

procedure, therefore, there is little that can be done, except to take every care against injuring the roots in transplanting. It has been suggested that the seed-bed be done away with, and the seed "planted four to a hill and in hills 3 to 4 feet apart in the field." When 5 or 6 inches high the plants are thinned out one to a hill. Whether this would be of practical value under our conditions is doubtful, although on an experimental scale it has been found to much reduce the loss.

WHEAT.

STINKING SMUT OR BYST (*Tilletia foetens* and *T. tritici*).

The life-history of this parasite is the same as that of the fungus causing smut of oats, except in certain minute details. The effect on the crop, however, is much more serious. In oat-smut, as a rule, the black spores and the damaged chaff are blown away before harvest, so that, although the yield is reduced, the quality is not impaired. In the case of bunt the fungus does not attack the chaff, but only the interior of the kernel. This becomes filled with a dark-brown, greasy mass of spores which has a very powerful and objectionable odour of putrid fish. Since these affected kernels remain in the ear and are harvested and threshed with the sound grain, they communicate their dark colour and disagreeable odour to the sample of flour made from such grain. Affected kernels are shorter and broader than normal ones and cause the chaff to stand apart more. They are also lighter and can therefore be picked out by their broader appearance and more erect habit. As in the case of oat-smut, and for a similar reason, if a plant is attacked at all, usually every ear and each kernel in the ear will be affected.

Control.—The method given under oat-smut is satisfactory, but there is one additional precaution necessary. The affected kernels or "smut-balls," as they are commonly called, may go through harvesting, threshing, and seed-disinfection without being broken. The disinfecting solution cannot penetrate these unbroken kernels sufficiently to kill the contained spores. However it is quite likely that some of these balls may be broken subsequently in the operations connected with seedling, thus contaminating the seed again with live spores and undoing the effects of the treatment. It is therefore necessary to remove unbroken "smut-balls" before treatment, if the sample is found to contain them. Most of them can be taken out with the fanning-mill, but if any are left the grain should be put loose into a barrel or other vessel of water and stirred vigorously. The smut-balls being lighter will rise to the surface and can be skimmed off and burned. They should not be left around or the spores may find their way again into the seed. If this method has to be resorted to, it is better to follow it by immersion in the formalin rather than by sprinkling.

Bluestone Method.—This is satisfactory for wheat, though not for oats. A $\frac{1}{2}$ -per-cent. solution is commonly employed—i.e., 1 lb. in 20 gallons—and the seed soaked twelve hours. It is then taken out, drained for a few moments, and dipped in blue-water (1 lb. blue to 8 or 9 gallons of water). This is done to counteract the injurious effect which the prolonged action of bluestone has on the germination of the seed. The seed is then dried and sown. Drills and other implements must also be disinfected.

LOOSE SMUT (*Ustilago tritici*).

This resembles in appearance the loose smut of oats, since it completely destroys the kernels and chaff. By harvest-time nothing is left of the ear except the bare stalk. The life-history of the fungus, however, is quite different. Spores are blown by the wind into the open flowers of near-by healthy ears. Here they germinate, each spore producing a fungus-thread which enters the developing kernel and gives rise to a rudimentary mycelium. This remains dormant in the germ of the seed until such an infected seed is sown. When the germ becomes active and begins to grow out into the seedling, the mycelium becomes active, too, and behaves from this