

# CAMPAIGN CONTRIBUTIONS.



—Los Angeles Times.

### TALK ON SMUT BY PROF. HUNTER

The recent harvest has probably broken all previous records in losses to wheat and oat smut in eastern Oregon, eastern Washington and northern Idaho. It is impossible to estimate with any degree of accuracy just what this loss will amount

but it is safe to say that the aggregate will run into the millions of dollars. So prevalent was this disease that scarcely a grain field could be found that was not more or less affected. In some localities practically all of the grain coming to the warehouses is smutty and much of it is docked from 2 to 7 cents per

bushel. The warehouse dockage is only a small portion of the total loss for 25 per cent of many crops consisted of smut and hence never reaches the warehouses. In addition to this direct loss from smut, many farmers suffered heavy losses indirectly. During the harvest season an unusually large number of thresh-

ing machines were burned, the causes of which were traceable in nearly every instance to the smutty condition of the grain. This gigantic loss from smut is a living universal treatment for smut—the usual vitriol or formalin treatment—is not always effective and can not be relied upon.

**What Smut Is.**  
To successfully handle the smut problem one should thoroughly understand the nature and development of the smut plant. In Bulletin No. 54 of the Washington state experiment station, Prof. R. K. Beattie describes the smut plant as follows:

"The disease we commonly call smut is produced by a small plant which lives upon the wheat plant and steals its food from it. The fine black powder called smut is made up of a multitude of small grains, each of which may grow into smut plant if placed under the proper conditions.

"When a grain of wheat is planted with a live smut grain on it, both of them soon germinate. The grain of wheat produces a wheat plant; the grain of smut produces a smut plant. The smut plant produces small colorless grains which at once grow into other smut plants. Thus from one original black smut grain several smut plants may soon come. One of these plants bores its way through the tissue of the stalk. Here it lives for the rest of its life, growing up with the stalk and stealing food from it. But only when the wheat's skin is soft and young can the smut penetrate. About the time that the first green leaf unrolls, the skin gets hard and from then on can not be penetrated by the smut. It the wheat has not been attacked by this time it is safe. If, however, the smut has succeeded in entering the wheat stalk the injury is done and the wheat will suffer. While growing up with the stalk during the winter and spring it checks the growth of the wheat straw and makes the smutted plants noticeably shorter than the sound ones. When the wheat head forms, the smut plant sends its branches into it and takes up the plant food as fast as it is deposited in the kernels. There it places its own grains and thus provides for its next year's growth."

From this description of the smut plant it is evident that the disease may be attacked in two ways: (1) To treat the seed wheat with something that will retard the germination of the smut grains until the wheat plants have developed skins that are too tough for the smut plants to enter; (2) to treat the seed with something that will KILL the smut grains, thereby removing all possibility of infection. The nature of the two treatments suggests which of the two is the most effective.

**Vitriol Retarding Process.**  
The vitriol treatment for smut is very familiar to all concerned and hence it is unnecessary to describe it in detail here. One peculiar thing about this process is the lack of uniformity in the strength of the solution used. Some use a weak solution while others use one of great strength. The vitriol solution is usually placed in a barrel or trough. The wheat to be treated is then immersed in the solution in sacks about a bushel to the sack. After remaining in the solution for an indefinite period of time—from 1 to 10 minutes—the sacks are set upon a draining board. If after drying, the kernels are covered with a visible coating of vitriol the wheat is usually considered well treated.

Men who have thoroughly investigated this subject tell us that very few of the smut grains are really killed by this treatment. Its chief value seems to be in retarding the development of the smut plants. If the wheat grains are covered with coating of vitriol when sown and germination takes place immediately, this treatment probably has considerable value.

**Why the Vitriol Treatment Fails.**  
The vital weakness of this process lies in the fact that but few of the smut grains are actually killed. Much of the smut is lodged in the groove on one side of the wheat kernel and when immersed in the solution there is usually an air bubble that occupies this groove, and completely protects the smut grains from the vitriol solution.

If the seed is well coated with vitriol and germination takes place soon after the seed is sown, this treatment probably has considerable value in retarding the development of the smut. But if the germination of the wheat is slow, if the seed is sown in the dry soil or if the weather becomes cold and the soil damp just after the seed is sown, the vitriol may all disappear from the wheat before the wheat is up. The smut then has an equal chance with the wheat and when the seed is sown under these conditions we often have smut.

**Formaline Treatment, or Killing Process.**  
While the formaline treatment for smut is not in general use, it is very superior to the vitriol or old method of treating the disease. It has been carefully tested by several of the experiment stations and found very efficient when the work is properly done. It kills the smut instead of retarding the growth. It costs little if any more than the vitriol and the process is just as simple and as easily performed.

Formalin or formaldehyde, as it is often called, is a 40 per cent solution of a volatile liquid in water. It is usually brought at the drug stores in round or pint bottles. It is poisonous in the concentration form in which it is brought but is not poison in the weak solution in which it is used to destroy smut. One pound costs from 45 to 50 cents and should treat from 45 to 50 bushels of grain. Inscrupulous dealers sometimes dilute formalin with water and it is necessary to make sure that it is really a 40 per cent solution and that it is a full pint. In other words, but from men whom you know are honest. If the solution is too weak the smut will not be entirely prevented and all of the trouble of treating the seed may be for nothing.

Seed wheat should first be run

through a good fanning mill with a good wind blast to blow out all the smut balls possible. The sacks used to put the treated seed in should be boiled or dipped into the formalin solution for a few minutes. Bins and floors into which and upon which the seed is poured should be treated with boiling water to be sure that the seed is not reinfected after it is treated. Before sowing the seed the drill should be cleaned with boiling water. These precautions may seem unnecessary but it must be remembered that smut grains are fine dust and may be blown everywhere.

There are three methods of treating grain with formalin that we wish to consider. For all of them use a solution of one pound of the 40 per cent formalin to 45 gallons of water. Do not make it stronger than one pound of formalin to 40 gallons of water or you are liable to kill much of your wheat.

**Sprinkling Process.**  
Spread out 8 or 10 bushels of seed on a clean floor, sprinkle the solution over the grain with a garden sprinkler, using about one gallon of water to each bushel of grain. While being sprinkled the grain is shoveled vigorously to get the every kernel thoroughly wetted. It is then covered with disinfected sacks and left in the pile for at least two hours. It may then be sacked up and set away to dry. For the man who only has a small amount of seed to treat this is a very satisfactory method for there is little waste of the solution and if the work is carefully done it is effective.

**Sack Method.**  
Most of the farmers who use formalin dip the grain just as it is done by the vitriol treatment. The solution 45 gallons of water to one pound of the formalin, is placed in a barrel provided with a drain board. Sometimes a large trough that will hold several sacks is used instead of the barrel. The sacks, each containing about a bushel of grain, are immersed in the solution for 10 minutes. They are then set on the draining board and after dripping ceases, piled up in a narrow pile to dry. There is perhaps one serious defect in this and the sprinkling method, viz: the smut balls that the fanning mill failed to remove may be broken in handling the grain after it is dried. In this way the wheat may be reinfected.

**Treating Seed Loose in Large Trough.**  
Perhaps the most effective way to treat wheat with formalin is to slowly pour the seed into the solution in a large trough. The trough should be large enough to treat 25 or 30 bushels at once. Such a trough may be kept by using it for a watering trough when not in use for this purpose. As the wheat is gently poured into the solution the smut balls, wild oats, and other trash will float. These are skimmed off as the wheat is poured into the solution. This practically eliminates the possibility of the seed becoming reinfected after it has been treated by the breaking of the smut balls that were not soaked long enough to kill all of the smut grains in them.

After the wheat has been in the solution for eight or ten minutes, the solution is drained off and the wheat thrown into a heap on a clean floor where it lies for two hours covered with disinfected sacks or other covering. Instead of throwing the treated seed into a heap it may be sacked immediately, placed on the draining board and then piled up to dry.

**Drying the Seed.**  
Writers upon this subject usually say to leave the grain in the sack or heap for two or more hours and then spread it out to dry on a floor or canvas that has been cleaned with boiling water. This is much the safest plan but under favorable conditions the seed dries satisfactorily in the sacks if piled so the air can get through it. Farmers usually dry it in this way. Care must be taken to see that the grain dries or it will heat in a few days and its vitality seriously injured. The one treating the seed must use his own judgment in this matter for under some conditions it will dry properly in the sack while under other conditions it will not. If the soil is in condition to germinate the seed immediately it is

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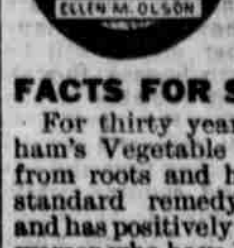
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much the safest to treat grain one or two days before it is sown.

### Why Formalin is Superior to Vitriol.

Formalin kills the smut grains. Being a volatile liquid fumes are given off as the grain lies covered in the pile or sacks. These fumes penetrate the grooves of the wheat kernels and kill the smut grains lodged therein. This is a very important point, especially when the sprinkling method is used, and an opportunity for this action to take place should always be provided. As we have previously pointed out in this article it is claimed upon good authority that the vitriol does not kill a greater per cent of the smut grains, as it is ordinarily used. Being a salt dissolved in water it can give off no fumes to reach the smut lodged in the grooves of the wheat kernels. Smut will occur at times with all methods when it is very difficult to satisfactorily explain the cause. But if directions are carefully followed with the formalin treatment especially if the seed be treated loose in a large trough and the smut balls skimmed off carefully as indicated above, grain should be very free from smut.

BYRON HUNTER, Assistant Agriculturalist, U. S. Department of Agriculture.

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