

## Karnal Bunt: A Fungal Disease of Wheat

Karnal bunt, or partial bunt, is a fungal disease of wheat, durum wheat, and triticale (a hybrid of wheat and rye). Typically, only a portion of the kernel is affected; this is why the disease is sometimes called partial bunt. Climatic conditions determine the extent of the disease. The damage may be twofold: infected plants may produce less grain, and the quality of the grain itself may be lessened.

The U.S. Department of Agriculture (USDA) regulates wheat infected with Karnal bunt and restricts the wheat's movement to keep the fungus from spreading or being co-mingled with other wheat. Infected wheat can, however, be sent to approved facilities where it is steam rolled, a form of heat treatment, and sold as animal feed.

### History

The disease was first reported in 1931 in wheat-growing areas near the city of Karnal in the Indian State of Haryana. Since then, it has been found in all major wheat-growing States of India, as well as in Pakistan, Iraq, and Afghanistan. The disease may have been present in Mexico since 1970 and has been well established in some areas in northwestern Mexico since 1982. Federal regulations prohibit entry into the United States of seeds, plants, unprocessed straw, chaff, and products of the milling process (other than flour) of wheat from countries where Karnal bunt is known to occur. These commodities can enter only with a USDA permit for scientific purposes.

### Impact

Although the overall crop losses caused by Karnal bunt might not be severe, the disease has quarantine significance and thus could affect U.S. grain exports. The United States is the world's leading wheat exporter, accounting for one-third of world wheat exports valued at approximately \$3.4 billion in fiscal year 2000.

### Detection

The disease cannot be easily detected in plants growing in the field: the grain must be removed from the head and examined. In addition, four other diseases can be mistaken for Karnal bunt: black point, common bunt, dwarf bunt of wheat, and a bunt of rye weed commonly present in wheat fields. These diseases are already established in the United States.

When checking crops for Karnal bunt, wheat growers should look for bunted kernels that are fragile, dark in color, and fishy smelling. The kernel usually remains whole, although part of the germ may be eroded. Cracks in the surface reveal a black powdery spore mass within the endosperm at the embryo end of the kernel or along the kernel groove.

Any kernels that show signs of contamination should be placed in a plastic bag within a sturdy container and taken to the nearest State regulatory official or to a field office of USDA's Animal and Plant Health Inspection Service's (APHIS) Plant Protection and Quarantine (PPQ) program.

### How It Spreads

Karnal bunt is spread mainly by the planting of infected seeds. Infection occurs during the flowering stage of the host plant, when its developing ovary comes into contact with infectious sporidia, a stage in the lifecycle of the pathogen *Tilletia indica*. The ideal conditions for infection are cool weather, rainfall, and high humidity at the time of heading of wheat. In soil, the spores may be able to survive as long as 5 years.

The spores can be carried on a variety of surfaces—plants and plant parts, seeds, soil, elevators, buildings, farm equipment, tools, and even vehicles.



### Symptoms of Karnal Bunt (*Tilletia indica*) Infection on Wheat Seed.

1. Healthy wheat seed.
2. "Tip" infection.
3. More advanced tip infection.
4. Advanced infection.
5. "canoe" symptom hollowing out interior of seed.

### Survey Work

USDA's Karnal Bunt National Survey provides information about potential Karnal bunt infections in new areas as well as identifies areas that are free of Karnal bunt infestations. The national survey covers areas that are not regulated for Karnal bunt in all States that produce wheat. As part of the survey, USDA collects and analyzes composite wheat samples at points of collection and co-mingling, such as county elevators, feed mills, seed laboratories, and seed trade and research locations.

The ideal time to sample grain is immediately after wheat harvest. However, grain samples can be collected at any time. Samples that do not have *Tilletia indica*-type spores will be considered negative. Samples with suspect *Tilletia indica*-type spores will be tested further for bunted kernels. If bunted kernels are found, USDA will regulate the area for Karnal bunt. Samples must be taken from 100 percent of the fields planted with wheat in the regulated area each year at harvest time. The samples are each 4 pounds and taken at random.

### Compensation

Every year since the harvest of 1996, when the first outbreak of Karnal bunt was discovered in the United States, USDA has compensated producers affected by the fungus. This does not include the 1998-1999 crop season because no wheat grown in the regulated areas tested positive for the disease. Only positive-testing wheat is eligible for compensation because of the lack of restrictions on negative-testing wheat.

USDA must publish regulations in the *Federal Register* before offering compensation to farmers. Once the compensation rate is determined and the final rule is published, USDA makes every effort to ensure affected producers, grain handlers, and seed companies are compensated as quickly as possible.

### Recent Developments

During an on-going testing and monitoring program, USDA recently found wheat fields in Texas, California, and Arizona that tested positive for Karnal bunt. Positive properties were found in Texas in the counties of Throckmorton, Young, Archer, and Baylor which are approximately 125 miles outside of the areas previously regulated for Karnal bunt. Other positive finds in Texas and in Arizona and California were restricted to fields in areas already quarantined for the fungus.

This is the first time since 1997 that Karnal bunt has been detected outside of a regulated area. Karnal bunt was first confirmed in the United States in Arizona on March 8, 1996. In the 1997 National Karnal Bunt Survey, the disease was discovered in San Saba, TX.

### Rapid Response

Upon confirmation of Karnal bunt-positive properties, APHIS amended its regulations to include Throckmorton, Young, Archer and Baylor Counties to the quarantine already in place since 1996. USDA halted grain movement, began traceback surveys, and tested surrounding fields for the fungus. This emergency action was necessary to prevent the spread of Karnal bunt into noninfected areas of the United States.

On June 15, APHIS sent a team of experts to northern Texas to help contain the fungus. In cooperation with the Texas Department of Agriculture, USDA assembled this group to reinforce its safeguarding activities to prevent the spread of this disease.

### Additional Information

To learn more about Karnal bunt or to report a suspected outbreak, please contact

USDA-APHIS-PPQ  
1-888-661-8083  
Surveillance and Emergency Program Planning and Coordination  
4700 River Road, Unit 98  
Riverdale, MD 20737-1236  
(301) 734-4387

You can also visit our Web site at [www.aphis.usda.gov/ppq/emergencyprograms/](http://www.aphis.usda.gov/ppq/emergencyprograms/)

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