

using this factor does not materially alter the obvious comparative significance of the data there given, the writer has refrained from further complicating the already rather overloaded tables. The data, however, will be gladly supplied to any worker to whom they may be of interest. Between each four rows of treated seed two rows of untreated seed from the same original sample were sown and counted in the same manner. The tables are presented in the order of sowing.

DISCUSSION OF TREATMENTS.

COPPER CARBONATE.

Copper carbonate was brought into prominence as a control for stinking-smut by the publication in the *Agricultural Gazette of New South Wales*, in 1918, of the results of three years' experiments by Darnell-Smith and Ross. The favourable nature of these results has been in the main confirmed by subsequent workers, and to-day the copper-carbonate treatment is generally recommended by plant pathologists in Australia and in the United States of America for the control of stinking-smut. Copper carbonate is a simple chemical compound, insoluble in water, and is mixed with the seed in the form of dust. Several firms are now making copper carbonates specially adapted for seed-treatment, and three of these were used in the present experiments, viz.: No. 1—Corona Coppercarb, made by the Pittsburgh Plate Glass Company, Newark, New Jersey, U.S.A. This product contains about half the proportion of copper compared with the other two brands, and is used at a double strength—the makers claiming that this ensures better covering of the seed, and hence greater effectiveness as a fungicide. This material arrived too late for the autumn sowings, and so was used only with the two Tuscan wheats. The wholesale price, f.o.b. New York, is quoted at about 10s. per pound. No 2—Stauffer's Copper Carbonate, made by Wheeler, Reynolds, and Stauffer, San Francisco; New Zealand agent, G. J. Miller, Ferry Buildings, Auckland; wholesale price quoted at about 1s. 5d. per pound. No. 3—Copper-carbonate sample supplied by Bowden Bros. and Co., Ltd., Sydney, N.S.W.; wholesale price at Sydney, 1s. 3d. per pound; makers not known to writer.

Method of Treatment used in Experiments.—Smutted seed was shaken vigorously for two minutes in a closed container with copper-carbonate dust in amounts proportionate to 4 oz. to the bushel for No. 1 and No. 2A, and 2 oz. per bushel for No. 2 and No. 3. The treatment marked "Copper carbonate No. 2A" in the table is No. 2 (Stauffer's), used at the rate of 4 oz. per bushel of seed.

Summary of Experimental Results.—(a.) Effect on the smut: With the low to medium infections shown by the Pearl, Hunter's, and Purple-straw Tuscan, all three copper-carbonate treatments (with the exception of a single head in the Hunter's) completely controlled the smut. With the high infection shown by the Solid-straw Tuscan, control was not complete, though only about $\frac{1}{2}$ per cent. of the heads were diseased, as against about 30 per cent. with the untreated seed.

(b.) Effect on the wheat-plant: In field germination, vigour of seedling, and number of heads harvested no significant differences were shown between the copper-carbonate-treated and the untreated seed—what difference there was being slightly in favour of the former.