COMPARISON OF DIFFERENT METHODS OF INOCULATING OAT SEED WITH SMUT

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REQUENT failure to obtain high percentages of smutted plants in oat varieties and crosses that are not immune from or even highly resistant to smut is one of the principal difficulties encountered in the study of seed treatments and physiological races of oat smuts and in the development of smut-resistant varieties. This applies particularly to studies in which the seed is sown outdoors, because soil conditions immediately after sowing may be highly unfavorable to smut infection or development. When plants are grown in the greenhouse, moisture and temperature conditions may be adjusted and controlled so as to be optimum for smut infection, and high percentages of smutted plants are more easily obtained.

A number of investigators have described experiments in which the hulls of the oats were removed before applying the smut spores in order to insure a high percentage of infection. There are several objections to this method of inoculating oats, the chief one being the time and labor involved in removing the hulls. Both Johnston (3) and Tapke (7) found that removing the hulls from naturally inoculated seed greatly reduced the amount of smut resulting from this naturally acquired inoculum, especially under field conditions. Stanton, et al. (6) reported that removing the hulls caused also an appreciable reduction in the percentage of emergence and in the percentage of plants reaching maturity.

In recent experiments by Leukel (4) the use of the spore-suspension-vacuum method as described by Haaring (2) resulted in relatively high percentages of infection. This method of applying spores to the seed involves but little labor, the seed is not injured, and the spores are placed under the hulls where, according to Gage (1), they may germinate and bring about infection in a manner similar to that supposedly obtaining in naturally inoculated seed.

The experiments here described were conducted at Arlington Farm, Arlington, Va., and at the experiment station at Aberdeen, Idaho. They were designed chiefly to compare the infection results following the application of dry smut spores to hulled seed with those following the application of spores by the spore-suspension-vacuum method to unhulled seed of a highly susceptible, a moderately susceptible, and, in one case, a resistant variety. Other methods of inoculation were included as checks. Because loose smut (Ustilago avenae (Pers.) Jensen) and covered smut (U. levis (Kell. and Sw.) Magn.) are similar in their life histories, no attempt was made in these experiments to distinguish between the two species.

1Cooperative investigations conducted by the Division of Cereal Crops and Diseases, Bureau of Plant Industry, U. S. Dept. of Agriculture, and the Idaho Agricultural Experiment Station. Received for publication July 28, 1938.
2Associate Pathologist, Senior Agronomist, and Assistant Agronomist, respectively.
3Numbers in parenthesis refer to "Literature Cited", p. 881.
4By the term "hulled" seed is meant seed with the hulls removed, while "unhulled" seed refers to seed from which the hulls were not removed.