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Tan Spot Disease of Wheat

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Symptoms, development and management of tan spot disease in wheat; addresses crop rotation, fungicides and crop residue management.

Tan spot, caused by the fungus *Pyrenophora tritici-repentis*, is a major leaf spot disease of winter wheat in the Great Plains of North America. Its incidence has increased recently, particularly in wheat cropping systems that maintain crop residue on the soil surface. Although tan spot can be a serious threat by itself, it occurs more often as part of a foliar disease complex involving tan spot, leaf rust and Septoria leaf blotch. Tan spot symptoms usually appear in early April, but its effect on yield loss is greatest during grain fill when severe spotting reduces the photosynthetic area of the upper leaves (*Figure 1*). The most severe damage occurs from the boot stage to dough stage and is greatest on late tillers.

Figure 1. Severe spotting reduces photosynthetic area on the upper leaves.

Wheat, bromegrass and wheatgrass are the primary hosts for *P. tritici-repentis*. Barley and rye are less frequently attacked and oats appear immune.

Symptoms

Tan spot first appears on wheat leaves as small, tan to brown lens or diamond-shaped spots. Characteristic symptoms are elliptical to elongate spots that are tan colored, have a dark brown spot near the center and are surrounded by a yellow border (*Figure 2*). The pattern of a small dark spot in a tan spot lesion along with the yellow border gives a distinctive "eye-spot" appearance. As the lesions increase in size, they tend to coalesce, producing larger, irregular areas of dead tissue. When leaves are young and actively growing, the spots typically remain small. Where spots are abundant, leaves may yellow, giving the field an overall yellow cast. The lower, more mature leaves are infected first and the pathogen spreads to the upper leaves as the disease progresses.

As plants mature the fungus invades the straw where it produces tiny black, raised, fruiting structures called pseudothecia (*Figure 3*). By mid-August, pseudothecia are visible on the stubble that remains after harvest and are diagnostic of tan spot. They feel like coarse sandpaper to the touch. The occurrence of pseudothecia on wheat stubble will confirm that at least part of the leaf damage observed on the crop was due to tan spot, even if leaf symptoms were not readily recognized.

Conditions Affecting Disease Development

Tan spot persistently occurs in many areas of Nebraska because of a monoculture (wheat-fallow-wheat or continuous wheat) of winter wheat coupled with the practice of leaving wheat residue standing to reduce erosion and conserve soil

Figure 2. Characteristic symptoms of tan spot.

Figure 3. Wheat stubble showing the raised pseudothecia of *P. tritici-repentis.*

moisture. The tan spot fungus can survive and reproduce in bales of infested straw, on standing wheat stubble or even on wheat stubble and straw that is on the soil surface or partially buried.

Frequent rain in May and June promotes wheat growth as well as disease development. Spores, called ascospores, are produced in pseudothecia and spread by wind or blowing rain. They are the primary source of infection of the lower, more mature leaves during tillering and early jointing. After the initial infection, the fungus spreads within a field or to neighboring fields by a different type of spore called a conidium. This spore is produced in the tan spot lesions. Conidia are spread by wind or blowing rain and are responsible for infections on upper leaves during late May and June. Wheat in fields distant from fields with infested stubble is generally less severely infected, but by June may show severe tan spot development on upper leaves because of conidial spread.

The disease progresses most rapidly when many spores are present and rainy, misty or foggy weather lasting more than 24 hours allows spores to germinate and infect plants. New releases of spores occur with each wet period. Symptoms appear within five to seven days after infection. Free moisture on the leaf surface is the most critical environmental factor associated with infection.

Management

A unique three-year conservation tillage rotation system called ecofarming (ecofallow) can be used to reduce the threat of tan spot. Ecofarming is defined as a crop rotation system that controls weeds and conserves soil moisture with minimum disturbance of crop residue. In this system, corn or sorghum is seeded directly into winter wheat stubble in a winter wheat-grain sorghum or corn-fallow rotation. In the ecofarming system a crop is planted directly into the residue of a different crop, rather than into the residue of the same crop. This crop rotation-fallow system effectively breaks disease cycles which involve host specific pathogens such as tan spot that survive in crop residue.

Application of foliar fungicides offers a supplemental method of control should tan spot become serious during the crucial post-boot stage of wheat development. The first step in deciding to use a fungicide is to determine disease progress and estimate yield potential. Crop scouting should begin around the early jointing stage and continue on a regular basis until disease is detected or a decision to spray is made based on the observed disease level. If yield potential is below 45 bushels per acre, it generally is not economical to apply a fungicide for foliar disease control.

The fungicides listed in *Table I* are recommended for control of tan spot. All fungicides listed except Stratego can be applied up to full head emergence (Feekes growth stage 10.5). Stratego can be applied up to emergence of the ligule of the flag leaf (Feekes 8). There are restrictions specific to each fungicide regarding intervals between applications, the amount of fungicide that can be applied per acre, the pre-harvest interval, feeding of grain or hay to livestock, the

Table I. Fungicides for control of foliar diseases of wheat[1].

Fungicide Common Name	*Trade Name*	*Application Timing*
azoxystrobin	Quadris	Up to Feekes 10.5 (full head emergence)
azoxystrobin + propiconazole	Quilt	Up to Feekes 10.5 (full head emergence) on wheat; up to Feekes 9 (ligule of flag leaf just visible) on barley, rye, and triticale
mancozeb	Dithane DF, Manzate 75DF, Pencozeb 80WP	Up to Feekes 10.5 (full head emergence)
propiconazole	Tilt, PropiMax EC	Up to Feekes 10.5 (full head emergence)
propiconazole + trifloxystrobin	Stratego	Up to Feekes 8 (emerging flag leaf)
pyraclostrobin	Headline	Up to Feekes 10.5 (full head emergence)

[1]This list is presented for information only and no endorsement is intended of products listed nor is criticism meant for products not listed. Consult the product label before buying and using a specific fungicide. Read and follow all label directions and restrictions.

number of times the fungicide can be applied per growing season, or the amount of fungicide that can be applied during a growing season. Always read and follow label directions. Adding a spreader sticker will usually improve disease control due to better coverage.

For aerial application, five gallons of water per acre are required. Ground application generally requires hollow-cone nozzles, spray pressures of 40-80 psi and 10 to 20 gallons of water per acre.

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