Bacterial Leaf Streak and Black Chaff of Wheat

Marcia McMullen, Extension Plant Pathologist, NDSU Department of Plant Pathology
Tika Adhikari, Plant Pathologist, NDSU Department of Plant Pathology

Causal Organism, Occurrence and Spread

Bacterial leaf streak (BLS) of wheat is caused by the bacterium *Xanthomonas translucens* pv. *undulosa*. Bacterial leaf streak has been observed frequently in recent years in North Dakota and in the neighboring states of Minnesota and South Dakota. During the 2008-09 growing seasons, surveys of wheat in five locations in North Dakota showed an average of 80 percent incidence of BLS. Yield losses due to BLS and black chaff are variable, ranging from negligible to up to 40 percent, depending on the stage of infection and severity.

The causal bacterium is primarily seed-borne but may survive in crop debris. The bacterium is spread by splashing or wind-driven rain, and enters the plant through wounds or natural leaf pores called stomata. Symptoms of this disease are most noticeable in areas that have had frequent storms associated with high winds. Overhead irrigation may increase the risk of BLS infection.

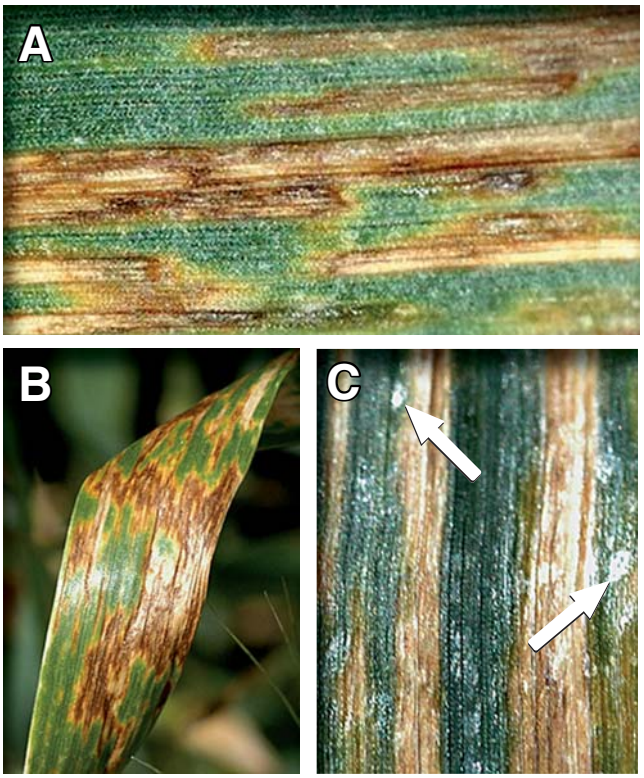

Figure 1. Bacterial leaf streak (BLS) symptoms. A. Brown, water-soaked lesions. B. Shiny or glazed appearance of dried bacteria on leaf surface due to BLS. C. Close-up of clumps of dried bacteria on leaf surface. (Marcia McMullen, NDSU)

Symptoms and Comparison to Other Common Wheat Diseases in North Dakota

Leaf symptoms: Early leaf infections of bacterial streak are characterized by translucent water-soaked streaks (Figure 1A). Initially, the causal bacterium may be visible as a shiny glaze or as clumps of dried bacteria on the leaf surface (Figure 1B and 1C).

In contrast to symptoms caused by BLS, necrotic lesions of infections by fungi in the Septoria species complex often have a grayish, non-water-soaked appearance (Figure 2A), and the "pepper-grain" sized spore-bearing structures of the Septoria species often are visible in the center (Figure 2B).

As the lesions of bacterial streak develop, these water-soaked streaks become dry and turn brown or necrotic (Figure 3A). In contrast, the symptoms of tan spot fungal infections are also distinct from those caused by BLS, with tan spot lesions having distinct spots with a tan or dark brown center and a yellow halo (Figure 3B).

Glume symptoms: For BLS, the bacterium may infect the glumes during grain fill and cause dark purple to black streaks, a symptom called black chaff (Figure 4A). Severe black chaff may result in discolored kernels. Black chaff symptoms also may be distinguished from glume blotch symptoms caused by fungi in the Septoria species complex. Septoria glume blotch symptoms are characterized by brownish-gray lesions on the glumes and awns (Figure 4B).

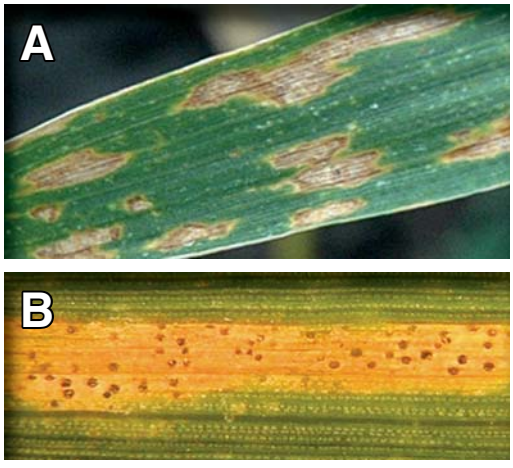

Figure 2. Leaf symptoms caused by fungal species in the Septoria complex. A. Grayish lesions surrounded by brown necrosis typical of infections by Septoria species. B. Close-up of spore bearing structures of Septoria species. (2A - Marcia McMullen, NDSU; 2B - Tika Adhikari, NDSU)

NDSU Extension Service
North Dakota State University
JUNE 2011

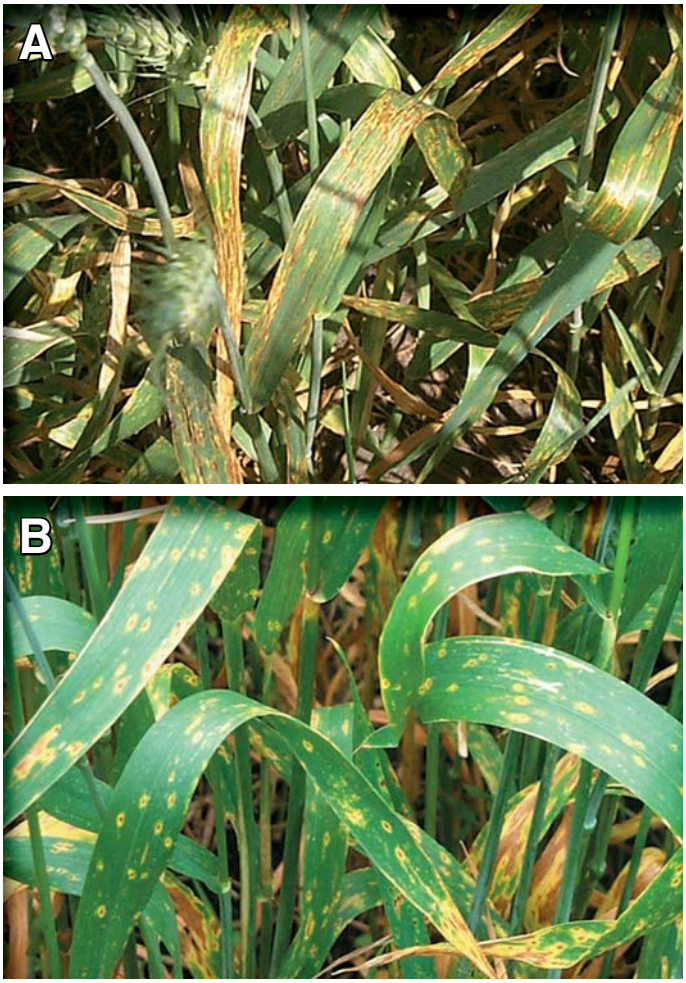

Figure 3. Comparison of bacterial leaf streak (BLS) and tan spot symptoms. A. Necrotic leaf streaks form as bacterial infections advance and dry up. B. Tan spot infections characterized by brown center and yellow halo.
(Marcia McMullen, NDSU)

Management of BLS and Black Chaff

Clean seed: The pathogen is seed-borne, so the use of clean seed can prevent infections and spread. However, because of the prevalence of this disease in North Dakota today in residue and soil, prevention of BLS through clean seed many not be practical. Although seed may be tested for the presence of the bacterium, NDSU does not provide such a test routinely. The NDSU Plant Diagnostic Lab (www.ag.ndsu.edu/pdl) may be contacted for information on seed testing. No effective chemicals are available for seed treatment.

Variety resistance: Most of the wheat varieties currently grown in North Dakota are susceptible to BLS. Although some variety differences in resistance have been observed in commercial fields or North Dakota test plots in recent years, these responses have not always been consistent. No currently released variety of spring or winter wheat is considered resistant or moderately resistant. Winter wheat accessions have been evaluated for resistance in greenhouse tests, and some of these accessions of diverse origin and improvement status have resistance that will be beneficial in breeding programs. Variety resistance will be the best avenue for reducing losses due to this disease in the future.

Foliar products: Foliar fungicides and antibiotic compounds have been tested in field environments for the reduction of BLS on spring wheat. Although some products significantly reduced disease severities compared with untreated plots in research trials at Fargo, results have been inconsistent, and more field data is needed before recommendations can be made for any seed treatment or foliar product.

Figure 4. Comparison of black chaff and glume blotch symptoms. A. Black chaff symptoms caused by bacterial streak bacterium: shiny brown to purple black streaks on glumes and awns. B. Glume blotch symptoms caused by Septoria species: nonshiny, powdery brown blotches on glumes and awns.
(Marcia McMullen, NDSU)

For more information on this and other topics, see www.ag.ndsu.edu

County commissions, North Dakota State University and U.S. Department of Agriculture cooperating. North Dakota State University does not discriminate on the basis of age, color, disability, gender expression/identity, genetic information, marital status, national origin, public assistance status, sex, sexual orientation, status as a U.S. veteran, race or religion. Direct inquiries to the Vice President for Equity, Diversity and Global Outreach, 205 Old Main, (701) 231-7708. This publication will be made available in alternative formats for people with disabilities upon request, (701) 231-7881. 2M-6-11