SEED TREATMENT FOR THE PREVENTION OF CEREAL SMUTS

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COLORADO AGRICULTURAL COLLEGE
Fort Collins, Colorado

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SEED TREATMENT FOR THE PREVENTION
OF CEREAL SMUT

By A. K. PEITERSEN
Head of Botany Department

LOSS CAUSED BY SMUT

Smut is one of the most destructive plant diseases of the cereal crops. It is so prevalent that the real loss due to this disease is frequently over-looked. In 1919 the farmers of Colorado lost 1,157,000 bushels of cereals from this disease alone. The loss of wheat from “stinking smut” and “loose smut” was approximately 235,000 bushels; of oats from the “loose and covered smuts” was 202,000 bushels; of barley from “loose and covered smuts” was 130,000 bushels and of corn was 590,000 bushels. Over fifty percent of this loss was due to those smuts which can easily be prevented by careful seed treatment.

... KINDS OF SMUTS AND THEIR NATURE

The stinking smut of wheat, the covered smut of barley, the oat smuts, the millet smuts, the kernel smuts of sorghum, stem smut of rye and covered smut of emmer can all be prevented by proper seed treatment. The treating of seed corn for smut is useless, as it is a very different type of infection. Crop rotation is the most efficient means for the control of corn smut. It has been shown that smut spores may pass through the digestive tracts of animals uninjured. Barnyard manure, therefore, is frequently a source of infection. The spores germinate freely in manure heaps. Hence, it is self-evident that only well rotted manure should be placed on corn fields. The smut organisms causing these diseases live over from one season to the next in the form of very small, seed-like bodies known as spores. The spores are spread by the wind, threshing machines, grain drills and by other means, to healthy grains where they lodge in the crevices, cracks and hairs which occur upon their surface. When such grains are planted, the smut spores germinate about the time the seed germinates and infects the young seedling. As the plant grows the growth of the fungus keep pace within. The presence of the smut is not noticeable until the time when the grain “heads.” At this time there appears a black powdery mass of smut spores in place of the normal fruit. (See figure 2, 3 and 4).

HOW TO PREVENT SMUT

Since the disease depends upon the presence of spores on the seed at the time of germination, the proper method of control is to treat the seed grain before planting. Formaldehyde is the most universal disinfectant used for this purpose. Copper sul-
phate or bluestone was one of the earliest disinfectants used and is still in use to some extent. However, several years of experimentation have shown that formaldehyde has many advantages over copper sulphate. Formaldehyde seldom injures the seed, and can be used equally well for all the cereals. It is applied more easily and there are no crystals to dissolve. Copper sul-

![FIGURE 2](image)

**FIGURE 2**

Left.—Head of oats badly affected with the loose smut. Note that the chaff is almost entirely destroyed. By harvest time these smut masses disappear, leaving the stalk barren.

Right.—Head of oats affected with closed smut. Note that the chaff is not destroyed, but encloses the mass of spores, which will not be broken down until threshed.

phate is often injurious to the grain, and for this reason the grain is first dipped in lime water. Grain treated with copper sulphate is poisonous while grain treated with formaldehyde can be safely fed to stock after drying. It is somewhat cheaper to treat grain with formaldehyde than copper sulphate. The use
of formaldehyde is recommended; but if one has become accustomed to the use of copper sulphate, and satisfied with the results obtained, a change of method is unnecessary.

FIGURE 3
Bunt or covered smut of wheat.

FIGURE 4
A—Healthy wheat kernels. B—Bunted wheat kernels.
HOW TO USE THE FORMALDEHYDE TREATMENT

Formaldehyde is sold by all druggists in standard forty per cent solutions. The average price being from fifty to seventy cents per pint.

There are three standard methods of treating grain with formaldehyde: by soaking, by sprinkling and by spraying. All three methods are effective if proper care is exercised in handling the grain. The soaking and sprinkling methods are more universally used and are more easily carried out on the ordinary farm than the spraying method.

SOAKING METHOD

1. Estimate the amount of seed to be treated and purchase formalin (forty per cent strength) one pint for forty bushels of grain.

2. Dilute the formalin to the required strength; see table below.

3. Put a sufficient amount of the solution into a barrel or tank to immerse one or more sacks of seed. Do not fill the sacks too full; allow room for agitation of the grain so that each grain will become thoroughly wet when sack is emerged.

4. Leave the seed in the solution according to the specified time; see table below.

5. Remove the sacks and drain, allowing the excess solution to run back into the barrel or tank. Replenish the solution when it gets too low.

6. Pile the treated grain and cover with wet sacks or canvas for not less than six hours nor more than twelve hours.

7. Shovel the grain over and spread out in a thin layer to dry. Drying may be facilitated by frequent shoveling.

Table Giving the Strength of Solution Used and the Time for Soaking the Different Grains

(Use formalin of commercial forty per cent strength.)

<table>
<thead>
<tr>
<th>Grain</th>
<th>Kind of Smut</th>
<th>Proportion of Formalin to Water Mixed</th>
<th>How Long to Soak in Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat</td>
<td>Bunt or stinking smut</td>
<td>1 pt. to 40-45 gals.</td>
<td>10-20 min.</td>
</tr>
<tr>
<td>Barley</td>
<td>Closed-Hidden</td>
<td>1 pt. to 40-45 gals.</td>
<td>10-20 min.</td>
</tr>
<tr>
<td>Oats</td>
<td>All Kinds</td>
<td>1 pt. to 40 gals.</td>
<td>10-15 min.</td>
</tr>
<tr>
<td>Millet</td>
<td>All Kinds</td>
<td>1 pt. to 40-45 gals.</td>
<td>40-60 min.</td>
</tr>
<tr>
<td>Rye</td>
<td>Stem Smut</td>
<td>1 pt. to 40 gals.</td>
<td>10-15 min.</td>
</tr>
<tr>
<td>Emmer</td>
<td>Closed</td>
<td>1 pt. to 40 gals.</td>
<td>10-20 min.</td>
</tr>
</tbody>
</table>
PREVENTION OF SMUT

SPRINKLING METHOD

(See cover page)

1. Use a clean floor or wagon-bed, or canvas in the open.
2. Spread out a few bushels of grain. Make the formalin solution according to table above and sprinkle it over the grain as it is being shoveled about.
3. Sprinkle at the rate of one gallon of formalin solution to one bushel of grain. A garden sprinkler may well be used.
4. After all the grain is treated, pile and cover it as directed under the soaking method.
5. Store in clean sacks or bins.

SPRAYING METHOD

The object of this method is to apply the solution in the form of a very fine spray, the gas vapor being the active agent in killing the spores.

“As the seed is being shoveled from one pile to another each shovelful is sprayed with a solution consisting of one part of forty percent formalin and one part of water. This solution is used at the rate of one quart to fifty bushels of seed.” An ordinary hand pump-sprayer may be used.

After all the grain is treated, it is piled and covered with wet sacks for five hours, after which it is spread out to dry or planted immediately.

PRECAUTIONS

Seed treatment, to be effective, must be thorough and done according to directions.

Utensils such as sacks, seeders, etc., if likely to be contaminated with smut should be cleaned before being used.

Treated grain may be kept indefinitely so long as protected from further contamination.

If treatment is performed during the winter, care should be taken not to expose wetted grain to frost, as it may result in injury to germination.

If the seed contains noticeable amounts of foreign matter, such as chaff, or dirt, etc., it should first be cleaned by fanning. Less of the solution will be needed in treatment if this is done.

Formalin, while not deadly poisonous, should be kept from the bare flesh and mucous membranes.