

## 4.5 PHOSPHORUS AND TRACE ELEMENT FOR MAXIMUM WHEAT PRODUCTION IN THE HIGH RAINFALL ZONE – GNARWARRE SITE

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HiFert

**Location:** Gnarwarre Site  
**Co-operator:** SFS, Wes Arnott



**Aim:**

To develop a phosphorus response curve for high rainfall production of white wheat as well as investigating the responsiveness of acid soils to zinc and or copper based products which showed promise in the 2000 trial at Streatham.

**Annual Rainfall mm:** 599mm  
**Growing season rainfall:** 480mm

**Soil Type:** Loam

**Trial layout:**

A fully randomised complete block design. Gnarwarre site 4 replicates, plot size 15 m , 10 treatments.

**Paddock History:**

2001 Wheat Kellalac  
2000 Canola (N-40kg/ha, P-20kg/ha, S-25kg/ha)

Test	Org. C %	P <sup>1</sup> mg/kg	K mg/kg	S mg/kg	pH H <sub>2</sub> O	pH CaCl <sub>2</sub>	Cu DTPA mg/kg	Zn DTPA mg/kg
<b>Result</b>	3.22	16.5	583	11.7	6.2	5.2	0.9	0.36
<b>Status</b>	High	High	High	Adeq	Slightly Acid	Slightly Acid	Adeq	Low

Test	CEC meq/100 mg	Ca %	Mg %	Na %	S 0-60	SALT dS/m	N (kg/ha) 0-10	N (kg/ha) 0-60
<b>Result</b>	22.5	55.8	35.1	2.5		0.09		138
<b>Status</b>								

<sup>1</sup>. P test is Olsen, Colwell P 45 0 – 10 cm nitrate 14 and Ammonium 8  
Phosphate buffering Index

A fully randomised complete block design. Gnarwarre 4 replicates 15 m long, 10 treatments.

**Treatment Details:**

Treatment	Sowing	Pre Sowing	Nutrients applied ( kg/ha)				
			N	P	S	Zn	Cu
1	Nil	Urea	60	0	0	0	
2	DAPS	Urea	60	25	17	0	
3	DAPS	Urea	60	35	24	0	
4	DAPS	DAPS/Urea	60	50	34	0	
5	DAP Zinc 5%	Urea	60	25	2.5	6.25	
6	DAPS	Urea 5% Zn	60	25	17	4.4	
7	DAP Cu 2.5 %	Urea	60	25	2.5	0	3.2
8	DAP	Urea	60	25	2.5	0	
9	DAP Cu/Zn 2.5 %	Urea	60	25	2.5	3.2	3.2
10	DAP im S R + D	Urea	60	25	12		

Urea was deep banded under all treatments to balance the total nitrogen input to 60 kg/ha. The additional P applied above 25 P was pre drilled.

**Co operation required:**

Sowing equipment , weed control and harvesting will be required from the SFS group/DNRE at each site.



**Calendar of Events and Observations <sup>1</sup>.**

Date	Event	Comments <sup>2</sup>
30/5/2001	Sowing	Sown into wet soil, just trafficable, and slug baited
12/6/2001	Baited	Site inspection P response evident 40 P plots looking better
4/8/2001	Sprayed	Broadleaf spray Tigrex
17/8/2001	Sprayed	Grass spray
4/10/2001	Tissue tests taken	Crop looking well a fraction dry soil cracking
1/11/2001	Field day held	Soil dry cracking rust on 2 nd and 3 rd leaf from flag
<sup>1</sup> . Record of trial management activities or events that may affect the trial		
<sup>2</sup> . Note observations relevant to effects of events on trial outcomes		

**Actual rainfall recorded total : 598mm**

J	F	M	A	M	J	J	A	S	O	N	D
7.8	36	45	147	35	52.2	21.2	74.6	35	53.8	61	30

**Results:****Yield and Protein**

Treatment	Product	Yield ( t/ha )	Yield % of Nil	WUE* ( kg/mm)	Protein ( % )
1	Nil	4.773	100	14.96	NA
2	DAPS	4.780	100	14.98	
3	DAPS	4.923	103	15.43	
4	DAPS	4.995	105	15.66	
5	DAP Zinc 5%	5.038	106	15.79	
6	DAPS	5.038	106	15.79	
7	DAP Cu 2.5 %	4.902	103	15.37	
8	DAP	5.103	107	16.00	
9	DAP Cu/Zn 2.5 %	4.830	101	15.14	
10	DAP impreg S	5.031	105	15.77	
Mean					
LSD 5 %		0.49			
CV %		6.0			

Water use efficiency = ( 0.5 \* (March + April) + GSR (M-N) – 110 mm) x 0.02 which for 2001 equals 6.38 tonne

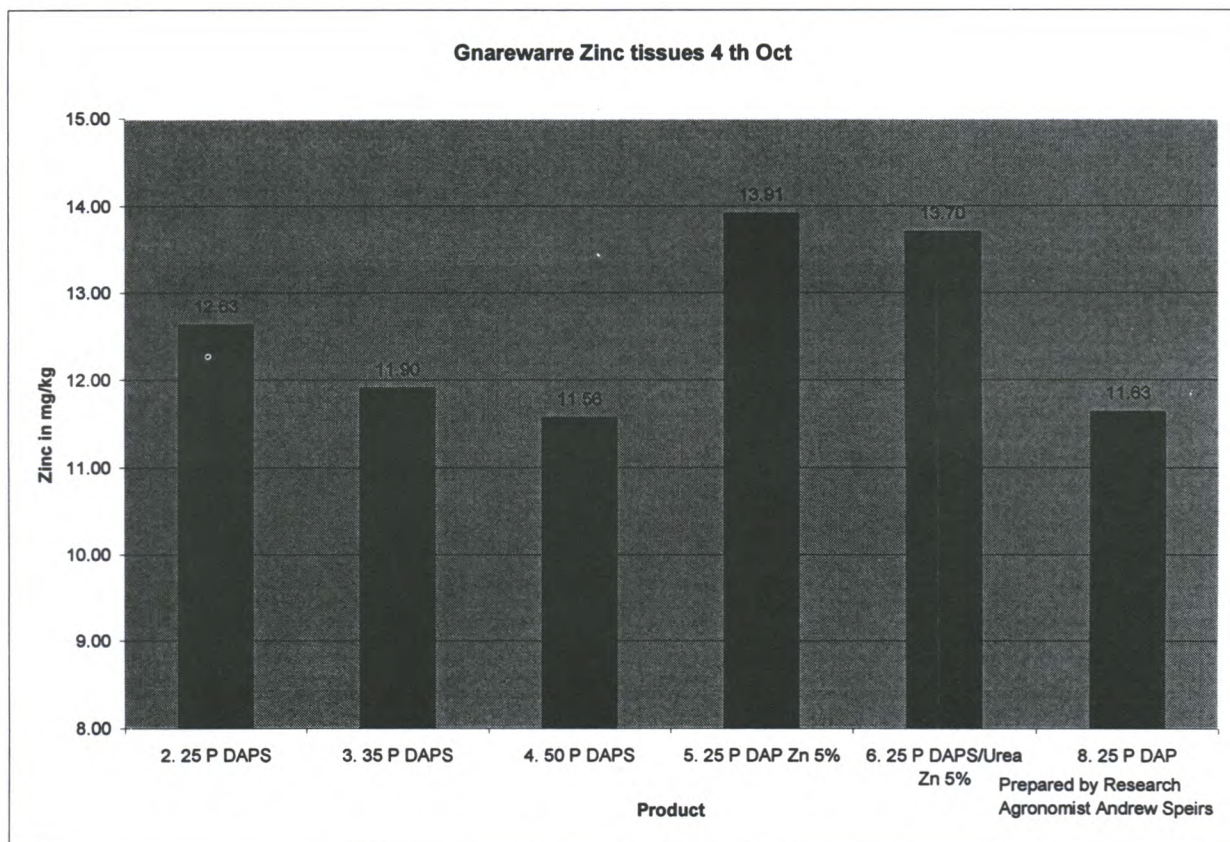
NA: Proteins not able to analysed due to the samples getting wet in transit.

**Tissue test results YEBS 4<sup>th</sup> October:**

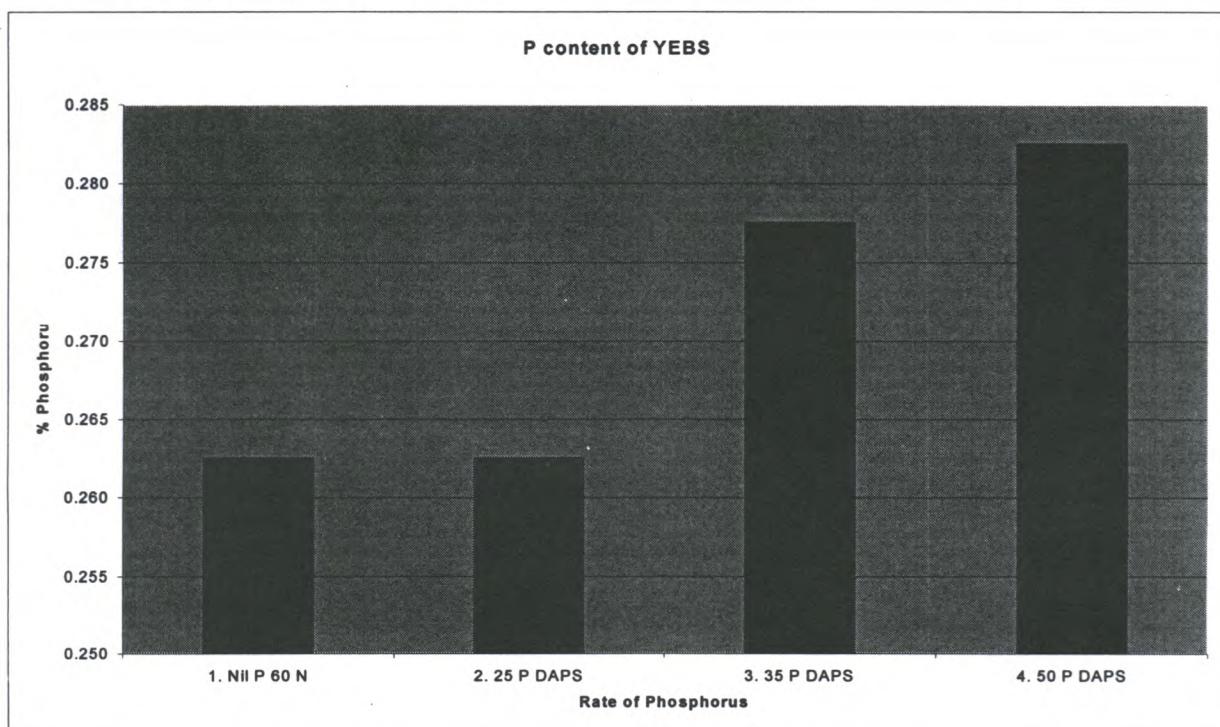
Treat	Product	N %	P %	K %	S %	Ca %	Mg %	Na %	Cu ppm	Zn ppm
1	Nil	3.58	6.73	14	0.138	0.133	0.098	2.450	0.263	0.235
2	DAPS	3.50	5.67	13	0.156	0.148	0.082	2.400	0.263	0.225
3	DAPS	3.34	5.20	12	0.156	0.148	0.083	2.475	0.278	0.220
4	DAPS	3.32	5.15	12	0.153	0.148	0.081	2.350	0.283	0.212
5	DAP Zinc 5%	3.37	5.61	14	0.154	0.143	0.096	2.375	0.260	0.225
6	DAPS	3.49	5.59	14	0.159	0.149	0.078	2.400	0.263	0.233
7	DAP Cu 2.5 %	3.22	5.36	12	0.159	0.150	0.08	2.400	0.270	0.213
8	DAP	3.31	5.40	12	0.160	0.151	0.087	2.425	0.263	0.215
9	DAP Cu/Zn 2.5 %	3.27	5.71	13	0.161	0.146	0.079	2.425	0.268	0.215
10	DAP impreg S	3.29	5.52	12	0.159	0.148	0.092	2.425	0.278	0.220
LSD 5 %			0.5	1.2					0.02	
CV %			6.0	6.2					5.0	



## Tissue zinc levels



## Phosphorus content of YEBS at rates of P





**Trial Summary:****Main Findings:**

Phosphorus (P) responses were visual and evident from 3 leaf stage until the end of September with the 50 of P treatments being well ahead of the nil P as well as the 25 of P plots showing out. There was a weak trend to increasing yield with increasing P rate but it was not significant.

At the time of the field day the crop looked under moisture stress and the soil was cracked open, however there was good rain in October and November.

Water use efficiency was between 15 - 16 kg per mm of growing season rainfall which is quite acceptable, however yields were still below the 20 kg per mm target. Grain size was good with screenings < 3 % across the site.

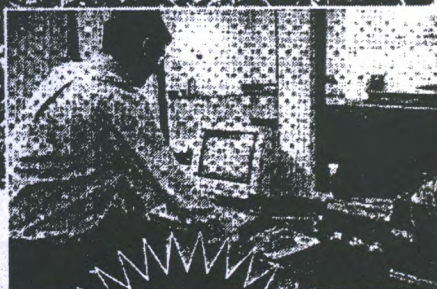
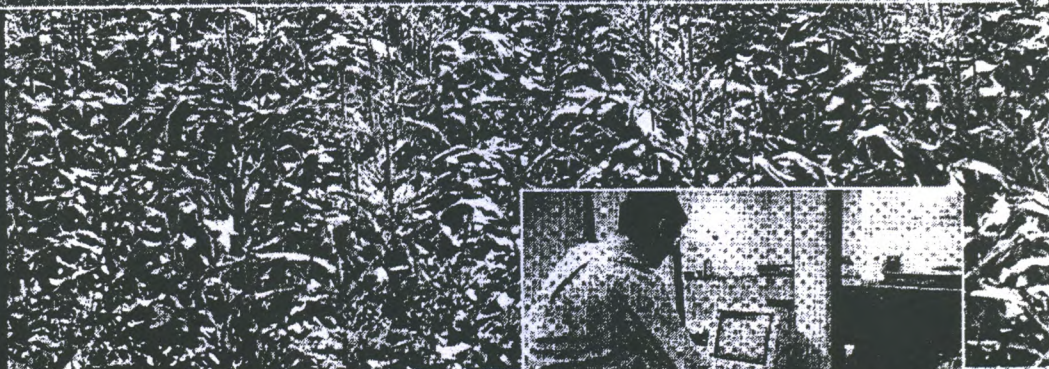
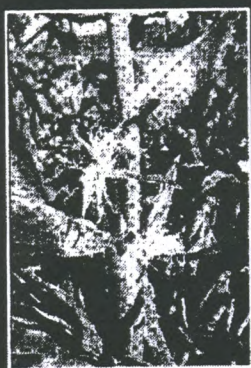
Zinc in the plant tissues was reduced by applying phosphorus at rates of 25 of phosphorus per hectare and further reduced as the P rate increase, hence with high yielding crops needing at least 25 of P to maintain soil P levels zinc may need to be included as a preventative due to the negative effect higher P rates have on zinc uptake.(see figure above) Note applied zinc effectively improved the zinc tissue levels.

Copper uptake was also reduced by increasing P rate and will also need to be monitored in high yielding situations.

There was not a significant effect of copper or zinc at this site this year on grain yield although there was significant effects in tissue test levels these were not expressed in yield gains.

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