

Phosphorus rate trial

Key findings

- The addition of any form of phosphorus did not increase grain yield.

Why do the trial?

To investigate the impact of traditional phosphorus fertilisers and phosphorus alternatives on the grain yield and quality of wheat.

How was it done?

Plot size	1.4m x 10m	Fertiliser	Urea @ 35 kg/ha at sowing Urea @ 50 kg/ha 10 th August Phosphorus applied as per treatment
Seeding date	25 th May 2009	Variety	Peake wheat @ 70 kg/ha

Trial 1 Phosphorus rate: randomised complete block design with 3 replicates and 4 treatments.

Treatments were re-sown over the same treatments from 2007 and 2008.

Trial 2 Biosolids and chicken litter: randomised complete block design with 3 replicates and 8 treatments.

A single application of biosolids and chicken litter were broadcast by hand prior to sowing in 2008. The Biosolids + 65 kg/ha Single super and Chicken litter + 65 kg/ha Single super treatments had a repeated application of 65 kg/ha Single super in 2009.

Treatments were sown over the same treatments from 2008.

Trial 3 Biochar, phosphorus solubiliser and foliar phosphorus: randomised complete block design with 3 replicates and 12 treatments.

Biochar is a carbon-rich product created when organic matter is burned in a low-oxygen environment. The foliar phosphorus treatments contained 20% phosphorus and were applied at the 5 leaf stage. The phosphorus solubiliser was a seed inoculant applied at seeding.

Treatments were sown into standing wheat stubble from the commercial crop from 2008.

Single superphosphate was used as the standard phosphorus treatment.

The initial soil phosphorus (March 2007) was 40 mg/kg (0 – 10 cm)

The phosphorus buffering index (PBI) (March 2007) was 102.

Plots were assessed for grain yield, protein, test weight and screenings with a 2.0 mm screen.

Leaf tissue samples were taken from selected treatments on 4th August 2009 at 1st node (GS31) on selected treatments.

Plant biomass cuts were taken from treatments 1 to 4 on 4th August 2009 at 1st node (GS31) to measure dry matter production.

Samples of the biosolids and chicken litter from 2008 were analysed for nutrient concentration (Table 1).

Table 1: Fertiliser nutrient concentrations

Nutrient	Single superphosphate	DAP	Biosolids	Chicken litter
	kg/t			
Nitrogen	0	180	15	43
Phosphorus	90	200	1	8
Potassium	0	0	8	2
Sulphur	110	15	8	6
Zinc	0	0	1	1

Results

Leaf tissue nutrient analysis taken on the 4th August 2009 (wheat growth stage 1st node, GS31) showed that there was no difference in phosphorus concentration in treatments, nil, 110 kg/ha single super, 165 kg/ha single super, biosolids and chicken litter, the average phosphorus concentration was 0.33%. Analysis of crop biomass on the same day showed no significant difference between treatments averaging 1.02 t crop biomass/ha.

No phosphorus treatment in any of the 3 trials produced significantly different grain yield results at Hart in 2009 (Tables 2, 3 & 4). Treatments in trials 1 and 2 did not show any significant yield response in the years 2007 and 2008.

Protein was generally higher in trial 2 when any form of phosphorus was applied but was not significant in trials 1 and 3. This is likely a result of different rotation history.

Screenings were less than 1.5% for all 3 trials in 2009.

There was a trend in all 3 trials in 2009 that when high rates of phosphorus fertiliser were applied the test weight was 0.3 kg/hL higher compared to other treatments.

Table 2: Grain yield (t/ha), protein (%), test weight (kg/hL) and screenings (%) for trial 1 at Hart in 2009.

Treatment	Grain yield (t/ha)	Protein (%)	Test weight (kg/hL)	Screenings (%)
Nil	3.09	10.6	78.4	1.1
5 kg/ha P	3.01	10.4	78.8	0.8
10 kg/ha P	3.27	10.5	78.7	0.8
15 kg/ha P	2.99	10.5	79.1	0.7
LSD (0.05)	ns	ns	0.3	0.3

Table 3: Grain yield (t/ha), protein (%), test weight (kg/hL) and screenings (%) for trial 2 at Hart in 2009.

Treatment	Grain yield (t/ha)	Protein (%)	Test weight (kg/hL)	Screenings (%)
Nil	2.96	10.8	78.8	0.9
5 t/ha Biosolids	3.10	11.3	79.1	1.0
5 t/ha Biosolids + 12 kg/ha P	2.90	10.9	79.1	0.9
3 t/ha Chicken litter	2.85	11.2	78.1	0.9
3 t/ha Chicken litter + 12 kg/ha P	3.06	11.2	79.0	1.0
10 kg/ha	2.84	11.1	79.2	1.0
LSD (0.05)	ns	0.4	0.3	ns

Table 4: Grain yield (t/ha), protein (%), test weight (kg/hL) and screenings (%) for trial 3 at Hart in 2009.

Treatment	Grain yield (t/ha)	Protein (%)	Test weight (kg/hL)	Screenings (%)
Nil	3.08	11.5	79.0	0.9
5 kg/ha P	3.27	11.6	78.9	1.0
10 kg/ha P	3.03	11.4	79.1	1.0
500 kg/ha Biochar	2.83	11.3	78.8	1.0
100 kg/ha Biochar + 5 kg/ha P	2.72	11.4	78.9	1.1
100 kg/ha Biochar + 10 kg/ha P	2.89	11.3	79.1	0.9
100 kg/ha Biochar + Liquid P 5 kg/ha	2.56	11.2	79.0	1.1
P solubiliser	2.80	11.4	78.6	1.3
P solubiliser + 5 kg/ha P	2.83	11.4	79.0	0.9
P solubiliser + 10 kg/ha P	3.06	11.1	78.6	1.0
2.0 L/ha Foliar P 1	2.86	11.4	79.0	1.0
2.5 L/ha Foliar P 2	2.95	10.9	78.6	1.2
LSD (0.05)	ns	ns	0.4	ns