10.6 PHOSPHORUS AND TRACE ELEMENT FOR MAXIMUM WHEAT PRODUCTION - GNARWARRE AND HAMILTON (HIFERT)

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Location: Gnarwarre and Hamilton

Background:
Raised bed technology has removed one of the major limitations to grain yield in Southern Victoria. With increasing yields, crop nutrition needs to be re assessed, particularly phosphorus. As yields increase it is possible that other nutrients may become limiting and in several areas of the south-west Victoria, both copper and zinc nutrition have been found to be important.

Aim:
- To develop a phosphorus response curve for wheat in the high rainfall zone of South West Victoria.
- Investigate responses to zinc and copper individually as well as in combination in Kellalac wheat

Method:
A fully randomised complete block design,
3 replicates. 15 treatments

Sowing Date:
Streatham (20th May 2003),
Hamilton (23rd May 2003)

YEBS Taken: Streatham (19th August 2003)

Fungicide Applied:
Streatham (500ml/ha Propiconazol GS39),
Hamilton (500ml/ha Propiconazol GS39 + GS54)

Growing season Rainfall (April – November):
Streatham 405 mm, Hamilton 497mm

Table 83: Treatment Details

Treatment	Sowing	Pre Sowing	Nutrients applied (kg/ha)				
			N	P	S	Zn	Cu
1	Nil	Urea	60	0	0	0	0.00
2	DAP	Urea	60	15	1	0	0.00
3	DAP	Urea	60	25	2	0	0.00
4	DAP	DAP/Urea	60	35	3	0	0.00
5	DAP	DAP/Urea	60	50	4	0	0.00
6	DAP Zinc cote 2.5%	Urea	60	25	2	3.2	0.00
7	DAPS	Urea	60	25	17	0	0.00
8	MAP Zn cote 1.25%	Urea	60	25	2	1.46	0.00
9	DAP	Urea	60	25	2	0	0.00
10	DAP Cu/Zn cote 2.5%	Urea	60	25	2	3.40	3.40
11	MAP	Urea	60	25	2	0	0.00
12	T1	Urea	60	25	2	1.45	0.00
13	T 2	Urea	60	25	2	2.33	0.00
14	MAP Cu 2.5%	Urea	60	25	2	0	2.95
15	MAP Zn cote 2.5%	Urea	60	25	12	2.98	0.00

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 .

Table 84: Soil Test Results – Streatham 2003

Test	Org. C %	P[9] mg/kg	K mg/kg	S mg/kg	pH H_2O	pH $CaCl_2$	Cu DTPA mg/kg	Zn DTPA mg/kg
Result	2.3	14.7	158	8	6.1	5.7	0.79	0.44
Status	High	Adeq	Adeq	Marginal	Mod Acidic	Mod acidic	Adeq	Marginal
Test	**CEC meq/100 mg**	**Ca %**	**Mg %**	**Na %**	**S 0-60**	**SALT dS/m**	**N (kg/ha) 0-10**	**N (kg/ha) 0-60**
Result	7.3	81	10.5	2.6	NT		52	
Status		Elevated	Adeq	Adeq				

[9] P test is Olsen, Colwell P 30 ppm
Phosphate buffering index 89

Table 85: Soil Test Results – Hamilton 2004

Test	Org. C %	P[10] mg/kg	K mg/kg	S mg/kg	pH H_2O	pH $CaCl_2$	Cu DTPA mg/kg	Zn DTPA mg/kg
Result	3.08	15.8	300	17.6	5.3	4.7	1.38	0.97
Status	High	Adeq	Adeq	High	Strongly Acidic	Strongly acidic	Adeq	Adeq
Test	**CEC meq/100 mg**	**Ca %**	**Mg %**	**Na %**	**S 0-60**	**SALT dS/m**	**N (kg/ha) 0-10**	**N (kg/ha) 0-60**
Result	7.6	67.3	12.7	1.3	NT			
Status		Adeq	Adeq	Adeq				

[10] P test is Olsen, Colwell P 43 ppm
Phosphate buffering index 89

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Southern Farming Systems in association with Landmark have been running a "Ploughback" scheme now for approximately 3 years. The results last year were excellent, with over $120,000 being returned to Southern Farming Systems Ltd as a result of the support by our members.

The system is simple. For every $ you spend as a Southern Farming Systems member on merchandise with **Wesfarmers Landmark** and on insurance with **Wesfarmers Federation Insurance,** a percentage of this "spend" is returned to SFS Ltd. **The scheme does not cost you any money**. Similarly on livestock and wool sales, SFS Ltd receives a percentage which comes out of the normal commission charges. **It costs you nothing to participate.**

In order for us to "capture" this revenue, we need you to register for the scheme. If you are not registered, then nothing comes back to SFS Ltd to support the on-ground trial activity.

For those of you who have not registered then please call (ph 03 5229 0566)
for a registration card, complete and return to:

Southern Farming Systems
P.O. Box 916
Geelong 3220

Results:

Table 86: Grain Yield and Protein Calculated on 1.2 width (Total bed width 1.7 metres) – Streatham

Treatment	Product	Yield (t/ha)	Yield % of Nil	WUE[11] (kg/mm)
1	Nil	4.96	100	16.8
2	DAP	5.54	112	18.8
3	DAP	5.81	117	19.7
4	DAP	5.88	119	19.9
5	DAP	5.54	112	18.8
6	DAP Zinc cote 2.5%	5.73	116	19.4
7	DAPS	5.57	112	18.9
8	MAP Zn cote 1.25 %	5.59	113	18.9
9	DAP	5.65	114	19.2
10	DAP Cu/Zn cote 2.5 %	5.29	107	17.9
11	MAP	5.58	113	18.9
12	T1	5.44	110	18.4
13	T 2	5.29	107	17.9
14	MAP Cu 2.5 %	5.58	113	18.9
15	MAP Zn cote 2.5 %	5.53	111	18.7
LSD (5%)		0.46		
CV %		5		

[11] Water Use Efficiency = (GSR (A-N) – 110 mm) x 0.02 which for 2003 equals 5.9 tonne

Table 87: Tissue Test Results YEBS – Streatham

Treatment	Product	N%	P%	K %	S%	Cu ppm	Zn ppm	Ca%	Mg%
1	Nil	5.26	.253	4.05	0.35	7.31	20.9	0.31	.100
2	DAP	5.64	.320	3.96	0.36	7.07	18.9	0.31	.127
3	DAP	5.57	.327	4.08	0.39	7.87	20.1	0.46	.153
4	DAP	5.70	.400	3.86	0.38	7.21	18.2	0.33	.138
5	DAP	5.72	.400	3.79	0.39	7.78	17.3	0.40	.147
6	DAP Zinc cote 2.5%	5.57	.337	3.86	0.36	6.82	18.1	0.33	.133
7	DAPS	5.66	.333	3.97	0.38	7.38	18.6	0.40	.140
8	MAP Zn cote 1.25%	5.58	.300	3.77	0.37	7.09	19.6	0.35	.127
9	DAP	5.64	.327	4.03	0.39	7.53	18.9	0.46	.153
10	DAP Cu/Zn cote 2.5%	5.61	.320	3.81	0.37	7.99	21.3	0.34	.133
11	MAP	5.69	.346	3.81	0.38	7.20	19.2	0.36	.143
12	T1	5.62	.347	3.99	0.38	7.63	21.5	0.31	.120
13	T 2	5.66	.340	3.73	0.37	6.84	20.0	0.31	.120
14	MAP Cu 2.5%	5.68	.327	3.82	0.35	7.09	18.7	0.33	.133
15	MAP Zn cote 2.5%	5.70	.333	3.92	0.38	7.48	19.7	0.39	.133
LSD 5%			Sig 0.063	ns	ns	Ns 1.04	ns 3.6	ns	Sig 0.16
CV %			10.9			8.3	10.7		7.0

Table 88: Grain Yield and Protein Calculated on 1.2 width (total bed width 1.7 metres) - Hamilton

Treatment	Product	Yield (t/ha)	Yield % of Nil	WUE[12] (kg/mm)
1	Nil	6.67	100	17.2
2	DAP	7.15	107	18.5
3	DAP	7.69	115	19.9
4	DAP	8.00	120	20.7
5	DAP	8.12	122	21.0
6	DAP Zinc cote 2.5%	7.22	108	18.7
7	DAPS	7.53	113	19.5
8	MAP Zn cote 1.25 %	7.54	113	19.5
9	DAP	7.43	111	19.2
10	DAP Cu/Zn cote 2.5 %	7.62	114	19.7
11	MAP	7.33	110	18.9
12	T1	7.47	112	19.3
13	T 2	7.56	113	19.5
14	MAP Cu 2.5 %	7.35	110	19.0
15	MAP Zn cote 2.5 %	7.30	109	18.9
LSD		**0.71**		
CV%		**6%**		

[12] Water Use Efficiency = (GSR (A-N) – 110 mm) x 0.02 which for 2003 equals 7.74 tonne

Trial Summary:

STREATHAM SITE

There was a strong early visual response to applied phosphorus (P), with the nil P plots lacking vigour early. This was confirmed with significantly better P levels in the plant tissue up to 35 kg of P applied see There was no significant response to applied copper, zinc or sulphur.

There was a significant yield response to applied P, however at the highest rate of applied P the yield began to fall. This is possibly due to the increased dry matter produced using more moisture and as a consequence of the dry finish in November losing some yield potential. In this situation the most appropriate rate of applied P for this year would have been between 15 – 20 kg P/ha.

The yield potential of the site was reduced by the tight finish in November and the rust which did attack the heads of the crop.

HAMILTON SITE

Although the site had a high colwell P of 43 ppm, there was a strong visual response to applied phosphorus (P) rates with nil P plots showing poor vigour early. Treatments with >= 25kg/ha of P applied appeared more dense and mature throughout the growing season and coped with the wet winter better. One reason for the strong response to applied P may be the fact that the PBI (Phosphorus Buffering Index) is moderate in this soil, which indicates this soil can fix a reasonable amount of applied P and make it unavailable to the crop.

There was a highly significant response to applied P when related to grain yield, with the 35 P treatments out yielding the 15 P treatments. The yield increased with increasing P rate all the way to 50 P, however 50 P applied was not significantly better than 35 P. Water use efficiency (WUE) was between 17 and 21 kg of grain per mm of growing season rainfall indicating yield potential was achieved.

There was no significant response in grain yield to applied copper, zinc or sulphur. The strong phosphorus response even at high soil P levels combined with high grain yields and nutrient removal indicate the need to be applying at least 25 kg of phosphorus per hectare.