

Common bunt (stinking smut) on wheat

Common bunt (stinking smut) occurs somewhere in Kansas almost every year, resulting in significant price penalties or rejected loads of grain. This fungal disease causes deformation of wheat kernels, and infected kernels often have a gray color. The infected kernels are filled with black powdery spores as opposed to the normal white starches of healthy kernels. The fungus produces volatile chemicals that have a strong fishy odor. This odor is readily detected in loads of grain and may persist through the milling and baking process.



Symptoms of common bunt (stinking smut) in wheat grain (right), compared to healthy wheat kernels (left), Photo by Erick DeWolf, K-State Research and Extension.

Common bunt is a seed-borne disease. The disease persists between seasons on seed that was contaminated with the fungus during harvest or subsequent grain handling. The spores will survive on the outside of the kernels until fall, when they germinate and infect the developing seedlings shortly after planting. This infection process is favored by cool and wet fall conditions. Survival in the soil is considered rare in Kansas, because summer rainfall is normally sufficient to trigger germination of the fungal spores left in the field after harvest. The potential for survival in the soil is greater when soil conditions remain dry.

Unfortunately, there do not appear to be many options for using the rejected grain. Saving this grain for seed will increase the chances of having problems with bunt in following years. In some situations, I have heard of growers working with local feed lots to move rejected grain. The availability of this option will likely vary regionally within the state.

Management options for common bunt:

Fungicide seed treatments: Seed treatment fungicides are the first line of defense against seed-borne fungal diseases like common bunt. Even low levels of bunt can become a serious problem the following year and growers that have detected bunt or smut should use fungicide seed treatment for all their wheat. Products such as Dividend Extreme, Raxil MD, and Charter are all highly effective at controlling seed-borne diseases like common bunt and loose smut. Thorough coverage of the seed with the fungicide is very important and growers should consider having their seed commercially treated where possible. When used properly these seed treatments are able to protect more than 98%

of the kernels from infection. Even at this high level of control, it may take several years of persistent use of the seed treatment fungicide to completely eliminate the disease.

Disease free seed: Common bunt is most likely to be a problem when wheat has been saved for seed for 2 or more years. Renewing the seed supply with certified seed every few years will greatly reduce the risk of future common bunt problems. On farms with a history of bunt problems, it is a good idea to have the new seed treated with a fungicide seed treatment. This seed treatment will reduce the risk of contamination from equipment (trucks, augers, grain chutes used to move and handle the new seed) and eliminate the risk of infection from soil-borne sources of the fungus.

Crop rotation and volunteer wheat: It is also important to clean up volunteer wheat in fields with a history of common bunt. Any grain that passed through the combine during harvest is likely contaminated with the spores of the bunt fungus. If weather conditions are right, these volunteer plants could become infected with common bunt and negate the efforts to use clean seed or fungicide seed treatments. Because the infection is favored by cool and wet conditions, the late flushes of volunteer wheat are most at risk for infection. Therefore, crop rotation in fields with a history of bunt is probably the best option. Where rotation is not possible it is important to remain vigilant about volunteer control prior to planting the next wheat crop. Wheat varieties with the Clearfield technology that allows use of the herbicide Beyond to control volunteer wheat and feral rye may also be an option for some growers.

Common bunt can be a frustrating problem, but the disease can be controlled with a few adjustments to the production practices. Remain persistent and pay attention to details so that you receive maximum benefit for your efforts.

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A significant outbreak of common bunt occurred in north central and central Kansas in 2006. The area most affected was generally within an area bounded by Washington, Beloit, McPherson and Great Bend. While it is not known exactly how many acres were affected, there was some wheat rejected at the elevators due to bunt contamination.

Common bunt causes losses by reducing yield and by imparting a foul, fishy odor to the grain. Grain with bunt is usually unfit for milling. Dockage for smutty grain is based on the number of "smut balls" or smutty kernels in a 250 g (about 1/2 lb) sample of grain. The amount docked for smutty grain may differ among elevators.

An alternate use for smutty grain is to feed it. Smut infected wheat may be fed to all classes of livestock, including poultry, without ill effects. Breathing high concentrations of smut spores may be hazardous especially to humans suffering from asthma. The bunt fungus does not produce chemicals toxic to animals.



Figure 1. Common bunt infected kernels.

Figure 2. Bunt balls and healthy grains.

Symptoms

Common bunt is not easily identified until the grain filling period is nearly complete. Infected plants generally produce fewer and smaller heads than normal plants. Heads of diseased plants generally are darker green and retain their green color longer than healthy heads. The diseased heads have a more open appearance due to the expanding of the smutted kernels that causes a spreading of the glumes or chaff (Fig. 1). When the grain is in the "dough" stage, the presence of smut can be detected by pinching the grains between the thumb and forefinger. Smutted kernels will be filled with a soft, black, pasty mass of smut spores. In mature grain the pasty interior of smutted kernels will have changed to an oily, black powder. Diseased kernels (bunt balls) are a dull gray-brown color, short and plump (Fig. 2). A strong, fishy odor is also associated with infected heads, although related diseases such as Karnal bunt can also produce a similar odor.

Common bunt differs from loose smut in that only the kernel tissues within the seed coat are replaced by smut spores, rather than the whole head. Bunted plants are weaker than healthy plants, and are often susceptible to seedling blights and winter injury.

Disease Cycle

In Kansas, common bunt is normally a seed-borne disease, although it can survive in the soil during excessively dry summers. Wheat seed becomes contaminated with bunt spores when a diseased field is harvested. The combine breaks open the bunt balls, releasing the smut spores that adhere to the surfaces of healthy kernels. In fields that are heavily infected, a black cloud of spores may

envelope the combine. The dust clouds can quickly clog air filters and may become a fire hazard.

When the contaminated seed is planted in the fall, the smut spores germinate at the same time the wheat seed germinates. The fungus invades the coleoptile of the developing seedling prior to emergence. The fungus then invades deeper into the young tissues and establishes itself in the tissues that eventually develop into the head. The fungus inhabits the developing kernels as the plant grows and displaces the tissues within the kernels, eventually converting into spores by the time the plant is mature. When the field is combined, the disease cycle is repeated.

Management

1. All currently grown wheat varieties are susceptible to common bunt.
2. The most common source of infection is the saving of infested seed from the previous crop. The more years away from seed certification, the greater the problem is likely to be in a seedlot.
3. The most effective and economic means of controlling of bunt is through the use of seed treatment fungicides. If all growers treated their seed each year with the proper fungicide, bunt could be eliminated as a disease problem in

Kansas. It is highly recommended that all non-certified seed be treated to control bunt and seedling blight diseases. Some fungicides that control bunt do not necessarily control seedling blights and those that control seedling blights may not control bunt. The best seed treatments therefore, are combinations of fungicides that are active against bunt and seedling blight diseases. It is best to have the seed treated commercially using modern seed treatment equipment or to buy certified seed that has been treated by the seed processor. If this is not possible, several formulations are available that can be used on the farm in the drill box of the planter. Thorough coverage of the seed is essential, especially when treating seed in the drill box. For more information on seed treatments and recommendations to control seed-borne diseases of wheat consult the K-State Wheat Seed Treatments fact sheet at <http://www.plantpath.ksu.edu/DesktopDefault.aspx?tabid=536>.

4. Planting wheat early when soil temperatures are above 60 F may allow the germinating seedling to outgrow the fungus and escape infection. Planting before the Hessian fly free date for an area is discouraged however, because of the increased risk not only of fly damage, but also because of increased risk of virus infection, especially from wheat streak mosaic virus and barley yellow dwarf virus.