THE CORRECTION OF MANGANESE DEFICIENCY IN BARLEY CROPS GROWN ON THE WAROOKA CALCAREOUS SANDS

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by

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STATEMENT

This thesis contains no material which has been accepted for the award of any other degree or diploma in any University and, to the best of my knowledge and belief, this thesis contains no material previously published or written by another person, except when due reference is made in the text of the thesis.

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SUMMARY

The research contained in this thesis was undertaken to establish the most satisfactory method to correct Mn deficiency in barley crops grown on the Warooka calcareous sands, (80 per cent $CaCO_3$), located on Southern Yorke Peninsula.

Seventy six per cent of added divalent Mn incubated with these soils was immobilised within 167 hours by chemical and biological processes. In this period 71 per cent of the total fixation was accomplished by chemical processes.

In field experiments conducted over seven years, manganese sulphate applications up to 16 kg Mn/ha drilled with the barley seed did not prevent Mn deficiency occurring in crops. However, the applications increased crop growth (tops and roots), delayed the appearance of plant symptoms characteristic of Mn deficiency, increased grain yield by an average of 61 per cent and improved grain quality. The optimum application of Mn at seeding for maximum grain yield was 6 kg Mn/ha (25 kg manganese sulphate/ha).

Increased vegetative growth and grain yield (from 14 to 23 per cent) and improved grain quality resulted where the fertiliser Mn was incorporated with the superphosphate carrier, (compound fertiliser), compared with fertilising with the conventional mixed fertiliser.

The incorporation of elemental S in compound fertilisers increased vegetative growth and grain yield by up to 10 per cent, particularly where S applications were high (63 - 126 kg S/ha) and where Mn and P fertiliser

applications were suboptimal for maximum crop yield. S applications do not obviate the necessity of applying P and Mn at seeding, and the small size of the crop response to S precludes its use as a fertilizer ingredient for these soils.

The application of up to three foliar sprays applied at 0.9 kg Mn/112 l/ha did not completely correct Mn deficiency in barley crops grown on these soils. The best results were obtained by applying 6 kg Mn/ha to the soil at seeding as a compound fertilizer and followed by up to three foliar sprays applied to the crop during the season.