

wagon and sprinkle it, afterwards shovelling it to the other end and to and fro until the grain is evenly moistened. The grain can remain in the wagon over night covered with bags when it will be dry enough to pass through the seed drill by next morning.

'*Smut machines.*'—Special machines have been devised to facilitate the treatment of grain for smut. Some of them are of greater value than others for the purpose, but in all it will be necessary to adjust the operations carefully or the grain will be treated for too long or too short a time to yield proper results. Such machines might be of great value if the grain elevators would install them and carry out the treatment for smut of grain which the farmers may bring to them. At any rate the question of a suitable machine only concerns private individuals who have to treat very large quantities.

*Injuries to the vitality of grain following treatment.*—It is important to realize that if treated grain, while still wet, is exposed to frost, the germination will seriously suffer. In some experiments undertaken with a large number of varieties of grain of all kinds, it was clearly demonstrated that the action of frost is decidedly destructive, more so with some varieties than with others. On wheat treated and thereafter exposed to frost over night—the temperature going down to 10 degrees of frost (22° F.)—it was found by subsequent germination tests that all varieties had lost over one-third of their power of germination. The highest germination was observed in the variety 'Huron,' 62 per cent, and the lowest in 'Turkey Red,' 19 per cent. In oats, 'Thousand Dollar' germinated highest with 49 per cent, and 'Improved Ligowo' with 26 per cent. Barley seemed to suffer most of all. 'Odessa' was the highest with 21 per cent and 'Hannechen' showed no germination at all. This clearly shows the necessity of guarding against frost. When once dry, the grain suffers no injury from cold of the same temperature.

The treatment with chemicals, while very effective in controlling smut, exerts an injurious influence on the grain. While the injury is reduced to a minimum by careful treatment, yet carelessness in preparing the solution or in keeping to the time recommended will often result in great losses.

In this connection, it may be stated that formalin treatment has been known to exert a very curious influence upon wheat kept in storage after treatment. Dr. C. E. Saunders, Dominion Cerealists, kindly furnished me with figures on this point which are very instructive. He found that wheat originally germinating 75 per cent had lost its life completely when retested one year later. A sample of oats originally germinating 62 per cent and one of barley with 71 per cent, germinated a year after treatment 2 per cent and 3 per cent, respectively.

Dr. Saunders further states: 'Unfortunately, it does not appear that any tests of these samples were made immediately after treatment. We know, however, from other experience with formaldehyde of that strength (36 ounces formaldehyde in 40 gallons of water) that the germination would not have been reduced immediately to any such figures as those found a year after the treatment. The worst case in wheat which I have been able to find shows that the sample germinating 83 per cent was reduced to 40 per cent by treatment with formaldehyde of the strength used in the above tests. In other cases the reduction in vitality was considerably less.'

Mr. Frank T. Shutt, M.A., Dominion Chemist, who deserves much credit for a considerable amount of valuable information on the question of the treatment of grain for smut, reports on two samples of wheat treated with 18 ounces formaldehyde to 40 gallons of water and soaked for five minutes. The vitality of these after treatment was shown to be 70 and 86 per cent. A year later they germinated only 9 per cent and 14 per cent, respectively.

The observations of these investigators are of great interest. The injurious influence of formalin is known to be specially severe on grain of low vitality. In the cases quoted by Dr. Saunders we are inclined to attribute the result to this fact, as wheat, originally germinating, as stated by him, 75 per cent, oats 62 per cent, and barley 71 per cent, cannot be considered of high vitality.