

A close-up photograph of a green wheat leaf. A long, narrow, orange-brown streak of rust pustules runs diagonally down the length of the leaf. The background is a blurred green field of wheat.

# Wheat Disease Identification





# Contents

## Diseases affecting heads and grain

Black chaff .....	1
Common bunt .....	2
Ergot .....	3
Fusarium head blight .....	4
Loose smut .....	5
Sooty head molds .....	6
Stagonospora nodorum blotch .....	7

## Diseases affecting leaves

Bacterial streak .....	8
Barley yellow dwarf .....	9
Leaf rust .....	10
Powdery mildew .....	11
Septoria tritici blotch .....	12
Stagonospora nodorum blotch .....	13
Stem rust .....	14
Stripe rust .....	15
Tan spot .....	16
Wheat soilborne mosaic .....	17
Wheat spindle streak mosaic .....	18
Wheat streak mosaic .....	19

## Diseases affecting lower stems and roots

Cephalosporium stripe .....	20
Common root rot .....	21
Eyespot .....	22
Fusarium root, crown, and foot rots .....	23
Rhizoctonia root rot .....	24
Take-all .....	25

## Rare and emerging diseases

Flag smut .....	26
Wheat blast .....	27





### **Black chaff**

Black chaff causes dark-brown or black lesions on the glumes of infected wheat heads. The stem below the head and the awns also can be infected. Infected awns often have alternating bands of diseased and healthy green tissue. The bacteria that cause black chaff also cause bacterial streak on leaves. Black chaff is often confused with *Stagonospora nodorum* blotch on heads or a physiological disorder of the plant known as “pseudo-black chaff.”

**Management:** Avoid highly susceptible varieties.





### Common bunt

Wheat kernels infected by common bunt have a gray-green color and are wider than healthy kernels. Diseased kernels can be seen in developing wheat heads but are often not detected until harvest. The outer layers of diseased kernels remain intact initially but are easily broken during grain harvest, releasing masses of black, powdery spores. The fungus produces chemicals with a fishy odor, which sometimes causes this disease to be referred to as “stinking smut.” Symptoms of common bunt resemble dwarf bunt; however, plants infected with dwarf bunt are stunted.

**Management:** Fungicide seed treatment, disease-free seed sources.





### Ergot

Wheat heads infected with ergot have large, dark-purple or black fungal structures that replace individual kernels. These fungal structures or “ergots” may be 5 to 10 times larger than normal wheat kernels and are often first detected in harvested grain. The ergots have a white interior, which distinguishes them from other types of foreign matter found in grain.

**Management:** Generally impractical or not needed.





### **Fusarium head blight**

Symptoms of Fusarium head blight include tan or light brown lesions encompassing one or more spikelets. Some diseased spikelets may have a dark brown discoloration at the base and an orange fungal mass along the lower portion of the glume. Grain from plants infected by Fusarium head blight is often shriveled and has a white chalky appearance. Some kernels may have a pink discoloration.

**Management:** Avoid the most susceptible varieties and planting into corn residue; suppress with foliar fungicides.







### Loose smut

The normal head tissue of plants infected by loose smut is completely replaced with dark masses of fungal spores, giving the heads a black powdery appearance. It is possible to see heads damaged by loose smut while much of the head is still inside the boot. Infected heads normally appear lower in the crop canopy than healthy heads. Only the central stem of the head is left after the spores are released.

**Management:** Fungicide seed treatment, disease-free seed sources.





### Sooty head molds

Sooty head molds are characterized by a dark green or black mold growth on the surface of mature wheat heads. These molds are part of a naturally occurring complex of organisms that help to decay plant debris. Sooty molds are most common when mature wheat is subjected to repeated rains and delayed harvest. This fungus also may grow on plants that were prematurely killed by root rot. The sooty head mold growth is normally superficial. Its affect on grain is thought to be minor, but it can make for dusty harvest operations. Sooty molds can contribute to a discoloration of the grain called "black point."

**Management:** Generally impractical or not needed.







### **Stagonospora nodorum blotch**

This disease causes dark brown or purple lesions on heads. Lesions are often more intense at the top of the glume, with brown streaks or blotches extending down toward the base of the spikelet. The presence of tiny fungal reproductive structures embedded in the tissue can confirm the diagnosis but will require significant magnification. The disease may spread to the head from leaf infections initiated earlier in the growing season.

**Management:** Genetic resistance, foliar fungicides, crop rotation, fungicide seed treatment.





### Bacterial streak

Early symptoms of bacterial streak include small, water-soaked areas between leaf veins. These water-soaked areas become tan streaks within a few days. When the disease is severe, streaks may merge to form large, irregular areas of dead tissue. When dew is present, the bacteria causing this disease may ooze from the lesions and dry to form a clear, thin film. This film flakes easily and is visible when the leaf is viewed from different angles.

**Management:** Avoid highly susceptible varieties and contaminated seed.





### Barley yellow dwarf

This viral disease causes wheat leaves to have a yellow or red discoloration. The discoloration is often more intense near the tip of affected leaves, giving them a flame-like appearance. Barley yellow dwarf often occurs in patches within a field. The size and distribution of these patches depends on the feeding activity of aphids, which spread barley yellow dwarf virus. Infected plants within these patches may be shorter than neighboring healthy plants.

**Management:** Genetic resistance, delayed planting date, insecticide seed treatment.





### Leaf rust

Small, orangish-brown lesions are key features of leaf rust infections. These blister-like lesions are most common on leaves but can occur on the leaf sheath, which extends from the base of the leaf blade to the stem node. Lesions caused by leaf rust are normally smaller, more round, and cause less tearing of the leaf tissue than those caused by stem rust.

**Management:** Genetic resistance, foliar fungicides.







### **Powdery mildew**

Signs of powdery mildew include white fungal growths on leaves and leaf sheaths. Glumes and awns also can be infected when the disease is severe. Fungal growth is largely limited to outer plant surfaces and can be easily wiped away by rubbing a finger across affected areas. Mature areas of fungal growth may have dark, reproductive structures mixed with the white, cottony growth of the fungus.

**Management:** Genetic resistance, foliar fungicides.





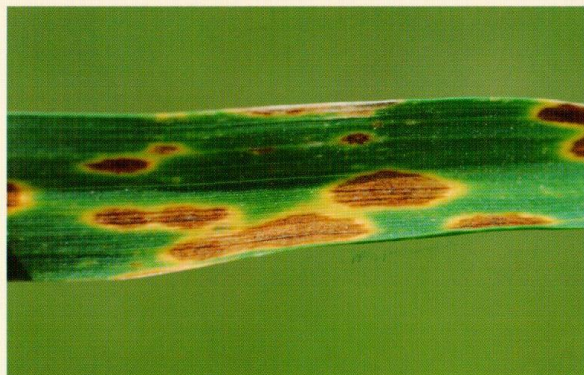
### **Septoria tritici blotch**

This fungal disease causes tan, elongated lesions on wheat leaves. Lesions may have a yellow margin, but the degree of yellowing varies among varieties. Rows of dark, reproductive structures produced by the fungus are key diagnostic features and can often be seen without magnification. This disease is also known as speckled leaf blotch.

**Management:** Genetic resistance, foliar fungicides, crop rotation.







### **Stagonospora nodorum blotch**

The lesions of *Stagonospora* leaf blotch are normally brown or tan, surrounded by a thin, yellow halo. Lesions caused by *Stagonospora* leaf blotch are more irregular in shape and often have a darker color than those of tan spot. The presence of small, honey-colored fungal reproductive structures is diagnostic for *Stagonospora nodorum* blotch; however, these reproductive structures are only visible with considerable magnification. This disease also may affect heads late in the growing season.

**Management:** Genetic resistance, foliar fungicides, crop rotation, fungicide seed treatment.

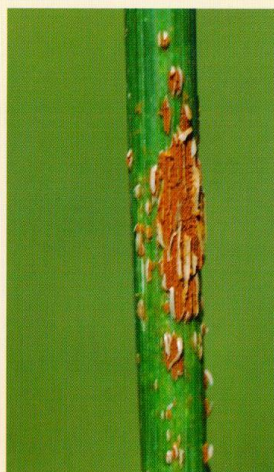




### Stem rust

Stem rust causes blister-like lesions on leaves, leaf sheaths, and stems. Infection of glumes and awns is also possible. The reddish-brown spores of the fungus cause considerable tearing as they burst through the outer layers of the plant tissues. Mature stem rust lesions are more elongated than those of leaf rust. Stem rust is typically most severe on later-maturing wheat varieties.

**Management:** Genetic resistance, foliar fungicides, select early-maturing varieties.







### Stripe rust

Stripe rust causes yellow, blister-like lesions that are arranged in stripes. The disease is most common on leaves, but head tissue also can develop symptoms when disease is severe. Outside the United States, this disease is sometimes referred to as yellow rust.

**Management:** Genetic resistance, foliar fungicides.





### Tan spot

The key diagnostic feature of tan spot is tan lesions with a yellow margin. Mature tan spot lesions often have a dark area in the center. Lesions may merge as they expand, resulting in large sections of diseased leaf tissue. The fungus that causes tan spot survives in the debris of previous wheat crops and produces small, black reproductive structures in the spring.

**Management:** Avoid planting into wheat residue, tillage where appropriate, genetic resistance, foliar fungicides.



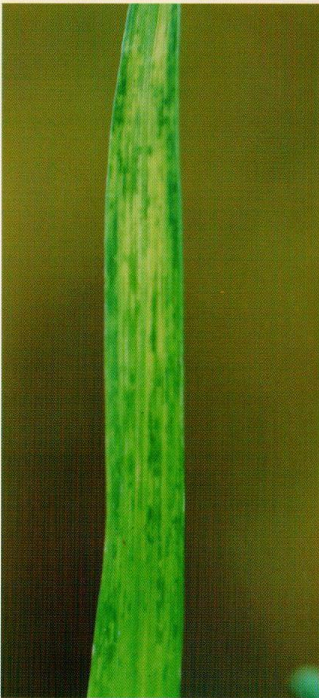




### **Wheat soilborne mosaic**

Winter wheat infected by wheat soilborne mosaic develops a pale-yellow discoloration shortly after breaking dormancy in the spring. The incidence of wheat soilborne mosaic is often greater in low areas of a field, where moist soil conditions favor growth of the protozoa that spread this viral disease. Leaves of infected plants often have a mosaic pattern of dark green blotches on a pale-yellow background. Symptoms normally fade when warm weather slows the viral activity within infected plants.

**Management:** Genetic resistance.





### Wheat spindle streak mosaic

Wheat spindle streak mosaic causes a yellow discoloration to wheat seedlings. This yellow discoloration is often most intense in the wettest areas of a field. Leaves of infected plants have long, yellow streaks that are slightly wider in the middle than at their ends. Symptoms are similar to wheat soilborne mosaic, and plants often are infected with both diseases. Symptoms fade when higher temperatures reduce viral activity within infected plants.

**Management:** Genetic resistance.







### **Wheat streak mosaic**

Leaves of plants infected with wheat streak mosaic have a bright yellow streaking. Symptoms are often most severe near the leaf tip. The virus that causes wheat streak mosaic survives in volunteer wheat and is spread by wheat curl mites. The disease is often most severe in areas of a field that are closest to these sources of the disease and mites. Commonly, plants infected with wheat streak mosaic also are infected with High Plains disease and Triticum mosaic. The symptoms of these diseases are nearly identical. Disease severity is greater when plants are infected by more than one virus.

**Management:** Control volunteer wheat, delayed planting date, genetic resistance, avoid planting near maturing corn.





### **Cephalosporium stripe**

Plants infected with *Cephalosporium* stripe have pronounced yellow stripes running the full length of the leaf blade. The center of the yellow stripe may have a long, brown streak that extends onto the leaf sheath. Splitting the stem of infected plants often reveals small, brown streaks within the node tissue. *Cephalosporium* stripe also can cause areas of stunted, irregular growth within a field. Often, infected plants die prematurely, causing patches of white heads within a field.

**Management:** Genetic resistance, crop rotation, control grassy weeds.







### **Common root rot**

Common root rot causes premature death of wheat, resulting in patches of white heads scattered throughout a field. Infected plants are often dark at the base and have poor root development. A key diagnostic feature of common root rot, however, is dark-brown lesions on the thin stem extending from the base of the plant to the remnant of the seed. This thin stem is known as the “subcrown internode.” Healthy subcrown internodes should be cream colored and firm.

**Management:** Crop rotation, control grassy weeds.





### Eyespot

Symptoms of eyespot, also called strawbreaker foot rot, include small lesions on the lower stem. Well-developed lesions have yellow-brown margins and a black fungal growth near the center. Most lesions occur on the lower 2 inches of the stem. Lesions may merge, causing the lower stem to collapse. Stems damaged by eyespot often die prematurely, resulting in white heads. Areas of the field with many infected stems are more likely to lodge.

**Management:** Genetic resistance, foliar fungicides, avoid planting into wheat residues.

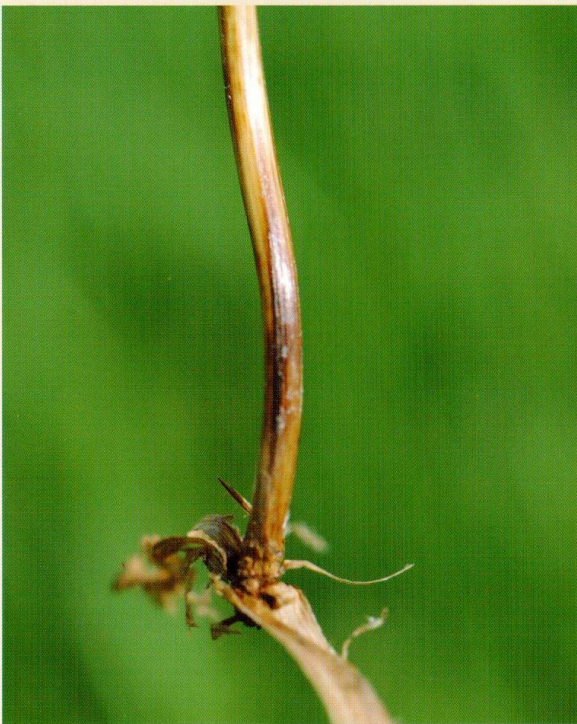




### **Fusarium root, crown, and foot rots**

Fusarium root, crown, and foot rots cause patches of wheat to die prematurely, resulting in areas of white heads within a field. Infected plants are typically brown at the base and have poor root development. During advanced stages of the disease, the *Fusarium* fungus often produces a pink, cottony growth inside the lower portions of the stem. Often, the disease is most severe after prolonged periods of dry weather.

**Management:** Crop rotation, control grassy weeds.





### **Rhizoctonia root rot**

Seedlings infected with Rhizoctonia root rot are often killed before emergence. Plants that are not killed by the disease may be stunted to different degrees, resulting in an uneven crop canopy. Individual roots infected by Rhizoctonia have small, reddish-brown lesions. The diseased roots break off easily when plants are removed from the soil, leaving their tapered, reddish-brown ends exposed.

**Management:** Crop rotation, control grassy weeds two weeks before planting.







### **Take-all**

This fungal disease causes wheat to die prematurely, resulting in patches of white heads in otherwise green fields of wheat. Plants infected by take-all normally have a shiny, black discoloration of the lower stem and roots. Frequently, the disease is most severe in wet areas of a field and near field edges where the fungus survives in association with grassy weeds.

**Management:** Crop rotation, control grassy weeds.



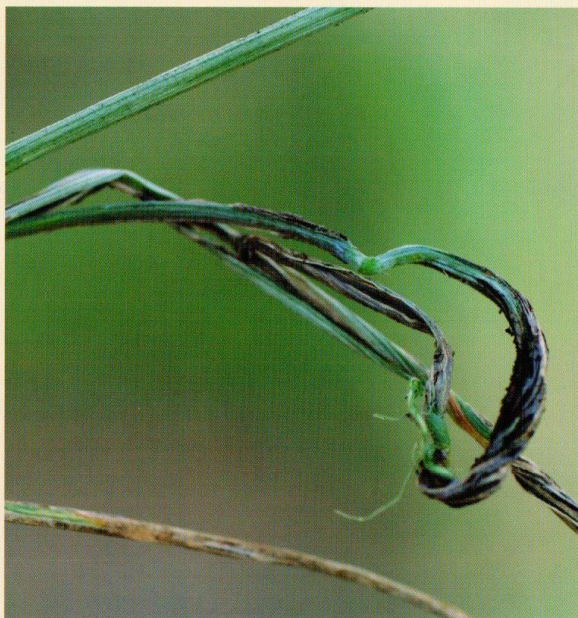


### Flag smut

Plants infected with flag smut often have twisted leaves and are typically shorter than healthy plants. On infected leaves, long, gray or black lesions run parallel to the leaf veins. These lesions rupture and release black, powdery spores of the fungus that causes flag smut. The heads of diseased plants are poorly developed and often become deformed as they emerge from the twisted leaves. Infected heads may have long, black lesions on stems and glumes.

**Management:** Seed treatment fungicides, crop rotation.

**Status:** This disease is considered rare in most regions of North America.







### Wheat blast

Symptoms include tan or light brown lesions on heads, which damage entire spikelets. Head symptoms closely resemble Fusarium head blight. Unlike Fusarium head blight, heads infected with blast often have a gray mass of fungal spores at the base of the glume. Wheat blast also can cause gray or tan lesions on leaves and leaf sheaths. These lesions are often elongated ovals with pointed ends and may have reddish brown margins. Not all varieties are susceptible to the leaf phase of wheat blast. As with head symptoms, leaf lesions often produce gray masses of fungal spores.

**Management:** Genetic resistance, foliar fungicides to suppress infection, crop rotation.

**Status:** This disease is not known to occur in North America but is causing problems in South America and parts of Asia.







### Acknowledgements

This publication was developed by the multi-state extension and research committees for small grain diseases, NCERA-184 and WERA-97. Publication authors: Erick De Wolf, and James P. Shroyer, Kansas State University. Photo credits: Erick De Wolf, Bill Bockus, Robert L. Bowden, James P. Shroyer, and Bill Willis, Kansas State University; Guillermo Isidoro Barea Vargas, Coperagro; Mary Burrows, Montana State University; Juliet Marshall, University of Idaho; Marcia McMullen, North Dakota State University; Karasi Mills, Ohio State University; Tim Murray, Washington State University; and Stephen Wegulo, University of Nebraska. This publication was supported by Agriculture and Food Research Initiative Competitive Grant 2013-68004-20378 from the USDA National Institute of Food and Agriculture.

This publication was developed and distributed with the assistance of the U.S. Department of Agriculture (USDA). The USDA prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or part of an individual's income is derived from any public assistance program.

January 2017

### For additional assistance identifying wheat diseases, contact:

South Dakota State University Plant Diagnostic Clinic  
SPSB 153, Box 2108  
Brookings, SD 57007  
Phone: (605) 688-5545  
Fax: (605) 688-4024

Dr. Emmanuel Byamukama  
SDSU Extension Plant Pathologist  
*Emmanuel.Byamukama@sdstate.edu*  
Phone: (605) 688-4521



South Dakota State University, South Dakota counties, and U.S. Department of Agriculture cooperating. South Dakota State University is an Affirmative Action/Equal Opportunity Employer and offers all benefits, services, education, and employment opportunities without regard for race, color, creed, religion, national origin, ancestry, citizenship, age, gender, sexual orientation, disability or Vietnam Era Veteran Status.