Utah State University
Exotic Pest Monitoring Series

Karnal (Partial) Bunt
Tilletia indica

EPMS 012

Quick Facts

- Karnal bunt is caused by the fungus *Tilletia indica*.
- Karnal bunt infects common wheat, durum wheat, triticale and rye.
- Spores produced by karnal bunt can survive in the soil for 5 years.
- Karnal bunt has not been found in Utah to date (2003)
- Karnal bunt infects the seed during head formation.
- Crop losses are rarely greater than 1% for karnal bunt, but more than 30 countries limit the import of grain from infected areas

Karnal bunt is caused by the smut fungus *Tilletia indica*. As with all other smut and bunt fungi, karnal bunt infects the seed. Infected seed kernels are partially or fully replaced with black spore masses of the fungi. Smut fungi in the genus *Tilletia* produce trimethylamine, which produces a foul decaying fish odor. When a few smut infected kernels make it through harvest and end up in stored grain, the processed flour or other products can result in decreased edibility. Smut fungi do not produce mycotoxins, which can be toxic when ingested, but in heavily infected fields (1%), enough infected kernels exist to taint the complete harvest. In addition to reduction in processed grain quality, many countries have quarantines on the import of grain products from areas where karnal bunt is found. Currently, 37 countries do not allow import of contaminated seed. Because much of the grain from Utah is exported, the introduction of karnal bunt to Utah could result in the significant loss of sales for Utah growers.

Symptoms:

Since severe karnal bunt infections occur at the most in only 1% of the kernels, it is extremely difficult to find infected kernels. Unlike most other bunt and smut fungi, karnal bunt infects during head and seed formation. Because of this, a single wheat head may have only a few of the kernels infected (Figure 1).

Figure 1. Wheat seed head with about half of the kernels healthy and half infected with karnal bunt.

Infected kernels also vary in their degree of severity. Individual kernels most commonly have a gray tint on the embryonic end but can be fully encompassed with a gray to black color (Figure 2). Kernels infected with the karnal bunt fungus do not disintegrate like other bunt fungi, because karnal bunt does not completely replace the seed with spores. A karnal bunt infection will not cause stunting, discoloration or any symptoms other than kernel infection. Because of the difficult nature of surveying for karnal bunt based on kernel symptoms, USDA-APHIS collects kernel samples at harvest time and conducts microscopic and molecular tests on them. Utah grain producers have annual sampling performed on their grain and have yet to test positive for the presence of karnal bunt.

Figure 2. Series of kernels infected with karnal bunt. Healthy kernel (left), kernels with a range of infection. Most common level of infection (left next to healthy kernel), severe karnal bunt infected kernel (right).

Causal Agent:

Tilletia indica is considered a smut or bunt fungus. Fungi in this category most commonly infect monocots. Karnal bunt infects common wheat, durum wheat and triticale during seed head formation. Most infections occur at a point during head formation where only the embryonic end of the seed is affected. Spores produced in seeds can be deposited into the soil where they remain viable for up to 5 years. Deposited spores are also suspected to move distances greater than 100 miles in wind currents, but because of the difficulty identifying infected seed, coupled with the fact that many countries where karnal bunt is present do not test for its presence, contaminated seed is the primary means of introducing karnal bunt into an agricultural operation.

Control:

Since karnal bunt is only found in 3 states in the United States, cultural and chemical controls have not been defined nor investigated for the environmental conditions that occur in Utah. Planting certified pathogen-free seed will reduce potential introduction of karnal bunt and eliminate the need for control recommendations.

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Questions for Karnal Bunt samples/survey.

Grower Information
Name:
Address:
Farm Location:

Crop Information:
Seed Source:
Plant and Variety:
Soil type:
Crop rotation history (current and previous 10 years):

Miscellaneous:
Pesticides applied:
Fertilizers applied:
Neighboring fields with common wheat, durum wheat or triticale: yes/no
Are neighboring fields experiencing same disease: yes/no