

Fact Sheet:

What is flag smut of wheat? Flag smut (Figure 1) is caused by a fungus known by the name *Urocystis tritici*, a basidiomycete which is in the same broad grouping of mushrooms, puffballs, and rust and bunt diseases of plants. Other smut diseases found in Kansas include common corn smut, head and covered smut of sorghum and loose smut of wheat. It is important to understand that flag smut of wheat infects only wheat or closely related grass species such of *Hordeum*, *Aegilops*, *Elymus* and *Agropyron*. The fungus or the plant material including the grain or seed is not known to be harmful to humans or animals and flag smut does not alter the grain quality. Yields are generally not affected over a wide area of infestation but some reports have been made where a loss in yield of individual plantings of nearly 50 percent.



Figure 1. Flag smut wheat with twisted tillers and leaves. Leaves have black streaking (sori) running parallel with veins.

Flag smut was first reported in Australia in late 1800s and in the United States in the early 1900s. In Kansas and other nearby states, the disease has a history in the 1920s and 1930s but has not been seen in growing plants for many years despite numerous observations by growers, seedsmen, crop scouts, and government personnel. Outbreaks of the disease are usually associated with planting of susceptible cultivars over a wide geographic area and specific temperature and moisture environmental conditions. These environmental conditions favorable to the disease can be described as being found in more arid climates and where seedling growth occurs slowly.

The flag smut fungus infects the young wheat plant in the fall of the year after the young plant germinates and the seedling is exposed in the soil. There the fungus spores germinate along with the plant seedling and invade the plant becoming systemic in the intercellular regions. No symptoms at this time can be seen by the naked eye. As the wheat plant breaks dormancy in the spring and grows, so does the fungus inside the plant. When the wheat plant reaches the heading and flowering stage, the flag smut fungus sporulates within leaves and stems. The sori of the fungus, a spore bearing structure, erupt through infected tissues and then can be seen by as black to gray smutted tissue. Infected plants (Figure 1) are also poorly tillered, stunted, stems and leaves twisted tightly or curled, and little seed or grain is produced. In Kansas it can be sometimes confused with loose smut of wheat (Figure 2) and the late telial stage of stripe rust. The spores, teliospores, produced from the plant are quite distinguishable under the microscope as they are reddish brown, smoothly rounded, and in clusters called spore balls.



Figure 2. Loose smut of wheat - note that the disease only affects the head with the black smut fungus.

Teliospores are quite robust and can remain viable for several years in the soil and for extended longer periods on stored seed or grain. These hardy spores can move from location to location on the outside or surface of the seed or grain, straw, by wind or runoff of water from an infected field, or by other

physical carriers such as machinery, clothing, and animals including deer or cattle in the form of dust or soil and mud.

Control: Seed treatments with specific fungicides are reported to provide excellent control of flag smut and offer growers and seedsmen an important tool in both controlling the fungus infection of the wheat plant and movement into new fields or wheat growing regions. In addition, crop rotation practices can aid in reducing the inoculum or spore load in a field since the fungus is primarily specific to wheat.

States such as Washington and Oregon where wheat grown in arid regions have been successfully managing the disease for some time and other countries have also had reduced or managed the disease to minimize the impact on yields and spread.

Grower and seedsmen should consider these protocols now as harvest grows near:

- Scout fields by walking slowly in several acres looking into the lower canopy for plants exhibiting poor tillering, few heads, and black twisted leaves. Contact your county extension agent if you believe your field to be infected and take a sample for confirmation.
- Consider seed treatments for the fall if you plan on planting your own seed.
- If buying certified seed, request a seed fungicide treatment. Seed fungicide treatments have been shown to be economically beneficial (cost effective) for most if not all plantings.
- Stay up to date with developments by coming back to this web page and the information available from your seedsmen, county agent, crop scouting service, or other agronomic professionals.

Why is this disease important? The disease caused by this fungus found in nearly every country around the globe. Several countries that grow wheat regulate the disease because of limited distribution in their country or the absence of flag smut. Since flag smut spores are on the grain or seed, both are sometimes regulated.

Kansas wheat is exported across the world and is financially linked to the almost all aspects of the Kansas economy in some form or another. Therefore flag smut is of importance and the disease taken seriously since exports of seed, grain, and even hay can be affected.

What do we know about flag smut currently in Kansas? Since the discovery of the disease on May 6 in Rooks County in north central Kansas and the USDA confirmation the following week both Kansas State University and Kansas Department of Agriculture plant health specialists along with their partners at USDA have been surveying, confirming, and tracing back leads regarding the outbreak in Kansas. It appears that from the current information that the disease is present in several western and central crop reporting districts in the state but within those districts the distribution is still being developed or understood.

It is a credible assumption to say that environmental conditions last fall for infection were favorable although we don't completely understand or have studied this. We do know that a number of wheat

varieties in Kansas have been shown to have the disease in demonstration trials and substantial acreage across Kansas has been planted to these varieties.

In limited surveys, not all fields visited have been found to have this disease and where it has been found levels are described to be as trace to 1 per cent in incidence. In the eastern half of the state, the disease has not been found at all.

What can be done to address future concerns and management of flag smut? Certainly seed treatments with fungicides with specific activity against flag smut will have to be considered both on individual farms and possibly in some form on a more regional basis. Industry and government will be working together in to address the issue as we know more about the extent of the disease in the upcoming weeks and months before planting this fall of the next wheat crop.