

# SMUT IN WHEAT.

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## UNIVERSITY EXPERIMENT STATION.

ST. ANTHONY PARK, MINNESOTA, MARCH 5, 1895.

Wheat "bunt" or "stinking smut in wheat" has done great damage to the yields and quality of the wheat crop in the Northwest during the past year. Hon. A. C. Clausen, chief grain inspector of Minnesota, estimates that one-fourth of the wheat crop of 1894 sent to the general markets from the three states tributary to Minnesota's terminal markets was more or less affected by stinking smut. The trouble appeared mainly in the northern parts of these states.

A year ago this station published a bulletin calling attention to smut in wheat, and prescribed a remedy. Farmers had not awakened to the importance of remedial measures, but the indications now are that all are anxious to know the best means by which they can avoid loss from smutted grain. Millers and grain dealers are thoroughly aroused to the importance of preventing smut from injuring the yields, and especially the quality of our wheat and flour and the reputation of these commodities in domestic and foreign markets.

Treating wheat with blue stone or with hot water costs only a small proportion of the value lost in growing smutty crops, and these remedies are very effective. All seed wheat can be treated at a cost of one to three cents per acre. Blue stone of good quality may be purchased by grocers or druggists so that they can retail it to farmers at about ten to fifteen cents per pound. In Manitoba stinking smut was very prevalent a few years since; now very little of it can be found, as the farmers use large quantities of blue stone. At Brandon, Manitoba, alone, a town of a few thousand inhabitants, two or three carloads have been purchased for the year's demand.

Bunt or stinking smut of wheat is a disease caused by small spores. These are very small, seed-like, spherical bodies which are produced in the diseased kernels of wheat. These kernels are broken in threshing and handling the grain and the minute spores scattered about cling to the grains of wheat. When the seeds are planted the spores germinate much like small seeds, and some of them lying on

the kernel against the sprouting plantlet send their thread-like stems into the wheat plant. Here the disease thrives, branches, grows upward as the wheat grows, and when the wheat forms its seed some of the branches of the smut will have found their way into the kernels of wheat. Here it develops its seed like spores, and when the grain is ripe the diseased kernel of wheat is a mass of smut spores inclosed in the slightly enlarged wheat bran. These spores or germs live until the next year. If chance favors them they germinate on another young and tender wheat plant. These smut spores are very small and we cannot dislodge all of them from the seed grains by thoroughly cleaning the wheat. Some method of destroying them by heat or by the use of fungicides is necessary. During the past year we made experiments in the laboratory and in the field with fungicides and with heating the kernels both in hot water and in hot air. A thorough review has been made of the reports of experiments conducted at experiment stations in this country and in Canada and a number of reports have been received from farmers who have tried the remedy we advised a year ago and also other remedies. The blue stoning remedies and the hot-water treatment contain the essential principles used by all those who have successfully treated wheat for smut. So far as we have learned, no one questions the effectiveness of the remedies or the profit of treating seed wheat. The blue-stone sprinkling method is the handiest and cheapest of all and is nearly as good as any. The blue-stone dipping method is an old and tried remedy, kills the smut and is only slightly more expensive than the sprinkling method. Blue stone has a slightly injurious effect in retarding the germination of the grain, and the dipping method, as ordinarily carried out by farmers, has a worse effect than the sprinkling method. The hot-water treatment is the best in effect on the quality of the seeds and crop, and it destroys the smut, but under ordinary farm conditions it is somewhat difficult to carry out, as the wheat must be carefully dried, a rather difficult task in our cold spring weather.

Statements of all three methods are given below and farmers are urged to use that one which seems to them best suited to their conditions. It will pay every farmer to treat his wheat if there is any smut in the neighborhood. If everyone would treat his wheat, smut would probably disappear. But as long as there is any in the neighborhood the threshing machine will carry enough to each farmer to make treating the seed an annual necessity.

#### THE BLUE-STONE SPRINKLING METHOD.

The blue-stone sprinkling method is the simplest and cheapest remedy we have tried. It is very effective and only slightly harmful to the seeds of wheat. Our own experience the past season, the ex-

perience of numerous farmers who have reported successful trials of this plan, and especially the strong words of commendation from Messrs. McKay and Bedford, superintendents of the Manitoba and Assinaboia Experiment farms, and from the farmers of those provinces where this plan has been generally adopted, all give us faith to recommend this method.

*Remedy.*—Dissolve one pound of blue stone (copper sulphate) in three gallons of water. Spread out ten bushels of wheat on a tight floor in barn or house or in a tight wagon-box and sprinkle on the solution. With scoop-shovel turn the grain several times during the sprinkling till every kernel is thoroughly wetted. The solution needs to penetrate even the hairs of the blossom end of each kernel and to penetrate the crease in the grain. In case of badly infested seed wheat it should be first thoroughly cleaned, using a strong blast to remove all grains of bunt and the three gallons of the solution should be applied to only seven bushels of wheat instead of ten. In three hours the wheat will be ready for the seeder and as the blue stone somewhat injures the seed it should not be prepared long before it is sown. A good plan is to prepare in the evening the seed to be used the next day. As the seed is somewhat swollen a few quarts more per acre should be sown than of dry wheat. The blue stone solution can be made by the barrel, using care to get the right proportions of blue stone and water, and then it can be measured out one ten quart pailful to seven or eight bushels of wheat. The wheat should be turned four or five times within an hour after sprinkling. If a water-tight floor is not available the solution should be sprinkled on so slowly that none runs through.

#### THE BLUE-STONE DIPPING METHOD.

We have many reports from parties who have successfully treated smutty wheat by immersing it in solutions of blue stone. The effect is practically the same as with the sprinkling method. However, the grain is wetter and must be dried with care before it can be put in the seeder. This can be done by spreading thinly on the barn floor and shoveling over a few or several times daily until dry, or it can be accomplished by sprinkling land plaster or lime over the wet grain. Some have thought that the land plaster or lime has a beneficial effect, but experiments by other experiment stations fail to show that these substances have much value other than to dry the grain. By earlier absorbing the solution they may slightly lessen the evil effects the blue stone has on the germinating qualities of the grain. The following statement of this remedy contains the essential directions:

*Remedy.*—Fill a barrel two-thirds full of a solution of one-half pound of blue stone (sulphate of copper) to one gallon of water.

Partially fill gunny sacks with wheat and immerse in the solution for five or ten minutes, moving the sack up and down and shaking or kneading it so that every kernel is thoroughly wetted. Arrange a drip shelf on which to set the sacks of wet wheat that the solution draining out may run back into the barrel or hang them on hooks and catch the drip in pails. When the water ceases dripping out of the bags pour the wheat on the barn floor and shovel a few times daily till dry enough to sow, or if to be kept some days, dry thoroughly enough to store without danger of heating. The drying may be facilitated by mixing plaster or slacked lime with the wet wheat. It is necessary to renew the quantity of the solution, and for this purpose the prepared solution may be kept ready in other barrels.

#### THE HOT-WATER METHOD.

Professor Jensen of Denmark discovered that smutty wheat immersed in water heated to 130 to 135 degrees F. is not injured for seed, but that this temperature kills the germs of stinking smut. A higher temperature harms the wheat and a lower temperature will not kill all the smut spores. This treatment causes the wheat to germinate sooner than wheat not so treated, while the blue-stone methods, especially the dipping method, retard germination. In fact the hot-water treatment seems to have a decided, though small, advantage in increasing the yield of the crop. This is doubtless the best of the three methods where the farmer has facilities for perfectly carrying it out. But on most Northwestern farms it is very difficult to dry the treated wheat, and few have thermometers which are accurate enough to be relied upon at the temperatures named. By this method, if the drying is rapidly and thoroughly done, the seed may be prepared some days or weeks before the time of sowing.

*Remedy.*—Fill two barrels or washtubs two-thirds full of water. Keep the water in No. 1 at 120 to 130 degrees and No. 2 at 130 to 135 degrees. Fill gunny sacks, or bags of other open-meshed material, partly full of wheat; immerse in No. 1 till the wheat is warmed up so as to not cool the water in No 2; drain the bag a few seconds and then immerse in No. 2 for five minutes, raising and lowering the bag or kneading the wheat, so that the water thoroughly penetrates to and heats every kernel. Spread out at once and shovel over until dry. It is a good plan to dip the bag of wheat in cool water, so as at once to cool the wheat. Care must be taken to add hot water so as to keep the water in No. 2 at 130 to 135 degrees; 133 degrees F. is the temperature preferred.

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