1979

G79-429 Tan Spot Disease of Wheat (Revised June 1993)

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G79-429-A
(Revised June 1993)

NebGuide

Published by Cooperative Extension, Institute of Agriculture and Natural Resources, University of Nebraska-Lincoln

Tan Spot Disease of Wheat

This NebGuide describes the development of tan spot disease in wheat and gives recommendations for controlling it by means of crop rotation, fungicides and good crop residue management.

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

Tan spot, caused by the fungus *Pyrenophora tritici-repentis*, is a major leafspot disease of winter wheat in the Great Plains of North America. It has become an increasing problem in wheat cropping systems using conservation tillage. Although tan spot can be a serious threat by itself, it more often occurs as a part of a foliar disease complex involving tan spot, leaf rust and Septoria leaf blotch. Usually tan spot symptoms appear in early April, but the greatest yield losses result during grain fill when severe spotting reduces the photosynthetic area of the upper leaves (*Figure 1*). The most severe damage occurs from boot to dough stage, and is greatest on late tillers.

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" type 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 remain small. Where the spots are abundant leaves may yellow, which gives 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.

Figure 2. Characteristic symptoms of tan spot.

As plants mature the fungus invades the straw where it then produces black, raised, spore-bearing bodies in the fall called pseudothecia (*Figure 3*). By mid-August, these are visible on the stubble that remains after harvest. These structures are distinct and feel like coarse sandpaper to the touch. The presence of these structures is a good field diagnostic sign of tan spot. Therefore their occurrence on wheat stubble from the preceding wheat crop will confirm that at least part of the leaf damage is due to tan spot even if leaf symptoms are not readily recognized.

Conditions Affecting Disease Development

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

Figure 3. Wheat stubble showing the raised pseudothecia of *P. triticirepentis*.

Years with frequent rain in May and June which favor crop production also favor tan spot. Spores, called ascospores, produced in the raised black structures on the stubble are the primary source of infection of the lower, more mature leaves during tillering and early jointing. Secondary spread of the fungus is by a different type of spore, called a conidium, that is produced in the tan spot lesions themselves. These conidia are blown to other plants and to other fields and are responsible for spread and infection of upper leaves during late May and June. Fields distant from infested stubble fields are less severely infected but there is evidence that long distance spread by wind does occur. By June fields some distance from old infested wheat stubble may show severe tan spot development on upper leaves because of secondary conidial spread.

The disease progresses 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 main limiting environmental factor associated with infection.

Due to the importance of crop residue in reducing soil erosion a discussion on crop residue management is included. Although wheat stubble is a primary source of tan spot inoculum, the threat it presents does not offset the value of crop residue. Also, tan spot can be effectively controlled with fungicides or crop rotation as is practiced in the ecofarming system.

Crop Residue Management

To reduce soil erosion from wind and water, crop residue needs to be maintained on the surface. The approximate amounts of crop residue for conservation compliance are listed in *Table I*. Check with your local Soil Conservation Service for the requirements for your fields.

Table I shows the importance of maintaining residue on sandy soils and soils with slopes greater than 5 or 9 percent. The months of greatest susceptibililty to wind erosion are the high wind months of March, April and May. Water erosion also is important during these months. Therefore, crop residue management plans should include maintaining crop residue during this period when soil is most susceptible to erosion regardless of whether it is required.

Table I. Crop residue required for conservation compliance in a winter wheat-fallow rotation.

	Erosion Type	
	Water	*Wind*
Soils that require residue	5% or greater slope	Fine sand
	9% or greater slope	Loamy fine sand
	in Panhandle	Fine sandy loam
% Residue cover required March, April, May	50%	45%
% Residue cover required June thru after planting	30%	15%

Good fallow practices, along with good stands of adapted winter wheat varieties planted and fertilized according to recommended practices, plus weed control in the growing crop, usually result in a large amount of quality residue. It is very important to spread the long straw and chaff at harvest to aid in the residue management program.

To control weeds in crop residue during the fallow period you may consider using herbicides. Use one of two options.

In the first option if there are few weeds after harvest, delay the herbicide application until late August and then use Roundup or Cyclone plus atrazine. The rate depends on soil type, pH, organic matter, and the succeeding crops. The first tillage operation can usually be delayed until late May or early June if fallowed the next year.

In years in which large amounts of annual grass weeds are present at harvest, use option two. This involves applying Roundup or sweep tillage soon after harvest to control the annual grass weeds and to prevent them from using moisture and producing seed. Many of the annual grass weeds are hosts of the wheat curl mite which can carry the wheat streak mosaic virus, a consideration in any weed control program in western Nebraska. A second application of atrazine plus Roundup or Cyclone or tillage should be made in August or early September if weeds are present.

Delaying tillage until late May or early June allows the farmer to use tillage implements that maintain crop residue. Sweeps, chisel plows, and rodweeders must be used in dry soil to kill weeds. These implements cannot be used effectively in cool moist weather.

If a spring seeded crop is to be grown, maintaining the crop residue is also very important. The success of the spring crop is often directly correlated to the efficiency of the weed control after winter wheat harvest. Good weed control results in increased soil moisture and reduced weed seed production. Also, effective and timely annual grass weed control (including volunteer wheat) is important in the winter wheat disease control program.

There are many benefits from maintaining crop residue in addition to soil conservation. These include higher moisture retention through trapping snow, slowing water movement, increasing water infiltration, lowering soil temperature and improving habitat for wildlife. Due to these benefits, it is better to reduce or control this disease through methods that do not destroy crop residue.

Controls

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 of controlling weeds and conserving 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/corn-fallow rotation. The uniqueness of the ecofarming system is that one 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 such as tan spot which involve pathogens that survive in crop residue.

Application of foliar fungicides offers a supplemental method of control should the disease 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. If yield potential is below 45 bu/per acre, it generally is not economical to apply a fungicide for foliar disease control. Crop scouting should begin around early jointing stage and continue on a regular basis until the final decision is made.

The fungicides mancozeb (Dithane F45, Dithane M-45, Manzate 200DF or Pencozeb), Tilt or Bayleton plus mancozeb are recommended for control of tan spot. For mancozeb, make the first application as soon as the flag leaf emerges and the second application in seven to 10 days. Tilt, which is effective for three to four weeks, is applied as a single season application when the flag leaf is just visible (Feekes stage 8). Tilt has limited curative activity against established infections, but will protect against new infections. The tank mix of Bayleton plus mancozeb is applied about the boot stage (Feekes 10). The addition of a spreader sticker will usually improve disease control.

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.

The mention of specific herbicide and fungicide products does not constitute a guarantee or warranty of the product by the University of Nebraska. Read and follow label directions.

File G429 under: PLANT DISEASES
C-13, Field Crops
Issued June 1993; 15,000 printed.

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Elbert C. Dickey, Director of Cooperative Extension, University of Nebraska, Institute of Agriculture and Natural Resources.