



# Kentucky Plant Disease Management Guide for Small Grains

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This guide contains information on the biology and management of the most important diseases of small grains (wheat and barley) in Kentucky. Fundamental information on symptoms, disease cycle, and management is provided. For some diseases, more extensive information on biology and management is also available in other Extension publications. Additional sources of information are listed under individual diseases.

Disease management in small grains relies heavily on using disease-resistant varieties and employing sound agronomic practices. It is important to integrate both of these strategies into a comprehensive disease management program. Failure to consider one or the other will compromise the success of your efforts. The appropriate use of pesticides sometimes plays a significant role in managing certain diseases, but it is secondary to sound cultural practices and proper variety selection.

Resistance to one or more diseases is often incorporated into modern crop varieties. Unfortunately, resistance is not available for some diseases. However, when available, disease resistance is often the foundation for economical disease control.

No one variety is resistant to all diseases present in Kentucky. Also, the importance and prevalence of crop diseases vary from one farm to the next, and from one year to the next. These facts can complicate the variety selection process. Nevertheless, an informed decision can be made by selecting varieties with resistance to the diseases most likely to be a problem. Resistance to other diseases should be considered on a secondary basis.

While it is not possible to know with complete certainty which diseases will develop, the disease history of the farm and area will indicate which diseases are most likely to occur. A disease history for a farm is established by scouting fields and identifying disease outbreaks when they occur. Your county Extension agent, farm supply dealer, and neighbor can also be good sources of information. However, farm-specific information obtained through field scouting is the most reliable basis for developing a farm disease history.

When selecting a variety, recognize that there are different levels of disease resistance. If available, agronomically acceptable varieties with high levels of resistance usually provide the best protection against a serious

disease outbreak. Under reduced disease pressure, however, a moderate level of resistance may be enough to achieve acceptable results. For some diseases, low to moderate resistance is all that is available among current commercial varieties, even though higher levels of resistance would be desirable. In these cases, use of a variety with even a low level of resistance is usually superior to planting a susceptible variety. However, recognize that using low to moderate levels of resistance may require you to pay greater attention to other disease management strategies in order to achieve good results. Varieties can also be selected for tolerance — the ability to yield well even though symptoms develop. Information on disease-tolerant varieties is limited, but tolerant varieties can be useful when available.

Always use pesticides safely and according to the label. Misuse of pesticides can be hazardous to the farmer, farm workers, the growing crop, the consumers of the harvested commodity, and/or the environment. The label is the most reliable source of up-to-date information on a pesticide. ALWAYS READ THE LABEL BEFORE USING A PESTICIDE, AND FOLLOW LABEL INSTRUCTIONS.

## WHEAT

### Black Chaff/Bacterial Streak

**CAUSE:** *Xanthomonas campestris* pv. *translucens*

**SYMPTOMS:** Glumes develop purple-brown blotches and streaks on glume veins, often starting at the glume tips. Black chaff is frequently confused with glume blotch and genetic head discoloration. Bacterial streak develops on foliage as water-soaked, random, narrow streaks that follow and are bounded by leaf veins. Streaks turn brown with age. Streaks may glisten when leaves are held up to light. Bacterial streak is often confused with septoria leaf blotch.

**KEY FEATURES OF DISEASE CYCLE:** Bacteria survive on and develop from infested seed and wheat stubble. Bacteria spread to healthy plants by splashing and wind-driven rain.

**MANAGEMENT:** Use high-quality, well-cleaned seed (e.g., certified seed). Allow a period of one or more years between wheat crops in a field. No chemical controls are

available. Plant moderately resistant wheat varieties where black chaff/bacterial streak has been a problem.

**SOURCES OF ADDITIONAL INFORMATION:**

1. Wheat Bacterial Streak, PPFS-44

### Barley Yellow Dwarf

**CAUSE:** Barley yellow dwarf virus (BYDV-various strains)

**SYMPTOMS:** Primary symptoms include plant stunting, reduced tillering, and yellow to red-purple discoloration of leaves. Leaf discoloration usually starts along the leaf margins and moves toward the leaf base and midrib. Symptoms can occur in the fall or spring, but are most common in early to mid-spring. Infected plants frequently occur in small, random groups which are evident as saucer-shaped depressions of yellowed plants in otherwise green fields. Large portions of fields or entire fields can be affected in severe cases.

**KEY FEATURES OF DISEASE CYCLE:** The virus is transmitted to wheat by several species of cereal aphids. In Kentucky, the primary aphid transmitting BYDV is the oat bird-cherry aphid. Infections can occur in the fall, winter, or spring. Early (e.g., fall and late winter) infections, where symptoms show in late fall or very early spring, result in the greatest yield reductions. Nonetheless, the appearance of symptoms as late as crop flag emergence has been associated with yield reductions of 10-15%. Yield reductions in wheat are generally not as severe as can occur in barley, which can exceed 50%. The virus overwinters in perennial grasses, such as tall fescue. Infections are frequently most numerous along the edges of fields, corresponding with higher aphid numbers in those areas.

**MANAGEMENT:** Plant after the Hessian fly-free date. This date ranges from October 15 in southwest Kentucky to October 4 in the northeast part of the state. Plant wheat varieties with at least some tolerance or resistance to BYDV. Highly resistant or tolerant varieties are not yet available. Limiting BYDV infection by controlling aphids with insecticides can be successful, but the results are very erratic and, thus, unreliable.

**SOURCES OF ADDITIONAL INFORMATION:**

1. Barley Yellow Dwarf, PPFS-46
2. Annual Kentucky Small Grain Variety Trials, Progress Report 355

### Glume Blotch

**CAUSE:** *Septoria nodorum*

**SYMPTOMS:** Infected glumes develop gray-brown blotches, usually starting at the tips of glumes. Unlike the bacterial disease black chaff, glume blotch is not associated with glume veins. Aged blotches develop dark pin-point structures called pycnidia. Pycnidia are the source of infectious spores. Infected heads develop low test weight, shriveled grain.

**KEY FEATURES OF DISEASE CYCLE:** Fungal spores blow or are splashed onto wheat heads. Spores usually

originate from diseased foliage (see septoria leaf blotch complex) or infested wheat stubble. Infections occur during periods of extended wetness.

**MANAGEMENT:** Plant moderately resistant varieties, unless you are willing to make at least one fungicide application. Plant high-quality, well-cleaned, disease-free seed (e.g., certified seed). Control foliar and head infections with fungicides applied prior to infection; fungicides are of little value once head infections are visible. Base spray decisions on the extent of foliar infections at heading through crop flowering (see septoria leaf blotch complex). Avoid nitrogen excesses and deficiencies. Crop rotation and tillage of infested wheat residue may help to moderate glume blotch severity, but neither provides a high degree of control because of the cropping systems prevalent in Kentucky.

**SOURCES OF ADDITIONAL INFORMATION:**

1. Septoria Diseases of Wheat, PPA-39
2. Fungicides to Control Leaf Diseases in Wheat, PPA-36
3. Foliar Fungicide Use in Wheat, Grain Gleanings, Vol. 1, No. 3 (1993)
4. Annual Kentucky Small Grain Variety Trials, Progress Report 355
5. Selecting Wheat Varieties, Grain Gleanings, Vol. 1, No. 9 (1993)

### Head Scab

**CAUSE:** *Fusarium* spp.

**SYMPTOMS:** Individual spikelets or groups of spikelets turn cream to white on otherwise green heads. Entire heads may become diseased when extended periods of warm, wet weather occur during flowering and early grain fill. Salmon pink-orange patches of fungal growth can frequently be seen at the base of infected spikelets. Infected spikelets often fail to develop grain, or grain is extremely shriveled and of low test weight. Shriveled grain may have a pinkish discoloration.

**KEY FEATURES OF DISEASE CYCLE:** Scab fungi overwinter in cereal, grain sorghum, and corn stubble and in soil. Spores are produced and heads infected when warm, wet weather occurs during the flowering period for wheat. Most fields, in most years, escape serious infection because flowering does not occur during warm, wet weather. Scab epidemics occur when extended periods of disease-favorable weather occur while much of the Kentucky wheat crop is in flower.

**MANAGEMENT:** Nature provides the best management by limiting disease-favorable conditions during crop flowering. No chemical controls exist, and all wheat varieties are susceptible. However, planting two or more wheat varieties on your farm will decrease the chance of head scab by altering flowering dates and reducing the chances that all your wheat acreage will be involved in a head scab epidemic. Planting wheat after corn or grain sorghum, especially no-till plantings, or not properly rotating fields out of wheat encourages head scab

development. Alternative production practices, however, do not preclude a severe head scab epidemic from developing. This is because of the widespread occurrence of the causal fungi throughout Kentucky soils.

**SOURCES OF ADDITIONAL INFORMATION:**

1. Head Scab of Small Grains in Kentucky, PPA-38

### Loose Smut

**CAUSE:** *Ustilago tritici*

**SYMPTOMS:** Floral parts of infected plants are transformed into a mass of black, powdery spores. Diseased tillers usually head out in advance of healthy tillers.

**KEY FEATURES OF DISEASE CYCLE:** Spores produced by diseased heads blow to and infect healthy heads (flowers) during rainy weather. Infected flowers give rise to infected grain. Infected grain develops normally, but harbors the loose smut fungus. The fungus remains dormant until the seed is planted and germinates. Infected plants appear to be normal, but develop smutted heads.

**MANAGEMENT:** Plant certified or otherwise high-quality, disease-free seed. Infections in seed can be eradicated by treating seed with carboxin or triadimenol.

**SOURCES OF ADDITIONAL INFORMATION:**

1. Fungicide Seed Treatment for Control of Small Grain Diseases, PPA-6

### Leaf Rust

**CAUSE:** *Puccinia recondita* f.sp. *tritici*

**SYMPTOMS:** Infections are first evident as pin-point, yellow flecks on upper leaf surfaces. Flecks deteriorate into orange pustules, each containing thousands of spores. Many things can cause wheat leaves to fleck. Thus, flecks are only a good indicator of leaf rust when at least some mature pustules are also visible. Leaf rust pustules usually form in random patterns, primarily on upper leaf surfaces. Frequently, however, rust will first be evident at the base of leaves because of the propensity for water to collect there. Mature rust pustules occur 7-10 days after infection by spores.

**KEY FEATURES OF DISEASE CYCLE:** The leaf rust fungus occasionally overwinters in Kentucky on wheat seeded in the fall. More commonly, it is blown into Kentucky from more southern states, such as Arkansas and Tennessee. Spores blow to and infect foliage during moderate to warm temperatures and six or more hours of continuous leaf wetness. Leaf rust is a potentially explosive disease; it requires a very short time to go from low to epidemic levels on a susceptible variety. Leaf rust can severely reduce yields if significant disease develops **prior to** the soft dough stage of grain development. After soft dough, rust will have only a modest effect on crop yields.

**MANAGEMENT:** Use resistant or moderately resistant wheat varieties, unless you are willing to make at least one fungicide application. Avoid excessively dense stands that discourage air circulation and light penetra-

tion into the crop canopy. If necessary, protect upper two leaves of plants with foliar fungicides. Base fungicide use decisions on field scouting for plant growth stage and level of disease. Fungicides will have little or no effect on mature rust pustules; however, eradicative fungicides such as propiconazole and triadimefon can inhibit pustule development after infection, but prior to pustule formation.

**SOURCES OF ADDITIONAL INFORMATION:**

1. Leaf Rust of Wheat, PPA-25
2. Fungicides to Control Leaf Diseases in High Yield Wheat, PPA-36
3. Foliar Fungicide Use in Wheat, Grain Gleanings, Vol. 1, No. 3 (1993)
4. Annual Kentucky Small Grain Variety Trials, Progress Report 355
5. Selecting Wheat Varieties, Grain Gleanings, Vol. 1, No. 9 (1993)

### Powdery Mildew

**CAUSE:** *Erysiphe graminis* f.sp. *tritici*

**SYMPTOMS:** White, powdery patches form on upper leaf surfaces of lower leaves and stems and eventually can spread to **all** aboveground portions of plants. Patches turn dull gray/brown with age, frequently with small, embedded black specks.

**KEY FEATURES OF DISEASE CYCLE:** Fungus persists between seasons in infested wheat stubble and in overwintering wheat. Spores infect plants during periods of high moisture (not necessarily rain) and cool to moderate temperatures. Disease development ceases when hot daytime (80°+ F) and moderate nighttime temperatures prevail. Low light intensity, which accompanies dreary weather, and a dense, lush crop canopy favor disease.

**MANAGEMENT:** Use resistant or moderately resistant varieties, unless you are willing to make a fungicide application. Avoid excessively dense, lush stands by using adequate, but not excessive, planting rates and spring-applied nitrogen. If necessary, protect upper leaves and heads of plants from powdery mildew using foliar fungicides. Powdery mildew on lower plant parts does not always result in measurable yield loss or indicate the need to spray. It does, however, indicate that upper plant parts may become seriously diseased if disease-favorable weather continues. Base all fungicide use decisions on field scouting, considering the plant growth stage and the level of disease.

**SOURCES OF ADDITIONAL INFORMATION:**

1. Fungicides to Control Leaf Diseases in High Yield Wheat, PPA- 36
2. Foliar Fungicide Use in Wheat, Grain Gleanings, Vol. 1, No. 3 (1993)
3. Annual Kentucky Small Grain Variety Trials, Progress Report 355
4. Selecting Wheat Varieties, Grain Gleanings, Vol. 1, No. 9 (1993)

## Septoria Leaf Blotch Complex

**CAUSES:** *Septoria nodorum* and *Septoria tritici*

**SYMPTOMS:** Foliar symptoms caused by *S. tritici* infection include brown, elongated rectangular lesions with irregular margins. Lesions will have numerous black pin-point specks throughout. Called pycnidia, they are the source of infectious spores. Pycnidia will be most evident in the morning following a heavy dew, or after rain. Symptoms usually start in the lower leaves and move upward. Lesions are often first found at the tips of leaves, especially where leaves are touching the ground or where frost damage has been sustained.

Foliar symptoms caused by *S. nodorum* infection are lens-shaped, tan-brown lesions of varying sizes, with regular borders, that are frequently surrounded by a yellow halo. Lesions will contain light brown pycnidia, but these are difficult to see without the aid of a hand lens. *S. nodorum* infections can occur very early in the season, but are most evident just prior to and after heading. As with *S. tritici*, *S. nodorum* infections tend to start in the lower leaves and move to the upper leaves and heads (see Glume Blotch). The above symptoms will be evident 7-10 days following infection.

**KEY FEATURES OF DISEASE CYCLE:** *Septoria* fungi overwinter in wheat stubble of previously diseased crops or on infested seed. Spores are produced during wet weather in the fall and spring, but spring infections, especially during and after crop heading, cause the greatest yield damage. Infection of plants by *S. tritici* is very temperature dependent and is greatest during cool to moderate temperatures and abundant moisture. Infection by *S. nodorum* can occur over a wide range of temperatures, but is favored in the mid- to late stages of crop development when plants are most susceptible to infection. The fungi that cause septoria leaf blotch complex can occur individually in a crop or at the same time, even on the same leaves.

**MANAGEMENT:** Plant moderately resistant varieties unless you are willing to make at least one fungicide application. Plant high-quality, well-cleaned, disease-free seed (e.g., certified seed). Avoid excessive seeding rates, as well as nitrogen deficiencies and excesses. Protect the upper two leaves and heads of plants with fungicides, where needed. The presence of septoria leaf blotch complex on lower plant parts does not always result in measurable yield loss or indicate the need to spray. It does, however, indicate that serious disease in the upper plant is likely if disease-favorable conditions persist. Fungicides should only be relied upon to prevent infections from taking place. Thus, fungicides **must** be applied **before** serious disease is evident on the upper leaves and heads of plants. Base all fungicide use decisions on field scouting, considering the stage of crop development and level of disease. Crop rotation and tillage of infested wheat stubble may help to moder-

ate leaf blotch severity, but neither provides a high degree of control because of the cropping systems prevalent in Kentucky.

### **SOURCES OF ADDITIONAL INFORMATION:**

1. Septoria Diseases of Wheat, PPA-39
2. Fungicides to Control Leaf Diseases in High Yield Wheat, PPA- 36
3. Foliar Fungicide Use in Wheat, Grain Gleanings, Vol. 1, No. 3 (1993)
4. Annual Kentucky Small Grain Variety Trials, Progress Report 355
5. Selecting Wheat Varieties, Grain Gleanings, Vol. 1, No. 9 (1993)

## Take-all

**CAUSE:** *Gaeumannomyces graminis* var. *tritici*

**SYMPTOMS:** Infected plants appear normal through crop green-up, but eventually they become stunted and uneven in height. There may be some premature death of secondary and, occasionally, primary tillers. This phase of the disease can be confused with Hessian-fly damage or barley yellow dwarf. Tillers that head out are sterile and turn white or buff-colored. Affected plants can be easily pulled out of the soil because of extensive root rotting. A shiny black discoloration will be evident under the leaf sheaths at the bases of diseased plants. Infected plants can occur individually, but more typically occur in small to large groups, depending on the degree of soil infestation by the take-all fungus. Entire fields or large portions of fields can be diseased in severe situations.

**KEY FEATURES OF DISEASE CYCLE:** The take-all fungus survives from season to season in infested wheat and barley stubble and residue of grassy weeds. Wheat becomes infected in the fall/early winter when developing roots come in contact with infested debris. After infection, root rot progresses, especially in early spring, and aboveground symptoms become evident during and after stem elongation. Infections are favored in neutral to alkaline, infertile (especially nitrogen and phosphorus), poorly drained soils. Yield loss potential due to take-all is greater with wheat than it is with barley.

**MANAGEMENT:** Allow at least one, and preferably two, years between wheat (or barley) crops in a field. Soybeans, corn, grain sorghum, and oats are acceptable alternative crops. Control grassy weeds, especially in years between small grain crops. Fertilize fields (phosphorus and potassium) and lime fields according to soil test recommendations. Avoid fall or spring nitrogen deficiencies in the small grain crops. Improve surface and internal drainage of fields. Tillage of diseased wheat stubble prior to planting the next crop (non-host) will aid in the decomposition of infested stubble and encourage population reductions of the take-all fungus.

### **SOURCES OF ADDITIONAL INFORMATION:**

1. Take-All of Wheat, PPFs-12

## Tan Spot

**CAUSE:** *Pyrenophora tritici-repentis*

**SYMPTOMS:** Tan spot lesions are difficult to distinguish from lesions resulting from *Septoria nodorum* infection. Tan spot lesions, however, will be devoid of pycnidia, will tend to remain more discrete, and will have more distinct yellow halos. Tan spot lesions frequently develop a small dark brown spot at their centers. Tan spot is usually most evident late in the season, but it can occur early (e.g., prior to flag leaf emergence) in some situations, especially where continuous wheat is grown.

**KEY FEATURES OF DISEASE CYCLE:** Fungus survives the winter in infested wheat stubble. Spores are produced and infect plants throughout the spring during extended periods of leaf wetness. Shortened or continuous wheat rotations and reduced tillage practices encourage disease development.

**MANAGEMENT:** Resistance to tan spot is available in wheat, but tan spot reactions of many commonly grown varieties are poorly defined. Rotate fields out of wheat for two or more years. Avoid excessively dense, lush stands. Till infested wheat stubble after doublecrop soybeans are harvested. Protect the upper leaves of plants with fungicides as discussed under septoria leaf blotch complex.

### SOURCES OF ADDITIONAL INFORMATION:

1. Fungicides to Control Leaf Diseases in High Yield Wheat, PPA- 36
2. Foliar Fungicide Use in Wheat, Grain Gleanings, Vol. 1, No. 3 (1993)

## Soilborne Wheat Mosaic

**CAUSE:** Soilborne wheat mosaic virus

**SYMPTOMS:** Leaves of infected plants will exhibit a mild green to prominent yellow mosaic. Small green islands and short streaks may be evident on an otherwise yellowed leaf. Infected leaves may be somewhat elongated with rolled edges. Symptoms can be confused with wheat spindle streak mosaic, but spindle streak will show yellow dashes on an otherwise green leaf. Also, plants with soilborne wheat mosaic are frequently stunted, while those with spindle streak are usually not. Tillering of plants can be reduced by soilborne infection. Soilborne can occur throughout fields, but may be most severe in poorly drained areas. Symptoms are most common early to mid-season when day temperatures are between 55-70°F.

**KEY FEATURES OF DISEASE CYCLE:** Virus is transmitted by a soil fungus, *Polymyxa graminis*, that is common throughout Kentucky. Infection can occur in the fall, winter, or spring, but autumn infections lead to the most serious problems. Infection is favored by high soil moisture.

**MANAGEMENT:** Plant resistant wheat varieties. Delay fall planting operations past the Hessian fly-free date (see Barley Yellow Dwarf) to limit fall infections. Improve

internal and surface drainage of fields where problems exist. Avoid crop production practices that encourage soil compaction.

## Wheat Spindle Streak Mosaic

**CAUSE:** Wheat spindle streak mosaic virus

**SYMPTOMS:** Symptoms are highly variable, depending on the wheat variety and growing conditions. Foliar symptoms appear as random, yellow to light green dashes running parallel with the leaf veins. Early in the spring, the dashes may have a non-descript appearance. With age, however, some dashes will be pointed at one or both ends, hence the name spindle streak. Spindles may have an island of green tissue in their centers. Plant stunting and reduced tillering may be associated with severe infection by the virus. Field symptoms usually appear during the period the crop should be greening up in early spring. Symptoms are frequently uniformly distributed across fields. Symptoms usually fade, and flag leaves may be free of symptoms as temperatures warm in mid- spring. In cool springs, however, symptoms may be evident well into the heading stages. Spindle streak can be confused with soilborne wheat mosaic.

**KEY FEATURES OF DISEASE CYCLE:** The virus is transmitted to wheat in the fall, winter, or early spring by a very common soil fungus, *Polymyxa graminis*. The onset and degree of symptom expression can be highly variable in a field from one year to the next, even though *P. graminis* and the virus are present at relatively constant levels. This is related to the time of year wheat becomes infected and the range and consistency of winter and early spring temperatures. Disease is favored in wet soils, although excessive moisture is not required for severe disease to occur.

**MANAGEMENT:** Plant resistant varieties. Delay fall planting operations past the Hessian fly-free date (see Barley Yellow Dwarf) to limit fall infections. Improve internal and surface drainage of fields where problems exist. Avoid production practices in fields that encourage soil compaction.

### SOURCES OF ADDITIONAL INFORMATION:

1. Wheat Spindle Streak Mosaic, PPFS-53
2. Annual Kentucky Small Grain Variety Trials, Progress Report 355
3. Selecting Wheat Varieties, Grain Gleanings, Vol. 1, No. 9 (1993)

## BARLEY

### Barley Yellow Dwarf

**CAUSE:** Barley Yellow Dwarf Virus (BYDV-various strains)

**SYMPTOMS, KEY FEATURES OF DISEASE CYCLE AND MANAGEMENT:** See BYDV under "wheat."

## Glume Blotch

**CAUSE:** *Septoria nodorum*

**SYMPTOMS, KEY FEATURES OF DISEASE CYCLE AND MANAGEMENT:** See glume blotch under "wheat."

## Head Scab

**CAUSE:** *Fusarium* spp.

**SYMPTOMS, KEY FEATURES OF DISEASE CYCLE AND MANAGEMENT:** See head scab under "wheat."

## Net Blotch

**CAUSE:** *Pyrenophora teres*

**SYMPTOMS:** Small brown leaf spots or streaks expand into dark brown lesions with a net-like appearance. Severely diseased leaves may die and dry up. Seed can become infected and will exhibit non-descript dark brown lesions at the base.

**KEY FEATURES OF DISEASE CYCLE:** The causal fungus overwinters in seed or barley residue. Barley is the only known host of *P. teres*. Infectious spores are produced on overwintered sources during cool, wet weather. Spores are carried in wind currents to barley and infect the crop during cool, wet weather. Serious yield loss can occur in susceptible varieties during excessively cool, wet seasons.

**MANAGEMENT:** Use high-quality, disease-free seed (e.g., certified seed). Treat seed with a broad-spectrum fungicide, such as thiram, captan, maneb or mancozeb. Rotate barley with other crops. Sow resistant varieties when available. Foliar fungicides, such as mancozeb, can be used to control disease on the foliage. This practice, however, will only be economical on susceptible varieties during exceptionally cool, wet seasons. The economic return associated with fungicide use in barley is usually less than it is with wheat.

### **SOURCES OF ADDITIONAL INFORMATION:**

1. Fungicide Seed Treatment for Control of Grain Diseases, PPA-36

## Leaf Rust

**CAUSE:** *Puccinia hordei*

**SYMPTOMS:** Small yellow-orange pustules on leaf blades and leaf sheaths.

**KEY FEATURES OF DISEASE CYCLE:** Fungus overwinters on fall-sown barley in production areas with very mild winters. The fungus moves into Kentucky by wind currents in the spring. Disease development and spread are favored by warm, wet conditions.

**MANAGEMENT:** Resistant varieties or foliar fungicides, such as mancozeb, can be used to control barley leaf

rust; however, leaf rust pressure in Kentucky is generally minimal, and these practices are rarely necessary.

## Loose Smut

**CAUSE:** *Ustilago tritici*

**SYMPTOMS, KEY FEATURES OF DISEASE CYCLE AND MANAGEMENT:** See loose smut under "wheat."

## Scald

**CAUSE:** *Rhynchosporium secalis*

**SYMPTOMS:** Large, irregular, tan to light brown lesions with a dark brown/brown-purple border. Lesions may occasionally have a zonate appearance.

**KEY FEATURES OF DISEASE CYCLE:** *R. secalis* overwinters in infected, fall-sown barley or on infested barley residue. Barley is the only known host of *R. secalis*. Production and dispersal of spores and infection of leaves occur during cool, wet weather in the spring and occasionally in the fall.

**MANAGEMENT:** Rotate barley with other crops. Scald is most severe where barley is planted using no-till or reduced tillage systems. Sow resistant barley cultivars in fields with a high risk for scald (i.e., poorly rotated, reduced tillage). Foliar fungicides such as propiconazole can be used to control scald on scald-susceptible barley varieties in cool, wet seasons. However, the economic return associated with fungicide use in barley is usually less than it is with wheat.

## Septoria Leaf Blotch Complex

**CAUSE:** *Septoria* spp.

**SYMPTOMS, KEY FEATURES OF DISEASE CYCLE AND MANAGEMENT:** See septoria leaf blotch complex under "wheat." Also note that the economic return associated with foliar fungicide use in barley is usually less than it is with wheat.

## Take-all

**CAUSE:** *Gaeumannomyces graminis* var. *tritici*

**SYMPTOMS, KEY FEATURES OF DISEASE CYCLE AND MANAGEMENT:** See take-all under "wheat."

## Tan Spot

**CAUSE:** *Pyrenophora tritici-repentis*

**SYMPTOMS, KEY FEATURES OF DISEASE CYCLE AND MANAGEMENT:** See tan spot under "wheat." Also note that the economic return associated with foliar fungicide use in barley is usually less than it is with wheat.

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