Figure 1. Early symptoms of bacterial leaf streak on wheat (1A) and barley (1B). Note water-soaked streaks with bacterial ooze. (Andrew Friskop, NDSU)

Figure 2. High levels of bacterial leaf streak on a susceptible variety causing chlorotic and necrotic lesions on the flag leaf. (Andrew Friskop, NDSU)

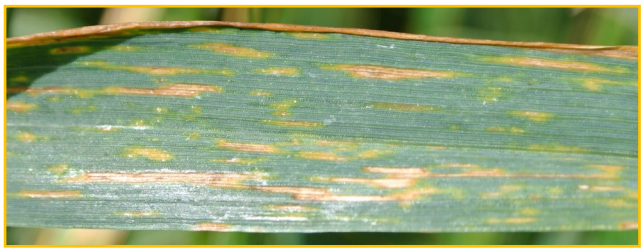

Figure 3. Bacterial ooze that hardens can give bacterial leaf streak lesions a shiny appearance. (Andrew Friskop, NDSU)

NDSU EXTENSION

North Dakota State University, Fargo, North Dakota

Bacterial Leaf Streak and Black Chaff of Wheat

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Causal Organism, Occurrence and Spread

Bacterial leaf streak (BLS) of wheat is caused by the bacterium *Xanthomonas translucens* pv. *undulosa*. A similar bacterium, *Xanthomonas translucens* pv. *translucens*, causes disease on barley.

Bacterial leaf streak is observed frequently in wheat across North Dakota, Minnesota and South Dakota. Yield losses due to BLS and black chaff are variable, ranging from negligible to greater than 50%, depending on the stage of infection and severity.

The causal bacterium is primarily seed-borne and also can survive in crop debris and grassy weeds. 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, especially during and after the flag leaf growth stage. Overhead irrigation may increase BLS risk due to splashing and prolonging leaf wetness periods.

Symptoms and Comparison to Other Common Wheat Diseases in North Dakota

Leaf symptoms: Early leaf infections are characterized by irregular translucent water-soaked streaks and readily observed on the flag leaf (Figure 1A and 1B). After prolonged periods of leaf wetness, bacterial exudate (ooze) can form within lesions.

Streaks eventually will turn yellow (chlorotic) and then brown (necrotic), reducing the photosynthetic potential of the flag leaf (Figure 2). Streaks also may appear shiny as clumps of bacteria dry on the leaf surface (Figure 3).

Leaf symptoms of BLS can be confused with the fungal leaf spots tan spot and Septoria blotch. A couple of tips to differentiate between BLS and fungal leaf spots include the onset of disease, appearance of lesions, color of lesions and presence of fungal structures.

Tan spot lesions have a distinct ellipsoid shape with a tan or dark brown center and a yellow halo (Figure 4A). Tan spot also tends to appear earlier in the season and move up the crop canopy gradually.

Septoria causes lens-shaped or irregular lesions that often have a grayish, non-water-soaked appearance and sometimes harbor “pepper-grain” sized spore-bearing structures of the fungus (Figure 4B).

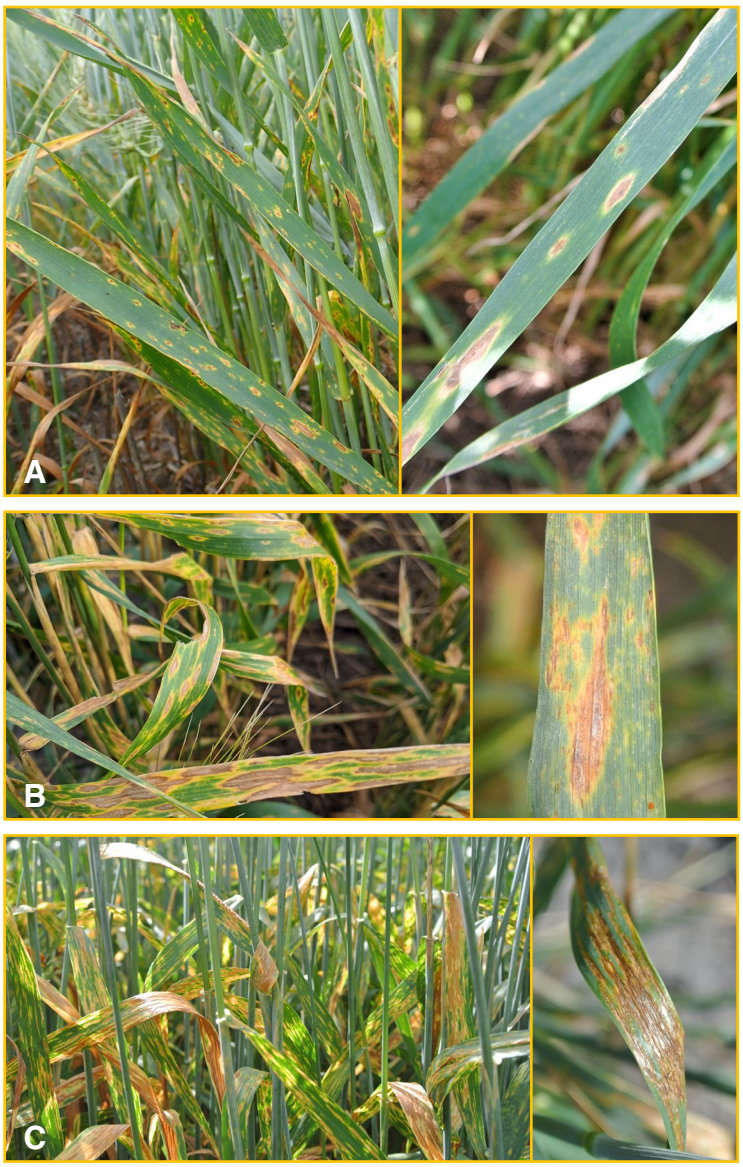

Figure 4. Comparison of wheat foliar disease symptoms: (A) tan spot, (B) Septoria/Stagonospora nodorum blotch and (C) bacterial leaf streak. (Andrew Friskop and Andrew Green, NDSU)

Figure 5. Bacterial exudate (ooze) on glumes of a newly infected wheat spike (left). After infection, dark purple to black streaks will develop on the glumes and awns (right). (Andrew Friskop, NDSU)

Symptoms of BLS tend to become most apparent after thunderstorms and high-wind rain events (Figure 4C). However, these leaf diseases are difficult to differentiate at the later growth season when lesions coalesce and often they occur together as a leaf disease complex.

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 5). A purple to yellow lesion on the peduncle (stem tissue below head) often is associated with black chaff. Severe black chaff may result in discolored kernels.

Black chaff symptoms can look similar to glume blotch caused by fungi in the Septoria species complex. However, Septoria glume blotch symptoms are characterized by brownish-gray lesions on the glumes and awns (Figure 4B).

Management of BLS and Black Chaff

Clean seed: The BLS pathogen is seed-borne (low seed transmission rate), so the use of clean seed can prevent infections and spread. However, because of the prevalence of this disease in North Dakota (residue and grasses), prevention of BLS through clean seed may not be practical.

Research is being conducted at NDSU to develop means for bacterial detection in seeds and other samples. No chemicals are recommended for use as a seed treatment.

Variety resistance: None of the available wheat varieties in North Dakota are immune to BLS. However, a large range exists in susceptibility among commonly grown wheat varieties.

Variety reactions to BLS for hard red spring wheat, hard red winter wheat and durum are presented in the annual variety selection guides prepared by NDSU Extension. Variety resistance is the best management tool to help reduce losses caused by BLS.

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 in a laboratory and greenhouse setting, field trial results have been inconsistent, and more field data is needed before recommendations can be made for any foliar product.

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2M-6-11, web-11-20