

## Plant Pathology Fact Sheet

# Preplant Decisions Greatly Impact Disease Potential in Wheat

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## How Pre-plant Decisions Affect Diseases

Kentucky wheat producers have a majority of their disease management program in place once the seed is in the ground. By that time, decisions have been made regarding the length of time since the last wheat crop (crop sequence), tillage method and seedbed preparation, variety selection (maturity, “disease package”, yield potential, etc.), seed quality (germination, vigor), seed treatment, planting date, seeding rate, seeding method, and fall fertility. Individually and collectively, these decisions play an important role in determining which diseases might develop, their severity, and their potential impact on crop yield, test weight, and grain quality. Because pre-plant and planting decisions are so important in the management of wheat diseases, you need to understand how they influence disease development.

## Variety Selection

Decisions relating to variety selection are, perhaps, the most important decisions you



can make in managing diseases. Every commercially available wheat variety has a unique “disease package” and this information is generally available for most soft red winter wheat varieties grown in Kentucky. For sure, excellent resistance is not available to manage some diseases and it is hard to find high-yielding varieties that have decent resistance to all major disease threats. Nonetheless, which and how many varieties are planted on your farm will determine the potential for certain diseases to develop. Failure to consider the ramifications of variety selection in managing diseases is a costly mistake made by many

producers. It is best to select two or three high-yielding varieties with the greatest level of available resistance to the most common diseases on your farm. To do this, you must have some idea about the disease history of your farm. If you do not have access to historical disease information for your farm, talk with your county Extension agent, farm supply dealers, local crop consultant, and/or neighbors. This information may not be as good as actual data from your farm, but it is far better than basing decisions on no information. It is important to plant more than one variety for this key reason: it is common for a single disease to severely damage a single variety. However, when multiple varieties are planted, the risk that a disease will wreak havoc on all your wheat acres is significantly diminished. In addition, planting more than one variety, especially when different maturities are represented, can help with the logistics of harvesting and planting doublecrop soybean.



## Crop Rotation

Few wheat producers in Kentucky give much thought to the influence of crop rotation on diseases. This is because our normal production systems rarely include planting wheat in the same field in consecutive years. This is good in that planting wheat in alternate years (or even less often) helps in the management of wheat pathogens that survive between wheat crops in wheat residue and/or are short-lived in the soil in the absence of a host crop. One such disease

is take-all. In fact, crop rotation is the only practical way to control take-all disease. Rotating crops also can reduce infections by certain windborne foliar diseases, such as the diseases that make up the leaf blotch complex (speckled leaf blotch, *Stagonospora* leaf blotch, and tan spot). It should be noted, however, that favorable effects are frequently compromised, or even negated, by spores blowing into fields from neighboring fields or from fields that are many miles away.

Most wheat in Kentucky is planted following corn. Actually, most wheat is now planted no-till behind corn. Corn is generally considered to be a good non-host crop to grow in rotation with wheat because the two crops have few diseases in common. However, there has been some concern that planting no-till wheat where corn was planted the previous season significantly increases the risk to Fusarium head blight (FHB; a.k.a. head scab). This is because the fungus that causes FHB also attacks corn (causing stalk and ear rot) and readily survives between seasons in corn stubble.

This is not an unreasonable concern, but as it turns out, planting wheat behind corn does not significantly enhance the FHB threat. Results of multi-year research trials, disease surveys, plus many years of observations, all point to the same conclusion: weather, not local tillage regime, determines if FHB will be serious enough to reduce yields and grain quality or not. This is because when weather conditions favor FHB, so many FHB spores are produced and blow into fields from both local and distant sources that the role of in-field spore production is relatively unimportant. Most Kentucky wheat producers have found this out for themselves and that is why most farmers now plant no-till wheat.

This said, under conditions favorable for FHB, disease severity (and levels of

deoxynivalenol [DON] – an undesirable mycotoxin usually associated with FHB) can be slightly elevated in no-till fields. Nonetheless, tillage regime will never be the factor that determines whether or not FHB will be severe in a particular field or not.

## **Tillage**

In continuous wheat systems, such as are common in the Great Plains Region, tillage hastens the breakdown of residue that harbors certain wheat pathogens. This can help reduce levels of some soil-borne and foliar diseases caused by fungi. However, in southern states, like Kentucky, where wheat is planted every second or third year in a field and soil conditions favor residue breakdown, most of the wheat residue is deteriorated by the time the next wheat crop is planted. Thus, local tillage regime has minimal impact on diseases that develop from one wheat crop to the next. Implementing community-wide or regional tillage programs might be beneficial, but this approach is impractical. (See the above section on crop rotation for a discussion on the limited impact of tillage on FHB.)

## **Seed Quality, Seeding Rate, Seed Fungicides, and Planting Method**

Seed quality, seeding rate, and planting method can each affect stand establishment and development. To achieve the highest possible yields, you must have sufficient stands. To achieve the desired stands, you must have excellent seed germination and development of seedlings. Using high-quality seed treated with a broad-spectrum fungicide. This, plus good planting techniques (especially depth), foster good stand establishment. Excess stands, however, encourage foliar and head diseases by reducing air circulation and light penetration into the canopy later in the season. Therefore, calibrate your equipment to achieve sufficient, but not excessive, stands.

## **Planting Date**

The trend in recent years has been to plant wheat earlier than is recommended for a given area. The desire to achieve high yields and the logistics of planting large acreages appear to be the main factors behind this trend.

The problem is that early-planted wheat (defined as wheat planted prior to the “Hessian fly-free” planting date) is at greater risk of damage caused by barley yellow dwarf (BYD), wheat streak mosaic (WSM), take-all disease, and Hessian fly than is later-planted wheat. In addition, early planted wheat may also encourage leaf rust and stripe rust infection in the fall and this can increase the risk that one or both disease will carry through a mild winter and into the spring.



If logistical considerations cause you to plant some of your wheat acres prior to the fly-free date for your area, make sure that volunteer corn (which is a “green bridge” for WSM) in and around the field has been killed, and that you plant a variety that can tolerate some BYD. You might also target these acres for a seed-applied or fall foliar insecticide treatment to control the aphids that transmit the BYD virus to wheat. Finally, make sure you scout your early-planted acres for signs of leaf rust and/or stripe rust in the spring so as to not miss hotspots which could lead to a more general infection later in the season. Planting all your wheat acreage prior to the

fly-free date is extremely risky and is not recommended under any circumstances.

### **Nitrogen Fertility**

Too much nitrogen in the fall can encourage excessive fall growth that can increase your problems with BYD and most foliar diseases caused by fungi, but especially powdery mildew. Increased problems with BYD has to do with an extended period of aphid activity (aphids transmit BYD virus) when stands are dense in the fall. The same situation encourages infection and overwintering of foliar fungal diseases, such as leaf and stripe rust, powdery mildew, and leaf blotch complex. Excessive spring nitrogen results in lush stands that promote disease in a manner similar to that associated with excessive seeding rates.

### **Additional Resources**

Disease management and crop production advice can be found in the following University of Kentucky publications available at County Extension offices, as well as on the Internet.

- Comprehensive Guide to Wheat Management in Kentucky, ID-125  
<http://www.ca.uky.edu/agc/pubs/id/id125/id125.htm>
- Kentucky Integrated Crop Management Manual for Small Grains, IPM-4 (2009)  
<http://www.uky.edu/Ag/IPM/manuals/ipm4smgr.pdf>
- Kentucky Plant Disease Management Guide for Small Grains, PPA-10c (1993)  
<http://www.ca.uky.edu/agc/pubs/ppa/ppa10c/ppa10c.pdf>
- No-Till Small Grains Production in Kentucky, ID-136 (2000)  
<http://www.ca.uky.edu/agc/pubs/id/id136/id136.htm>

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*Photos by Matt Barton, University of Kentucky Agricultural Communications Services (wheat field, pg. 1), Howard F. Schwartz, Colorado State University, Bugwood.org (planter, pg. 1 inset), Chad Lee, University of Kentucky Department of Plant and Soil Sciences (pg. 3 and pg. 4)*

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