

Waterlogging trial – trace elements

Background

The trace element trial was conducted to investigate the effect of some common trace elements on wheat yields in waterlogged soils. Zinc, Copper and Manganese were used in the trial as they are micronutrient deficiencies known to occur in southern Australia. Oxides were used as they have better crop safety, are relatively cheap and have a wider compatibility range than sulphates.

What was done

Details of the foliar trace element treatments can be seen in TABLE 1.

TABLE 1. Trace element treatment details

Treatment	Treatment defined	Rate per application	First application	Second application
Zinc oxide	Foliar Zinc oxide (700g/L Zn)	2L/ha	4th July	31st Aug
Manganese oxide	Foliar Manganese oxide (500g/L Mn)	2L/ha	22nd July	31st Aug
Copper oxide	Foliar Copper oxide (500g/L Cu)	500ml/ha	4th July	31st Aug
Mix of all 3	Mix of all 3 oxides used in trial	As above	Zn,Cu 4th July Mn 22nd July	31st Aug
Control	no foliar trace elements	–	–	–

The trial was a completely randomised block design with 4 replicates. This means that each trace element treatment appeared 4 times in the trial, once in each of the four blocks. Each plot was 8m long by 3m wide.

Please refer to 'Agronomy and site conditions' section of the 'Waterlogging trial- Nitrogen' report as this information applies to both trials with the exception of Nitrogen. All treatments received the same nitrogen regime. In-crop N for the trace element trial consisted of 50kg/ha Urea applied late June and 60kg/ha Urea applied early August. The trial was sown to Orion biscuit wheat.

The only trace elements applied were to individual treatments as per TABLE 1. Treatments were applied at maximum label rates and twice throughout the growing season to ensure adequate supply.

Results

TABLE 2. Grain yield and quality data

Treatment	Test Weight (g/hl)	Screen (%)	Protein (%)	Average yield (t/ha)
Zinc oxide	70.8	2.8	8.4	3.90
Manganese oxide	70.6	2.5	8.2	3.77
Copper oxide	71.8	2.2	7.9	3.95
Mix all 3	72.6	2.4	8.2	3.83
Control	71	2.4	8.3	3.80

An analysis of variance has determined that there is no statistically significant effect of trace element treatment on grain yield at the 95% confidence interval. This suggests that at this site in the 2012 season, none of the 3 foliar oxides had an effect on grain yield of Orion wheat.

The grain quality data is not replicated and hence there are no statistics available.

Approximately one month after the first trace element application, all trace element treatment plots were tissue tested on the 13th August.

TABLE 3. Effect of foliar trace element treatment on tissue nutrient concentration

Treatment	Tissue Cu (mg/kg)	Tissue Zn (mg/kg)	Tissue Mn (mg/kg)
Zinc oxide	2.47	17.86	54.92
Manganese oxide	3.15	14.19	49.41
Copper oxide	2.99	14.95	54.81
Mix all 3	2.78	20.09	49.27
Control	2.8	16	57.48
Critical value for wheat at mid tillering	2 – 4	14	24

This data is not replicated and hence there are no statistics to support it.

TABLE 3 shows that the applied treatments did not necessarily result in the highest concentration of that trace element in the plant tissue. For example copper levels were higher in the manganese treated plots than in those with copper applied. For all the Zinc, Copper and Manganese oxide treatments none of them had the highest tissue concentration of the nutrient applied.



Spray boom used in the application of foliar trace elements and other crop trial work on KI.

These tissue test results are not what we would expect. Possible explanations could include normal variation in the data as there is no replication and only small differences between treatments. Or slow uptake of the oxides which made it hard to detect an increase in tissue nutrient concentration in the new growth that was sampled. This should not be considered a reflection on the efficacy of oxide trace elements as they can be considered as good at correcting deficiencies as sulphates and chelates but require longer to work and higher rates.

If we compare the tissue concentration of Zn, Cu and Mn for the control to the critical value for wheat at mid tillering (bottom row in TABLE 3), it shows that they are all adequate. The control tissue test results suggest that the crop was not deficient in the 3 trace elements. The yield results in TABLE 2 suggest that there was no significant yield benefit to the application of Zn, Cu and Mn oxides to wheat at this site in the 2012 season. Both of these factors indicate that there was no Cu, Zn or Mn deficiency at this site.

Take home messages

- Site received only 'mild' waterlogging
- No statistically significant effect of Zn, Mn and Cu oxides on yield in 2012
- Plants were not deficient at this site.

For further information contact

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