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Why are my wheat heads black?

By Bob Hunger
OSU Extension Plant Pathologist

Although the time has past for updates regarding the wheat diseases most commonly observed in Oklahoma, there is a need to discuss the head discoloration that occurred late in the season on much of the wheat. The type of discoloration I am referring to is pictured in Figures 1A-B.

What can cause this head discoloration? Discoloration in the head such as that shown in Figure 1A-B, can have several causes, including infection by fungi, infection by bacteria, or a reaction to stress.

- 1. Infection by fungi:** *Septoria* and *Stagonospora* that cause the leaf blotch/glume blotch complex can cause a discoloration of heads that includes a darkening of the glumes. Both of these diseases were observed commonly in Oklahoma this year because both are favored by cool and wet weather. The fungi that cause these diseases survive on wheat residue, so the incidence and severity of leaf blotch/glume blotch should be more severe in no- and low-till fields where continuous wheat is planted.
- 2. Infection by bacteria:** Two bacteria can cause head and culm (stem) discoloration, including *Xanthomonas* and *Pseudomonas*. *Xanthomonas* causes a disease called "black chaff" and *Pseudomonas* causes a disease called "basal glume rot." As with leaf and glume blotch (fungal diseases), wet and cool weather favors the incidence, spread and severity of black chaff and basal glume blotch.
- 3. Reaction to stresses:** Here no pathogen is directly involved and the condition has been most commonly called, "false black chaff," "pseudo-black chaff," "melanism or melanosis," or "brown necrosis."



Q – Of the three causes listed on page 1, what was most likely the cause of the head discoloration I saw in 2007?

A – I am confident that much of the head discoloration observed this year in Oklahoma was black chaff. Although I was not able to isolate bacteria from samples I collected (they were quite dry and past their optimum condition for isolation), I frequently saw alternating bands of healthy and discolored tissue in the awns (see figure to the right). This type of symptom is very diagnostic for black chaff. Also, I'm confident that *Septoria/Stagonospora* (leaf and glume blotch) also occurred to some level on heads because of the large number of samples from which I isolated these fungi (especially *Septoria*).



Q – What will be the consequences of this head discoloration on yield and quality?

A – Both these fungal and bacterial diseases can result in shriveled seed and sterile heads, especially if infection occurred early. Some seed discoloration also can result, but seed discoloration is more of a concern with a disease called “Black Point” or “Black Tip” that results from Black (Sooty) Head mold (sooty head mold and black point are discussed later in this update). Reports indicate that black chaff is the more damaging of the two bacterial diseases, but usually this is only a disease of major concern in areas where weather such as we have had this year is common every year. The biggest effect from the black chaff in Oklahoma this year (as with the *Septoria/Stagonospora* complex) most likely will be shriveling of seed and lowering of test weight.

Q – Should I save and re-plant seed from a field in which there was severe head discoloration?

A – Shriveled seed may not germinate as well or produce as vigorous a seedling as plump, healthy seed. Hence, saving seed from a field that was severely infected with any of these diseases is not advised. There are no seed treatments for the bacterial diseases, and although some seed treatments are active against *Septoria/Stagonospora*, the majority of the inoculum for this disease complex comes from wheat residue left in the field. Seed germination and emergence is critical to successful stand establishment, so planting of healthy seed is crucial to having vigorous seedlings.

REMEMBER, it takes three components for disease to occur, including (1) a virulent pathogen, (2) a susceptible host, and (3) a favorable environment. Regarding black chaff, we probably have a susceptible host and a virulent pathogen present every year, but only rarely do we have an environment as favorable as we did in 2007.

B – Are there other disease concerns related to the delayed harvest and wet weather?

A – Another major concern resulting from the delayed harvest due to wet and cool weather is the occurrence of Black (Sooty) Head Mold. This head mold can be caused by many different fungi colonizing the mostly dead plant material in the heads.

Typically areas in fields will appear dark to black in color (top picture to right), and examination of the heads reveal a fungal growth on the mature heads (middle picture to right). The longer harvest is delayed, the more likely it is that these fungi will infect maturing and mature grain, and cause a disease called “Black Point”, “Kernel Smudge,” or “Black Tip.”

Occurrence of black point is significant for a couple of reasons. First, black point contributes to the category of “damaged” wheat when the wheat is graded. According to Dr. Kim Anderson (O.S.U. – Agricultural Economist), U.S. wheat graded as U.S. Number 1, 2, 3, 4, and 5, can not have more than 2%, 4%, 7%, 10% or 15% damaged kernels, respectively. A damaged kernel (e.g., one caused by black point) has discoloration covering the germ and going into the cheek/crease as shown on the wheat grains in the bottom picture to the right

The other consequence of black point is that such seed can have reduced germination and produce seedlings with reduced vigor. Hence, seed with a high incidence of black point should not be saved and used to plant wheat the next year. Seed treatments may have some value in increasing stands when there is a high incidence of black point in the planted seed, but this is variable and it is best to plant seed with no black point present.



Disregard the pinkish-red color associated with the outer wheat grains in this picture. This color is not associated with the disease, but is a seed treatment that had been applied to this grain.

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