DUPONT PIONEER
FIELD FACTS

Managing Diseases in Wheat

Introduction

Viruses, leaf diseases and head diseases may all affect a wheat crop and reduce yields. In one major wheat-producing state, extension specialists estimate that yield losses may be as high as 30 to 50% when diseases are not managed. Wheat diseases are generally worse with prevailing wet weather patterns in the spring – conditions that have been quite common in many wheat-growing areas in 2013. Consequently, growers should plan to manage wheat diseases effectively to optimize yields and profits.

Viral Diseases

The barley yellow dwarf virus is the most common virus affecting wheat. It is vectored by aphids, which feed on wheat plants in both the fall and the spring. Other common wheat viral diseases include wheat streak mosaic, transmitted through the feeding of wheat curl mites; and wheat spindle-streak mosaic and wheat soilborne mosaic, both transmitted by soil fungi.


Barley yellow dwarf virus

Leaf and Head Diseases

Most fungal wheat diseases survive on wheat residue or that of other grasses and on wheat seed, and spread during wet conditions. Three of the primary leaf and head diseases of wheat are highlighted below.

Powdery mildew, *Blumeria graminis f. sp. tritici*, is a foliar disease of wheat that is favored by cool temperatures below about 77° F and moist conditions common in some environments, especially with dense stands and high applied nitrogen. After fall infection, the disease may appear on the lower leaves in April and May and spread during the tillering and jointing stages of growth.


Powdery mildew on wheat

Leaf and glume blotch may be caused by any of three fungal pathogens, including *Septoria*. Spread of these fungi is favored by wet, windy weather. During periods of wet weather, these fungi spread rapidly from the lower leaves to the upper leaves.

Small, chocolate-brown spots enlarge into lens-shaped lesions with dark brown edges. The centers of the lesions bleach, and brown specks form in the centers. Similar lesions appear on the glumes as on the leaves. Heads develop a dark chocolate color. Infected seed are discolored, shriveled, and may not germinate.

Fusarium head blight (head scab), *Fusarium graminearum*, can be the most devastating disease of wheat when conditions favor its development. The disease reduces both grain yield and quality; quality losses can be due to lower test weights and production of a toxin (deoxynivelanol, or DON) by the head scab fungus. Both low test weight and contamination of the grain by DON can cause serious problems for producers and millers.

This disease overwinters in diseased seed and residues of wheat, corn and other grasses in surrounding fields. Spores are produced and blown onto the wheat heads, which germinate in free water on the head and invade the flower.

Symptoms occur on the head after flowering. Individual spikelets or the entire head may be prematurely bleached. The bleached spikelets usually contain shriveled, scabby seeds and brown or black lesions may be present where the head joins the stem.


Wheat infected by Fusarium head blight (head scab)

The fungal pathogen that causes Fusarium head blight in wheat also causes Gibberella stalk and ear rot in corn. Because corn is widely grown in rotation with wheat, the pathogen is already present in most fields, and disease development depends on prevailing weather patterns.

Because wheat is susceptible to the disease during flowering, weather conditions from flowering through kernel development play a key role in the incidence and severity of scab. Moderate temperatures (75 to 85°F), prolonged high humidity, and prolonged wet periods favor disease development.

Other leaf diseases – Other common leaf diseases of wheat include leaf blight and tan spot, which generally survive in previous crop residue; and leaf rust and stripe rust, which generally blow into the mid-South and Midwest from more southern states.

Management Practices

Management of wheat viral diseases – Viral diseases can be managed by selecting resistant varieties or by controlling insects or mites that vector the disease. Genetic differences are evident among varieties in their resistance to the spindle streak mosaic virus and soilborne mosaic virus. DuPont Pioneer rates its varieties for resistance to these diseases and makes these ratings available to customers.

To manage barley yellow dwarf virus, growers must manage the aphids that vector it. Thresholds for treatment vary by state, time of application, and in some cases, by the type of aphid. Many insecticide choices are available for controlling aphids in wheat. See your local or state extension recommendations for treating aphids in wheat.

Management of wheat fungal diseases – Fungal diseases should be managed by a combination of practices:

- Variety selection. DuPont Pioneer rates its varieties for resistance to leaf blight, leaf rust, stripe rust, powdery mildew and head scab.
- Practices that reduce disease inoculum:
  - Rotation to a non-host crop
  - burying crop residue by tillage (not appropriate in all fields).
- In addition, timely application of fungicides can help protect plants and reduce disease spread (Fig. 1). Some commonly used fungicides are shown in Appendix 1.

Specific management tips for fusarium head blight - A "full management" approach is needed to achieve levels of head scab control that will be acceptable to most growers:

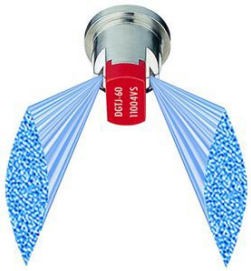
- Plant wheat following soybeans to reduce the initial inoculum in the field (corn residue can harbor the *Fusarium* pathogen).
- Plant wheat varieties that have an acceptable level of genetic tolerance to head scab. However, this does not mean such varieties will not benefit from a fungicide. Recent research has shown that applying fungicides to these varieties may actually get you closer to the 80 to 90% levels of control.

Figure 1. Aerial application of foliar fungicide to wheat field in Missouri.

- Time fungicide applications precisely.
- Use appropriate spray volume and nozzle type.
- Use products with the highest rating for this disease.

Fungicide timing - Timing of a fungicide application is very critical for successful management of Fusarium head blight. The ideal application timing to achieve around 50 to 60% control is exactly at Feekes Growth Stage 10.51. Growers should begin spraying when 75 to 100% of the wheat heads on the main stem are fully emerged (~ Growth Stages 10.3 to 10.51). In a normal year, this timing translates into about a 36-hour window for optimum effectiveness; treating prior to or after that ideal window usually results in about a 10 to 20% loss in control for each day the window is missed.

Spray volume and nozzle type - To achieve good control of head scab, use a minimum of 10 gallons of water per acre as a carrier, preferably 15 to 20 gallons. Also, use a twin flat fan nozzle that sprays a fan forwards and backwards at about a 60 degree angle. This will give much better coverage of the wheat head, the goal in this type of application.



Example of a twin flat fan nozzle that improves fungicide spray coverage of wheat heads by spraying both forward and backward.

Photo courtesy of TeeJet®.

Highest-rated fungicides – Fungicides that are rated "good" for Fusarium head blight suppression are Caramba™ 0.75 SL, Proline® 480 SC and Prosaro® 421 SC

(Appendix 1); there are no fungicides rated very good or excellent for head scab. Caramba 0.75 SL, Proline 480 SC and Prosaro 421 SC are also labeled for leaf diseases such as Septoria, rust, and powdery mildew, but the timing of the Fusarium head blight application may be too late for flag leaf protection. Check your local extension source for specific recommendations. Always read and follow the label directions.

Quick Guidelines for Fungicide Use

Erick De Wolf, Plant Pathologist at Kansas State University, offers the following tips for fungicide use in wheat (De Wolf, 2013):

"Research conducted by K-State indicates that a single fungicide application made to susceptible wheat varieties when the risk of disease is high will often result in a 4 percent to 13 percent yield increase with an average increase of approximately 10 percent relative to wheat that remained untreated. A lower yield response is likely if the disease remains at low levels or is absent. The following guidelines will help maximize the potential for effective disease management and a positive yield response:

Application timing. In general, the largest reductions in disease severity and greatest increases in wheat yield or grain quality occur when fungicides are applied between full extension of the flag leaves and anthesis (when the male flower parts have just begun to emerge). Applications intended for the management of glume blotch or head scab should be made between the beginning of anthesis and 50 percent flowering. Always consult the product label for specific growth stage restrictions and preharvest intervals (PHI) before making fungicide application.

Pay attention to disease scouting reports. The risk of severe disease and yield loss is greatest when foliar diseases become established early and result in consistent disease pressure throughout the growing season. Discovery of low disease levels within a field or regional reports of disease outbreaks when the local wheat crop is between jointing and flag leaf emergence, is a valuable indicator of an elevated disease risk and potential yield loss.

Know the vulnerabilities of varieties. Growing wheat varieties that are susceptible to leaf rust, stripe rust, tan spot, or powdery mildew increases the risk of severe disease and yield loss. Fungicides are most likely to improve yield when applied to varieties that are susceptible to one or more of these common diseases. Varieties with moderate or high levels of resistance to these diseases are less likely to benefit from a fungicide application."

References

De Wolf, E. 2013. Foliar fungicide efficacy ratings for wheat disease management – 2013. Kansas State University Extension Publication EP130. http://www.ksre.ksu.edu/bookstore/pubs/ep130.pdf

Hershman, D. and D. Johnson. 2009. A comprehensive guide to wheat management in Kentucky. Section 7: disease management. University of Kentucky Extension. http://www.uky.edu/Ag/GrainCrops/ID125Section7.html

Appendix 1. Efficacy of fungicides for wheat disease control based on appropriate application timing (De Wolf, E. 2013).

Fungicide(s)												
Class	Active ingredient	Product	Rate/a (fl. oz.)	Powdery mildew	Stagonospora leaf/glume blotch	Septoria leaf blotch	Tan spot	Stripe rust	Leaf rust	Stem rust	Head scab	Harvest restriction
Strobilurin	Picoxystrobin 22.5%	Aproach SC	6.0 - 12	G[1]	--	--	--	E	VG	--	--	Feekes 10.5 and 45 days
	Fluoxastrobin 40.3%	Evito 480 SC	2.0 – 4.0	G	--	--	VG	--	VG	--	NL	Feekes 10.5 and 40 days
	Pyraclostrobin 3.6%	Headline 2.09 EC	6.0 - 9.0	G	VG	VG	E	E[2]	E	G	NL	Feekes 10.5
Triazole	Metconazole 8.6%	Caramba 0.75 SL	10.0 - 17.0	VG	VG	--	VG	E	E	E	G	30 days
	Propiconazole 41.8%	Tilt 3.6 EC[3]	4.0	VG	VG	VG	VG	VG	VG	VG	P	Feekes 10.5
	Prothioconazole 41%	Proline 480 SC	5.0 - 5.7	--	VG	VG	VG	--	VG	VG	G	30 days
	Tebuconazole 38.7%	Folicur 3.6 F[3]	4.0	G	VG	VG	VG	E	E	E	F	30 days
	Prothioconazole 19% Tebuconazole 19%	Prosaro 421 SC	6.5 - 8.2	G	VG	VG	VG	E	E	E	G	30 days
Mixed modes of action[4]	Metconazole 7.4% Pyraclostrobin 12%	TwinLine 1.75 EC	7.0 - 9.0	G	VG	VG	E	E	E	VG	NL	Feekes 10.5
	Fluxapyroxad 14.3% Pyraclostrobin 28.6%	Priaxor	4.0 - 8.0	G	VG	VG	E	E	E	VG	NL	Feekes 10.5
	Propiconazole 11.7% Azoxystrobin 7.0%	Quilt 200 SC[3]	10.5 - 14.0	VG	VG	VG	VG	E	E	VG	NL	Feekes 10.5
	Propiconazole 11.7% Azoxystrobin 13.5%	Quilt Xcel 2.2 SE	10.5 - 14.0	VG	VG	VG	VG	E	E	VG	NL	Feekes 10.5
	Prothioconazole 10.8% Trifloxystrobin 32.3%	Stratego YLD	4.0	G	VG	VG	VG	VG	VG	VG	NL	35 days
	Tebuconazole 22.6% Trifloxystrobin 22.6%	Absolute 500 SC	5.0	G	VG	VG	VG	E	E	E	NL	35 days

[1]*Efficacy categories: NL=Not Labeled and Not Recommended. P=Poor; F=Fair; G=Good; V=Very Good; E=Excellent; -- =Insufficient data to make a statement about efficacy of this product.*

[2]*Efficacy may be significantly reduced if solo strobilurin products are applied after stripe rust infection has occurred.*

[3]*Multiple generic products containing the same active ingredients also may be labeled in some states. Products including tebuconazole include: Embrace, Monsoon, Muscle 3.6 F, Onset, Orius 3.6 F, Tebucon 3.6 F, Tebustar 3.6 F, Tebuzol 3.6 F, Tegrol and Toledo. Products containing propiconazole include: Bumper 41.8 EC, Fitness, Propiconazole E-AG, and Propimax 3.6 EC. Products containing propiconazole + azoxystrobin include: Avaris 200 SC.*

[4]*Products with mixed modes of action generally combine triazole and strobilurin active ingredients. Priaxor is an exception to this general statement and combines carboxamide and strobilurin active ingredients.*

Efficacy ratings for each fungicide listed in the table were determined by field testing the materials over multiple years and locations in Kansas. They were verified by the members of the North Central Extension and Research Committee (NCERA-184) for the management of small grain diseases.

Efficacy is based on proper application timing needed 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.