

Bacterial Leaf Streak and Black Chaff of Cereal Crops in the Prairies

In recent years bacterial leaf streak and black chaff, caused by *Xanthomonas translucens* pv. *undulosa*, have become more prevalent in the Prairie provinces due to favorable conditions. Bacterial leaf streak is an important disease of cereal crops all over the world, and can cause a significant reduction in yield. It has been reported that severe infections can reduce yield by up to 50%,¹ however losses this significant have not been reported in Western Canada.

Disease: Bacterial Leaf Streak,
Black Chaff

Causal Agent: *Xanthomonas translucens* pv. *undulosa*

Hosts: Cereals: wheat, barley, oats, triticale, perennial grasses

Life Cycle

Bacterial leaf streak is a polycyclic disease, meaning that there can be multiple infection cycles in a single

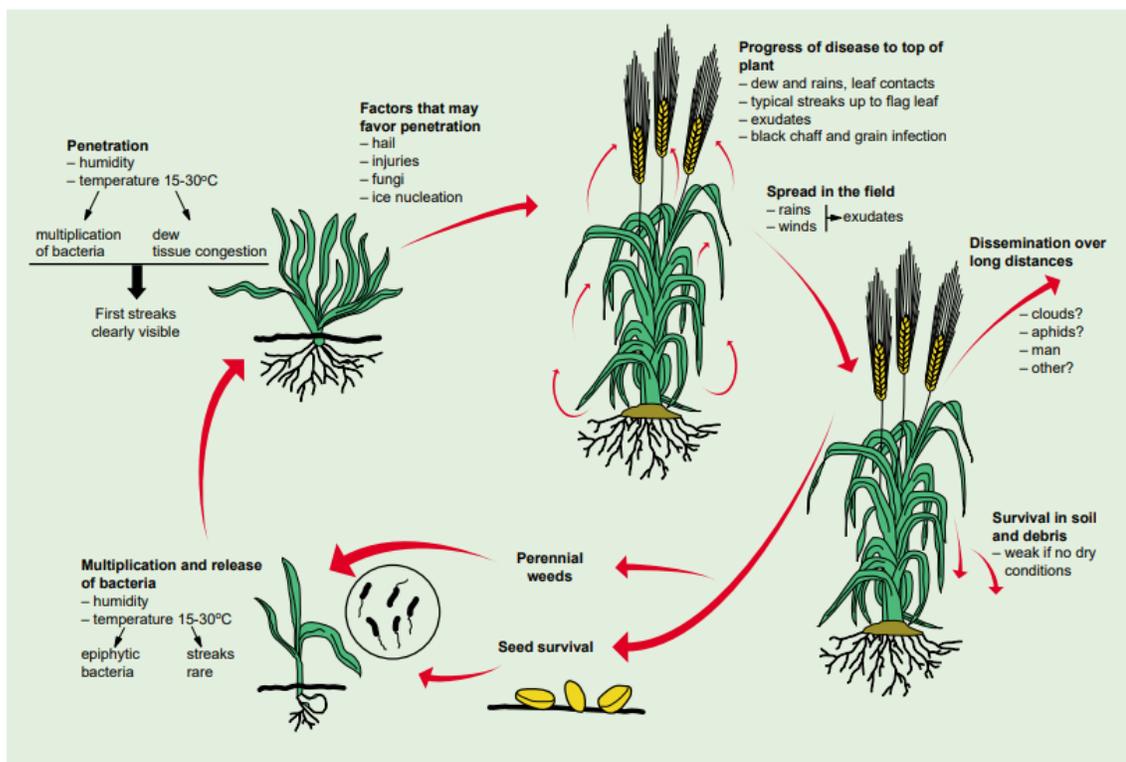


Figure 1. Disease cycle for bacterial leaf streak

growing season. The bacteria overwinter on crop residues, as well as host perennial grasses and weeds. Bacteria can also overwinter on winter wheat and fall rye.² However, the most significant source of inoculum and spread is infected seed. Bacterial leaf streak is primarily a seed-borne disease. The pathogen in the infected plant material is dormant,

¹ Friskop, A., Lux, L., & Liu, Z. (2020, November). *Bacterial Leaf Streak and Black Chaff of Wheat*. Retrieved from North Dakota State University: <https://www.ag.ndsu.edu/publications/crops/bacterial-leaf-streak-and-black-chaff-of-wheat>

² Duveiller, E., Bragard, C., & Maraite, H. (2002). *Bacterial leaf streak and black chaff*. Retrieved from Food and Agriculture Organization of the United Nations: <http://www.fao.org/3/y4011e0n.htm#bm23>

seed or volunteer wheat and weed hosts infected debris. In addition to moisture, the pathogen requires a temperature between 15-30°C to infect and multiply.³

Bacterial leaf streak thrives in areas with warm days, cooler nights, and with an abundance of rainfall and/or irrigation. Rain splashing, wind-driven rain, irrigation, mechanical field activities, and even insects can cause it to spread throughout the field. Bacteria then enter the plant through stomata or wounds caused by hail, wind, insects, soil particle abrasion, and mechanical abrasion due to leaf rubbing. Lesions begin to expand and lengthen, and are usually bordered by leaf veins. This causes the initial infection spots to elongate and form larger streaks, especially on leaves.

Signs and Symptoms



Figure 2.1. Bacterial leaf streak.
Source: Dr. Mike Harding

Bacterial leaf streak can display several symptoms, many of which can be confused with symptoms of fungal leaf spot diseases in Western Canada. In early stages of development, the lesions appear as small, oval, light green, water-soaked spots or streaks, and may have a translucent appearance. Lesions can produce a milky white or yellowish exudate (masses of bacterial cells) in wet conditions, which helps differentiate bacterial leaf streak from other common fungal diseases or environmental conditions;⁴ however, exudates aren't always present. Lesions later come together to form irregular streaks, which rob the plant of photosynthesis. Symptoms typically start on the middle or apex of the leaf, where the dew stays the longest. Heavy infection can lead to withering and death of leaves, starting from the leaf tip.⁵



Figure 2.2 Black Chaff on wheat.
Source: Dr. Mike Harding

Black Chaff, which is caused by the same pathogen, infects heads of wheat and barley. It appears as dark lines or strips on the glumes and awns. In more severe infections the stripes coalesce and the glumes turn fully black, causing 'black chaff'. Glumes can also have exudates present in severe infections, giving a water-soaked appearance.⁶

³ Duveiller, E., Fucikovsky, L., & Rudolph, K. (1997). Bacterial Leaf Streak and Black Chaff Caused by *Xanthomonas translucens*. In *The Bacterial Diseases of Wheat: Concepts and Methods of Disease Management* (pp. 25-47). Mexico: CIMMYT.

⁴ See note 2

⁵ Menzies, J., & Gilbert, J. (2003). Diseases of Wheat. In *Diseases of Field Crops in Canada* (pp. 106-107). Saskatoon: The Canadian Phytopathological Society.

⁶ See note 5

Management

An integrated approach is required to manage bacterial leaf streak in cereals. As the disease is bacterial and not fungal, it cannot be controlled with foliar or seed treatment fungicides. Starting with clean seed, being vigilant scouting for disease, and extending crop rotation are the best management strategies for bacterial diseases.

Clean Seed

The best way to avoid a bacterial leaf streak outbreak, is to use clean seed. Currently, there are no available seed tests for bacterial leaf streak. If a field has bacterial leaf streak, do not use harvested grain for seed. Seed is the largest source of inoculum for bacterial leaf streak.⁷ Consider attaining seed from another source to minimize risk. Research has indicated that depending on storage conditions, the seed bacterium can be decreased by 79% after 6 months of storage but will require 63-81 months to completely die.⁸

Crop Rotation

An extended crop rotation, with greater than 2 years between cereals, will help reduce viable inoculum in crop debris, as it is broken down. The inoculum can remain viable from season to season, although it is a relatively minor source of bacterial streak, as most of the inoculum comes from infected seed.⁹

Scouting

Scouting fields for signs of the disease is the best way to identify if bacterial leaf streak is an issue. Scouting can begin during in-crop herbicide application timing through to the beginning of leaf necrosis. Special attention should be given to scouting after the occurrence of severe weather events such as strong winds, wind-driven rain, hail, heavy rain, and thunderstorms. If bacterial leaf streak is suspected, avoid scouting in wet conditions as walking through a wet crop will spread the disease. Bacterial leaf streak has been identified in Alberta, Saskatchewan and Manitoba, so it may be an emerging disease on the prairies.

Variety Selection

Historically, there are no bacterial leaf streak or black chaff resistant varieties available on the Prairies. Bacterial diseases are typically minor in terms of yield loss, so no breeding efforts have been made in Canada for bacterial leaf streak resistance. In areas where bacterial leaf streak has been more common, like North Dakota, research has been conducted to create a rating scale which measures the susceptibility of varieties to the disease.¹⁰ Some of these varieties are grown in Western Canada, such as Glenn, Faller, Prosper, and Bolles.

⁷ See note 3

⁸ Forster, R.L., and Schaad, N.W. 1990. Longevity of *Xanthomonas campestris* pv. *translucens* in wheat seed under two storage conditions. In: Proceedings of the 7th International Conference of Plant Pathogenic Bacteria, Budapest, Hungary, Part A. Z. Klement, ed. Akadémiai Kiadó, Budapest. pp. 329-331.

⁹ See note 2

¹⁰ See note 1