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WINTER WHEAT DISEASE MANAGEMENT PROGRAM

Diseases reduce wheat yields by up to 30 percent or more each year in Illinois, depending on the diseases involved, the varieties grown, and the environmental factors. Some 30 different diseases commonly reduce yields and grain quality. Potential and average losses can be avoided by a comprehensive, integrated disease management program.

An integrated control program is based on knowledge of which yield-reducing diseases are most likely to be present in an area and their disease cycles. Such a program integrates the use of (1) disease-resistant varieties, (2) high-quality seed, (3) planting site and time, (4) crop rotation, (5) tillage practices, (6) fertility, (7) fungicide seed treatment, (8) foliar fungicide applications, (9) proper storage, and (10) other cultural practices.

Disease Resistant Varieties

Growing disease-resistant varieties is the most economical and efficient method of controlling diseases. Resistance to stem rust, leaf rust, loose smut, Septoria diseases, powdery mildew, soilborne wheat mosaic, barley yellow dwarf, wheat streak mosaic, and wheat spindle streak (or wheat yellow mosaic), is of major importance in Illinois. No single wheat variety is resistant to all major diseases. Thus, varieties should be selected according to their local adaptability, high yield potential, and resistance to the most common and serious diseases. For the best information on how a given variety is likely to perform in an area, check with your nearest Extension office, the current issue of the Circular C1360 Illinois Agronomy Handbook and the Illinois Agricultural Pest Management Handbook (revised annually).

High-quality Seed

The use of high-quality seed is essential to produce consistently high yields. Selecting seed free of mechanical damage, foreign matter, certified as to variety, and free of seedborne disease-causing organisms (pathogens) is the best method to ensure early-season growth and stand development. Seed that has been improperly stored (bin run) will lose vigor and may develop problems in the seedling stage that continue throughout the season and result in reduced crop yield and quality. Diseases such as bunt, loose smut, basal glume rot, black chaff, ergot, Septoria diseases, Helminthosporium spot blotch or black point, and scab may be carried with, on, or within the seed.

Planting Site

The choice of a planting site often determines which diseases are likely to occur, since many pathogens survive on or in crop debris, soil, volunteer wheat, and alternate host plants. This is most important in

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the control of Septoria leaf and glume blotches, Helminthosporium spot blotch, tan or yellow leaf spot, scab, ergot, take-all, Fusarium and Helminthosporium root rots, crown or foot rots, Cephalosporium stripe, bunt or stinking smut, downy mildew, eyespot or strawbreaker, Pythium and Rhizoctonia root rots, sharp eyespot, soilborne wheat mosaic, and wheat spindle streak mosaic or wheat yellow mosaic. There are other diseases which are not affected by choice of planting site including airborne and insect-transmitted diseases. These include barley yellow dwarf virus, wheat streak mosaic virus, and rusts.

Crop Rotation

Crop rotation is an extremely important means of reducing carry-over levels of many common wheat pathogens. Diseases strongly associated with continuous wheat production include take-all, Helminthosporium spot blotch, tan or yellow spot, crown and foot rots, root rots, head blights, Septoria leaf and glume blotches, black chaff, powdery mildew, Cephalosporium stripe, soilborne wheat mosaic, wheat streak mosaic, scab, downy mildew, eyespot and sharp eyespot, ergot, and anthracnose.

With many common wheat diseases, crop debris provides a site for pathogen populations to survive adverse conditions. Many of these pathogens do **not** survive once crop debris is decomposed. Rotations of two or three years with nonhost crops (such as corn, sorghum, alfalfa, and clovers), coupled with other practices that promote rapid decomposition of crop residue will reduce the carryover populations of these pathogens to very low levels. Soilborne wheat mosaic and wheat spindle streak or wheat yellow mosaic increase when wheat is planted continuously in the same field. To control these diseases, rotations must cover at least six years. Using highly resistant varieties is the best way to control losses from these types of diseases. Replanting the same field to winter wheat following an early summer harvest does **not** constitute an adequate rotation.

Seed Treatment

Fungicide seed treatment is an important practice in terms of producing high yields of top-quality grain. Seed treatment trials in Illinois during the last 17 years have increased yields 3 or more bushels per acre by controlling diseases such as bunt, loose smut, Septoria diseases, seed rots, and seedling blights. Failure to control seedling blights may result in serious winterkill of diseased seedlings.

No single fungicide controls all of the diseases just listed. A combination of fungicides is necessary to obtain broad-spectrum seed protection. The commonly used fungicides for wheat seed treatment and the important diseases they control are given in the Illinois Agricultural Pest Management Handbook (revised annually). Since some seedborne pathogens are more difficult to control than others, the full recommended label rate should always be used. For example, loose smut is very difficult to control unless the higher labeled rate is applied.

Planting Time

Planting time can greatly influence the occurrence and development of a number of diseases. Early fall planting and warm soil (before the "fly-free" date) promote the development of certain seed rots and seedling blights, Septoria leaf blotches, leaf rust, powdery mildew, Cephalosporium stripe, Helminthosporium spot blotch, wheat streak mosaic, soilborne wheat mosaic, barley yellow dwarf, and wheat spindle streak mosaic. Wheat that is planted early often has excessive foliar growth in the fall, which favors the buildup and survival of leaf rust, powdery mildew, and the Septoria diseases. Disease buildups in the fall commonly favor earlier and more severe epidemics in the spring. Many of these problems can be avoided if planting is delayed until after the "fly-free" date.

Planting after the "fly-free" date is an effective means of limiting the transmission of viruses and yield losses from virus diseases such as wheat streak mosaic and barley yellow dwarf. The cooler temperatures usually limit the activity of mites and aphids that transmit these viruses. Since fall infections result in the greatest yield losses, serious virus problems can be avoided by late planting. See your nearest Extension office for information on the fly-free date for your area.

Foliar Fungicides

Septoria leaf and glume blotches, powdery mildew, and rusts may occur every year regardless of the precautions taken. If extended periods of moist weather occur prior to heading, these diseases may cause losses of 10 to 30 percent. Septoria and powdery mildew diseases are favored by rainy, windy weather and heavy dews, and are a threat whenever such weather prevails from tillering to heading.

Rusts, powdery mildew, and Septoria diseases can be controlled by timely and proper applications of fungicides. The decision to apply fungicides should be based on the prevalence of the disease(s), its severity, and the yield potential of the crop. As a general guideline, the upper two leaves (flag and flag-1) should be protected against foliar pathogens since head filling depends largely on the photosynthetic activity of these two leaves. Loss of leaves below flag-1 usually cause little loss in yield.

Weekly scouting for foliar diseases should begin no later than emergence of the second node (growth stage 6). If diseases are present at this time and weather conditions favor continued disease development (cool and rainy), a fungicide application should be considered. Be certain that diseases are correctly diagnosed to ensure proper fungicide selection. With protectant fungicides the first application should be at early boot stage followed by a second spray 10 to 14 days later, depending on the weather. Systemic fungicides can be applied when diseases become evident on the upper leaves and provide protection for about 18 days. A protectant fungicide may be needed at heading time for late-season disease control.

The best application method for fungicides is by air (fixed-wing aircraft or helicopter), using a minimum of 5 gallons of water per acre. Fungicides **must** be applied uniformly. If the label recommends, a spreader-sticker (surfactant) should be added to the spray to insure more uniform coverage.

Proper Storage

The development of storage rots and molds depends on grain moisture levels and the temperature. Storage molds cannot develop at grain moistures less than 12 to 13 percent. Stored grain is only as "safe" and dry as the **wettest** grain, **not** the average for the bin. Bins and auger pits should be thoroughly cleaned before filling. Carryover grain is often mold infected as well as insect infested. Such grain is a common source of storage problems. If allowed to grow, storage molds produce their own moisture and heat, and can grow through an entire grain mass. Grain should be aerated periodically to maintain a uniform temperature and should be probed weekly for "hot spots".

Other Cultural Control Measures

The wheat streak mosaic virus oversummers in volunteer wheat plants, corn, and a number of weeds and cultivated grasses. This virus is spread by the windblown wheat curl mite. Wheat streak mosaic is best controlled by destroying volunteer wheat and grasses early in or around fields where wheat is to be planted growing only corn hybrids resistant to wheat streak, and sowing winter wheat **after** the "fly-free" date.

The planting of wheat and other small grains in set-aside acres may provide a reservoir of inoculum for winter wheat crops. Avoid locating production wheat fields adjacent to set-aside acres.

Wheat Disease Management

Adopting a comprehensive management program for wheat diseases will sharply reduce losses in yields and grain quality. Disease-related losses are often the difference between making a profit or sustaining a loss. Wheat producers who promptly and correctly identify disease problems and take action to prevent losses are likely to produce high yields of top-quality grain. The relative effectiveness of various methods of controlling major wheat diseases is given in the following Table.

Table 1. Relative Effectiveness of Various Methods of Controlling the Major Wheat Diseases in Illinois

Disease	Resistant varieties	Crop rotation	Clean plow-down	Balanced fertility[a]	Planting after the fly-free date	Fungicides: Seed treatment	Fungicides: Foliar sprays	Other controls and comments
Stem rust	1				3		1	
Leaf rust	1				3		1	
Loose smut	1					1		
Bunt or stinking smut						1		
Septoria leaf blotches	1	2	2		2	3	1	
Septoria glume blotch	1	2	2		3	2	1	
Scab		1	3	3	3	2		Avoid planting adjacent to corn stubble or following corn
Take-all	2	1	3	2	2			Control virus diseases
Tan or yellow spot		2	2		3		2	
Cephalosporium strip		1						
Powdery mildew	1			3	3		1	
Seedling blights		3	3	3	2	1		
Helminthosporium spot blotch		2			3		2	
Soilborne wheat mosaic virus	1	3			2			
Wheat streak mosaic virus		3	3		2			
Barley yellow dwarf virus	1				1			
Wheat spindle streak virus	1				1			

NOTE: 1 = highly effective control measure; 2 = moderately effective; 3 = slightly effective. A blank indicates no effect.