased plants exhibit poorly developed ears, premature ripening, lodging and drying of the stalk. Stalks are soft and discolored at the base, and the pith becomes shredded.	This fungus survives in old plant debris or in the soil.	Rotate crops. Bury stubble. Maintain balanced potassium/ nitrogen rates.
Common Rust (*Puccinia sorghi*)	Common rust can be recognized by small oval- to elongated-pustules, which are at first cinnamon-brown and then become brownish-black as the corn matures. The pustules may appear on any aboveground part of the plant but are most abundant on the leaves – scattered over both surfaces.	Spores usually are windblown from the south. An alternate host is the wood sorrel (*Oxalis* sp.).	Most hybrids are tolerant to this disease. Always use the recommended hybrids for your area.
Fusarium Stalk Rot (*Fusarium* spp.)	Leaves of infected plants become grayish-green as plants approach maturity. Softening and discoloration of the exterior of lower internodes occur. When stalks are affected with stalk rot, they split and generally will show a reddish discoloration of the diseased area.	This fungus lives in old stubble or in the soil.	Practice crop rotation. Plow crop residue under. Make sure adequate potassium is applied with high nitrogen rates.
Gray Leaf Spot (*Cercospora zeae-maydis*)	The early lesions produced on the corn leaves by *Cercospora zeae-maydis* are yellow to tan and look similar to those produced by other diseases, except they have a faint watery halo that can be seen when held up to the light. After about two weeks, the lesions appear tan to brown and rectangular shaped, bordered by the veins of the leaf. When fully expanded, individual lesions may be 3 to 4 inches long and 1/16- to 1/8-inch-wide, depending on the distance between veins. If several infections occur near each other on the same leaf, however, a broader lesion will result.	The fungus causing gray leaf spot overwinters in and on corn debris left above and on the soil surface.	Hybrids are available with moderate resistance. Crop rotation and clean plowing are effective in reducing the level of surviving fungus in fields.
Northern Corn Leaf Blight (*Exserohilum tursicum*)	Leaves of infected plants have a few to numerous elongated (up to 1 inch by 6 inches) leaf spots that are tan but reveal black spore growth at maturity.	Carried on the seed and in old plant refuse, spores also are readily windborne	Disease resistance is available. The hybrids should also be ones recommended for your area.

Disease	Symptoms	Source of Inoculum	Management
Smut (*Ustilago maydis*)	All aboveground parts of the plant are susceptible, particularly the young, actively growing embryonic corn tissue. Symptoms are easily recognized. Galls are first covered with a glistening greenish-white to silvery-white membrane. Except for galls on leaves, the interiors of the galls soon darken, with the membrane rupturing to expose millions of greasy to powdery, sooty spores known as chlamydospores or teliospores. Galls on leaves seldom develop beyond pea-size, becoming hard and dry without rupturing. Early infection may kill young plants, but not often.	The teliospores of this fungus overwinter on the soil surface.	Use hybrids recommended for your area. Most have adequate resistance.
Southern Leaf Blight (*Bipolaris maydis = Helminthosporium maydis*)	Leaves of infected plants have numerous elongated spots between the veins. The spots are buff to reddish-brown.	Carried on the seed and in old plant refuse, spores also are readily windborne.	Use only seed produced by normal tasseling (N). The hybrids also should be ones recommended for your area.
Southern Rust (*Puccinia polysora*)	Southern rust is recognized by small circular to oval pustules, which are light cinnamon-brown. The pustules may appear on leaves and sheaths but are most abundant on the leaves.	Spores are windblown from the south. No alternate host is known.	Use hybrids tolerant to this disease. Fungicides might be necessary if southern rust symptoms are expressed prior to soft dough growth stage.

Management of Corn Diseases Using Fungicides

Based on fungicide experimentation over the past five years, it has been determined that fungicides should only be used if corn foliar diseases are present and threaten the ear leaf with diseased areas covering 5% or more.

Fungicide Efficacy for Management of Corn Diseases — January 2020

The Corn Disease Working Group (CDWG), which includes LSU AgCenter pathologists, develops ratings for how well fungicides control major corn diseases in the United States. The ratings are determined by field testing the materials over multiple years and locations. Ratings are based on the product's level of disease control and do not necessarily reflect yield increases obtained from product application. A product's efficacy depends upon proper application timing, rate and application method as determined by the product label and overall disease level in the field at the time of application. Differences in efficacy among each fungicide product were determined by directly comparing products in field tests using a single application of the labeled rate. **The table includes marketed products available that have been tested over multiple years and locations and 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.

Link to publication: https://cropprotectionnetwork.org/publications/fungicide-efficacy-for-control-of-corn-diseases

Recommended fungicides, rates and application timing for corn diseases.

Leaf Blights (primarily *Helminthosporium* and *Excerohilum* spp.)

Product Choices[1]	Product Mode of Action Group[2]	Rate[3]	Time of Application	PHI[4]
Adastrio	3, 7, 11	7-9 fl oz	See label	30
AmTide Propiconazole 41.8% EC	3	2-4 oz	At first appearance	30
Avaris	3, 11	7-14 oz	At first appearance	30
Affiance	3, 11	10-17 fl oz	See label	7
Aproach Prima	3, 7	3.4-6.8	See label	30
Bumper	3	2-4 fl oz	At first appearance	30
Delaro	3, 11	8-12 fl oz	At first appearance	14
Fitness	3	2-4 fl oz	At first appearance	30
Headline AMP	3, 11	10-14.4 fl oz	Prior to disease development	20
Headline SC	11	6-12 fl oz	Prior to disease development	7
Lucento	3, 7	3-5.5 fl oz	At first appearance	10
Orius 3.6F	3	4-6 fl fl oz	Prior to disease development	36
Miravis Neo	3, 7, 11	13.7 fl oz	See label	30
Priaxor SC	7, 11	4-8 fl oz	Prior to disease development	21
PropiMax	3	2-4 fl oz	At first appearance	30
Quadris	11	6.2-9 fl oz	Prior to disease development	7
Quadris S	11	9.2-15.4 fl oz	Prior to disease development	7
Quilt	3, 11	7-14 fl oz	At first appearance	30
Quilt Xcel	3, 11	7-14 fl oz	At first appearance	30
Revytec	3, 7, 11	8-15 fl oz	See label	21
Stratego	3, 11	10-12 fl oz	At first appearance	30
Stratego YLD	3, 11	4-5 fl oz	At first appearance	14
Tebuzol 3.6F	3	4-6 fl oz	Prior to disease development	36
Tilt	3	2-4 fl oz	At first appearance	30
TopGuard EQ	3, 11	5-7 fl oz	At first appearance	7
Veltyma	3, 11	7-10 fl oz	See label	21
Xyway	3	See label	In-furrow at planting	-

[1] Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

[2] Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

[3] Rates are the amount of formulation (product) per acre unless otherwise indicated.

[4] Preharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

Rust (Common only)

Product Choices[1]	Product Mode of Action Group[2]	Rate[3]	Time of Application	PHI[4]
Adastrio	3, 7, 11	7-9 fl oz	See label	30
Quadris	11	6.2-9 fl oz	Prior to disease development	7
Quadris S	11	6.2-9 fl oz	Prior to disease development	7

Rusts (Common and southern)

Product Choices[1]	Product Mode of Action Group[2]	Rate[3]	Time of Application	PHI[4]
Adastrio	3, 7, 11	7-9 fl oz	See label	7
AmTide Propiconazole 41.8% EC	3	2-4 fl oz	At first appearance	30
Avaris	3, 11	10.5-14 fl oz	At first appearance	30
Affiance	3, 11	10-17 fl oz	See label	7
Aproach Prima	3, 11	3.7-6.8	See label	30
Bumper	3	4 fl fl oz	At first appearance	30
Delaro	3, 11	8-12 fl oz	At first appearance	14
Fitness	3	4 fl oz	At first appearance	30
Headline AMP	3,11	10-14.4 fl oz	Prior to disease development	20
Headline SC	11	6-12 fl oz	Prior to disease development	7
Lucento	3, 7	3-5.5 fl oz	At first appearance	10
Miravis Neo	3, 7, 11	13.7 fl oz	See label	30
Orius 3.6F	3	4-6 fl oz	Prior to disease development	36
Priaxor SC	7, 11	4-8 fl oz	At first appearance	21
PropiMax	3	2-4 fl oz	At first appearance	30
Quilt	11, 3	10.5-14 fl oz	At first appearance	30
Quilt Xcel	11, 3	10.5-14 fl oz	At first appearance	30
Revytek	3, 7, 11	8-15 fl oz	See label	21
Stratego	11,3	10-12 fl oz	At first appearance	30
Stratego YLD	11, 3	4-5 fl oz	At first appearance	14
Tebuzol 3.6F	3	4-6 fl oz	Prior to disease development	36
Tilt	3	4 fl oz	At first appearance	30
TopGuard EQ	3, 11	5-7 fl oz	At first appearance	7
Veltyma	3, 11	7-10 fl oz	See label	21

[1] Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

[2] Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

[3] Rates are the amount of formulation (product) per acre unless otherwise indicated.

[4] Preharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

The corn section was revised October 2023 by Boyd Padgett.

Cotton

Disease

Symptoms, source of inoculum and management of cotton diseases.

Disease	Symptoms	Source of Inoculum	Management
Bacterial Blight (*Xanthomonas citri* pv. *malvacearum*)	On seedlings lesions appear as small, water-soaked irregular spots eventually turning brown; hypocotyls will appear black with elongated lesions girdling the stem and causing death. Foliar symptoms on older plants consist of angular lesions that initially appear water-soaked and later turn brown to blackish purple, occasionally following main leaf veins and rarely with yellow halos. Petioles and stems may appear blackened, and significant defoliation may occur. The bacterium may cause boll blight, which begins with round, water-soaked lesions eventually turning brown to black and allowing entry of secondary organisms that cause rot.	The primary source of inoculum is seed, and the secondary source is cotton debris.	Use acid-delinted seed. Destroy cotton debris, rotate to another crop, and/or use resistant varieties. The pathogen may be moved from field-to-field by equipment or insects. Overhead irrigation or excessive rainfall along with windy conditions may exacerbate disease. Infected bolls will have infected seed, which serves as primary inoculum.
Boll Rots (many fungi and bacteria)	There are a wide range of symptoms since there are many organisms involved and many stages of boll development when damage may occur. Discolored, sunken areas may develop on the boll surface. Seed and fiber may be damaged without surface lesions on the boll. Fiber may be stained.	Organisms causing boll rots may be carried over in the soil, on crop debris, or on the seed coat.	Avoid rank growth and control insects during boll development. Plant-growth regulators may be helpful in reducing rank growth and, in turn, boll rot incidence.
Fusarium Wilt (*Fusarium* spp.)	Plants usually are stunted and may fruit early. Leaves may turn yellow, wilt, and drop. Brown to dark-brown discoloration occurs on woody tissue just beneath the bark. Disease is more severe on sandy soils during hot weather when root-knot or reniform nematodes are present. (See root-knot nematode section.)	The pathogen lives indefinitely in soil along with nematodes.	Use tolerant varieties. Most recommended varieties exhibit tolerance to Fusarium wilt. Under more severe conditions, use recommended nematicides.
Leaf Spot Complex (*Alternaria* spp., *Cercospora gossypina*, *Stemphylium* spp., *Ascochyta* spp., and other fungi)	Brown to red to tan circular lesions on leaves that may occur at any stage. Lesions may be up to ¾ inch, and margins usually appear reddish to purple. As the diseases progress, centers of lesions may appear sooty due to sporulation of the pathogens and eventually fall away resulting in a “shothole” appearance of foliage. In cases of heavy infestation, lesions may overlap and cause premature defoliation resulting in decreased lint yields.	Fungi overwinter in previous crop/weed debris.	Plow under infected plant debris. Plant high-quality, acid-delinted, fungicide-treated seed. Avoid nutrient stresses (particularly Potassium), drought stress, other pest damage, and/or herbicide injury. Foliar fungicides may reduce incidence and severity, but economic benefit is very unlikely.
Reniform Nematodes (*Rotylenchulus reniformis*)	These nematodes cause severe stunting, reduced boll set, and tight, locked bolls. Root systems are restricted but not knotted. May be found in mixed to heavy soil.	Reniform nematodes live from year to year in the soil.	Apply nematicides. Refer to Nematode Management Field Crops section. There are very few resistant varieties. Rotate to a non-host crop.

Disease	Symptoms	Source of Inoculum	Management
Root Knot Nematodes (*Meloidogyne incognita*)	Root systems are knotted or galled. Plants are stunted, slow growing, and low yielding. Usually associated with a high incidence of Fusarium wilt. Damage from RKN is most severe on sandy soils. (See Fusarium wilt above.)	Root-knot nematodes live from year to year in the soil as eggs, juveniles, or adults.	Use resistant varieties. Apply nematicides. Refer to table on nematode control in field crops. Rotate to a resistant or non-host crop.
Seedling Diseases (*Rhizoctonia* spp., *Pythium* spp., *Fusarium* spp., and many other fungi)	Loss before emergence is characterized by rotting of the seed or seedling. After emergence, affected seedlings have dark lesions on the stem, often girdling and extending downward into the root system. Older plants have reddish-brown, sunken lesions near the soil line.	Some of the organisms causing seed rot and seedling diseases may be carried on the seed coat, while others persist in the soil.	Use only high-quality seed. Plant seed only when soil temperatures at a 4-inch depth reach 68° F for three to four days. Plant fungicide-treated seed to a weed-free seedbed at proper depth for soil type and weather conditions along with adequate drainage.
Target Spot (*Corynespora cassiicola*)	Brown to tan circular lesions on leaves usually beginning low after canopy closure. Lesions usually will not have reddish to purple margins when found low in the canopy and will have a “bullseye” appearance. Target spot lesions are usually larger than other leaf spot lesions. The disease progresses from low in the canopy upward, and severe defoliation may occur in a relatively short period of time, particularly during warm, rainy periods. During severe epidemics, target spot lesions in the upper canopy are smaller, do not have a target-like pattern, and may be confused with the cotton leaf spot complex.	The pathogen overwinters in crop debris.	Destroy debris. Some varieties may tolerate target spot better than others. Avoid excessive nitrogen and rank plant growth (apply PGRs as necessary). Scout closely prior to and after canopy closure. Scout nearby soybeans for target spot. Foliar fungicides may lower disease incidence and in severe cases preserve yield. Fungicide coverage is key, and applications should be made by ground with a minimum total volume of 15 gal/A with high pressure using hollow cone or flat fan nozzles. Refer to Table 1.
Verticillium Wilt (*Verticillium* spp.)	Leaf margins and between veins have pale yellow markings. Severely affected plants shed the young bolls. Light brown discoloration occurs in the interior woody tissue of the stem with little to no discoloration just beneath the bark. Disease occurs in cool weather with or without nematodes.	The pathogen lives indefinitely in the soil.	Rotate with soybeans, sorghum, or small grains.

Foliar fungicides labeled for use in Louisiana cotton.

Fungicide[1]	Mode of Action Group[2]	Use Rate (fl oz/A)	Target Disease(s)/Pathogen(s)[3]
Amistar Top (Syngenta)	11+3	8-11.6	Alternaria leaf spot (*Alternaria* spp.), Anthracnose (*Glomerella gossypii*), Areolate mildew (*Ramularia gossypii*), Ascochyta blight (*A. gossypii*), boll rots (*Ascochyta gossypii*, *Alternaria* spp., *Diplodia* spp., *Phoma* spp.), cotton rust (*Puccinia schedonnardi*), Diplodia boll rot (*Diplodia* spp.), hard lock (*Fusarium verticillioides*), leafspots and blights (*Alternaria* spp., *Ascochyta gossypii*, *Cercospora* spp., *Stemphylium* spp.), Southwestern cotton rust (*Puccina cacabata*, *Puccinia* spp.) Stemphylium leaf spot (*Stemphylium* spp.), target spot (*Corynespora cassiicola*)
Aproach	11	6-12	Stemphylium leaf spot (*Stemphylium* spp.)
Delaro (Bayer)	11+3	8-12	Target spot (*Corynespora cassiicola*), rust (*Puccinia* spp.)
Elatus (Syngenta)	11+7	5-7.3	Ascochyta blight (*A. gossypii*), Target spot (*Corynespora cassiicola*)
Headline (BASF)	11	6-12	Alternaria leaf spot/boll rot (*Alternaria* spp.), Anthracnose/boll rot (*Glomerella* spp.), Ascochyta blight/boll rot (*Ascochyta* spp.), Cercospora blight and leaf spot (*Cercospora* spp.), Diplodia boll rot (*Diplodia* spp.), Hard lock/boll rot (*Fusarium* spp.), Phoma blight, boll rot (*Phoma* spp.), Stemphylium leaf spot (*Stemphylium* spp.)
Miravis Top (Syngenta)	7+3	13.7	Alternaria leaf spot (*Alternaria* spp.), Areolate mildew (*Ramularia gossypii*), Ascochyta blight (*A. gossypii*), boll rots (*Ascochyta gossypii*, *Alternaria* spp., *Diplodia* spp., *Phoma* spp.), hard lock (*Fusarium verticillioides*), leafspots and blights (*Alternaria* spp., *Ascochyta gossypii*, *Cercospora* spp., *Stemphylium* spp.), target spot (*Corynespora cassiicola*)
Priaxor (BASF)	7+11	4-8	Same as above plus Target spot/Corynespora leaf spot (*Corynespora cassiicola*)
Proline (Bayer)	3	5-5.7	Target spot (*Corynespora cassiicola*)
Quadris (Syngenta)4	11	6-9	Same as Amistar Top.
Revytek (BASF)	3+7+11	8-15	Same as Priaxor plus Rust (*Phakopsora* and *Puccinia* spp.)
Topguard (FMC)	3	7-14	Alternaria leaf spot/boll rot (*Alternaria* spp.), anthracnose/boll rot (*Glomerella* spp.), Areolate mildew (*Ramularia gossypii*), Ascochyta blight/boll rot (*Ascochyta gossypii*), Cercospora blight and leaf spot (*Cercospora* spp.), Diplodia boll rot (*Diplopia* spp.), Fusarium boll rot (*Fusarium* spp.), hard lock (*Fusarium verticillioides*), Phoma blight/boll rot (*Phoma* spp.), Stemphylium leaf spot (*Stemphylium* spp.), target spot (*Corynespora cassiicola*)
Topguard EQ (FMC)	11+3	5-7	Same as Topguard.
Twinline (BASF)	3+11	7-8.5 (10-12 for Target spot)	Same as Priaxor.
Vertisan (Corteva)	7	16-24	Boll rot (*Diplodia* spp., *Fusarium* spp.), Foliar disease complex, Alternaria leaf and stem spots (*Alternaria* spp.), Cercospora leaf spot (*Cercospora* spp.), Stemphylium leaf spot (*Stemphylium* spp.), Hard lock (*Fusarium* spp.), Soil-borne diseases, Seedling and root rot (*Rhizoctonia solani*)

[1] Reference to commercial or trade names is made with the understanding that no discrimination or endorsement of a particular product is implied by LSU or the LSU AgCenter. Multiple biofungicides, generic tebuconazoles, and other triazoles exist on the market and are not included because these products have not been tested in Louisiana cotton. This list is not all-inclusive; generic pre-mixes that are labeled for use in cotton may be available locally.

[2] Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

[3] Consult product label for disease pressure or additional target pathogens.

[4] Multiple generics are available with the same active ingredient.

The cotton section was revised September 2023 by Trey Price.

Grain Sorghum

Disease

Symptoms, source of inoculum and management of grain sorghum diseases.

Disease	Symptoms	Management
Anthracnose (*Colletotrichum graminicola*)	Infection first appears on the leaves as small tan to reddish-purple circular spots, which later enlarge and may unite to involve large areas of the leaf. Later, the centers of the leaf spots fade to grayish-tan. Infection on the leaf midrib is strikingly discolored. The leaf anthracnose organism also causes a stalk rot. The stalk rot phase of this disease usually follows the anthracnose stage on the leaves. The fungus enters the stalk directly through the rind or a wound in the rind and spreads to the interior of the plant. The lesions that form on the outside of diseased stalks usually have reddish to purplish margins and whitish centers. When infected stalks are split, the pith is red or purplish-red. Diseased stalks frequently break over at the base or at a node low to the ground. Poor head and seed development results from severe infections.	Plant fungicide-treated seed. Practice at least a three-year rotation with other crops such as wheat, oats, barley, cotton and soybeans. Turn under old crop stubble after harvest. Fungicides are available (see following table).
Charcoal Rot (*Macrophomina phaseolina*)	Injury from this disease usually does not become evident until the plant approaches maturity. Affected plants show poorly developed heads, light kernels, premature ripening, drying of the stalk and lodging. Diseased stalks are soft and discolored at the base, and the pith becomes shredded.	Irrigate where possible.
Downy Mildew (*Sclerospora* sp.)	Systemically diseased seedlings are yellowed, stunted and frequently have a white downy growth on the underside of the yellowed leaves. Later, the plants have green-and-white-striped or mottled leaves. These plants may fail to head, produce sterile heads or form partially affected heads. Diseased plants usually are found in poorly drained areas.	Follow cultural practices outlined for anthracnose.
Head Blight (*Fusarium moniliforme*, *Curvularia* sp., *Cladosporium* sp.)	Head blight is caused by several fungal organisms that infect plants from flowering to maturity, depending on high moisture conditions. (Fusarium head blight, the most destructive of sorghum head blights, occurs most commonly along the Gulf Coast production areas). The fungus is capable of infecting sorghum heads at and soon after blooming. Panicles and rachis branches are infected first, followed by infection of stalk tissue at and immediately below the head. Weak neck and stalk lodging may follow.	
Gray Leaf Spot (*Cercospora sorghi*)	Small circular-to-elliptical dark purple or red spots appear on leaf surface. Later, leaf center becomes tan or brown, and spots elongate with gray spore masses covering the spots. Other hosts include corn, johnsongrass and cultivated grasses.	Most varieties have adequate tolerance to this disease.
Zonate Leaf Spot (*Gloeocercospora sorghi*)	On the leaves, circular, reddish-purple bands alternate with tan or straw-colored areas that give a concentric or zonate pattern with irregular borders. Spots may occur along the margins of leaves or on other plant parts.	Recommended varieties have some tolerance to the disease. Crop rotation and clean cultivation help.

Recommended fungicides, rates and application timing for Anthracnose (*Colletotrichum graminicola*) disease of grain sorghum.

Product Choices[1]	Product Mode of Action Group[2]	Rate[3]	Time of Application	PHI[4]
Adastrio	3,7,11	7-9 fl oz	See label	30
Aframe	11	6-15.5 fl oz	Prior to disease development	14
Aproach	11	12 fl oz	Prior to flowering	–[6]
Evito 480 SC	11	2-4 fl oz	Prior to disease development	21
Headline	11	6-12 fl oz	Apply no later than 25% flowering	–[5]
Headline SC	11	6-12 fl oz	Apply no later than 25% flowering	–[5]
Nexicor	3,7,11	7-13 fl oz	Prior to disease development	21
Priaxor	7,11	4-8 fl oz	Prior to disease development	21
Quadris	11	6-15.5 fl oz	Prior to disease development	14
Quilt	11,3	14 fl oz	Prior to disease development	21
Quilt Xcel	11,3	10.5-14 fl oz	At first appearance of disease	21
Topguard	3	7-14 fl oz	Prior to disease development	7
Topguard EQ	3,11	5-7 fl oz	Prior to disease development	30

[1] Reference to commercial or trade names is made with the understanding that no discrimination or endorsement of a particular product is implied by LSU or the LSU AgCenter.

[2] Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

[3] Rates are the amount of formulation (product) per acre unless otherwise indicated.

[4] Preharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

[5] Must be applied prior to 25% flowering.

[6] Must be applied prior to flowering.

The grain sorghum section was revised October 2023 by Boyd Padgett.

Oats

Disease

Symptoms, source of inoculum and management of oat diseases.

Disease	Symptoms	Source of Inoculum	Management
Crown Rust (*Puccinia coronata*)	Small, scattered, oval or oblong, orange-yellow pustules develop principally on the leaves. Similar pustules may occur on the leaf sheaths, stems (culms) and panicles. The pustules soon break open to release a dusty mass of golden spores.	The source of spores that cause the primary infection during the fall in Louisiana is not known. Disease spreads by windborne spores.	Plant recommended varieties that have resistance to the prevalent races of the rust ungus.
Stem Rust (*Puccinia graminis avenae*)	Elongated, reddish-brown pustules occur on the stem, leaf sheaths, leaf blades and glumes. Pustules rupture the epidermis to expose a powdery, reddish-brown mass of spores. Fragments of epidermis adhere to sides and ends of pustules to give them a ragged appearance.	The source of spores that cause the primary infection is not known. Stem rush has an alternate host, European or common barberry (*Berberis vulgaris*).	Plant recommended varieties that have resistance to the prevalent races of the rust fungus.
Yellow Dwarf (Barley Yellow Dwarf virus)	The most typical symptom is leaf discoloration. Affected oat plants may have leaves that are dull yellow to brilliant red. The red leaf color is not always present, however. Plants infected late in the season may be stunted and have reduced yields.	The virus may live in perennial grasses. Aphids spread the virus.	No practical control measure is available.
Leaf Blotch (*Drechslera avenacea* = *Helminthosporium avenaceum*)	This fungus can cause seedling disease. On older plants the disease appears as reddish-brown, round to oval spots, primarily on leaves and leaf sheaths but sometimes on stems and floret parts. Spots have irregular margins and frequently have sunken centers. Long linear blotches result from merging of spots. Severely infected leaves turn yellow and die.	The fungus can live on seed and plant debris.	Rotate oat crops on different fields.

The oats section was revised October 2023 by Boyd Padgett.

Peanuts

Integrated Peanut Disease Management

An effective disease management program incorporates a number of strategies including genetic resistance, seedbed preparation, field drainage, weed/insect management and judicious use of fungicides.

Variety Selection: Successful disease management begins by selecting agronomically acceptable varieties containing effective genetic resistance to plant pathogens. The LSU AgCenter does not have a variety testing program for peanuts, but information on variety performance and management from the University of Georgia can be found at:

https://extension.uga.edu/publications/detail.html?number=B1146

Seedbed Preparation and Planting: Prior to planting, burying plant debris from the previous crop or cover crops can reduce initial inoculum of some soilborne pathogens (*Rhizoctonia solani*, *Pythium* spp. and *Phytophthora* spp.). After seedbed preparation is completed, plant when environmental conditions favor rapid seed germination and seedling establishment. The 4-inch soil temperature should be at least 68 F to 70 F for three consecutive days.

Field Drainage: Avoid planting in poorly drained fields. Waterlogging can result in reduced plant vigor and increased risk to some soilborne pathogens. Ensure fields do not support standing water by strategically cutting water furrows in the field immediately after planting.

Plant Health/Pest Management: After the crop has emerged, maintain plant health to minimize the risk to plant pathogens. This is accomplished in part through effective weed and insect pest management and proper nutrient management.

Table 1: Recommended pesticides, rates and pesticide use restrictions for Late Leaf Spot (*Nothopassalora personata*) and Early Leaf Spot (*Passalora arachidicola*) in peanuts.

Product Choices[1]	Product Mode of Action Group[2]	Rate[3]	PHI[4]	Maximum Use
Bravo Weather Stik[5]	M5	1-1.5 lb	14	12 pt
Bravo Ultrex[5]	M5	0.9-1.4	14	10.9 lb
Chloronil 720[5]	M5	1-1.5 lb	14	12 pt
Chlorothalonil 720SC[5]	M5	1-1.5 lb	14	12 pt
Echo 720 (**Late leaf spot**)[5]	M5	1.5 pt	14	9 lb a.i.
Echo 720 (**Early leaf spot**)[5]	M5	1-1.5 pt	14	9 lb a.i.
Echo 90DF (**Late leaf spot**)[5]	M5	1.25 lb	14	9 lb a.i.
Echo 90DF (**Early leaf spot**)[5]	M5	0.875-1.25 lb	14	9 lb a.i.
Equus 720 SST[5]	M5	1-1.5 pt	14	12 pt
Equus DF[5]	M5	0.9-1.36	14	10.9 lb
Artisan	3, 7	Refer to label	40	84 fl oz
Absolute 500SC[5]	3, 11	3.5 fl oz	14	4 app
Aproach Prima	3, 11	5-6.8 fl oz	30	13.6 fl oz
Elatus	7, 11	7.3-9.5 oz	30	21.9 oz
Evito T[5,6]	3, 11	6-9 fl oz	14	44.8 fl oz
Headline[5]	11	6-15 fl oz	14	45 fl oz
T-Methyl 70WSB	1	0.5 lb	14	1.4 lb
Topsin M 70 WP	1	0.5 lb	14	2 lb
Topsin M 4.5FL	1	10 fl oz	14	40 fl oz
Lucento[5]	3, 7	3-5.5 fl oz	14	11 fl oz
Fontelis	7	16-24 fl oz	14	72 fl oz
Priaxor[5]	7, 11	4-8 fl oz	14	24 fl oz
Quash[5]	3	2.5 oz	14	4 app
Revytek[5]	3, 7, 11	8-15 fl oz	14	45 fl oz

Table 2: Recommended pesticides, rates and pesticide use restrictions for Stem Rot (*Sclerotium* sp.) and Limb Rot (*Rhizoctonia* sp.) in peanuts.

Product Choices[1]	Product Mode of Action Group[2]	Rate[3]	PHI[4]	Maximum Use
Absolute 500SC[5]	3, 11	Refer to label	14	14.0 fl oz
Elatus	7, 11	7.3-9.5 oz	30	21.9 oz
Lucento[5]	3, 7	3-5.5 fl oz	14	11 fl oz
Folicur 3.6F[5, 7]	3	7.2 fl oz	14	28.8 fl oz
Monsoon[5, 7]	3	7.2 fl oz	14	28.8 fl oz
Orius 3.6F[5, 7]	3	7.2 fl oz	14	28.8 fl oz
Tebustar3.6F[5,7]	3	7.2 fl oz	14	28.8 fl oz
Muscle 3.6F[5, 7]	3	7.2 fl oz	14	28.8 fl oz
Tebuzol 3.6F[5,7]	3	7.2 fl oz	14	28.8 fl oz
Convoy[8]	7	Refer to label	40	64 fl oz
Headline[5]	11	6-15 fl oz	14	45 fl oz
Quash[5]	3	2.5-4 oz	14	4 app
Abound	11	12-24.5 oz	14	49 fl oz
Fontelis	7	13-21 fl oz	14	72 fl oz
Artisan	3, 7	Refer to label	40	84 fl oz
Priaxor[5]	7, 11	8 fl oz	14	24 fl oz
Revytek[5]	3, 7, 11	15 fl oz	14	45 fl oz

[1] Reference to commercial or trade names is made with the understanding that no discrimination is intended nor is endorsement of a particular product by LSU or the LSU AgCenter implied.

[2] Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

[3] Rates are the amount of formulation per acre unless otherwise indicated. Check label for recommended application volume of spray solution per acre.

[4] Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

[5] Do not allow livestock to graze treated areas. Do not feed hay or threshings from treated fields to livestock.

[6] Supplemental label.

[7] Use a four-application spray program (four consecutive applications at 14-day intervals). Consult label for timing of applications.

[8] Application timings differ for stem rot and limb rot. Consult label for timing of applications.

The peanut section was revised October 2023 by Boyd Padgett.

Rice

Rice Diseases

Best results in disease management are achieved when an integrated pest management (IPM) strategy is used. The combination of host resistance, cultural practices and reasonable use of fungicides offers better disease control than these methods applied isolated. Overall, varieties with some levels of disease resistance are available for most of the relevant rice diseases, and their use is encouraged. Unbalanced mineral fertilization and late planting are frequently associated with severe disease epidemics for most diseases. Because the list of labeled fungicides may change, check with your cooperative extension agent for current recommendations. Fungicide timing is critical for disease control (Table 1 and Figure 1).

- **Bacterial Panicle Blight (BPB):**
  Bacterial panicle blight, caused by the bacterias *Burkholderia glumae* and *B. gladioli*, is one of the most important rice diseases in the South. The disease is associated with warm temperatures (day and night) and moisture. Losses include reduced yields and poor milling. The bacteria are seed-borne, survive in the soil and live on the surface of the leaves and leaf sheaths following the canopy up.

  The bacteria infect the grain at flowering and cause grain abortion and rotting during grain filling. The disease is first detected as a light- to medium-brown discoloration of the hulls' lower third to half shortly after emergence. The stem below the infected grain remains green. Pollination occurs, but the grain aborts sometime after grain filling begins. Rain splash can disperse the bacteria on the plant surface to other plants, developing a circular pattern in the field with the most severely affected panicles in the center remaining upright because of grains not filling.

  No chemical control measures are recommended. Fungicide application will not control or prevent BPB. Some varieties have more resistance than others. Rice planted later in the season and fertilized with high nitrogen rates tends to have more disease.

- **Blast:**
  Blast is caused by the fungus *Pyricularia grisea*. The leaf blast phase occurs between the seedling and late tillering stages. Leaf spots begin as small white-, gray- or blue-tinged spots and then enlarge quickly under moist conditions to either oval diamond-shaped spots or linear lesions with pointed ends with gray or white centers and narrow brown borders. Leaves and whole plants are often killed under severe conditions. Rotten-neck symptoms appear at the base of the panicle, starting at the node soon after heading. The tissue turns brown to chocolate-brown and shrivels, causing the stem to snap and lodge. Panicle branches and stems of florets also have gray-brown lesions.

  Varieties with good resistance are available, although new races can develop fast and overcome genetic resistance. Scouting for blast should begin early in the season, and the flood must be maintained. Areas of heavy nitrogen fertilization and edges of the fields are also potential sites. If leaf blast is in the field or has been reported in the same general area and if the variety is susceptible, fungicide applications are advisable to reduce rotten-neck blast. The absence of leaf blast does not mean rotten-neck blast will not occur. Fungicide timing is critical (Table 1 and Figure 1). If a single fungicide application is used to control blast, it should be applied when 50% to 70% of the heads have begun to emerge. Application before or after this growth stage will not control this disease well. This growth stage is very difficult to detect, so it is important to scout for the crop growth stage at the same time as scouting for disease. Allow time to obtain a fungicide, schedule the application, and consider the chances of poor weather conditions. Under heavy blast pressure and conducive weather conditions, two applications, one at boot and one at 50% to 70% heading, may be needed to suppress blast effectively.

- **Cercospora:**
  This disease is caused by the fungus *Cercospora janseana*, and symptoms can develop on the leaf, sheath, panicle and grains. Similarly to blast, different names are used for this disease depending on the infected site. When symptoms occur in the leaf, the disease is referred to as **narrow brown leaf spot (NBLS)**, with linear and reddish-brown lesions along the leaf blade as the classic symptoms of NBLS. Some variation of the disease symptoms can be observed depending on the cultivar's resistance, with more susceptible varieties having wider, more numerous, and lighter brown with gray necrotic centers. Spots usually appear near or after heading growth stage, but both young and old leaves are susceptible. When symptoms develop on the sheath, the disease is called **Cercospora net-blotch (CNB)** due to the brown cell walls and the tan-to-yellow intracellular areas forming a netlike pattern. When infection occurs in the panicle, it can be referred to as **Cercospora panicle blight (CPB)**, where branches of the seed heads can become infected, causing premature ripening and unfilled grains. Symptoms of CPB can be confused with blast rotten-neck and panicle blast lesions, but CPB symptoms usually are darker brown and develop in the internodal area of the neck. Glumes can also be infected, causing significant discoloration and necrosis, and grain infected appears as a diffused brown discoloration. The distinction between NBLS, CNB, and CPB is important because some varieties can have some genetic resistance to NBLS, such as those with CRPS2.1 gene, but not CNB and CPB.

  The disease's intensity is intermittent between years but is often severe on late planting fields and in the second crop. Warm, rain, and conditions that prolong leaf moisture favor the disease infection and development. However, it can

take up to 30 days from the infection to the development of visible symptoms. The best fungicide timing for NBLS is between early boot to heading growth stages (Table 1 and Figure 1). However, the later the rice is planted, the earlier the fungicide must be applied. Triazoles fungicides, such as propiconazole and difeconazole, provide the best efficacy.

- **False Smut:**
  The false smut fungus, *Ustilaginoidea virens*, infects rice at flowering. The disease is characterized by large orange to olive-green spore masses that replace one or more grains on the panicle. In the middle of the spore masses are sclerotia that act as the survival structure. These sclerotia can be spread with the seed and infect the next crop. Removal of the sclerotia in seed cleaning reduces spread. A fungicide seed treatment also reduces inoculum potential. False smut spores cause discoloration of milled rice, but no significant yield loss is associated with the disease. The presence of the smut sclerotia in grain for export has caused problems. Some foliar fungicides applied at boot can reduce disease incidence. Research results indicate the 2- to 4-inch panicle in the boot applications of demethylation inhibitors (propiconazole and difenoconazole) reduce damage significantly. Applications after boot split have little, if any, activity.
- **Grain and Head Disorders:**
  Many fungi and bacteria infect developing grain and cause spots and discoloration on the hulls or kernels. Damage by the rice stink bug also causes discoloration of the kernel. Kernels discolored by fungal infections or insect damage are commonly called pecky rice. This complex disorder in rice involves many fungi, the white-tip nematode, and insect damage. High winds at the early heading stage may cause similar symptoms. Proper insect control and disease management will reduce this problem.
- **Kernel Smut:**
  Kernel smut symptoms appear just before maturity. A black mass of smut spores replaces all or some of the seed's endosperm. Often, the spores ooze out of the grain, leaving a black mass along the seam of the hulls. The fungus, *Tilletia barclayana*, overwinters as spores in the soil of affected fields and seeds. Significant yield reductions are possible, but usually, the damage is limited to grain quality. High nitrogen rates favor disease development. Research results indicate that boot applications of demethylation inhibitors (propiconazole and difenoconazole) reduce damage significantly. Applications after boot split have little, if any, activity.
- **Sheath Blight:**
  Sheath blight is one of the most important diseases in rice in Louisiana. It is characterized by large oval spots on the leaf sheaths and irregular spots on the leaf blades. Infections usually begin during the late tillering/joint-elongation stages of growth. The fungus, *Rhizoctonia solani* AG-1, survives between crops as structures called sclerotia or as hyphae in plant debris.

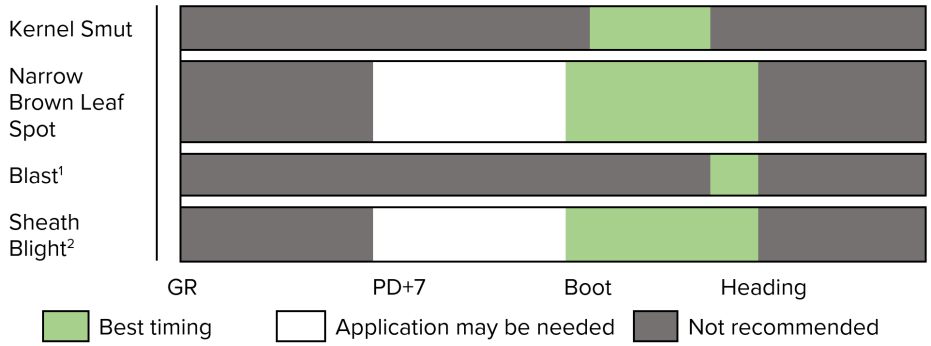
  Sclerotia on plant debris floating on the surface of irrigation water serve as sources of inoculum that attack and infect lower sheaths of rice plants at the waterline. Fungal mycelium grows up the leaf sheath, forms infection structures, infects and causes new lesions. The infection can spread to leaf blades. After the panicle emerges from the boot, the disease progresses rapidly to the flag leaf on susceptible varieties. With very susceptible varieties, the fungus will spread into the culm from early sheath infections, weakening them and causing tillers to lodge.

  As lesions coalesce on the sheath, the blades turn yellow-orange and eventually die. Damage is usually most common where wind-blown, floating debris accumulates. Disease severity can be reduced by integrating several management practices. Dense stands and excessive use of nitrogen fertilizer both tend to increase sheath blight damage. The same pathogen also causes aerial blight on soybeans. Therefore, rotation with soybeans or continuous rice increases the amount of inoculum in soils and should be avoided when possible. Fungicides are available for managing sheath blight. Avoid late application beyond 50% to 70% heading (Table 1 and Figure 1). In some areas of south Louisiana, the fungus has developed resistance to the strobilurin fungicides (e.g., azoxystrobin), and the use of other modes of action, such as carboxamides (e.g., flutolanil), is recommended where fungicide resistance was detected.
- **Sheath Rot:**
  Sheath rot is caused by the fungus *Sarocladium oryzae*. Symptoms are most severe on the uppermost leaf sheaths that enclose the young panicle during the boot stage. Lesions are oblong or irregular oval spots with gray or light brown centers and a dark reddish-brown diffuse margin. Early or severe infections may affect the panicle so that it only partially emerges. The non-emerged portion of the panicle rots with florets turning reddish-brown to dark brown. A powdery white growth consisting of spores and hyphae of the pathogen is usually observed on the inside of affected leaves. Insect or mite damage to the boot or leaf sheaths increases the damage from this disease. Emerged panicles may be damaged with florets discolored reddish-brown to dark brown and unfilled. Some varietal resistance is available. The disease is usually minor, affecting scattered tillers in a field and plants along levees. Occasionally, large areas may have significant damage. No control measures are currently recommended.
- **Stem Rot:**
  The fungus *Sclerotium oryzae* causes stem rot. Losses are not usually detected until late in the season when control practices are ineffective. Damage appears as severe lodging, which makes harvesting difficult. Seed sterility also has been reported. No high level of resistance to stem rot is available. High nitrogen and low potassium levels favor the disease. Stem rot is more serious in fields that have been in continuous rice for several years. The pathogen overwinters as sclerotia in the top 2 to 4 inches of soil and in plant debris. During early floods, sclerotia float to the surface, contact plants, germinate and infect the tissues near the water surface.

The first symptom is a black angular lesion on leaf sheaths near the waterline at tillering or later growth stages. As lesions develop, the outer sheath may die as the fungus penetrates the inner sheaths and the culm. These become discolored and have black or dark brown lesions. At maturity, the softened culm breaks, plants lodge, and numerous small, round, black sclerotia develop in the dead tissues. The fungus can continue to develop in the stubble after harvest, and numerous sclerotia are produced. Control measures include burning or cultivating stubble after harvest to destroy sclerotia, using crop rotation when possible, applying potassium fertilizer, and avoiding excessive nitrogen rates. Fungicide applications used against other fungal diseases may reduce stem rot damage.

- **Straighthead:**
  This physiological disorder is associated with sandy soils, fields with arsenic residues, or fields having anaerobic decomposition of large amounts of organic matter incorporated into the soil before flooding. Panicles are unfilled and upright at maturity or do not emerge from the flag leaf sheath. Hulls may be distorted and discolored, with portions missing or reduced in size. Distorted florets with a hook on the end are called “parrot beak” and are typical of straighthead. Plants are darker green or blue-green and often produce new shoots and adventitious roots from the lower nodes. These symptoms can be confused with herbicide damage. Management is accomplished by using resistant varieties and draining the field approximately ten days before internode elongation (green ring), allowing the soil to dry until it cracks. This growth stage can be determined by slicing the crown of the plant lengthwise and counting the nodes. When three nodes are distinctly visible, internode elongation is approximately ten days away. It is important that the flood be established again by internode elongation.

Figure 1: Rice Fungicide Timing



[1] Susceptible varieties under high disease pressure may require an application at the boot stage followed by 50-70% heading.

[2] An early application may be necessary if a sheath blight appears before the boot stage.

Rice Disease Management

The yield potential of any rice variety can be severely reduced under high disease levels. Management strategies with integrated pest management have a higher chance of successfully maintaining the disease below economic damage levels. It is important to have a comprehensive understanding of the field’s history and variety’s disease resistance package to plan the disease management strategy. Avoid scenarios that can increase the risk for multiple diseases. For example, late planting with a susceptible variety for sheath blight and blast in a field with historical problems for sheath blight may require multiple fungicide applications with uncertain control efficacy or investment return. For overall disease management, consider the following:

- Field disease’s historic from pathogens that can survive in the soil (e.g., kernel smut). Also, consider crop rotation that can host rice pathogens, such as soybean aerial blight and rice sheath blight.
- Choose varieties with some level of genetic resistance.
- Avoid late planting as rice is more likely to encounter foliar disease problems.
- Maintain proper fertility levels.
- Maintain adequate irrigation flood, especially for varieties susceptible to blast.
- Use fungicides at the correct growth stage when necessary.
- Consider the yield potential, cost application, and overall disease intensity and risk for fungicide application.
- Rice cultivated for seed production purposes should have the minimum disease risk tolerance.
- If a ratoon crop is planned, disease not suppressed in the first crop may cause significant damage in the second crop.
- Plan to scout the fields frequently to assess the disease intensity, especially if the weather is conducive to disease development.

Rice disease control using a single fungicide application can be difficult because of fungicide resistance and multiple diseases requiring different timings for effective control. Rice producers are encouraged to use full labeled rates, rotate modes of action when possible, and use multiple fungicide applications when justified to effectively and economically manage rice diseases.

Fungicide timing is critical for disease control (Table 1 and Figure 1). Some growth stages are difficult to detect, and plant development may be uneven in the field, so scouting for disease and growth stages should be done frequently and throughout the entire field. Also, consider the logistics for fungicide application. Allow time to obtain a fungicide, schedule the application, and the chances for poor weather conditions that can prevent the application at the correct time.

Table 1: Rice variety reactions to common diseases in Louisiana.

Table Legend

Rating	Abbreviation
Very Susceptible	VS
Susceptible	S
Moderately Susceptible	MS
Moderately Resistant	MR
Resistant	R
Unknown	-

Varieties labeled "S" or "VS" for a given disease may be severely damaged under conditions favoring disease or disorder development.

Variety	Blast	Sheath Blight	Narrow Brown Leaf Spot	Bacterial Panicle Blight	Straighthead
Addi Jo	R[1]	S	MR	MR	MR
Aroma22	S	MS	MR	MS	MS
Avant	S	S	MR	S	MR
Cheniere	MS	S	S	MS	MS
CL111	R[1]	VS	S	VS	MS
CL151	VS	S	S	VS	VS
CL153	R[1]	S	MS	MS	MS
CLJ01	MS	MS	MS	S	MS
CLL16	R[1]	S	MR	S	MR
CLL18	MS	MS	MR	-	MR
CLL19	R[1]	S	MS	S	S
CLM04	MS	MS	MR	MR	S
Della-2	MS	S	MS	MS	R
DG-263L	MR	S	R	MS	MR
Frontiere	-	S	S	-	S
Jazzman	MR	MS	S	S	MS
Jupiter	S	MS	S	MR	S
Mermentau	S	S	S	S	S
PVL03	R[1]	S	MS	MR	MR
PVL04	–[1]	S	MR	-	S
RT7301[2]	MR	MS	MR	MS	R
RT7302[2]	-	MR	MR	-	MR
RT7331MA[2]	-	MR	MR	-	MR
RT7421FP[2]	-	MR	MR	-	MR
RT7431MA[2]	-	MR	MR	-	MR
RT7521 FP[2]	MR	MS	MR	MR	R
RT7812	-	MR	MR	-	MR
Taurus	S	MS	MS	S	MS
Titan	S	S	MS	MS	S

[1] Varieties with Pita-2 gene, known to confer resistance to most common blast races.

[2] Marker data not available for RiceTec products.

Table 2: Efficacy of fungicides in managing rice diseases.

Table Legend

Rating	Abbreviation
Poor	P
Fair	F
Good	G
Very Good	VG
Not Labeled for use against this disease.	NL

Varieties labeled "S" or "VS" for a given disease may be severely damaged under conditions favoring disease or disorder development.

Class and Mode of Action Group[1]	Active Ingredient	Product(s)[2]	Rate (fl oz) [3]	Blast	Sheath Blight	Sheath Blight QoI Resistant	Cercospora	Kernel Smut
QoI Strobilurins Group 11	Azoxystrobin	Quadris 2.08 SC	9-15.5	G	VG	P	P	P
QoI Strobilurins Group 11	Generic	Others						
QoI Strobilurins Group 11	Trifloxystrobin	Flint Extra	3.1-4.7	VG	G	P	NL	NL
Carboxamides Group 7	Flutolanil	Elegia 3.8 F	12-32	NL	G	G	NL	NL
Demethylation Inhibitors (DMI)	Propiconazole	Tilt 3.6 EC	6-10	NL	F	F	G	G
Group 3	Generic	Others						
Mixed[4]	Azoxystrobin	Quilt Xcel 2.2 SE	14-27	G	VG	P	G	G
Mixed[4]	Propiconazole	Others						
Mixed[4]	Azoxystrobin	Amistar Top	10-15	G	VG	G	G	G
Mixed[4]	Difenoconazole	Other						

[1] Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

[2] Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied. Many products have specific use restrictions about the amount of active ingredient that can be applied within a period of time or the amount of sequential applications that can occur. Please read and follow all specific use restrictions prior to fungicide use. This information is provided only as a guide. It is the responsibility of the pesticide applicator by law to read and follow all current label directions. Members or participants in the CDWG assume no liability resulting from the use of these products.

[3] Rates are the amount of formulation (product) per acre unless otherwise indicated.

[4] Refer to product label for the fungicide class and mode of action group.

The rice section was revised October 2023 by Felipe Dalla Lana.

Soybeans

Disease

Symptoms, source of inoculum and management of soybean diseases.

Disease	Symptoms	Source of Inoculum	Management
Aerial Blight (*Rhizoctonia solani*)	The initial infected area typically involves the lower third of one or more of the three leaflets. Necrotic areas may vary in shape from circular to irregular with reddish-brown margins. Leaf blight, leaf spots, and defoliation are symptoms of the disease. Lesions may vary from reddish-brown to brown or tan. Several leaflets may appear to be matted together with a cottony growth (mycelia). Sclerotia may be visible (round survival structures, white to brown, mustard seed to pencil eraser-sized). Petioles, stems, and pods also may be infected.	Weed hosts, field debris, and soil. Rice, grain sorghum, corn and cotton serve as alternative hosts. Risk of disease is increased in rice/soybean rotations.	Fall cultivation of stubble. Use good seedbed preparation and weed control. Research and field observations indicate that some varieties may be tolerant aerial blight. Resistance to strobilurin fungicides has occurred in some areas. SDHI fungicides will be more effective in these situations (Table 1).
Anthracnose (*Colletotrichum* spp.)	Symptoms appear as irregular brown areas most frequently on stems and pods. In advanced stages, affected tissues are covered with black fruiting bodies. The disease may cause serious losses, especially during rainy periods. Seed may fail to form or be wrinkled and moldy.	The pathogens are seed- and debris-borne.	Plant disease-free seed. Some benefit may be derived from seed treatment. Plow under crop residue. Fungicides may be effective (Table 1).
Brown Spot (*Septoria glycines*)	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.	The fungus overwinters in crop residue and on infected seed.	Plant disease-free seed. Rotate. Bury crop residue if possible. Resistant varieties may be available. Fungicides are effective and may be economically beneficial in severe cases (Table 1).
Cercospora Leaf Blight (*Cercospora* spp.)	Longitudinal, purplish lesions on petioles appearing at R5 or later. Purpling to bronzing of leaves and/or blighting (brown, necrotic areas on leaflets) beginning in the upper canopy during pod fill. The pathogen may sporulate on leaflets resulting in a grayish hue. Premature defoliation may occur.	The same fungi cause purple seed stain. Pathogens overwinter in crop debris. Some weeds and cotton are alternative hosts. Spores may be airborne. Latent infection occurs with these pathogens; therefore, plants may be infected long before symptoms appear.	Use tolerant varieties based on ratings nearest your location. Fungicides may be effective but are notoriously inconsistent (Table 1).

Disease	Symptoms	Source of Inoculum	Management
Charcoal Rot (*Macrophomina phaseolina*)	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. Lower stems may be disintegrated.		Avoid excessive seeding rates. Maintaining good fertility will reduce the incidence of this disease. Avoid drought stress, if possible.
Downy Mildew (*Peronospora manshurica*)	Indefinite yellowish-green areas on upper leaf surface, later becoming reddish-brown with age. Grayish tufts of mold growth on lower leaf surface beneath chlorotic spots.	Overwinters in soil, on seed and in soybean residue.	Crop rotation. Use disease-free seed. Seed treatment reduces seedling infection. This disease does not affect yield, and fungicides are ineffective.
Frogeye Leaf Spot (*Cercospora sojina*)	An eyespot type of lesion with a gray or light tan center and a narrow reddish-brown border forms on the leaves. Usually occurs in the upper half of the canopy. May cause premature defoliation. May occur as purplish lesions on petioles, stems, and pods.	Seed and airborne.	Use resistant varieties. Apply foliar fungicides, if necessary, to susceptible varieties (see Table 1).
Minor Nematodes (Spiral, Lance, Ring, Lesion, Stubby-root)	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.		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.
Phytophthora Root Rot (*Phytophthora* spp.)	Destroys roots and tender stems of infected seedlings, resulting in rapid death. Older plants turn yellow and leaves wilt. A brown discoloration develops in the stem. Damage is most severe on heavy clay soils or on poorly drained soils.	The pathogen is soilborne.	Avoid planting susceptible varieties on poorly drained soils. Rotate. Improve drainage.
Pod and Stem Blight (*Diaporthe phaseolorum* var. *sojae* = *Phomopsis sojae*)	Numerous small black fruiting bodies appear on the pods and stems of mature plants. Blight usually occurs in linear rows on the stem. Under favorable environmental conditions for the disease, white mycelial growth may be observed on seed.	Fungus is seedborne and overwinters on diseased plant tissue in the field.	Plant disease-free seed. Some benefit may be derived from the seed treatment. Foliar fungicides may be effective; however, efficacy data is limited (Table 1).
Purple Seed Stain (*Cercospora* spp.)	Pink or light purple to dark purple discoloration of seed. Cracks may occur in discolored areas.	The same fungi cause Cercospora leaf blight. Pathogens overwinter in crop residue and on infected seed. Some weeds and cotton are alternative hosts. Spores may be airborne. Latent infection occurs with these pathogens; therefore, plants may be infected long before symptoms appear.	Plant disease-free seed. Fungicide efficacy is unknown. Varieties vary in susceptibility.

Disease	Symptoms	Source of Inoculum	Management
Red Crown Rot (*Calonectria ilicicola*)	First symptoms appear as an interveinal chlorosis in leaves during R5 to R6 followed by browning and defoliation. On the stems, reddish-orange fruiting structures appear at the soil surface and up to 3 inches above. Stem tissue may appear reddish.	The pathogen is soilborne.	Research and field observations indicate differences in varieties, but ratings are not available. Delayed planting may reduce disease incidence and severity.
Reniform Nematode (*Rotylenchulus reniformis*)	Severely infected plants are stunted and may be chlorotic. Severe yield reductions may occur when nematode populations are relatively high.	The nematode overwinters in the soil.	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.
Root Knot Nematode (*Meloidogyne incognita*)	Aboveground symptoms are poor pod set with wilting and stunting in more-or-less circular patches on lighter soil types. Interveinal chlorosis on foliage is commonly observed. 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. Southern blight is commonly observed along with root knot nematodes.	The nematode overwinters in the soil as eggs or larvae.	Resistant varieties may be available, and rotation to peanut may reduce populations. Precision-applied nematicides may be economically beneficial. Use sanitation with equipment that may spread nematode infested soil.
Seedling Disease (*Rhizoctonia solani*, *Phytophthora* spp., *Pythium* spp., etc.)	Seed decay and postemergence “damping off.” Roots and basal portion of stem may deteriorate. Brownish-red lesions are often observed on seedling stems at the soil line.	Most of these organisms are soilborne and persist in crop residue.	Fungicide seed treatment or in-furrow spray.
Southern Blight (*Athelia rolfsii*)	Seedlings and vegetative stage plants may be affected in a row. 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. Southern blight is often seen with southern RKN.	The fungus is soilborne and occurs widely in many soils. It is capable of persisting on almost any type of organic matter.	Resistant varieties may be available. Rotation to less-susceptible crops may reduce incidence and severity. Do not follow soybean with peanut.
Southern Stem Canker (*Diaporthe phaseolorum* var. *meridionalis*)	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.	The fungus is seedborne and overwinters on infested soybean debris in the field. There may be alternative hosts.	Use resistant varieties. Delayed planting, avoiding stress, and maintaining good fertility may reduce disease incidence and severity.

Disease	Symptoms	Source of Inoculum	Management
Soybean Cyst Nematode (*Heterodera glycines*)	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. May occur in conjunction with sudden death syndrome.	Nematodes overwinter in soil, primarily inside resistant cysts. They may be spread to new locations by any means that spread soil.	Practice two-to-four-year rotation with cotton, corn, or sorghum. Use sanitation with equipment that may spread nematode infested soil.
Soybean Rust (*Phakopsora pachyrhizi*)	Rust pustules can be found on the underside of lower leaves. Pustules are tiny, raised, and resemble sand grains requiring at least a 15X hand lens.	This pathogen overwinters on kudzu or volunteer soybean.	Fungicides are very effective on soybean rust (Table 1).
Sudden Death Syndrome (*Fusarium virguliforme*)	Interveinal chlorosis and necrosis similar to red crown rot and stem canker. Will cause premature defoliation. Plants are easily pulled from the ground. White/blue spore masses may be found on roots. Vascular discoloration of stems with pith remaining white. May be exacerbated by soybean cyst nematode.	The fungus is soilborne; however, the disease is rare in Louisiana.	Rotate to a non-host. In-furrow fungicides or seed treatments may be effective. Use sanitation with equipment that may spread infested soil.
Taproot Decline (*Xylaria necrophora*)	Taproot decline may cause plant death 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. Blackened soybean debris from previous seasons is usually found near affected roots.	The fungus survives within debris from previous seasons.	Rotation to a nonhost and/or tillage may reduce disease incidence and severity. Resistant varieties may be available.

Table 1: Management of Soybean Diseases Using Fungicides

Plant pathologist throughout the United States have developed the following information on foliar fungicide efficacy for control of major foliar soybean diseases. Ratings in this table have been modified by LSU AgCenter Pathologists to reflect observations more accurately in Louisiana. Efficacy ratings for each fungicide listed in the table were determined by field-testing the materials over multiple years and locations. Efficacy ratings are based upon level of disease control achieved by product and are not necessarily reflective of yield preservation. 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.**

The table is not intended to be a list of all labeled products.

Table Legend

Efficacy Rating	Abbreviation
Poor	P
Fair	F
Good	G
Very Good	VG
Excellent	E
Not Labeled	NL
Unkown Efficacy	U

Active ingredient	Product/Trade name	Rate (fl oz/A)	AB[1]	AN	BS[2]	CB[3]	FE[4]	PS	SR	TS	Harvest Restriction
thiophanate-methyl tetraconazole	Acropolis 2.37 SC	20.0-23.0	NL	U	U	U	VG	U	VG-E	U	R5
azoxystrobin tetraconazole	Affiance 1.5 SC	10.0-14.0	U	VG	VG	P-G[6]	VG	U	U	U	R5, 14 days
cyproconazole	Alto 100SL	2.75-5.5	U	U	VG	F	F	U	VG	U	30 days
picoxystrobin	Aproach 2.08 SC	6.0-2.0	VG	G	P-G	P	P	U	G	U	14 days
picoxystrobin cyproconazole	Aproach Prima 2.34 SC	5.0-6.8	VG	U	G	P-G[6]	F-G	U	VG-E	F-G	14 days
prothioconazole triflozystrobin	Delaro 325 SC	8.0-11.0	VG	U	VG	U	G-VG	U	U	NL	21 days
prothioconazole trifloxystrobin fluopyram	Delaro Complete 3.83 SC	8.0-11.0	U	U	VG	U	U	U	U	NL	21 days
tetraconazole	Domark 230 ME	4.0-5.0	NL	VG	VG	P-G[6]	VG	U	VG-E	P	R5
fluoxastrobin	Evito 480 SC Aftershock 480 SC	2.0-5.7	VG	G	P-G	P	P	U	U	U	R5, 30 days
boscalid	Endura 0.7 DF	3.5-11.0	U	NL	VG	U	P	NL	NL	U	21 days
inpyrfluxam	Excalia 2.84 SC	2	E	NL	NL	NL	NL	NL	U	NL	R5
pyraclostrobin	Headline 2.09 EC/SC	6.0-12.0	VG	VG	P-G	P	P	U	VG	P-F	21 days
flutriafol bixafen	Lucento 4.17 SC	3.0-5.5	VG	U	VG	G	VG	U	VG-E	F-G	21 days
pydiflumetofen difenoconazole	Miravis Top 1.67 SC	13.7	G-VG	U	VG	G	VG	G	NL	F-G	14 days

Active ingredient	Product/Trade name	Rate (fl oz/A)	AB[1]	AN	BS[2]	CB[3]	FE[4]	PS	SR	TS	Harvest Restriction
flutriafol fluoxastrobin	Preemptor SC Fortix SC	4.0-6.0	U	U	G-VG	P-G[6]	G-VG	U	VG	P	R5
pyraclostrobin fluxapyroxad	Priaxor 4.17 SC	4.0-8.0	E	VG	G-VG	P-G[6]	P-F	G	VG	F-G	21 days
prothioconazole	Proline 480 SC	2.5-5.0	NL	NL	NL	NL	G-VG	NL	VG	U	21 days
fluopyram prothioconazole	Propulse 3.34 SC	6.0-10.2	NL	NL	U	NL	U	U	U	NL	21 days
azoxystrobin	Quadris 2.08 SC Multiple Generics[5]	6.0-15.5	VG	VG	P-G	P	P	U	G-VG	P-F	14 days
azoxystrobin difenoconazole	Quadris Top 2.72 SC Quadris Top SBX 3.76 SC	8.0-14.0 7.0-7.5	VG	U	G-VG	P-G[6]	VG	F-G	VG	F-G	14 days
azoxystrobin propiconazole	Quilt 1.66 SC Multiple Generics[5] Quilt Xcel 2.2 SE	14.0-20.5	VG-E	VG	G	P	F	U	VG	P	21 days R6
mefentrifluconazole pyraclostrobin fluxapyroxad	Revytek	8.0-15.0	VG	U	VG	G	VG	U	VG-E	F-VG	21 days
trifloxystrobin prothioconazole	Stratego YLD 4.18 SC	4.0-4.65	VG	VG	G	P-F	F-G	U	VG	P	21 days
propiconazole	Tilt 3.6 EC Multiple Generics[5]	4.0-6.0	P	VG	G	NL	F	NL	VG	U	R5
flutriafol	Topguard 1.04 SC	7.0-14.0	U	VG	VG	P-G[6]	G-VG	U	VG-E	P	21 days
azoxystrobin flutriafol	Topguard EQ	5.0-7.0	VG	U	VG	P-G[6]	G-VG	U	E	P	21 days
thiophanate-methyl	Topsin-M Multiple Generics[5]	10.0-20.0	U	U	U	P	VG	U	G	U	21 days
benzovindiflupyr azoxystrobin propiconazole	Trivapro	13.7-20.7	E	U	G-VG	P-G[6]	F-G	G	VG-E	U	14 days R6
mefentrifluconazole pyraclostrobin	Veltyma	7.0-10.0	U	U	U	U	U	U	U	U	21 days
tetraconazole fluoxastrobin	Zolera FX 3.34 SC	4.4-6.8	U	U	U	U	F-G	U	U	U	R5 30 days

[1] In areas where strobilurin resistance has been found, efficacy of products containing strobilurins may be reduced.

[2] Strobilurin resistance has been discovered in nearby states in this pathogen population and may exist in Louisiana. Reduced efficacy of strobilurins may be observed.

[3] Fungicides 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.

[4] Fungicides 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.

[5] Generics containing the same active ingredient may be available.

[6] Efficacy of this product on CLB has been inconsistent across locations and years.

The soybean section was revised September 2023 by Trey Price.

Sugarcane

Integrated Disease Management of Sugarcane

Sugarcane productivity and profitability rely on effective disease management. Most diseases are managed with varietal resistance and a healthy seed cane program in Louisiana. Since sugarcane is vegetatively propagated, regularly obtaining and planting healthy seed cane is essential to manage a group of systemic diseases, such as ratoon stunt, leaf scald, smut, mosaic and yellow leaf. These diseases all can be spread and increased by planting infected stalks. Several of the diseases reported here can be managed by using disease-free sugarcane seed. This is an overview of diseases commonly found in Louisiana and management tactics for each.

Disease

Symptoms, source of inoculum and management of sugarcane diseases.

Disease	Symptoms	Source of Inoculum	Management
Leaf Scald (*Xanthomonas albilineans*)	Leaves of young plants may show bleaching or yellowing and dead tissue. The characteristic symptom of leaf scald is the presence of one or more narrow, white “pencil lines” running longitudinally along a vein from the leaf margin down the blade into the sheath. Bands of dead tissue then develop along pencil lines starting at the leaf margin and may expand until the entire leaf is dead. Young shoots may be killed. Mature stalks may show leaf symptoms and develop side shoots with symptoms. Under severe disease conditions, entire plants may die. Drought stress, water logging and low temperatures can increase symptom expression and severity. This may occur in different ways – the chronic phase of leaf scald is characterized by a progressive increment in disease severity; the acute phase is defined by sudden disease outbreaks that can rapidly lead to the death of mature sugarcane plants.	The bacteria that cause leaf scald live from year to year in infected plants. Many times, although the bacterium is present in the plant, symptoms won’t manifest due to the lengthy latent period of the disease. It is spread by harvesters and farm equipment, and possibly by other cultivation practices that cause plant wounding. The disease can be spread aerially in windblown rain.	Varietal resistance is the best means of control. The current varieties have adequate levels of resistance, particularly when produced with progeny from a tissue-culture based seed cane program. Avoid planting seed cane from fields with obvious disease. Regular planting of healthy seed cane produced through tissue-culture has kept the incidence of leaf scald low. Sanitize equipment, especially after working in fields where leaf scald was observed. Sanitation can be performed with suitable sanitizer products, such as disinfectant sprays, alcohol and bleach solutions. The heat treatment previously used to control ratoon stunting disease is not effective against leaf scald.
Mosaic (Sorghum mosaic virus and Sugarcane mosaic virus)	The mosaic pattern of irregular, interspersed, pale green, yellowish and green areas on leaves varies with cane variety, stage of growth, temperature and the strain of the virus involved. The mosaic symptom is most evident in the youngest emerging leaves and is most easily seen in young plants.	The virus persists from year to year in infected plants. It is spread primarily by migrating aphids and also by planting infected seed cane.	Mosaic is controlled primarily with host plant resistance. Historically, mosaic was a major disease adversely affecting sugarcane production in Louisiana. However, basic breeding and development of sources of resistance have greatly reduced the impact of this disease. Currently grown varieties have adequate levels of resistance to mosaic with the exception of three recently released varieties, HoCP 09-804, L 11-183 and HoL 15-508. Planting seed cane produced through tissue-culture can help keep disease incidence low in susceptible varieties.

Disease	Symptoms	Source of Inoculum	Management
Ratoon Stunt (*Leifsonia xyli* subsp. *xyli*)	Ratoon stunting disease (RSD) has no visible external symptoms. RSD-infected plants may be shorter with little or no decrease in diameter of the stalk. Stunting severity is associated with adverse environmental conditions, particularly drought stress, and it is more severe in ratoon crops. Affected plants, when split, may or may not show a pinkish color in the growing point of young shoots and orange-to-brownish discoloration of vascular bundles at the nodes in the lower portion of mature stalks.	The bacteria live from year to year in infected plants. It is spread mechanically by the cane harvester and by planting infected seed cane.	A healthy seed cane program is the primary method for RSD control. Seed cane produced from tissue-culture free of RSD is commercially available. Heat treatment of seed cane in hot water at 50 C (122 F) for two hours can provide control of most RSD bacteria. A regular annual heat treatment program can provide good RSD control. Sanitation of farm machinery and tools is a form of prevention. Sanitation of farm equipment is especially important when moving from different fields, and of utmost significance when moving from an area where RSD was detected to other areas where the disease is not present. Monitoring of RSD infection levels and the success of a healthy seed cane program can be provided by collecting stalk samples and having them tested at the LSU Ag Center's Sugarcane Disease Detection Lab (https://lsu.edu/agriculture/ppcp/outreach/sugarcane-disease-detection-lab.php). The level of RSD resistance varies among varieties. High levels of resistance are uncommon, so a healthy seed cane program is essential for successful RSD control.
Red Rot (*Colletotrichum falcatum*)	Red rot adversely affects stand establishment by rotting planted seed cane. Splitting stalks dug up from portions of row without living plants reveals red discoloration of the internode tissue and rotted nodes. Within the red areas, white spots usually elongated at right angles to the long axis of the stalk, are diagnostic of red rot infection. Red rot is more severe when planted stalks are exposed to drought stress or waterlogging, especially on plant cane. The disease is highly associated to sugarcane borer infestations.	The fungal pathogen survives from season to season in infected cane tissues. Fungal inoculum is present on most planted stalks.	Plant multiple whole stalks and avoid planting heavily bored or physically damaged seed cane. Provide good drainage for planted seed cane. High levels of varietal resistance are uncommon, so cultural practices that minimize stress on planted seed cane are needed to minimize red rot damage. This is especially the case when planting billets (stalk sections). The use of seed treatment chemicals to improve stand establishment and yield obtained from billet planting is under investigation. Labels have been obtained for application of three fungicide combination products to billets at planting: azoxystrobin + propiconazole (Quilt Xcel), fluxapyroxad + pyraclostrobin (Priaxor), and pyraclostrobin + mefentrifluconazole + fluxapyroxad (Revytek).

Disease	Symptoms	Source of Inoculum	Management
Brown Rust (*Puccinia melanocephala*)	Small chlorotic areas appear on the leaves at first as flecks. Later, the flecks elongate and become reddish-brown. The spots continue to enlarge with a slight yellow halo surrounding the lesion on some varieties. The lesion takes on a pustular appearance on the lower surface of the leaf. The pustules erupt, releasing a reddish-brown mass of spores. On susceptible varieties, heavily infected leaves dry out and die prematurely.	Rust survives the winter in living green leaf tissue usually in southern areas of the industry. Spores are then produced and aerially dispersed to spread the disease over short and long distances.	Host plant resistance is the primary control method. However, the rust pathogen has the capability to adapt and overcome varietal resistance. Once a variety becomes susceptible, rust can be controlled with the application of fungicide. Avoiding excess fertilization is another way to prevent the disease – excessive levels of nutrients may lead to brown rust development. Detailed information on varietal resistance ratings, fungicide labels and use recommendations, and other brown rust management strategies can be found through the LSU Ag Center website in "Best Management Practices for Minimizing the Impact of Brown Rust in Sugarcane" at https://www.lsuagcenter.com/profiles/lblack/articles/page1553195579511
Smut (*Sporisorium scitamineum*)	Smut is characterized by the production of a black, whip-like structure at the apex of stalks with smaller than normal diameter that can grow more rapidly and extend above the crop canopy. The whip often elongates to a length of 2-3 feet and curls downward. The whip is covered by a layer of dark brown fungal spores. Prior to the emergence of whips, smut-infected plants can have a grassy appearance with many small-diameter shoots.	Tremendous numbers of smut spores are released over time from whips and dispersed in air currents to spread the disease over short and long distances.	To control smut, grow resistant varieties and plant healthy seed cane. Current varieties have adequate resistance to smut with the exception on L 01-299 that is moderately susceptible under field conditions. Cultivar HoCP96-540 is resistant to smut. High rates of disease increase do not occur under Louisiana climatic conditions, so it is possible to grow varieties with moderate smut susceptibility, if a rigorous healthy seed cane program is followed. Tissue-culture produced seed cane will have little or no smut infection. On-farm roguing of smut-infected plants with glyphosate is only feasible in seed cane sources with low levels of infection. Avoid planting seed cane sources of smut susceptible varieties next to smut infected cane. Do not plant seed cane with more than 2% smut infection.
Yellow Leaf (Sugarcane yellow leaf virus)	The underside of the mid-vein on young leaves at the apex of mature plants turns bright yellow in SCYLV-infected plants. The yellowing can spread into the leaf blade, and mid-veins can turn pink in severely infected plants. Due to the short growing season in Louisiana, symptoms are not seen most years because of ripener applications and/or frosts. Despite the lack of visible symptoms, infected plants may exhibit reduced growth and juice quality.	The sugarcane aphid acquires the virus during feeding on an infected plant. The aphid retains the virus for life and can transmit SCYLV during feeding to healthy plants within the same field or in other fields.	Certified seed cane produced through tissue-culture is tested for SCYLV. Continuous planting of seed cane with little or no virus infection will keep the incidence of yellow leaf low. Information is lacking on the disease resistance levels of commercial varieties.

Disease	Symptoms	Source of Inoculum	Management
Red Stripe and Top Rot (*Acidovorax avenae* subsp. *avenae*)	Narrow, dark red stripes of variable length run longitudinally along veins. Symptoms are often seen in 4- to 6-month-old cane. The leaf spindle at the shoot apex can become infected in susceptible varieties, particularly under warm, wet conditions. The infection can then spread into the shoot apex and cause a top rot. Reddish brown discoloration and cavities may form in stalk internodes. An unpleasant odor is associated with the rotting spindle that may be detected outside the field.	Bacterial exudates form that are readily spread from plant to plant by wind-blown rain. The bacteria infect through wounds and stomates.	Red stripe is usually a minor disease. Most commercial varieties are resistant and never exhibit top rot. HoCP 00-950 is a current variety that may develop top rot during wet growing seasons.
Brown Stripe (*Bipolaris stenospila*)	In leaves, elongate, reddish-brown lesions with an obvious yellow “halo” develop parallel to veins. During severe infection, lesions may coalesce, and entire leaves may be killed. Disease is more severe when plants are under nutritional stress or injured by herbicides. Brown stripe may be severe in fields cut the previous season for seed cane.	Spores produced by the fungus are spread by the wind to cause new infections.	Brown stripe is usually a minor disease. Severe disease symptoms have been observed in L 01-299, L 03-371, HoCP 04-838 and HoCP 09-804 during early spring following mild winters. Disease development is minimal when conditions are favorable for growth. Symptoms usually diminish after fertilization.
Pokkah Boeng (*Gibberella fujikuroi*)	Malformed or twisted leaves occur near the shoot apex. Young leaves may exhibit pronounced wrinkling, twisting and shortening. Chlorosis (yellowing) is often evident at the leaf base, and necrosis may develop. Spindle infection can spread into the stalk. In severe cases, dark red streaks and ladder-like lesions form inside the stalk and the rind. A “knife-cut” lesion may form in the rind.	Spores of the fungus are spread by wind and rain.	Grow resistant varieties. All the current varieties have adequate resistance. Pokkah boeng may become evident during warm, wet periods when rapid plant growth is occurring. However, plants recover, and the effect on yield is minimal.
Orange Rust (*Puccinia kuehnii*)	Leaf lesions are very similar to brown rust except that young lesions and the spores produced in pustular lesions on the underside of the leaf are orange, lighter than brown rust spores. It is easier to distinguish orange rust lesions from brown rust on younger leaves in the upper section of sugarcane plants. Symptoms will persist into the summer months, whereas few brown rust symptoms are evident in young leaves during summer.	Same as for brown rust. The fungus overwinters in green leaf tissue, and spores produced during late spring spread the disease over short and long distances.	Orange rust was first observed in 2012. Varietal resistance has provided good control. One variety, Ho 05-961, has shown moderate susceptibility to orange rust. Avoiding excessive fertilizer applications may avoid orange rust outbreaks.
White Stripe (Physiological disorder)	Characterized by variable amounts of longitudinal, white striping on leaves of some plants, usually occurring during spring. The white stripes extend the full length of the leaf. Striping is not considered infectious but rather a growth response to environmental conditions.		None. Plants will recover after fertilizer uptake in the presence of adequate rainfall.

The sugarcane section was revised September 2023 by Andre Gama and Jeff Hoy.

Wheat

Disease

Symptoms, source of inoculum and management of wheat diseases.

Disease	Symptoms	Source of Inoculum	Management
Leaf Rust (*Puccinia triticina*)	Leaf rust is widespread and probably is a destructive disease on wheat in Louisiana. The leaf rust fungus produces small, yellowish-orange pustules on the leaves. These masses of spores turn dark as wheat matures. Infection usually begins on lower leaves and spreads upward. Infected leaves turn yellow and die.		Resistant varieties are the most practical approach. Some seed treatments provide early season suppression, but foliar-applied fungicides are most effective (Tables 1 and 2b).
Stem Rust (*Puccinia graminis tritici*)	Elongated, reddish-brown pustules occur on the stem, leaf sheaths, leaf blades and glumes. Pustules rupture the epidermis to expose a powdery, reddish-brown mass of spores. Fragments of epidermis adhere to sides and ends of pustules to give them a ragged appearance.	Has alternate host species of Berberis and Mahonia where new races may occur but spread in this area primarily is from wheat to wheat.	Stem rust can be a serious problem in some years in localized regions of Louisiana. Resistant varieties are the most practical approach for control of this disease, although fungicides may be used (Table 2b).
Stripe Rust (*Puccini striiformis*)	The first sign of disease is individual yellow pustules, usually at the tip of the leaf. Later, pustules develop in rows, giving the characteristic of striped appearance. Leaves, sheaths, stems and glumes may be attacked.		Resistant varieties are the most practical approach for control of this disease, although fungicides may be used (Table 2b).
Powdery Mildew (*Erysiphe graminis tritici*)	Powdery mildew usually is found on leaves but may attack all aboveground parts of the plant. It first appears as small irregular or circular light gray spots on the upper leaf surface. Later, the plant is covered with a “floury” appearance. Leaves eventually become misshapen and die.		The application of fungicide for the control of powdery mildew has rarely been economical.
Bacterial Streak/Black Chaff (*Xanthomonas campestris* pv. *translucens*)	Symptoms on leaves begin as dark green, water-soaked spots that eventually become necrotic and develop into streaks. On the heads, black chaff appears as stripes on the glumes, but blackening may be total.		Use crop rotation, clean tillage and pathogen-free seed.
Fusarium Head Blight/Scab (*Fusarium* spp.)	The symptoms after flowering appear as a bleaching of the glumes, spikelets, areas of the head or even the entire head. Salmon-red or pink-red spore masses frequently form on infected heads.		Well-timed, foliar-applied fungicides only suppress disease incidence (Table 2c).

Disease	Symptoms	Source of Inoculum	Management
Leaf and Glume Blotch (*Stagonospora* sp.)	The disease appears on the chaff and may be seen as small, irregular, grayish or brownish spots or blotches, which enlarge and become chocolate brown. As the spots age, their centers turn grayish-white and may include tiny, round, raised black spore-bearing bodies. Ordinarily, only a few glumes in a head become infected, but in severe cases the entire head is attacked and turns dark brown. Spots on the sheaths are dark brown and often include most of each sheath. Spots on leaves are light colored and usually surrounded by a brown border.		Varieties differ in tolerance to leaf and glume blotch. Consult variety recommendations. For fungicide recommendations, please refer to (Table 2a).
Take-all (*Gaeumannomyces graminis*)	Affected plants have shortened, bleached heads that stand erect, and the affected plants are distributed irregularly throughout the field. The stem base is blackish-brown, and the roots show dark discoloration and are extensively rotted.		Maintain balanced soil fertility and some labeled seed treatment fungicides for suppression only.
Tan Spot (*Pyrenophora triticirepentis*)	Tan spot first appears on the lower leaves as small yellowish-brown spots that develop into oval spots. Lesion centers become tan and usually are surrounded by a yellow border or halo. As the leaf declines, the spots expand and merge into irregular tan to brown lesions.		Deep plow crop residues. Fungicides may be used.
Yellow Dwarf (barley yellow dwarf virus or BYDV)	Leaf discoloration in shades of yellow, red or purple, especially from tip to base and from margin to midrib. Stunting and excessive tillering are noted. White sterile heads may develop. The virus is spread by some species of aphids.		No adequate controls are available at this time.

Table 1. Fungicides available to manage seed and seedling diseases in wheat.

Product[1]	Rate[2]	Disease
Apron XL LS	0.0425-0.085 fl oz	Pythium damping-off
Charter F2	5.4 fl oz	Common bunt, flag smut, Fusarium seed rot, Fusarium seedling blight, loose smut, Pythium damping-off
Charter	3.1 fl oz	Common bunt, flag smut, Fusarium seed rot, Fusarium seedling blight, loose smut
Dividend XL RTA	5-10 fl oz	Common bunt, dwarf bunt, loose smut, flag smut, seed-borne Septoria, general seed rots, Fusarium Seed scab, Pythium damping-off
Dividend Extreme	2-4 fl oz	Common bunt, dwarf bunt, loose smut, flag smut, seed-borne Septoria, general seed rots, Fusarium Seed scab, Pythium damping-off
ManKocide	4 oz	Bacterial diseases, common bunt
Manex	3.5-5.2 fl oz	Damping-off, seed rot, seedling blight
Maxim 4FS	0.08-0.16 fl oz	Damping-off
Maxim XL	0.167-0.334 fl oz	Damping-off
Raxil 2.6F	0.1 fl oz	Stinking smut, flag smut, loose smut, early season Septoria disease complex, early season Rhizoctonia root rot, early season common root rot, early season Fusarium foot rot, early season suppression of powdery mildew, early season suppression of wheat leaf rust
Stamina	0.4-0.8 fl oz[3]	Dry seed decay, Rhizoctonia seed and seedling disease
Stamina F3	4.6 fl oz	Common bunt, common root rot, dry seed decay, flag smut, Fusarium seed rot, Fusarium seedling blight, loose smut, Pythium damping off, Rhizoctonia root rot
Vibrance Extreme	2.8-5.6 fl oz[3]	General seed rots, seedling blight, root rot and damping-off caused by seed- and soilborne Fusarium spp. or Rhizoctonia spp. seedling blight, root rot and damping-off caused by soil-borne Pythium spp. seed-borne Septoria, Septoria leaf blotch. common bunt, dwarf bunt, karnal bunt, flag smut, Fusarium seed scab, loose smut, Pythium damping-off

[1] Reference to commercial or trade names is made with the understanding that no discrimination or endorsement of a particular product is implied by LSU or the LSU AgCenter. **Labels are subject to change and users should always read the label before applying a pesticide.**

[2] Rates are the amount of formulation (product) per-hundredweight unless otherwise noted.

[3] Consult label for specific rates.

Table 2a. Recommended fungicides, rates and application timing for Leaf and Glume Blotch (*Phaeosphaeria nodorum*[5]).

Product Choices[1]	Product Mode of Action Group[2]	Rate[3]	Time of Application	PHI[4]
Adastrio	3, 7, 11	5-9 fl oz	Consult label	30
Aproach	11	6-12 fl oz	Consult label	45
Aproach Prima	3, 11	3.4-6.8 fl oz	Consult label	45
Bumper 41.8EC	3	4 fl oz	Consult label	-
PropiMax	3	4 fl oz	Flag leaf emergence	-
Tilt	3	4 fl oz	No applications past Feeke's 10.54	-
Caramba	3	10-14 fl oz	Protect as flag leaf emerges	30
Delaro	3, 11	8 fl oz	Consult label	35
Headline	11	6-9 fl oz	No later than Feeke's 10.5	-
Lucento	3, 7	3-5.5 fl oz	Consult label	30
Miravis Ace	3, 7	13.7 fl oz	Do not apply after Feeke's 10.5.4	-
Priaxor	7, 11	4-8 fl oz	No later than Feeke's 10.5	30
Proline 480 SC	3	4.3-5 fl oz	First appearance of disease but not past Feeke's 10.5	30
Prosaro 421 SC	3	6.5-8.2 fl oz	Consult label	30
Prosaro Pro 400 SC	3, 7	10.3-13.6 fl oz	Consult label	30
Quilt Xcel	3, 11	10.5-14 fl oz	No applications past Feeke's 10.5	7
Sphaerex	3	4.0-7.3 fl oz	Consult label	30
Stratego YLD	3, 11	4 fl oz	Consult label	35
Twinline	3, 11	7-9 fl oz	No applications past Feeke's 10.5	-

[1] Reference to commercial or trade names is made with the understanding that no discrimination or endorsement of a particular product is implied by LSU or the LSU AgCenter. **Labels are subject to change and users should always read the label before applying a pesticide. Consult label for restrictions.**

[2] Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

[3] Rates are the amount of formulation (product) per acre unless otherwise indicated.

[4] Preharvest interval (PHI) is the minimum number of days allowed between the last application and harvest. If not listed consult label.

[5] Formerly *Stagonospora nodorum* and *Septoria nodorum*.

Table 2b. Recommended fungicides, rates and application timing for Rusts.

Product Choices[1]	Product Mode of Action Group[2]	Rate[3]	Time of Application	PHI[4]
Adastrio	3, 7, 11	5-9 fl oz	Consult label	30
Aproach	11	6-12 fl oz	Consult label	45
Aproach Prima	3, 11	3.4-6.8 fl oz	Consult label	45
Priaxor	3, 7	4-8 fl oz	No later than Feeke's 10.5	-
Bumper 41.8EC	3	4 fl oz	Consult label	-
PropiMax	3	4 fl oz	Flag leaf emergence	-
Tilt	3	4 fl oz	No applications past Feeke's 10.54	-
Caramba	3	10-14 fl oz	Protect as flag leaf emerges	30
Delaro	3, 11	8 fl oz	Consult label	35
Headline	11	6-9 fl oz	No later than Feeke's 10.5	-
Lucento	3, 7	3-5.5 fl oz	Consult label	30
Miravis Ace	3, 7	13.7 fl oz	Do not apply after Feeke's 10.5.4	-
Proline 480 SC	3	4.3-5 fl oz	First appearance of disease but not past Feeke's 10.5	30
Prosaro 421 SC	3	6.5 to 8.2 fl oz	Consult label	30
Prosaro Pro 400 SC	3, 7	10.3-13.6 fl oz	Consult label	30
Quilt Xcel	3, 11	10.5-14 fl oz	No applications past Feeke's 10.5	7
Stratego YLD	3, 11	4 fl oz	Consult label	35
Folicur 3.6F	3	4 fl oz	Consult label	30
Orius 3.6F	3	4 fl oz	Consult label	30
Tebustar3.6F	3	4 fl oz	Consult label	30
Monsoon	3	4 fl oz	Consult label	30
Muscle 3.6F	3	4 fl oz	Consult label	30
Tebuzol 3.6F	3	4 fl oz	Consult label	30
Sphaerex	3	4.0-7.3 fl oz	Consult label	30
Twinline	3, 11	7-9 fl oz	No applications past Feeke's 10.5	-

[1] Reference to commercial or trade names is made with the understanding that no discrimination or endorsement of a particular product is implied by LSU or the LSU AgCenter. **Labels are subject to change and users should always read the label before applying a pesticide. Consult label for restrictions.**

[2] Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

[3] Rates are the amount of formulation (product) per acre unless otherwise indicated.

[4] Preharvest interval (PHI) is the minimum number of days allowed between the last application and harvest. If not listed consult label.

Table 2c. Recommended fungicides, rates and application timing for Scab (*Fusarium graminearum*).

Product Choices[1]	Product Mode of Action Group[2]	Rate[3]	Time of Application	PHI[4]
Caramba6	3	10-14 fl oz	Consult label	30
Proline 480 SC6	3	4.3-5 fl oz	Consult label	30
Prosaro 421 4C	3	6.5 to 8.2 fl oz	Consult label	30
Prosaro Pro 400 SC	3, 7	7.3 fl oz	Consult label	30
Folicur 3	3	4 fl oz	Consult label	30
Orius 3.6F6	3	4 fl oz	Consult label	30
Tebustar3.6F6	3	4 fl oz	Consult label	30
Monsoon6	3	4 fl oz	Consult label	30
Muscle 3.6F6	3	4 fl oz	Consult label	30
Tebuzol 3.6F6	3	4 fl oz	Consult label	30
Miravis Ace	3, 11	13.7 fl oz	Do not apply after Feeke's 10.5.4	-
Sphaerex	3	7.3 fl oz	Consult label	30

[1] Reference to commercial or trade names is made with the understanding that no discrimination or endorsement of a particular product is implied by LSU or the LSU AgCenter. **Labels are subject to change and users should always read the label before applying a pesticide. Consult label for restrictions.**

[2] Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

[3] Rates are the amount of formulation (product) per acre unless otherwise indicated.

[4] Preharvest interval (PHI) is the minimum number of days allowed between the last application and harvest. If not listed consult label.

[5] Formerly *Stagonospora nodorum* and *Septoria nodorum*.

[6] Suppression only.

The wheat section was revised October 2023 by Boyd Padgett.