

such infected soil while dry, then, after the first rain, both wheat-seed and smut-spore germinate together—an ideal condition for the parasite. Previous treatment of the seed would in this case be largely ineffective in preventing infection, the most hopeful method lying in the breeding of immune varieties of wheat. Fortunately, only very exceptionally are such conditions likely to occur in New Zealand.

Under present conditions, therefore, the problem of stinking-smut control in this country consists in finding some means whereby the smut-spores carried by the wheat-seed may be destroyed without injury to the wheat itself, and which will be cheap and easy to apply under farm conditions. A review of the published accounts of experiments to this end conducted in other countries shows that the best results in the past have been obtained by various modifications of the hot-water, bluestone, and formalin dips. Hot-water treatments, though effective if properly applied, are not adapted to farm practice, and so are not included in the present inquiry.

Practically all observers agree that both the formalin- and bluestone-dip treatments, if properly carried out, will completely prevent infection by seed-borne spores, but there is equal agreement that both injuriously affect the germination of the wheat. Injury to the seed-coat of the grain in threshing seems to be the predisposing cause of this harmful action of the fungicide, as the germination of hand-threshed seed does not appear to be materially affected.

Microscopical examination of samples of two of the wheats, presumably machine-threshed, used in the experiments here recorded showed injuries as follows: Pearl—Uninjured, 65 per cent.; seed-coat broken, over endosperm, 7 per cent., over embryo, 26 per cent.; embryo broken off, 2 per cent. Tuscan—Uninjured, 80 per cent.; seed-coat broken, over endosperm, 3 per cent., over embryo, 15 per cent.; embryo broken off, 2 per cent.

Hand-threshed seed is not a commercial possibility in New Zealand, but every effort should be made in machine threshing to minimize injury, and samples of seed-wheat that show much broken seed-coat when viewed under a hand-lens should be rejected.

Various modifications of the standard bluestone- and formalin-dip treatments have been recommended, the most promising of which are being tested in these experiments. Unfortunately, it has not been possible to test in the laboratory the current farm practice of sprinkling and turning on a floor as compared with the complete dip, but it is hoped to do this later under practical farm conditions.

The question as to whether delay in sowing seed which has been treated will injuriously affect germination is one of great importance, especially in a wet winter such as experienced this year. Formalin in particular has a bad reputation in this respect, but an elaborate inquiry in the United States by Hurd shows that post-treatment injury only takes place at humidities below 70°, a degree of dryness rarely attained by New Zealand air in winter. Further, it is stated that damage by formalin can be entirely avoided by washing in water after treatment. Part of the present series of experiments is designed to verify these statements, though a complete test can be made only under field conditions.