

Wheat Disease Control

Heather Kelly, Ph.D. Extension/Research Plant Pathologist

For a disease to develop and have significant effect on yield there are 4 major factors that have to align:

- Time – regarding the growth stage of the plant and when the disease develops
- Susceptible host – a variety that is susceptible to disease
- Environment – the right conditions for disease to develop
- Pathogen present – influenced by field history

For wheat production the last leaf (flag leaf) to emerge from the whorl is very significant because it makes up approximately 75% of the effective leaf area that contributes to grain fill. Hence, a diseased flag leaf = yield loss. Leaves in the lower canopy of wheat contribute very little to yield and hence disease or injury to the lower canopy leaves has very little impact on yield. Therefore, disease scouting is very important from the time before the flag leaf until the end of flowering.

To identify the flag leaf split the stem above the highest node. If no additional leaves and the head are found inside than the flag leaf is confirmed. To protect the flag leaf from disease timing is critical because if a fungicide application is made too early, the flag leaf will not be protected and if too late, disease may develop to the point that a fungicide application would not be effective.

The decision to apply a fungicide to wheat should be based upon multiple factors including: 1) disease presence, 2) fertility and yield potential, 3) weather conditions and 4) cropping history. For example, a fungicide application would be warranted if:

- Disease is present
- Nitrogen has been applied and the wheat has good yield potential
- Weather conditions favor disease development (dependent on the disease, but most are favored by wet, humid)
- Wheat has been planted in the field in the past year or two

Disease scouting in wheat should be continued through the beginning of flowering because even if a fungicide at the flag leaf is not recommended, a fungicide application during a boot growth stage (Feekes 10.0- 10.5.1) may be warranted to protect the flag leaf and the head from disease. A detailed foliar fungicide point system is on the next page and can be found at UTCrops.com (Wheat Foliar Fungicide Point System) that can be used as a guide to determine the need for a fungicide application.

Another critical time for fungicide application is at bloom (Feekes 10.5.1) which would protect wheat from Fusarium Head Blight/Head Scab. Head Scab can be more severe in wheat planted behind corn that has high nitrogen levels. For Head Scab to occur rain events and warm temperatures during flowering are necessary and while Tennessee doesn't regularly experience a lot of Head Scab the risk varies from year to year. A forecasting tool is available at www.wheatscab.psu.edu, which will have commentary for Tennessee as the wheat gets closer to flowering.

There are multiple fungicides labeled for wheat and for the control of different diseases. The North Central Regional Committee on Management of Small Grain Diseases (NCERA-184) has developed information on fungicide efficacy for control of certain wheat diseases. This information can be found at UTCrops.com ([Wheat Fungicide Table – NCERA 184](#)) and in the following pages. Application coverage is also important and applications should be made in at least 5 gallons of water per acre by airplane or at least 15 gallons of water per acre by ground application.

Common foliar wheat diseases in Tennessee include: Glume (Stagonospora) Blotch, Septoria (Leaf) Blotch, Leaf Rust, Stripe Rust; and less common include: Powdery Mildew and Fusarium Head Blight (Scab). Short descriptions of fungal wheat diseases which include conditions for disease development, symptoms, and management options are in the pages to follow and can be found along with images at UTCrops.com ([Fungal Wheat Disease Worksheet](#)).

To summarize the specific 4 factors for a disease to develop and have significant effect on grain yield are:

- Timing – scout wheat before flag leaf emergence through flowering with critical timing for fungicide application, when warranted, at flag leaf and mid bloom.
- Susceptible host – check your variety to see if it has resistance to certain diseases, in which case fungicide application may not be necessary.
- Environment – usually wet weather, either rain events and/or high relative humidity will promote disease, with some diseases developing during warmer temperatures and some during cooler temperatures. Reference the Fungal Wheat Disease Worksheet in the following pages or at UTCrops.com ([Fungal Wheat Disease Worksheet](#)).
- Pathogen presence – similarly reference the Fungal Wheat Disease Worksheet in the following pages or at UTCrops.com ([Fungal Wheat Disease Worksheet](#)) to identify diseases found out in the field and for conditions for disease development.

WHEAT FOLIAR FUNGICIDE POINT SYSTEM

This point system should be used only as a guide to determine the need for application of foliar fungicides. It does not guarantee an economical return. If a "zero" is indicated in any major (I-VII) category, then the field **should not** be sprayed.

			<u>Points</u>
I. Yield Potential (5-7 days before first spray)			
1. 40 Bu/A or above	= 150		
2. 30-39 Bu/A	= 50		
3. Below 30 Bu/A	= 0	I.	_____
II. Cropping History			
1. Wheat in field last year	= 100		
2. Wheat in field two years ago	= 50		
3. First time in wheat three years or longer	= 25	II.	_____
III. Fertility (total Nitrogen)			
1. Applied 90-120 lbs. of Nitrogen/A	= 100		
2. Applied only 60-90 lbs. of Nitrogen/A	= 50		
3. Applied no nitrogen	= 0	III.	_____
IV. Seeding rate (assuming 80% plus germination)			
1. Planted 2 or more Bu/A	= 75		
2. Planted 1.5-2.0 Bu/A	= 50		
3. Planted less than 1.5 Bu/A	= 25	IV.	_____
V. Disease at application time (stage F10.3)			
1. Severe (disease starting on flag leaf)	= 100		
2. Moderate (bottom & middle leaves diseased)	= 75		
3. Light (disease found on lower leaves)	= 50		
4. No foliar disease present	= 25	V.	_____
VI. Seasonal rainfall prior to first application			
1. Above normal	= 100		
2. Normal	= 75		
3. Below normal	= 25	VI.	_____
VII. Traditional Disease Pressure			
1. Heavy	= 125		
2. Moderate	= 75		
3. Light	= 25	VII.	_____
Total Points			_____

After inspection of each field (boot stage), producers should total the number of points to determine the probability of a yield increase

<u>Total Field Points</u>	<u>Chances of Yield Increase</u>
750-1000	Excellent
500-749	Fair
Below 500	Poor

Fungal Wheat Diseases – short descriptions and images

Leaf Blotch (*Septoria tritici*)

- **Conditions for disease development** include temperatures between 59 to 77 °F and periods of rainy or humid weather that last for more than 1 day. Disease outbreaks occur more prevalently on lower leaves in the early spring after **cool, wet conditions**. The pathogen will start to decline as temperatures increase.
- **Symptoms** usually develop on winter wheat in early spring on the **lowest overwintered leaves** and will develop on higher leaves if cool, wet conditions persist. Lesions have tan to brown centers surrounded by yellow areas that are laterally restricted. Lesions may have small, black specks (pycnidia) in the necrotic areas of lesions. Lesions can be scattered over the leaf blade and may coalesce to cover large portions of the leaf blade.
- **Management** options include reducing risk of infection by growing wheat at 2 year intervals, wide row spacing, planting resistant varieties, and timely fungicide treatments (see [Wheat Fungicide Table](#)).



Glume Blotch (*Stagonospora nodorum*)

- **Conditions for disease development** are more prevalent in **dense foliage** and **areas of heavy fertilization**. No-till and minimum tillage increase the risk of occurrence of disease in continuous or short-rotation wheat production. Disease outbreaks are promoted by **wet, warm** weather. Optimal temperature for symptom development is between 68-80 °F.
- **Symptoms** are often first seen in the spring on the **lowest overwintered leaves** and will develop on higher leaves if warm, wet conditions persist. Foliar lesions begin as yellow flecks, becoming brown or grayish brown, elongated, and often lens-shaped. Stem infections are also common, especially at nodes. Glume infections result in purple brown or grayish brown streaks and blotches, starting at the glume tips.
- **Management** options include reducing risk of infection by growing wheat at 2 year intervals, balanced fertilization rates, wide row spacing, planting resistant varieties, and timely fungicide treatments (see [Wheat Fungicide Table](#)).



Leaf blotch and glume blotch may occur in different combinations within a field and on individual plants

Stripe Rust/Yellow Rust (*Puccinia striiformis*)

- **Conditions for disease development** are optimal during **50 to 64 °F with intermittent rain or dew**. High levels of disease can occur in years with cool, wet springs, mild winters, and cool summers for spores to survive from season to season. Stripe rust can overwinter on leaf tissue, volunteer wheat, and other grass hosts as it can survive temperatures as low as 23 °F. The spores rapidly decline at temperatures above 59 °F.
- **Symptoms** first appear as yellow, chlorotic patches on leaves. **Tiny, yellow to orange raised pustules** develop in these areas with thousands of yellow orange spores. **Distinct stripes** of pustules develop on upper leaves after stem elongation, but not on seedling leaves. Depending on temperature and the resistance of the cultivar, yellow to tan spots or stripes of various sizes can develop, with or without spores.
- **Management** options include growing resistant cultivars, destroying volunteer wheat, avoiding excessive water and fertilizer, and timely fungicide applications (see [Wheat Fungicide Table](#)). Resistant cultivar usually contain adult plant resistance, where the resistance occurs at later growth stages such as jointing/elongation or flag leaf emergence.



Leaf Rust (*Puccinia triticina*)

- **Conditions for disease development** include temperatures between **64 and 77 °F with high humidity or moisture**. After spores land on leaves infection is completed in 6 to 8 hours and disease symptoms can develop within 7 days.
- **Symptoms** include **small round, or oblong raised pustules that are orange red** in color. Leaf rust pustules are more scattered and larger in size compared to stripe rust.
- **Management** options include growing resistant cultivars, destruction of volunteer wheat, avoiding excessive water and fertilizer, and timely fungicide applications (see [Wheat Fungicide Table](#)).



Powdery Mildew (*Blumeria graminis* syn. *Erysiphe graminis*)

- **Conditions for disease development** are optimal between **59 and 72 °F with high humidity**, and are more prevalent in **dense foliage** and **areas of heavy fertilization**. The pathogen survives on volunteer wheat and in the spring when wheat growth resumes powdery mildew symptoms can appear on the older leaves initially.
- **Symptoms** will usually appear in the lower canopy on older leaves and is more prevalent on the upper surface. Stems can also become infected and show the same symptoms as leaves. Symptoms include **patches of white, cottony growth** (colonies) on the surface of the plant that can turn a dull gray brown. As wheat and the powdery mildew mature, distinct brown black dots within aging colonies may be seen, which are the sexual fruiting structures (cleistothecia). Symptoms can occur at any time after seedlings emerge.



- **Management** options include growing resistant varieties, destruction of volunteer wheat, balanced fertilization rates, wide row spacing, and timely fungicide applications (see [Wheat Fungicide Table](#)).

Fusarium Head Blight/Scab (*Fusarium* species)

- **Conditions for disease development** are more prevalent in wheat planted behind corn and when warm, wet conditions occur during flowering. Although wheat can become infected from head emergence until harvest, infections initiated at and soon after flowering have the greatest destructive potential.
- **Symptoms** include bleaching of spikelets or entire heads of wheat. Superficial, often pink or orange masses of spores may be seen on and especially at the base of diseased spikelets. Small, dark (blue-black) fruiting structures will often be seen some time after the initial infection. If seed is formed from infected heads, it is often shriveled or discolored. The fungus may also produce mycotoxins in the wheat. The most frequently associated mycotoxin is deoxynivalenol (vomitoxin, also referred to as DON), which is very poisonous and hence grain can be rejected based on the amount of mycotoxin present.
- **Management** options include crop rotation with at least a 1-year break from a host crop (corn, wheat, barley, and other cereals), plowing to bury crop residues, using a less susceptible variety (research is ongoing to develop a commercial variety with improved resistance), and timely fungicide applications (see [Wheat Fungicide Table](#) and [Fusarium Head Blight Prediction Center](#)).

