Lect. 4

Smut of Cereals

- Large group and also affect other crops.
- Until the 20th century, smuts were the causes of serious grain losses.
- Seldom kill their hosts, but in some cases infected plants may be severely stunted.
- Most smut fungi produce only two kinds of spores, teliospores and basidiospores.

Common bunt (stinking smut)
Pathogen:
Tilletia caries (= *T. tritici*)
Hosts:The disease is specific to wheat

Wheat kernels filled with black spores (arrows) of the common bunt fungus

Symptoms:

- No symptoms can be observed prior to ear emergence.
- The flag leaves of infected plants show yellow streaks and plants can be stunted.
- In infected ears the grain is replaced by seed like 'bunt balls' each containing millions of black, foul- smelling spores.

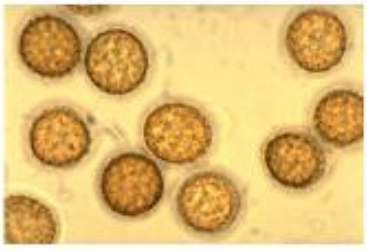
Contaminated grain healthy

- In severe cases, the whole field may smell of rotting fish.

Wheat flag leaf showing typical yellow streak symptoms

Survival:

- The fungus survives between growing seasons as teliospores on the surface of seeds or in the soil.
- can remain viable in either location for a number of years.



teliospores

Importance:

The disease is potentially very damaging and can lead to complete crop loss.

Spread:

- Saved and re-sown seeds without treatment, can build up the disease very rapidly.
- Harvesting or handling equipment contaminated by spores can introduce the pathogen into seed lots sown in the following season.
- During harvest, the smut spores are released from infected ears. They contaminate other seed being harvested or are spread by the wind to the soil surface.

Environmental conditions:

- Cool temperatures (5-15°C) favor the germination of the teliospores.

Loose Smut:

Pathogen: *Ustilago nuda f.sp. tritici (U. tritici) - Wheat*
Ustilago nuda f.sp. hordei - Barley
Ustilago avenae - Oats

Loose smut infected wheat ears

Close-up of infected wheat ears

Symptoms:

Loose smut is easily recognized at ear emergence as individual grains are completely replaced by a mass of black fungal spores.

Wheat ears infected with loose smut. The right ear is all that remains after the loose smut has blown free.

Occurrence & environmental conditions:

- Occurs wherever cultivated host is grown.
- Causes low to moderate losses.
- It is more common in regions with a cool, moist climate during flowering of the host.
- Infection during flowering is favorite by frequent rain showers, high humidity and temperatures of 16 -22°C.

Survival:

The mycelium remains dormant in the embryo, and developing kernels are replaced by black teliospores.

Spread:

The disease is spread by windblown teliospores.

Flag smut:

Cause

Urocystis agropyri

Hosts

The disease infects wheat and many grass species

Streak symptoms of flag smut on a wheat leaf

Symptoms:

- Affected plants are often severely stunted
- Often the ears fail to emerge.
- Plants show long dark grey to black streaks (spore masses) on the leaf

Black teliospores on a wheat leaf

Importance:

Many countries have ***quarantine*** restrictions which prohibit the import of wheat products from countries where the disease is established.

- **Environmental conditions:**
- As a general rule, flag smut occurs more frequently in light, relatively dry soils in the 18° to 24°C temperature range.

- **Inoculum sources:**
- Teliospores on the seed or in soil provide the inoculum.

Control:

1- Use certified smut-free seed of a resistant variety.
2- Seed treatments are extremely effective in controlling bunt.
3- Application of a systemic fungicide.
4- All machinery that handled infected grain should be thoroughly cleaned.
5- Remove plant debris
6- Wheat should not be sown back into an infected field for several years.