Oat Smut in Indiana.

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In the winter of 1914, the writer, representing the Botanical Department of the Indiana Agricultural Experiment Station, conducted, in co-operation with the Extension Department of Purdue University and the county agricultural agents, a series of meetings at which demonstrations were given of the formaldehyde treatment of seed oats and potatoes. The meetings were held in Benton, Lake, Porter, Jasper, Pulaski, Laporte, Elkhart, Grant, Madison, Randolph, Clinton and Montgomery counties, which are among the largest oat-growing counties in the State. According to the report of the last census these twelve counties raised over thirty-two per cent., in acreage, of the entire oat crop of the State. It may be of interest, therefore, to report some facts resulting from these meetings, since they furnish fairly reliable data as to the oat smut situation throughout the State.

A most striking thing has come to light in connection with this campaign. It has been learned that out of 3,168 persons reached through the meetings less than a dozen farmers previous to that time had ever used the formaldehyde treatment for their seed oats. The use of formaldehyde as a general disinfectant and a specific fungicide for potato scab was originated, about eighteen years ago, in the Botanical Department of the Indiana Agricultural Experiment Station, by Dr. J. C. Arthur. It was then applied as a disinfectant for oat smut and the stinking smut of wheat by Professor H. L. Bolley, formerly assistant to Dr. Arthur. It remains to the present date the simplest, cheapest and most effective seed grain disinfectant in use. A large majority of the farmers of the State, however, evidently have not, for some reason, taken advantage of this discovery, and still allow the smut disease to reduce the oat yield by several million bushels every year.

One of the reasons for this neglect evidently is the fact that most farmers do not fully realize the extent to which the oat smut occurs in their crops. About thirty years ago, Dr. Arthur, then a botanist for the

New York Agricultural Experiment Station, at Geneva, demonstrated that oat smut is not readily visible to the unpracticed eye unless ten or more per cent. of the crop is affected. The smutted stalks are, to a large extent, considerably shorter than the sound stalks, and can not usually be seen except upon close examination of the field. And again, most of the smutted masses are blown away by harvest time and only bare stalks remain, leaving nothing conspicuous to indicate the amount of damage done.

Dr. Arthur found nine and one-half per cent. of smutted plants in fields at the Geneva Station in which the presence of smut could scarcely be detected without close examination. In the third annual report of the New York Experiment Station he remarks in this connection: "The appearance of smut as one passed through the fields was no greater than is usually to be seen in any part of the country. * * * and the result of the count * * * is as much a surprise to the writer as it will doubtless be to others."

E. S. Goff, of the Wisconsin Experiment Station, estimated the loss from oat smut in that State, in 1896, at about nine per cent.

Bowman and Burnett, of the Iowa Experiment Station, found, in 1907, an average of seven and nine-thenths per cent. of smutted heads in twenty fields examined.

Kellerman and Swingle estimated, in 1888 and 1889, that Kansas lost annually over eleven per cent. of the oat crop from smut.

In bulletin No. 37, of the Ohio Experiment Station, J. F. Hickman says: "In passing through one of our oat fields last summer I observed what seemed to be a smutted head here and there, but upon careful examination I found more than seven per cent. of this variety smutted."

In order to demonstrate the importance and the value of the formaldehyde treatment as effectively as possible the county agents in a number of counties made arrangements with some of the farmers to treat all their seed oats except a small portion to serve as a check on the treatment. It may be well to state here that most of the farmers who agreed to make the tests were under the impression that their oat crops of the previous seasons were comparatively free from smut. The test fields were distributed over Madison, Grant, Laporte, Pulaski and Benton counties.

When the oats headed out the county agents counted the smutted heads and figured out the percentage of smut on the treated and untreated plots. In Madison County, where the writer assisted the county agent,

Mr. W. R. Butler, in this work, counts of smut were also made in several fields where no treatment had been tried.

The following table shows the results of the tests as reported by the county agents.

TABLE 1.

RESULTS OF THE FORMALDEHYDE TREATMENT FOR OAT SMUT ON TEST FIELDS IN FOUR COUNTIES.

County.	Number of Test Fields.	Reported by.	Average Per Cent. of Smut on Treated Fields.	Average Per Cent. of Smut on Untreated Fields.
Madison	15	W. R. Butler	.3	12.0
Grant	4	O. Crane	.8	13.0
Pulaski	7	W. V. Kell	.1	11.7
Benton	6	J. W. McFarland	.2	11.0
Average			.3	11.9

In Laporte County, Mr. L. B. Clore, the county agricultural agent, arranged for a test of the formaldehyde treatment on the county poor farm. The manager of the farm was very reluctant at first to make the test, claiming that there never had been any oat smut on the farm. When the smut was counted, however, it was found that fifty-two per cent. of the crop was smutted on the untreated field and only about one per cent. on the treated field.

The results demonstrated to the farmers beyond any doubt the value of the treatment. The treated fields were practically free from smut, while those not treated had, individually, from one to fifty-two per cent. of the crop destroyed by the disease. Three fields in Madison County had thirty or more per cent. of smutted heads, and one field in Pulaski County showed a loss of forty-five per cent. The average percentage reported from Madison, Grant, Pulaski and Benton counties correspond closely, indicating that the prevalence of oat smut is fairly uniform throughout the sections these counties represent.

In addition to the data obtained from the test fields further reports on the prevalence of oat smut were received from seven counties as shown in the next table. The figures submitted in these reports were secured by the county agricultural agents and other men who made, in most cases, careful observations and counts of oat smut in their respective counties.

TABLE 2.

AVERAGE PERCENTAGE OF SMUT FOUND IN THE OAT CROP OF 1914 IN SEVEN COUNTIES.

County.	Reported by.	Average Per Cent. of Smut.
Randolph	C. A. Mahan	15
Whitley	W. C. Dilts	01
Montgomery	R. A. Chitty	15
Starke	H. R. Smalley	10
Lake	S. J. Craig	20
Gibson	H. F. Buk	10
Jefferson	G. Culbeertson	15
Average		13.5

As shown in the table the average per cent. of smut reported from the seven counties corresponds closely with the average figures from the counties mentioned in Table 1. Leaving out the report from Laporte County, which can not be considered representative owing to the high per cent. of smut obtained in the single test, the grand average for the counties under consideration is practically 13 per cent. This no doubt is a fairly accurate figure representing the loss from oat smut in the State. It corresponds closely with the estimate of Dr. Arthur who placed the loss in the State, figured from general observations, from eight to twelve per cent.

According to the crop statistics, compiled by the United States Department of Agriculture, Indiana devotes annually about 1,735,000 acres (average of 1909 to 1913 seasons) to the production of oats. The average yield for the State has been about thirty bushels per acre. It may be considered, therefore, that the average annual production of oats in Indiana is, in round figures, about 52,000,000 bushels. Considering that smut destroys about thirteen per cent. of the crop the above yield represents

only eighty-seven per cent. of the full crop. Figuring on this basis the annual loss from oat smut amounts to 7,770,113 bushels. This is more than the total yield of Benton, Allen and Tippecanoe, three of the largest oat-growing counties in the State. At the average price of oats of thirty-five cents per bushel the loss in cash value equals $2,719,539. The cost of treating seed oats with the formaldehyde solution would be about two cents per acre, or $34.00 for all seed sown in the State. The net profit resulting from the treatment would be, therefore, considerably over two and one-half million dollars. To gain this amount every year by practicing the treatment is certainly worth the effort, and practical instructions and demonstrations along this line in all oat growing sections of the State are highly desirable.

The formaldehyde treatment of seeds oats, as recommended by the Indiana Agricultural Experiment Station, is briefly as follows:

Spread out the seed on a floor and sprinkle with a solution of one pint of 40 per cent. formaldehyde to 50 gallons of water until thoroughly moist. Shovel over repeatedly to distribute the moisture evenly, then shovel into a pile and cover with sacks or canvas for at least two hours. The seed may be sown as soon as dry enough to run without clogging the drill. If to be kept longer than one day, grain should be dried as rapidly as possible by spreading in a thin layer and stirring occasionally with a rake. Avoid reinoculating with smut from smutting sacks or bins after treatment. One gallon of the solution will treat a little more than one bushel of oats.

In order to facilitate the work of treating the grain, machines have been invented which much simplify the labor and enable one to treat large quantities of grain in a comparatively short time. Several types of these machines are now on the market selling for twenty dollars or more each.

If total destruction of the oat crop in three counties occurred, it would arouse the farmers of the State to action. Why should not the loss of more than two and one-half million dollars distributed over the State do so? If all farmers in Benton County treated their seeds oats they would save enough in one season to build at least eight township schoolhouses, each costing not less than twelve thousand dollars. And then they could save enough every year to pay the salaries of all their school teachers. Many other counties in the oat-growing sections could do equally well.

In some townships the formaldehyde treatment would save the farmers enough money to pay for the building of miles of stone roads. Should not these facts stir the farmers to some concerted action by which they would banish the smut disease from the State? The grain treatment is simple, cheap and easy of application. It is up to the oat growers in the State to make up their minds and do the right thing. A man in Madison County, on whose farm a test of the formaldehyde treatment was made this spring, was very much pleased with the results, and he said in substance: "Why it's a very simple thing. There's very little work connected with the treatment and the cost can almost be disregarded. I treated my seed for less than twenty cents. I wonder why I haven't been practicing it long before."