4.8 Enhancing phosphorus fertiliser efficiency in wheat – Lake Bolac, Vic

Location: SFS Lake Bolac Research Site

Funding:
The trial was funded by Incitec Pivot Fertilisers

Researcher(s):
Peter Howie from Melbourne University and Rohan Davies & Charlie Walker from Incitec Pivot Fertilisers

Author(s):
Craig Farlow, Incitec Pivot Fertilisers

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Summary of findings:
- Phosphorus rates of 10 and 20 kgP/ha applied in various straight, compound, coated and liquid fertiliser forms were not found to result in any significant responses in grain yield or quality.
- Results were impacted by the failure to control a population of herbicide resistant annual ryegrass at this trial site using both pre and post-em herbicide options, resulting in high variability between plot measurements.

Background/Aim:
Incitec Pivot Fertilisers continues to evaluate a range of starter fertilisers to improve the efficiency of applied phosphorus in winter cropping systems. This trial aims to assess whether phosphorus utilisation can be enhanced through the use of liquids, compound fertilisers and slow release coated fertiliser options.

Rainfall:

2011 Total:	595mm
Avg. Annual:	540mm
2011 G.S.R.:	347mm
Avg. G.S.R.:	400mm

Paddock History:
2009: Barley
2010: Wheat

Variety: Beaufort wheat

Sowing rate: 80 kg/ha

Sowing date: 14 Jun 2011

Harvest date: 21 Dec 2011

Herbicide:

14-Jun-11	Roundup PowerMax at 1.5 L/ha and Boxer Gold 2.5 L/ha IBS
5-Aug-11	Hussar at 100 mL/ha plus Lontrel 100 mL/ha plus BS1000 250 mL/100L water
8-Sep-11	Axial 400 mL/ha + Adigor

Fungicide:

26-Sep-11	Laguna at 290 mL/ha + DC Trate 1% (growth stage DC32)
3-Nov-11	Laguna at 290 mL/ha + DC Trate 1% (growth stage DC60)

Insecticide: none

Treatments: 21

Plot size: 17.4m x 1.74m x 3 reps.

Plot type: Flats

Measurements: Yield, grain moisture %, protein %, screenings and test weight.

Tillage type: Stubble burnt prior to sowing. Sown with a 6 row cone seeder on 290mm row spacings.

Trial information:
A field trial was established at Lake Bolac to evaluate the response of wheat (cv. Beaufort) to applied phosphorus from various straight, compound, coated and liquid fertilisers. Soil analysis results for the site are presented in Table 1 and indicated a phosphorus (Colwell) level of 42 mg/kg. Phosphorus was applied at 10 and 20 kgP/ha and compared with a control, with no applied phosphorus or sulphur, and a second control, with 17.5 kgS/ha applied as Gran Am. A basal application of urea used to ensure all treatments received the equivalent of 60 kgN/ha in total.

Fertiliser treatments and applied nutrient rates are shown in Table 2. Di-Ammonium Phosphate (DAP), Granulock Z, Basacote P Max 3M (3 month release), P Max 6M (6 month release) and blends of these products were applied at 10 kg P/ha. Granulock SZ, Granulock Z, Granulock S, Granulock 15 , TSPS, Easy NP, MAP, DAP, TSP, P Max 3M and Megafert MES-10 were applied at 20 kg P/ha. Granulock Z was also blended with P Max 3M in a ration of 7:3 ration and applied at the same rate of 20 kg P/ha.

Table 1. Initial Soil test results summary

Soil Test Analyte	Result
Sample Depth To	0-10cm
pH (1:5 Water)	7.2
pH (1:5 CaCl2)	6.8
Elec. Cond. (Sat. Ext.) dS/m	0.16
Chloride (mg/kg)	28
Nitrate Nitrogen (NO3) mg/kg	30
Ammonium Nitrogen (KCl) mg/kg	4.1
Phosphorus (Colwell)	42
Phosphorus Buffer Index (PBI-Col)	72
Available Potassium (mg/kg)	350
Calcium (Amm-acet.) Meq/100g	10
Calcium/Magnesium Ratio	13
Cation Exch. Cap. Meq/100g	11.8
Sodium % of Cations (ESP) mg/kg	0.81
Copper (DTPA) mg/kg	0.49
Iron (DTPA) mg/kg	77
Manganese (DTPA) mg/kg	19
Zinc (DTPA) mg/kg	0.54
Boron (Hot CaCl2) mg/kg	0.75
Sulfate Sulfur (KCl40) mg/kg	11
Organic Carbon (OC) %	2.0
Soil Colour	Brown
Soil Texture	Clay Loam
Disp. Index, Loveday/Pyle	0
Slaking 2Hrs	Partial

Table 2. Treatments and nutrient rates applied (kg/ha)

	Nutrient applied (kg/ha)				Product rate (kg/ha)
Product	N	P	S	Zn	
Control	0.0	0.0	0.0	0.0	0
Control + S	0.0	0.0	0.0	0.0	0
Granulock SZ	23.3	20.0	1.5	0.5	166.7
Mes 10	13.3	20.0	11.1	0.0	111.1
Granulock Z	10.1	20.0	3.7	0.9	91.7
Granulock S	18.8	20.0	14.1	0.0	117.6
TSPS	0.0	20.0	9.9	0.0	102.0
EASY NP	13.7	20.0	0.0	0.0	161.3
Granulock Z : P Max 3M	12.2	20.0	2.7	0.7	95.7
MAP	9.1	20.0	1.4	0.0	91.3
DAP	18.0	20.0	1.6	0.0	100.0
TSP	0.0	20.0	1.0	0.0	96.6
P MAX 3M	18.1	20.0	0.0	0.0	106.4
Granulock 15	23.8	20.0	17.5	0.0	166.7
Granulock Z : P MAX 3M Half District	6.1	10.0	1.3	0.3	47.8
Granulock Z Half District	5.0	10.0	1.8	0.5	45.9
P MAX 3M Half District	9.0	10.0	0.0	0.0	53.2
PMAX 3M: Basacote Plus 3M	14.8	10.0	4.5	0.0	89.7
Pmax 3M : Pmax 6M Half District	9.0	10.0	0.0	0.0	53.2
DAP Half District	9.0	10.0	0.8	0.0	50.0
P MAX 6M Half District	9.0	10.0	0.0	0.0	53.2

Results and discussion:

There were no statistically significant responses to any fertiliser at any rate as measured by grain yield, protein, or test weight. This is attributed to an inability to effectively control a population of herbicide resistant annual ryegrass at this site through a combination of knockdown, pre-emergent and post emergent grass selective herbicides. As noted at harvest, variability in ryegrass density resulted in high variability in plot yields and hence statistical analysis (as indicated by the relatively high CV values across all measurements).

Table 3: Results

	P rate	Grain Yield	Grain Protein	Screenings	Test Weight
Product	**kg/ha**	**t/ha**	**%**	**%**	**kg/hL**
Control	0	2.62	10	1.71	63.8
Control + S	0	2.09	9.5	2.87	63.7
Granulock SZ	20	2.03	9.37	1.77	67.4
Mes 10	20	2.09	8.93	1.8	67.0
Granulock Z	20	2.21	8.8	2.81	64.4
Granulock S	20	2.47	9.31	2.18	65.5
TSPS	20	2.59	9.2	1.5	68.3
EASY NP	20	2.37	9.26	2.46	66.2
Granulock Z : P Max 3M	20	2.11	9.06	1.71	66.1
MAP	20	2.40	9.1	2.03	65.5
DAP	20	2.32	9.1	2.18	64.9
TSP	20	2.71	9.8	1.73	64.1
P MAX 3M	20	2.49	9.17	1.8	65.0
Granulock 15	20	2.11	9	1.9	66.5
Granulock Z : P MAX 3M Half District	10	2.04	9.25	1.95	68.0
Granulock Z Half District	10	2.27	9.5	1.97	65.1
P MAX 3M Half District	10	2.86	9.71	1.91	64.6
PMAX 3M: Basacote Plus 3M	10	2.44	9.73	2.43	63.7
Pmax 3M : Pmax 6M Half District	10	2.22	9.17	1.6	66.5
DAP Half District	10	2.34	9.4	4.05	60.3
P MAX 6M Half District	10	2.16	9.41	1.88	66.1
	CV	*24.2*	*5.6*	*35.1*	*4.1*
	LSD	*NSD**	*NSD**	*1*	*NSD**

Summary:

This trial highlights the need to effectively control weeds, particularly those species with increasing levels of resistance to multiple herbicide groups, to avoid wasting resources invested in fertiliser, seed and other inputs.