

Micronutrient Field Evaluations - Westmere, Glenthompson, 2012

The objective of this experiment, conducted at two sites in 2012 was to assess the response of wheat to zinc and/or copper plus some other micronutrient supplement mixtures in a standard cropping system.

The sites selected were at Streatham (brown sodosol) and Glenthompson (yellow sodosol). No past history is available. Table 1 gives a soil test summary for both sites and shows DTPA zinc levels above critical, although the copper levels at Glenthompson was below the recommended value.

Table 1. Soil test result summary for the experimental sites in 2012.

Site	pH (1:5 water)	OC %	Colwell P mg/kg	PBI	Zinc (DTPA) mg/kg	Copper (DTPA) mg/kg
Streatham	6.0	2.89	78	–	2.2	0.9
Glenthompson	5.8	5.8	89	–	4.3	0.5
Critical level*					0.8	0.7

Critical levels taken from Peverill et al. 2005, Soil Analysis – An Interpretation Manual, CSIRO Publishing.

Sites were sown using district best practice for seeding rate and crop protection. Two nil treatments were included in each of the three replicates, and there were 10 micronutrient applied alone or in combination and using different formulations. Treatments were boron, copper, molybdenum and zinc alone and also in a four-way mixture, a mixture of zinc, molybdenum and copper, and a mixture of copper and molybdenum. Copper was applied either as copper oxide or copper sulfate, and there was also a copper sulfate treatment split between GS25/GS33. Similarly, zinc as zinc oxide was applied either as a single application (GS40) or split between GS40 and GS70. Rates and products used are given in Table 2.

Table 2: Products used and rates when applied alone or in combination with others, including the total grams per hectare of that nutrient applied.

Micronutrient	Product Rate	Nutrient applied per ha
Activist Max Zinc (70% Zn)	500 ml/ha	350 g Zn/ha
Activist Red (50% Cu)	500 ml/ha	250 g Cu/ha
Supa Moly (25% Mo)	200 ml/ha	50 g Mo/ha
Supa Bor (10% B)	1 l/ha	100 g B/ha
Copper Sulfate (6.7% Cu)	2 l/ha	134 g Cu/ha
Zinc Sulfate (16.7% Zn)	2 l/ha	334 g Zn/ha

Table 3 shows the mean yields for each treatment at the two sites, and indicates there were no significant differences due to the use of either micronutrient alone or in combination ($p=0.07$). The sites use showed good uniformity with the experimental coefficient of variation around 5% of the site mean. There were no significant interactions among the sites and the nutrients applied, so that one site was not more (or less) responsive to the micronutrients than the other site.

Table 3: The effect of micronutrient application on wheat yield at two sites in the Western District in 2012.

Treatments	Streatham t/ha	Glenthompson t/ha	Mean t/ha
Nil	2.25	2.79	2.52
B	2.65	2.98	2.81
Mo	2.30	2.97	2.63

Treatments	Streatham t/ha	Glenthompson t/ha	Mean t/ha
CuO	2.56	3.25	2.91
CuS	2.11	3.07	2.59
Cusplit	2.01	3.14	2.58
Cu+Mo	2.19	2.81	2.56
ZnO	2.51	3.37	2.94
Znsplit	2.31	2.98	2.65
Zn+Cu+Mo	2.44	3.03	2.74
Zn+Cu+Mo+B	2.16	2.81	2.49
<i>Site Mean</i>	<i>2.05</i>	<i>3.08</i>	
SE	0.15 (nsd)		nsd
<i>Experimental CV%</i>	<i>5%</i>		

Tissue tests taken from the surrounding crop of youngest mature leaf at jointing stage on the Glenthompson site showed copper levels of 3.2 mg/kg (adequate = >5), and zinc levels of 24 (adequate >16).

Grain from these experiments were analysed for elemental composition using ICP-OES through Waite Analytical Services (University of Adelaide). This provides a 20 element analysis, with Cr and Ti analysis used as checks for soil contamination. These results are shown in Table 4.

Table 4: The effect of micronutrient application on grain nutrient composition at two sites in the Western District in 2012.

Treatment	Streatham				Glenthompson			
	Mn mg/kg	B mg/kg	Cu mg/kg	Zn mg/kg	Mn mg/kg	B mg/kg	Cu mg/kg	Zn mg/kg
B	65	1.1	2.7	19	37	0.8	3.8	19
CuMo	62	1.1	2.8	19	39	0.8	4.0	19
CuO	63	1.1	2.6	18	39	0.7	3.8	18
CuS	69	1.1	2.6	24	37	0.8	3.6	18
Cusplit	65	1.1	2.9	18	33	0.8	3.8	17
Mo	60	1.2	2.7	20	38	0.7	3.8	18
Nil	62	1.1	2.8	19	39	0.8	3.7	19
ZnCuMo	65	1.1	2.7	19	40	0.7	3.9	19
ZnCuMoB	65	1.0	2.6	18	39	0.7	3.6	18
ZnO	56	1.1	2.3	20	37	0.8	4.0	18
Znsplit	66	1.2	2.5	43	37	0.7	3.9	32
<i>Site Means</i>	<i>64</i>	<i>1.1</i>	<i>3.2</i>	<i>22</i>	<i>37</i>	<i>0.8</i>	<i>3.6</i>	<i>19</i>
SE	2.8	0.1	0.1	0.8	2.8	0.1	0.1	0.8

The mean grain values for Mn, B, Cu and Zn were significantly different between the two sites. Mn at Streatham was almost twice the concentration at Glenthompson (38 versus 63

mg/kg), which is probably a reflection of the lower pH of the Streatham site. Grain B levels were 0.8 mg/kg at Glenthompson and 1.1 mg/kg at Streatham but the grain Cu levels showed no difference due to site or treatment. Mean grain zinc levels were different between the two sites, and the late Zn application (ZnSplit) significantly increased grain Zn at both sites. Higher grain zinc content has been associated with increased seedling vigour so this treatment may produce better quality sowing seed.

The use of copper sulfate also significantly increased the grain Zn at the Streatham site, but not the Glenthompson site. No particular reason for this could be ascribed to the treatment applied and it may be a statistical aberration.

Where Mo was added the grain Mo content averaged 0.48 ± 0.07 mg/kg but where no Mo was used, the grain Mo was less than 0.40 mg/kg (limit of Mo detection using ICP-OES).

Wheat grain Mo more than about 0.16 to 0.20 mg/kg is considered adequate.

Conclusion

Neither zinc, boron, copper or molybdenum applied to wheat on these two sites showed any significant effect on grain yield. The late application of zinc increased grain Zn content, but no other nutrient concentrations were noted due to the application of micronutrients.