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ST. PAUL CAMPUS

PLANT PATHOLOGY NO. 6—REVISED 1973

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Barley Smuts

Barley smuts, caused by fungi, have been a disease problem in the barley crop since it was first grown. At one time smut was just smut, but we now recognize three distinct species on barley. Being able to distinguish among these species is important when deciding which control measures to use.

THREE SPECIES OF BARLEY SMUT

Loose Smut, Ustilago nuda

This species was particularly troublesome in 1959 in Minnesota and North Dakota. The infected head is a loose mass of smut spores that blow away, leaving a bare rachis (figure 1). The dustlike spores are carried by air and some of them lodge in flowers of healthy heads. If moisture and temperature are suitable, spores germinate and germ tubes then enter the flower's ovary and grow into the embryo of the developing seed (figure 2). When the grain matures, the fungus becomes dormant; when the seed germinates, the fungus grows with the new plant and produces smutted heads.

Covered Smut, Ustilago hordei

Grain heads infected with this fungus have membranes around the smutted kernels (figure 1). These membranes remain more or less intact until the grain is threshed. During threshing the membranes are broken and the smut spores are spread onto and under hulls of healthy kernels. Smut spores remain dormant on the grain in storage. When the seed germinates, the smut spores also germinate and infect the young plants.

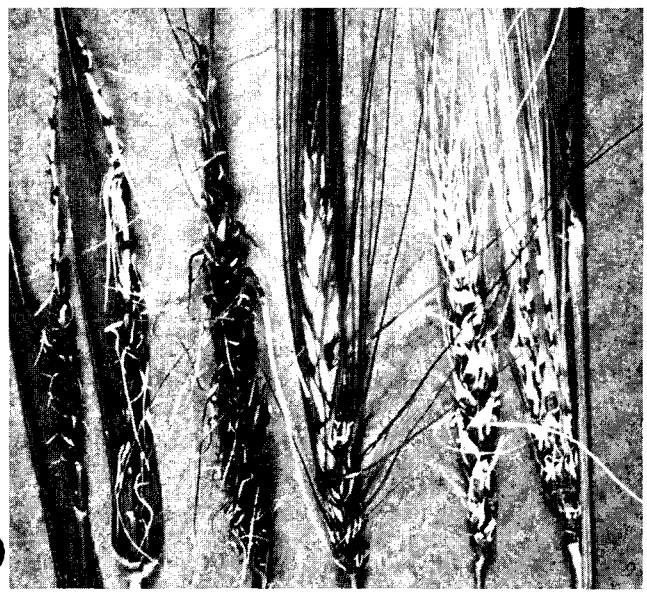


Figure 1. The three heads on the left are loose smut; the three on the right are covered smut.



Figure 2. Left: barley embryo infected with the loose smut fungus. Right: healthy embryo. Embryos are about 1/16 inch long.

Semiloose Smut, Ustilago nigra

Smutted heads look like loose smut (figure 1), but this disease acts like covered smut. The fungus goes through storage as spores on or under hulls of barley kernels Spores germinate and infect young plants during germination of the seed. Semiloose smut can be distinguished from loose smut only by observing the type of spore germination with a microscope. Less than 5 percent of the smutted heads collected from western and northwestern Minnesota in 1959 were semiloose smut.

YIELD LOSSES FROM BARLEY SMUTS

Yield losses from barley smuts (in percentage terms) are approximately equal to the percentage of smutted heads in the field.

WHAT DETERMINES THE PERCENTAGE OF SMUT

Loose Smut

The percentage of loose smut infection in a new barley crop depends on: (1) the percentage of smutted heads in the old crop, (2) weather conditions at flowering time, and (3) the barley variety. A heavy infection in the field often results in a fairly heavy infection in the new crop. But even fields with a light infection sometimes produce seed with a high percentage of smut.

Weather at the time of flowering has a great effect. Cool, moist weather generally results in a heavier infection of the crop than does hot, dry weather. All barley varieties currently recommended for use in Minnesota are susceptible to loose smut.

Covered Smut and Semiloose Smut

Infection with these smuts depends on the number of smut spores on the seed at planting time and on the temperature and moisture of the soil during germination.

CONTROL OF COVERED SMUT AND SEMILOOSE SMUT

Chemical seed treatments may effectively control these diseases if they are properly applied. The application of seed treatment chemicals is very important because such a small amount of material (usually less than 2 oz./bushel) is being used to cover the seed surface.

The following fungicides, or combination of them, will control these diseases:

Maneb

Maneb + Hexachlorobenzene

Thiram

Thiram-Vitavax

Zineb

CONTROL OF LOOSE SMUT

Chemical control of loose smut is now available in the form of a seed treatment fungicide known as Vitavax. The rate used depends on the formulation, wettable powder or flowable.

Largescale Control

The practical control of loose smut for the commercial crop is to plant seed that is either free from the fungus or that has a very low percentage of infected embryos. This control is made possible through use of the embryo test. This laboratory test involves treatment of seed with chemicals and microscopic examination; it requires special equipment and experience. The test accurately determines the percentage of infection in the seed. Lots with a low percentage of smut can be saved for seed without specific treatment for loose smut; those with a high percentage can be used for seed if they are treated for loose smut with an effective fungicide such as Vitavax.

Interpretation of Embryo Test Results

Results of the embryo test are given as a percentage of the seeds of a sample that have embryos infected with loose smut. The percentage loss in yield from loose smut infection is about the same as the percentage of infected embryos. In some cases, the loss may be less than the percentage of infected embryos, but it should not be higher if the sample tested was truly representative of the lot.

To estimate expected yield loss from loose smut, multiply the expected yield in bushels by the percentage of infected seeds and divide by 100. The result will be the expected loss in bushels. For example, an expected yield of 40 bushels per acre and an embryo infection of 5 percent would result in a loss of not over 2 bushels per acre. On this basis, you can decide whether to save the grain for seed or use it in some other way.

You can obtain information on various seed treatments and on the procedure for obtaining the embryo test through your county agricultural agent.

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