

4.9 EVALUATION OF TRACE ELEMENTS IN WHEAT UNDER CONSTANT PHOSPHORUS AND NITROGEN RATES (YALLA-Y-POORA VIC)

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Location: SFS Yalla-Y-Poora Research site

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Background:

A range of trace elements may be limiting in this region, now that water logging and leaf disease can be well managed. Can the addition of trace elements help to lift yields further?

Aim:

- To evaluate yield response to copper, zinc, molybdenum, boron and cobalt when placed with the seed.
- To evaluate the response to molybdenum when applied at late tillering when nitrogen demand increases.

Summary:

There were significant increases in tissue tests levels where boron and moly had been applied. Plant tissue levels were also significantly lower in phosphorus where 18 kg/ha had been applied versus 25 kg P. Tissue nitrogen levels were significantly higher in Silverstar mainly as a result of reduced dry matter production of the variety compared to Chara.

There was not a significant yield response to any of the trace elements applied including boron and moly which had been suggested as possibilities. The longer season Chara significantly out yielded Silverstar 6.189 to 5.492 tonnes. Chara is possibly sensitive to the rate of P applied.

This result raises an interesting question in regards to variety trials on low P sites when only maintenance P rates are applied. In the high rainfall zone this may be limiting the potential of some varieties more than others.

Table 4-21: Last Soil Test Results

Test ¹	Org. C %	P ⁸ mg/kg	K mg/kg	S mg/kg	pH H ₂ O	pH CaCl ₂	Cu DTPA mg/kg	Zn DTPA mg/kg
Result	2.17	11.8	191	17.1	4.7	5.7	0.64	0.38
Status	High	Adeq	Adeq	Adeq	StronglyA cidic	Strongly Acidic	Marg	Marginal

Test	CEC meq/100 mg	Ca %	Mg %	Na %	S 10 - 50	SALT dS/m	N kg/ha 0-10	N kg/ha 0-50
Result	5.87	70	18.7	3.5	6.6	0.104	26	75
Status		Adeq	Elev	Adeq				

⁸ P test is Olsen, Colwell P 22 ppm, PBI 94.9. In crop deep N 18.8.05 0 – 35 cm = 128 N available plus 2.5 – 3 tonne of DM above ground so no further N applied, as well as further mineralisation to end of season.

Table 4-22: Treatment Details

Treatment	Sowing	Nutrients applied (kg/ha)				
		N	P	S	Zn	Cu
1	DAP + Moly Foliar	40	25	2	0.00	0.00
2	DAP Cu/Zn cote 2.5 %	40	25	2	3.36	3.36
3	DAP Cu/Zn cote 2.5 % + Moly Foliar	40	25	2	3.36	3.36
4	MAP District Practice	16	18	1	0.00	0.00
5	MAP Cote multi Co,Mo,Zn,Cu	40	25	2	1.67	1.64
6	MAP 25 P	40	25	2	0.00	0.00
7	MAP Cu 2.5 %	40	25	2	0.00	2.95
8	DAP + 1 kg Boron	40	25	2	0.00	0.00
9	MAP (40 N 18 P)	40	18	1	0.00	0.00
10	MAP (16 N 25 P)	16	25	2	0.00	0.00

Urea was deep banded under all treatments to balance the total nitrogen input to 40 kg/ha apart from treatments 4 and 10.

Table 4-23: Calendar of Events and Observations

Date	Event	Comments ²
5/6/2005	Sown	
18/8/2005	Tissue testing	8 leaf 4 – 5 tillers
26/8/2005	Molybdenum sprayed	Crop growing well
30/8/2005	Fungicide applied	Tilt extra @ 250 ml additional fungicides have been applied
	Fungicide applied	GS 33
	Fungicide applied	Flag leaf GS39
4/01/06	Harvest	

Table 4-24: Tissue Results Of YEBS Taken 18.8.05

Treatment	% N		% P		Cu ppm	
	Chara	Silver star	Chara	Silver star	Chara	Silver star
1. DAP + Moly Foliar	6.36	6.69	0.44	0.42	6.19	6.46
2. DAP Cu/Zn cote 2.5 %	6.39	6.59	0.45	0.47	6.00	6.65
3. DAP Cu/Zn cote 2.5 % + Moly Foliar	6.46	6.62	0.45	0.43	6.84	7.61
4. MAP District Practice	6.15	6.57	0.42	0.41	6.10	6.65
5. MAP Cote multi Co,Mo,Zn,Cu	6.33	6.70	0.47	0.46	6.29	6.52
6. MAP 25 P	6.28	6.62	0.44	0.44	6.15	6.64
7. MAP Cu 2.5 %	6.23	6.69	0.49	0.44	6.42	6.61
8. DAP + 1 kg Boron	6.52	6.72	0.45	0.45	6.96	6.54
9. MAP (40 N 18 P)	6.39	6.55	0.40	0.39	6.90	6.36
10. MAP (16 N 25 P)	6.39	6.38	0.50	0.46	6.61	6.65
LSD	NS	NS	0.05	0.05	NS	NS

Treatment	Zn ppm		B ppm		Moly ug	
	Chara	Silver star	Chara	Silver star	Chara	Silver star
1. DAP + Moly Foliar	27.05	26.81	3.25	3.95	116.00	129.67
2. DAP Cu/Zn cote 2.5 %	27.99	35.94	3.29	3.13	150.00	139.33
3. DAP Cu/Zn cote 2.5 % + Moly Foliar	34.68	27.34	2.82	3.22	278.50	141.00
4. MAP District Practice	38.11	26.92	3.29	3.09	179.00	315.67
5. MAP Cote multi Co,Mo,Zn,Cu	30.24	33.60	3.28	3.51	4279.00	4145.00
6. MAP 25 P	33.12	28.35	3.79	3.40	293.25	253.00
7. MAP Cu 2.5 %	29.29	31.55	2.37	2.91	267.00	214.00
8. DAP + 1 kg Boron	25.02	33.41	10.41	10.79	144.00	157.00
9. MAP (40 N 18 P)	31.35	27.46	3.48	3.18	141.50	204.33
10. MAP (16 N 25 P)	29.78	26.56	3.26	4.14	195.50	228.67
LSD	NS	NS	Sig	Sig	Sig	Sig

Note the average of the N % between varieties was significant 6.6 % for Silverstar versus 6.34 % for Chara. There was a trend for the two lower P treatments (18P) to have lower P levels than the rest of the treatments at 25 P. All treatments were adequate for copper and zinc. The addition of boron to treatment 8 significantly increased the boron level and the addition of molybdenum in treatment 5 also significantly increased the level of moly on the tissue. Foliar moly had not yet been applied to treatments 1 and 3 at the time of sampling. Adequate moly level is > 100 ug and adequate boron level is considered > 4 ppm, however the information is much stronger at the toxicity end of the boron data. This trial indicates that the critical level for YEBS is below 2 ppm.

There was not a significant response to any of the trace element treatments used in this trial. Hence the varieties could be combined for each treatment

Table 4-25: Grain Yield And Protein (Proteins Not Yet Measured) By Treatment And Variety

Treatment	Chara t/ha	Silver Star t/ha
1. DAP + Moly Foliar	6.338	5.991
2. DAP Cu/Zn cote 2.5 %	6.265	6.055
3. DAP Cu/Zn cote 2.5 % + Moly Foliar	6.447	5.954
4. MAP District Practice	6.210	5.726
5. MAP Cote multi Co,Mo,Zn,Cu	6.091	5.872
6. MAP 25 P	6.292	5.676
7. MAP Cu 2.5 %	6.292	5.699
8. DAP + 1 kg Boron	6.283	5.872
9. MAP (40 N 18 P)	5.936	5.753
10. MAP (16 N 25 P)	6.356	5.353
LSD 0.05%	NS	NS

Table 4-26: Grain Yield And By Treatment Varieties Combined

Treatment	Yield t/ha
1. DAP + Moly Foliar	6.164
2. DAP Cu/Zn cote 2.5 %	6.160
3. DAP Cu/Zn cote 2.5 % + Moly Foliar	6.201
4. MAP District Practice	5.968
5. MAP Cote multi Co,Mo,Zn,Cu	5.982
6. MAP 25 P	6.146
7. MAP Cu 2.5 %	5.995
8. DAP + 1 kg Boron	6.077
LSD 0.05%	0.343
CV	6.8%

Table 4-28: Comparing Varying Phosphorus And Nitrogen Rates And The Possible Effect Yield Of The Two Varieties

Variety	Treatment	Yield t/ha
Chara	6. 16 N & 25 P	6.274
Chara	9. 40 N & 18 P	5.936
Chara	10. 16 N & 25 P	6.356
Silver star	6. 16 N & 25 P	5.370
Silver star	9. 40 N & 18 P	5.753
Silver star	10. 16 N & 25 P	5.352
		NS P<0.5 %

Table 4-27: Combined Yield Data For All Treatments Comparing Varieties

Variety	Yield t/ha
Chara	6.189
Silver star	5.492
LSD 0.05% sig	0.670

When looking at a variety difference however there was a significant difference in yield with the longer season Chara yielding significantly more (see Table 4-25), which is interesting given the shorter tough season we had.

Although there was no significant difference ($p < 0.05$), between these treatments, there was an interesting difference between varieties. Chara appears sensitive to the rate of phosphorus (P) applied, yielding higher with higher P applications, whereas Silverstar didn't. This raises an interesting question in regards to variety trials on low P sites. Where only maintenance P rates are applied in the high rainfall zone, this may be limiting the potential of some varieties more than others.