

Practical Considerations.—The advantage and disadvantages of bluestone can be discussed most effectively in conjunction with formalin, and will be dealt with under the latter heading. Whether the subsequent lime-bath is worth while must be left to the individual judgment on the figures presented, but there is a strong case in its favour where the 1-in-5 solution is used.

FORMALIN.

Formalin was first suggested as a smut-controllant in 1895. The excellent results given by it in laboratory trials and experimental work led to its rapid rise in favour among plant pathologists, who have of recent years generally given it preference over the older bluestone. On the farms, however, the formalin treatment is, in general, looked on with some suspicion, a suspicion which the experimental results recorded below will not tend to allay. However, a considerable portion of the cereals sown in New Zealand are regularly treated by this method. Commercial formalin consists of a solution of the gas formaldehyde in water, the sample used in the present experiments containing 39.2 per cent. formaldehyde (analysis carried out by the Dominion Analyst, Wellington).

Method of Treatment used in Experiments.—Smuttered seed was immersed for ten minutes in solutions made up of 1 pint formalin to 40 gallons water (1-320) and 1 pint to 60 gallons (1-480) respectively, allowed to drain in a wet mass for twenty minutes, and then spread out to dry on blotting-paper on the laboratory benches. When outwardly dry it was placed in paper packets for conveyance to Ashburton for sowing. The "presoak method" consisted in soaking the seed in water at room-temperature for six hours, then steeping for ten minutes in 1-320 formalin solution, and draining for twenty minutes, followed by a rapid rinse in water before spreading out to dry as described.

Summary of Experimental Results.—(a.) Effect on the smut: With the low infection in the Pearl and Hunter's, all the formalin treatments showed complete control of the smut. With the medium infection in the Purple-straw Tuscan, both the straight 1-320 and 1-480 steeps were completely effective, though a single smuttered plant appeared in the presoaked 1-320. With the high infection in the Solid-straw Tuscan, on the other hand, the presoaked 1-320 was the only formalin treatment completely controlling the smut, the ordinary steep at 1-320 showing 0.1 per cent. of smuttered heads and the 1-480 showing 0.5 per cent., as against over 30 per cent. in the untreated controls.

(b.) Effect on the wheat-plant: The straight formalin steep at both the 1-320 and 1-480 strengths proved extremely detrimental to germination and vigour of seedling, and this applies to all four wheats, although the injury to the older Pearl, Hunter's, and Purple-straw Tuscan seed was much greater than to the newer Solid-straw Tuscan. In view of the fact that some workers have used these treatments without causing material damage to the wheat-plant, it appears that possibly some factor or factors may have been introduced in the present experiments which greatly accentuated the damage normally occurring with the formalin steep. The point requires further investigation. The 1-480 steep proved less harmful to the plant than the 1-320. The presoak method, however, with the Pearl, Hunter's, and Purple-straw