

Black Chaff of Wheat

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Cause, symptoms, disease cycle, and management of black chaff of wheat.

Black chaff is a bacterial disease of wheat common in irrigated fields or in areas with abundant rainfall during the growing season. It is also known as bacterial stripe or bacterial leaf streak. The disease also occurs on barley, oats, rye, triticale, and many grasses. It is the most important and most

widely distributed bacterial disease of small grains and can cause yield losses of up to 40 percent.

Cause and Symptoms

Black chaff is caused by the bacterium *Xanthomonas campestris* pathovar (pv.) *undulosa*. The disease derives its name from the darkened glumes of infected plants (Figure 1A). This symptom is similar to that caused by genetic melanism (darkening of tissue) and glume blotch incited by *Stagonospora nodorum*. Black chaff can be distinguished from other diseases by the appearance of cream to yellow bacterial ooze in the form of slime or viscous droplets produced on infected plant parts during wet or humid weather. This ooze appears light colored and scale-like when dry. Bands of necrotic and healthy tissue on awns (“barber’s pole” appearance) are indicative of black chaff.

A dark brown to purple discoloration may appear on the stem below the head and above the flag leaf (Figure 1B). On leaves, symptoms start as small water-soaked spots or streaks that turn brown after a few days. Lesions are irregularly shaped and elongate and may extend the length of the leaf blade (Figure 1C). In wheat, a diffuse lime-green halo may surround lesions. Leaf symptoms give plants an overall orange cast (Figure 2).

Disease Cycle

The black chaff bacterium survives on and in seed. It is suspected to survive on crop residue and in the soil, but this is not well documented. During the growing season, the bacterium is capable of living on the plant surface as an epiphyte without causing symptoms. Over short distances, it is spread by splashing water, plant-to-plant contact and insects. It is spread over long distances by contaminated seed, the primary source of inoculum. Bacterial exudates on infected plants and epiphytic populations on grassy weeds and volunteer cereals serve as secondary inoculum. Bacteria enter plants through stomata and wounds.



Figure 1. Symptoms of black chaff on wheat: A. discoloration of glumes on a mature wheat head; B. dark brown to purple discoloration of wheat stems; and C. leaf streaking.



Figure 2. Symptoms of black chaff on wheat leaves give plants an overall orange cast.

Glumes and kernels are infected after head emergence. Infection and disease development are favored by wet weather. In Nebraska, black chaff occurs mainly in irrigated fields.

Management

The most effective management strategy for black chaff is use of certified, pathogen-free seed. Seed producers should consider testing their seed lots for black chaff before planting. In seed increase and certification programs, plants should be raised at least one-fourth mile away from potential sources of inoculum. These include irrigated commercial production fields and fields with wheat stubble. Controlling volunteer cereals and grassy weeds can help reduce primary inoculum.

Irrigation management is critical in creating an environment that is less favorable for disease development and spread. Irrigation should be managed in such a way as to allow the plant canopy to dry completely between irrigations. Although highly resistant wheat cultivars are currently not available, those known to be highly susceptible to black chaff should not be planted.

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