



LOOSE SMUT OF WHEAT

Loose smut, caused by the fungus *Ustilago tritici*, is a common disease of wheat throughout the world. Wheat yields are reduced in proportion to the percent of smutted heads, since most infected heads produce no seed. The amount of loose smut varies from year to year, depending on environmental conditions during flowering. Cool, humid weather accompanied by light showers or heavy dews is most favorable for infection. Under favorable weather conditions, the wheat produced from a field with only one percent of the heads infected, can have seed with 10 percent or more infection of loose smut.

Over a 35-year period in Illinois, the greatest statewide loss was 7 percent, and the smallest amount 0.3 percent (average, almost 2 percent). In 1961, individual field losses from loose smut were as high as 40 percent.

The loose smut fungus is carried as dormant mycelium within healthy-appearing seed and is spread by planting infected seed. A smut-infected seed or plant cannot be distinguished from a normal one until the head starts to emerge.



Figure 1. Loose smut.

SYMPTOMS

The disease is easily recognized at the time of heading by the characteristic dusty black appearance of diseased heads. The infected heads emerge from the boot one to three days earlier than those of healthy plants. As a rule, all the glumes (chaff) and grain in a smutted head are completely transformed into black powder. This sooty mass is composed almost entirely of millions of microscopic smut spores (teliospores). The spores are quickly dispersed by the wind during the flowering period of normal heads, and by harvest only an erect bare rachis remains (Figure 1).

DISEASE CYCLE

Infection of wheat plants takes place shortly before, during, and two days after the flowering period. The maximum infection occurs during flowering. Wind, rain, insects, and other agents carry the olive black teliospores from a smutted head to the open flowers of a healthy head. Here, in the presence of moisture, with a temperature of 60° to 71°F (16° to 22°C), the spores quickly germinate and grow down the stigma and pistil—the female parts of the flower—to invade the young embryo (seed). Infection also may occur

For further information contact your nearest Extension office or an Extension Specialist, Department of Crop Sciences, University of Illinois at Urbana-Champaign.

by direct penetration of the embryo wall. Within a week after flowering, the ovary and flower parts become resistant to infection. After establishing itself as mycelium in the embryo of the developing kernel, the loose smut fungus becomes dormant (Figure 2).

When an infected kernel is sown and begins to sprout, the mycelium of the smut fungus again becomes active and grows systemically into the young shoots to the growing point. The fungus normally keeps pace with the development of the wheat plant. By heading time, the spikelets in an infected wheat head are completely transformed, except for a pericarp membrane, into a dusty mass of teliospores (Figure 3). The delicate gray membrane soon tear away as the head emerges to release the mass of dry spores, completing the disease cycle.



Figure 2. Dormant mycelium of the loose smut fungus in the scutellar region of an infected wheat embryo (left), and a normal, healthy embryo (right). The wheat kernels have been cleared and stained (Photograph with dissecting microscope).

CONTROL

1. Sow certified seed of wheat varieties that are resistant to loose smut and recommended for your area by University of Illinois agronomists and your nearest Extension adviser. None of the wheat varieties are resistant to all the physiologic races of the loose smut fungus, however some are moderately to highly resistant to the races currently prevalent in Illinois.
2. If you grow a variety susceptible to loose smut, be sure to plant certified seed purchased from a reliable dealer. Certified seed carries a minimum amount of infection. Only wheat fields that meet rigid specifications with respect to disease will pass certification requirements. Competent inspectors closely examine fields of all growers who apply for seed certification to make sure that no loose smut, or other serious seedborne wheat diseases are present.



Figure 3. Smutted heads (right) are conspicuous during heading. As a rule, glumes and grain are completely transformed to black powder (smut spores), which soon blow away leaving a bare spike at harvest. The two heads on the left are in bloom, the stage at which infection occurs (Illinois Natural History Survey photograph).

3. The best insurance against loose smut is seed treatment with a fungicide containing carboxin or triadimenol systemic fungicides applied to the seed. These fungicides have the unique ability of being taken up by the germinating seed. They check or kill the loose smut fungus within the seed while controlling surface-borne bunt or covered smut and a number of fungi that cause seedling blights (damping-off). Carboxin is sold under various trade names often in combination with another fungicide. These mixtures give excellent smut control and also provide protection against a wide range of fungi that attack the germinating seed and young seedling.
4. The hot-water soak technique for ridding wheat seed of the loose smut fungus, while highly effective, is difficult to use and often reduces the germination percentage and vigor of the wheat seed. This procedure should be attempted only by experienced personnel with the necessary equipment.