Smut diseases of wheat are not often seen. Consequently, many farmers believe these diseases no longer exist, or are no longer a threat. Smut diseases, however, are still present and occur statewide. Smut appears to cause more damage on wheat since ethyl and methyl mercuries were banned as seed protectants. If the use of seed protectants, resistant varieties and smut-free pure seed is not practiced, smut diseases pose a threat to the Texas wheat industry. All smut diseases are either seedborne or soilborne.

*Bunt (stinking smut) (*Tilletia foetida*)

Bunt on wheat, sometimes called stinking smut or covered smut, gets its name from the characteristic fishy odor given off by infected heads. Two types of losses result from bunt infection in wheat: (1) smutted heads are a total loss and reduce yield in proportion to their number and (2) the presence of bunt in threshed wheat gives the grain the foul, fishy odor which makes the wheat unfit for milling and is subject to dockage when sold. The prevalence of bunt varies from year to year. It depends partly on soil conditions following planting and the extent to which preventative measures have been used.
A head affected by bunt has a distinct blue cast when it first emerges from the boot. This color remains until after normal heads are ripe. At bloom time, it is more slender than healthy heads and does not put out pollen sacks, but at maturity it usually appears plumper and fuller than normal heads because of its wide-spreading and open chaff. During growth the kernel is transformed into a smut ball which is shorter and plumper, but lighter weight than normal wheat grain. The smut ball consists of a mass of oily, foul-smelling, dark brown powder which is the spores of the bunt fungus.

In the field, bunted heads usually stand more nearly erect than healthy heads because of their lighter weight. The blue tint in diseased heads and the spreading of the chaff at maturity vary considerably. In some wheat varieties it is necessary to crush the kernels to determine if heads are diseased. The offensive odor indicates heavy infestations in fields and the presence of smut balls in grain being shipped or stored.

Many smut balls are crushed during threshing and spores are released, lodging on healthy kernels, especially at the brush end and in the grooves. Planted in the soil with the wheat, the spores germinate when soil conditions are favorable. By the time a wheat sprout emerges, the smut fungus has produced spores of another type which infect young wheat plants. After entering a young shoot, the fungus continues to grow as an internal parasite, eventually transforming wheat kernels into smut balls. A single smut ball may contain 1 to 8 million spores. Soil becomes infested with bunt when smut balls shatter before and during harvest or when the balls are planted with healthy seed.

Use chemical seed protectants to kill spores carried on kernels.

Flag Smut (Urocystis tritici)

Flag smut of wheat, as the name implies, attacks the leaves, leaf-sheath and stems of wheat plants. The smut is produced in stripes that run parallel to the leaf vein; the stripes break open and expose the black spores. Flag smutted plants often are stunted and malformed.

Spores of flag smut spread at harvest when plants are disturbed; some spores contaminate the grain and others fall to the soil. Smut spores survive in the soil and on the seed. Affected leaves, many of which are rolled and twisted, split along the stripes and release the smut spores. In very early stages, these stripes are lighter green than the rest of the leaf areas, but some may develop a copper and later a black color. They first appear on upper leaves of diseased plants before the plants joint and become very conspicuous by heading time.

When diseased wheat is threshed, spores on the straw of smutted plants spread over the threshed grain as well as throughout the straw and chaff. If contaminated grain is used for seed, spores of the flag smut fungus are carried into the soil where they soon germinate when moisture and temperature conditions are favorable. As the wheat seed sprout, the germinating smut spores infect the young sprouts they contact. Having gained entrance to a plant, the smut organism overwinters there, and in the spring it resumes growth along with the host which it dwarfs, distorts and finally kills. Flag smut spores remain alive in the soil for more than a year. To prevent flag smut damage use seed protectant fungicides that effectively kill flag smut spores carried on the seed.

Loose Smut (Ustilago tritici)

Loose smut is the most easily recognized of all wheat smut diseases because of the characteristic dusty black appearance of diseased heads, an appearance that has given it such common names as smut, black head and black smut. An important difference between this and the other two smuts of wheat is that infection is carried over from season to season within the seed and not as spores on the seed surface.

The term "loose smut" is very descriptive since fungal spores, which make up each black head, adhere loosely and are knocked off easily, leaving only the bare stalk. Loose smut is recognizable as soon as the affected head emerges from the boot. Usually the
entire head is diseased, although sometimes part of the head remains normal and develops grain. Most of the smut mass, which consists entirely of fungus spores, is dislodged during the blooming period and by harvest only a bare spike remains, which is overlooked easily by a casual observer.

Spores of the loose smut fungus are approximately the size of a pollen grain. When healthy wheat is in bloom, the smut spore is blown to the healthy bloom and infection occurs. The fungus grows down the flower and establishes itself inside the developing kernel. Later establishing itself, it becomes inactive and lives within the seed in a dormant state for a year or more. When an infected wheat seed has been sown and begins to sprout, the fungus becomes active again, growing into the young shoots up to the growing points and keeping pace with development of the plant. As wheat heads form, the fungus begins its own process of reproduction and replaces the spikelets with a new crop of dusty, black spores which are ready to infect the flowers of healthy plants. A diseased seed or plant cannot be distinguished from a healthy one until the plant begins to head out.

Because loose smut is not surface-borne on the seed, contact seed protectants are ineffective. To be effective any control method must kill the fungus inside the seed without injuring the germ of the seed. The only seed protectant materials effective against loose smut are those with systemic activity.

Certified seed should be relatively free of loose smut infections. Use of seed from a plot where care has been taken to produce disease-free seed of a variety suitable to the locality is another dependable way of preventing loss from loose smut.

**Identifying Characteristics**

- **BUNT** — Internal parts of the wheat kernel are replaced by short, plump smut balls consisting of a mass of oily, foul-smelling, dark brown spores.
- **FLAG** — Attacks the leaves, leaf sheaths and stems of wheat. The smut is produced in stripes that run parallel to the leaf veins; the stripes break open and expose the black smut spores.
- **LOOSE** — The entire wheat kernel is replaced by smut spores. Wind usually shatters the spores, leaving only the center stem of the head.
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