The Prevalence and Prevention of Stinking Smut in Indiana.

By C. R. Orton.

In bringing before the Academy the subject of "Stinking Smut" the writer wishes to impress upon its members the fact that this disease is of considerable economic importance, and that so far little, if any, systematic effort has been made to eradicate it. It is hoped that the importance of this disease will soon be brought before the wheat growers and agriculturists of Indiana, and since the disease is one which has been proved, both experimentally and practically, to be easily and cheaply prevented, that active measures will be taken to check its further spread in the State.

There is little doubt that stinking smut has been present in Indiana since the introduction of wheat growing in the State, and that in some years comparatively small loss has been occasioned, but it is not a matter of doubt that in some years a very severe loss is reported which amounts to startling figures when represented in monetary values.

There have been several bulletins[1] issued from the Purdue Experiment Station in years past concerning this disease, but none which have given any definite information regarding its prevalence throughout the State.

In the fall and winter of 1910-11, Dr. Frank D. Kern, Associate Botanist at the Purdue Experiment Station, sent out from that Department about 1,200 interrogatory letters, one of which is here reproduced, to the leading elevators and grain dealers throughout the State, each county being represented.

"Name.....

Postoffice.....

County.....

Did stinking smut of wheat occur in your vicinity the past season? .....

[1]Arthur, J. C. Smut of Wheat and Oats. Bull. Agr. Exp. Sta. of Ind. 28:1889.

Arthur, J. C. Treatment of Smut in Wheat. Bull. Agr. Exp. Sta. of Ind. 32, 2:1890.

Arthur, J. C. and Johnson, A. G. The Loose Smut of Oats and Stinking Smut of Wheat and their Prevention. Circular Agr. Exp. Sta. of Ind. 22. 1910.

If so, to what extent? (General, local, or occasional.).....

About how many bushels of smutted wheat from the past season's crop did you buy?.....

What was the average dockage on such wheat?.....

Kindly estimate as closely as possible the total number of bushels of smutted wheat from the past season's crop bought in your county.....

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What was the general average of dockage in your county?.....

Is the formaldehyde (formalin) seed treatment practiced in your territory?.....

If so, to what extent, and with what success?.....

What are the greatest pests of wheat, and the greatest drawbacks to its successful culture in your vicinity?.....

In your opinion how may these be overcome?".....

The following statistics are compiled from 503 replies to these letters: Five counties were not heard from. Reporters from Benton County replied that no wheat was raised in that county. Eight counties reported that stinking smut did not occur with them, and eight counties reported it as occurring, but did not report the amount of smut estimated present or actually purchased. This leaves seventy counties from which we compile our statistics. From these seventy counties 422 reports were returned, of which practically all stated that stinking smut occurred locally or generally with them, showing that it is thoroughly distributed throughout the State.

Of these 422 reporters who replied, only 247 reported the number of bushels of smutty wheat which they actually purchased. These were in varying amounts from fifty bushels by one correspondent in Morgan County, to 150,000 bushels by another in Vigo County. In all there were 885,610 bushels actually purchased by them. This was "docked" varying amounts, from 2 cents to 40 cents per bushel, averaging 8½ cents per bushel. This made a total reported loss to the State for 1910 of $75,276.85. Considering that only 247 of the 1,200 dealers written to replied with figures from which we can draw conclusions, it seems very conservative to estimate the actual loss from stinking smut to be three times that reported, or about $225,000 for the State.

DESCRIPTION OF THE FUNGUS.

It is not the purpose of the writer of this article, in the treatment of the subject-matter at hand, to attempt a technical description of the fungus popularly called "stinking smut of wheat," or known scientifically as *Tilletia foetens* (B. & C.) Trel. It is in order that those not acquainted with the disease may recognize it that a brief description is here included.

The fungus belongs to a family of the smuts which form their spore masses usually within the ovaries of various grains and grasses. In this particular it differs materially from the so-called "loose smut" of oats, wheat and barley. The spores when mature render the seed coat brittle and it is soon ruptured. The spores in dissemination become attached to the sound seed and remain there until planted. Germination of the smut spores takes place about the same time that germination of the wheat kernel occurs. This is an especially favorable time for the vegetative growth (mycelium) of the fungus to invade the soft tissues of the wheat seedling, and their growth and development goes on simultaneously. When the wheat plant has attained its growth and is forming its seed, the fungus has also attained to its maximum mycelial development and produces its spores within the maturing kernel of the wheat. These spores soon mature and form a greasy mass of dark brown color which gives off a disagreeable odor if the seed coats become ruptured. They are soon disseminated by various agents.

Thus the wheat, instead of growing sound heads, produces heads which are light and chaffy and worse than worthless, for any appreciable amount of them ground together with sound seed produces an unmarketable flour. They are also a very grave source of further contamination and infection of seed wheat. A field infected with stinking smut or a bin of wheat containing a very small per cent. of stinking smut is readily detected by the strong disagreeable odor it gives off. Thus it is that grain dealers and elevator men instantly detect stinking smut in the wheat they buy.

PREVENTION AND TREATMENT.

From the nature of the disease and its habit of growth it is readily understood that a contact fungicide should be effective in controlling this disease. It has been conclusively demonstrated by several experimental workers, including the Purdue Experiment Station, that the following treatment of seed wheat will entirely prevent it and at a very low cost.

This is quite clearly brought out in the report. Of the five hundred and three reporters, only forty-four knew of the formaldehyde treatment being tried for stinking smut, and forty-two of these had been successful. The two failures reported could easily have been caused by careless methods of treatment or perhaps by storing in contaminated vessels after treatment.

The formaldehyde treatment consists in spreading the seed on a tight floor or canvas and sprinkling until thoroughly moist with a .1% formaldehyde solution (made by adding one pound of 40% commercial formaldehyde to about 50 gallons of water). The grain should be shoveled over several times during the sprinkling process in order that the formaldehyde may be evenly distributed. It should then be shoveled into a pile and covered with canvas, or some closely woven material, for about two hours. The covering should then be removed and the grain either planted immediately or else dried by shoveling or spreading the seed into a thin layer and stirring occasionally. It may then be stored, care being taken to thoroughly disinfect the bins or sacks in which the treated wheat is placed.

The cost of treating the seed required to plant the crop of 1910 is estimated as follows: By multiplying the number of acres planted in wheat, or 2,027,000, by one and one-quarter bushels, or the amount of seed planted per acre, we obtain 3,283,750 bushels of seed required to raise a crop equal to that of 1910.

Figuring that formaldehyde costs 40 cents per pound, and that one pound mixed with 50 gallons of water will be sufficient to disinfect 80 bushels of seed, we have a cost of the formaldehyde for treating one bushel, of approximately one-half cent.

Then the amount of seed required, or 3,283,750 bushels multiplied by one-half cent, gives $16,418.75, or the cost of the formaldehyde for treating all the seed wheat planted in the State. This sum subtracted from the estimated loss of $225,000, leaves $208,582, approximately, which would be the gain to the State in one year by treating the seed wheat with formaldehyde. These figures need no emphasis. The whole subject is one which is now in the hands of the farmer. It is for him to decide whether he wants to prevent this heavy loss or not. The Purdue Experiment Station is anxious to assist, in every possible way, those interested in this work.

Purdue University,
Lafayette, Indiana,