Bacterial Leaf Streak

Bacterial leaf streak of corn is caused by the bacterium *Xanthomonas vasicola.* The disease has been observed on field corn, seed corn, popcorn, and sweet corn.

Bacterial leaf streak of corn was only recently identified in the United States. The identity of the disease was confirmed in 2016, but the symptoms of this disease have been present in Nebraska since at least 2014. To date, the disease has been reported in nine states, including Colorado, Illinois, Iowa, Kansas, Minnesota, Nebraska, Oklahoma, South Dakota, and Texas.

Symptoms

Bacterial leaf streak symptoms appear as narrow leaf lesions with wavy-edges that occur between the veins of corn leaves (Figure 1A-1D). The lesions range from less than an inch to several inches long. The lesions may be yellow, tan, brown, or orange and look greasy or water-soaked.

Figure 1. These photos show the narrow leaf lesions characteristic of bacterial leaf streak.

Lesions can appear anywhere on the leaf blade, sometimes close to the midrib (Figure 1D). Lesions appear translucent with bright yellow halos, which when backlit, are easy to see extending from the lesions (Figure 2).

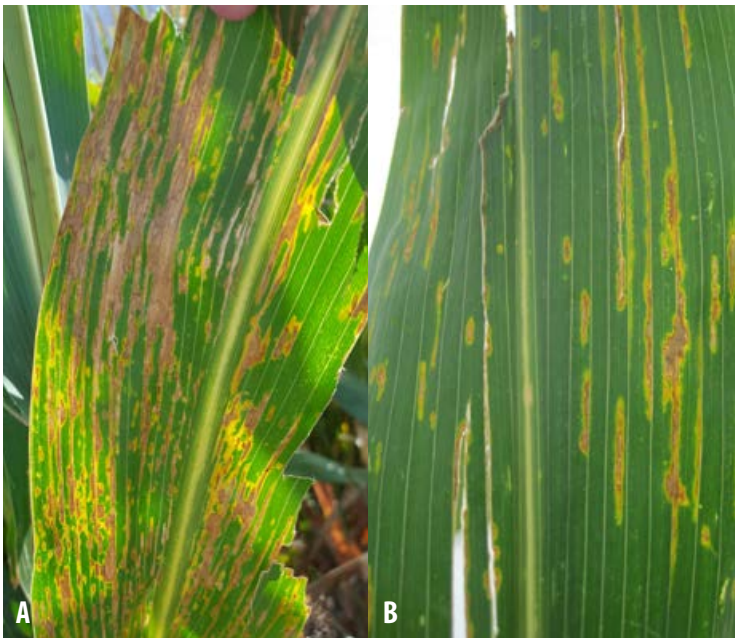

Figure 2. Bacterial leaf streak lesions have visible bright yellow halos when backlit.

Over time, lesions can expand to cover larger areas of the leaf (Figure 3). In extreme cases, lesions may extend along the entire length of the leaf and grow together to form large, necrotic areas (Figure 4).

Figure 3. Bacterial leaf streak lesions can expand to cover large areas of the leaf.

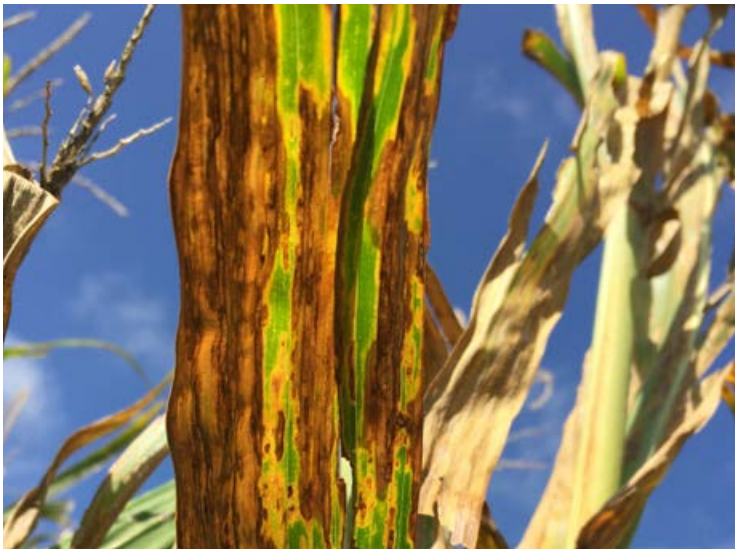

Figure 4. In extreme cases of bacterial leaf streak infection, you may observe large necrotic areas.

Disease symptoms have been observed in corn as early as growth stage V7 — the lesions first appear on lower leaves (Figure 5). Under favorable conditions, the disease can spread up the plant canopy, but symptoms may also occur only in the upper canopy (Figure 6). Symptoms in the upper canopy are more common when the disease occurs after tasselling. Some reports indicate that bacterial leaf streak appears after high wind and rain events.

Figure 5. You may first observe bacterial leaf streak lesions on the lower leaves.

Figure 6. Bacterial leaf streak in the upper canopy is more common after tasseling.

Disease Cycle

We know very little about the bacterial leaf streak disease cycle. Researchers presume that *X. vasicola* survives the winter in infected crop residue, because the disease has been observed in volunteer corn that was growing in a soybean field where the disease had been identified the previous year in corn.

Most likely, irrigation, splashing rain, and wind-driven rain spread the bacterium, but it is unclear how far the bacterium can travel. It does not appear that plants must be wounded for the bacterium to enter the plant.

It is unknown if the bacterium is seedborne or if weeds adjacent to cornfields are alternative hosts (as is the case with other bacterial diseases such as Goss's wilt). Researchers are currently investigating each of these aspects of the bacterial leaf streak disease cycle.

Conditions that Favor Disease

Bacterial leaf streak is more common in fields under continuous corn production, but it has been observed on corn following soybeans, wheat, and fallow. Bacterial leaf streak occurrence appears to increase after overhead irrigation or rainfall during hot weather. Under these favorable conditions disease severity can approach 30 percent (Figure 7).

Yield Loss and Impact

Not surprisingly, we only have limited information about bacterial leaf streak effects on yield. We expect losses will be minimal if symptoms develop late in the season, or if extensive leaf blight does not occur before or during grain fill. Similarly, we have no information how bacterial leaf streak affects grain quality.

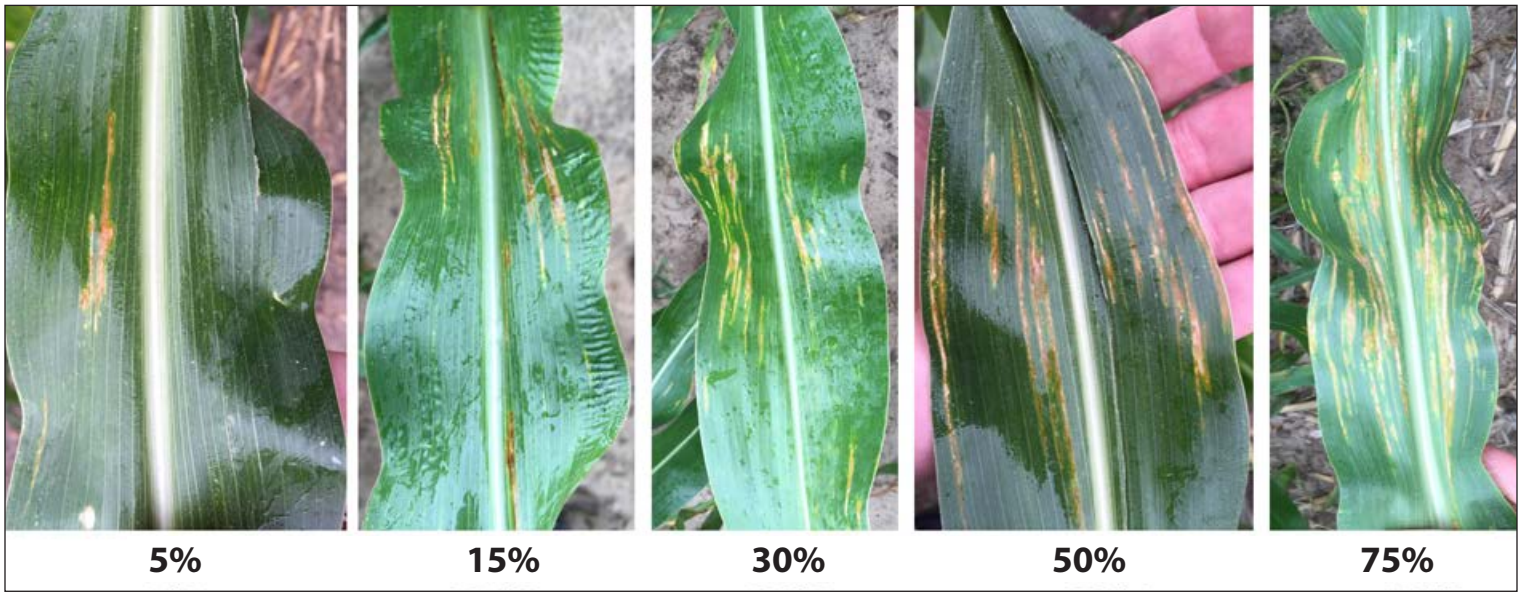

Figure 7. These photos show the severity of disease.

Diagnosis

Diagnosing bacterial leaf streak in the field can be difficult because it can resemble other corn diseases and disorders (see Diseases and Disorders with Similar Symptoms below).

A laboratory can easily distinguish bacterial leaf streak from fungal diseases by bacterial streaming. Bacterial streaming occurs when you put a small section cut from the edge of a leaf lesion in a droplet of water on a microscope slide. When you view the slide under a microscope, you can observe the bacterial cells streaming out from the cut edge of the lesion (Figure 8).

However, other bacterial diseases also produce this streaming, so you should confirm the presence of *X. vasicola* by sending a sample to a plant disease diagnostic laboratory. If you suspect bacterial leaf streak, send symptomatic plants to a diagnostic lab to confirm the cause before implementing a disease management program. An accurate diagnosis will allow you to determine the best management strategy.

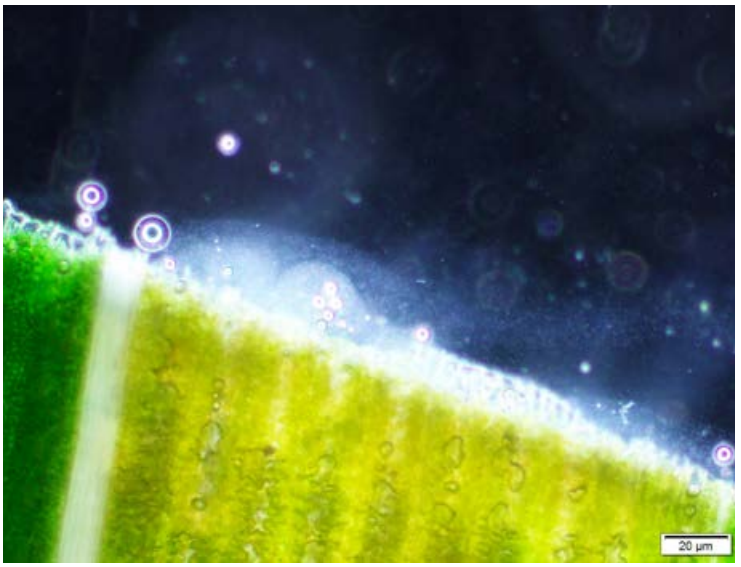

Figure 8. Observing bacteria streaming from an infected corn leaf is the first step to diagnosing bacterial leaf streak.

Diseases and Disorders with Similar Symptoms

Diseases

Gray Leaf Spot (*Cercospora zeae-maydis*)

Gray leaf spot (GLS) produces lesions that look similar to bacterial leaf streak (Figure 9). GLS lesions tend to be more rectangular than bacterial leaf spot lesions.

How to distinguish gray leaf spot from bacterial leaf streak: GLS lesions have straight sides while bacterial leaf streak lesion margins are wavy (Figure 10). Light does not easily pass through backlit GLS lesions, so they are more opaque than the translucent lesions of bacterial leaf streak. If you examine the undersides of GLS lesions with a hand lens, you will often see dark, finger-like fungal structures (condiophores) emerging through the stomata.

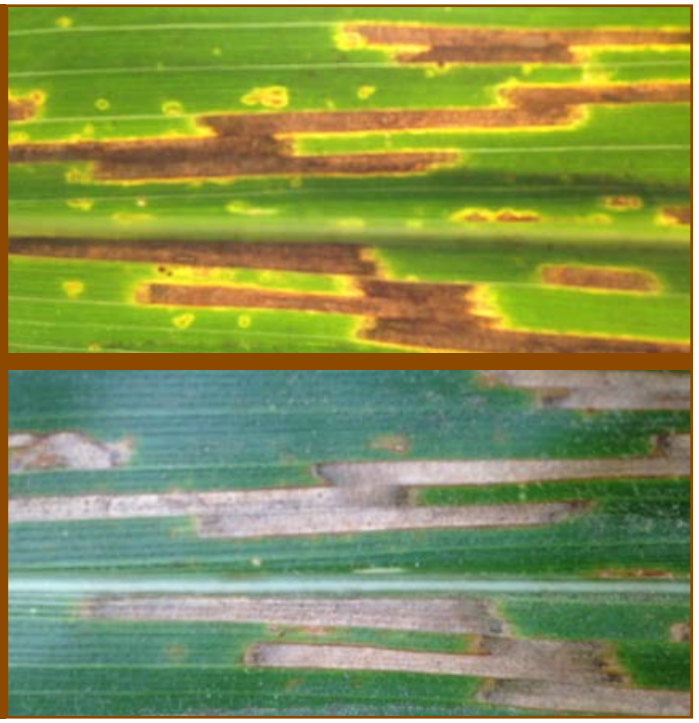

Figure 9. (Top) Gray leaf spot lesions have small, opaque yellow halos when backlit.

Figure 10. (Bottom) Gray leaf spot lesions are rectangular with straight sides.

Common Rust (*Puccinia sorghi*)

Common rust may be mistaken for bacterial leaf streak (Figure 11).

How to distinguish common rust from bacterial leaf streak:
Common rust lesions have raised, blister-like structures (pustules) within the lesion. When backlit, the pustules appear as dark circles (Figure 12).

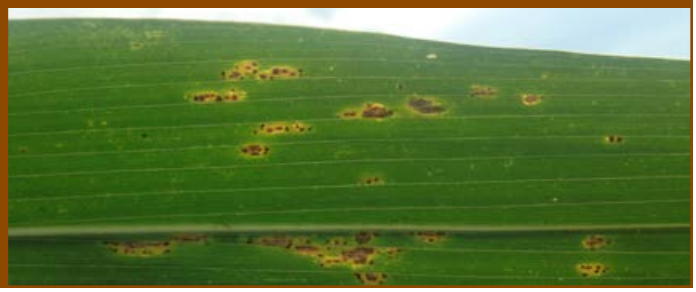

Figure 11. (Top) Common rust lesions have raised, blister-like structures (pustules) within the lesion.

Figure 12. (Bottom) When backlit, common rust pustules appear as dark circles within the lesion.

Diplodia Leaf Streak (*Stenocarpella macrospora*)

Early Diplodia leaf streak symptoms include dark, water-soaked, linear lesions that become tan with long, parallel sides and a bright yellow halo (Figure 13).

How to distinguish Diplodia leaf streak from bacterial leaf streak:
As Diplodia leaf streak lesions mature, they become more elliptical and look less like bacterial leaf streak. You will also observe small, black fungal reproductive structures (pycnidia) scattered within the center of most mature Diplodia leaf streak lesions (Figure 14).

Figure 13. (Top) Early Diplodia leaf streak symptoms.

Figure 14. (Bottom) These mature Diplodia leaf streak lesions have pycnidia scattered within the lesion.

Southern Corn Leaf Blight (*Bipolaris maydis*)

Mature southern corn leaf blight lesions can have brown to tan lesions with wavy sides and yellow halos in the lower canopy that resemble bacterial leaf streak (Figure 15). Southern corn leaf blight lesions are generally 1/8 to 1 inch long, but lesion length depends on hybrid genetics.

How to distinguish southern corn leaf blight from bacterial leaf streak:
Southern corn leaf blight lesions do not produce bacterial streaming the way bacterial leaf streak does.

Figure 15. Southern corn leaf blight lesions.

Other Conditions

Genetic Disorders

Genetic disorders such as lesion mimic may resemble bacterial leaf streak (Figure 16).

How to distinguish genetic disorders from bacterial leaf streak: Genetic disorders that produce lesion mimic symptoms usually occur on every leaf of a plant. Unless the disease occurred early during vegetative growth, it would be unusual to see bacterial leaf streak symptoms on every leaf of a plant. Plants with genetic disorders may occur singularly or in small areas of a field, while bacterial leaf streak occurs in localized or widespread areas of a field.

Figure 16. Genetic disorders can mimic bacterial leaf streak lesions.

Insect Injury

Leaf miner feeding may be mistaken for bacterial leaf streak.

How to distinguish insect injury from bacterial leaf streak: When you backlight a leaf with leaf miner feeding, the injured tissue has a "window-pane" appearance (Figure 17).

Figure 17. Leaf miner feeding damage on a corn leaf.

Abiotic Disorders

Fertilizer burn and sunscald can cause symptoms that resemble bacterial leaf streak.

How to distinguish abiotic disorders from bacterial leaf streak: Leaf tissue that has fertilizer burn or sunscald symptoms will be white, even when backlit (Figure 18). Saprophytic fungi may colonize the leaf lesions abiotic disorders cause. The fungi will look like black specks.

Figure 18. Fertilizer burn on a corn leaf.

Management

Currently, there is little information available for managing bacterial leaf streak. Field observations suggest that corn hybrids differ in susceptibility. Once hybrids can be screened for resistance, using resistant hybrids will be the best way to manage bacterial leaf streak.

Like other bacterial diseases (such as Goss's wilt) there are no effective chemical controls.

We do not recommend tillage to reduce the risk of bacterial streak due to the need to manage soil erosion. While bacterial leaf streak has been most commonly observed in overhead-irrigated fields, it is also known to occur under both flood irrigation and dryland conditions. Researchers are investigating possible effective management strategies and potential sources of resistance.

Authors

Alison Robertson, Iowa State University
Kirk Broders, Colorado State University
Ron French, Texas A&M University
Tamra Jackson-Ziems, University of Nebraska-Lincoln
Doug Jardine, Kansas State University
Kevin Korus, University of Florida
Jillian Lang, Colorado State University
Jan Leach, Colorado State University

Reviewers

Tom Allen, Mississippi State University
Gary Bergstrom, Cornell University
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Clayton Hollier, Louisiana State University
Tom Isakeit, Texas A&M University
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Nathan Kleczewski, University of Delaware
Dean Malvick, University of Minnesota
Hilary Mehl, Virginia Tech University
Daren Mueller, Iowa State University
Anna Freije, Purdue University
Pierce Paul, The Ohio State University
Adam Sisson, Iowa State University
Damon Smith, University of Wisconsin
Kiersten Wise, Purdue University

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