

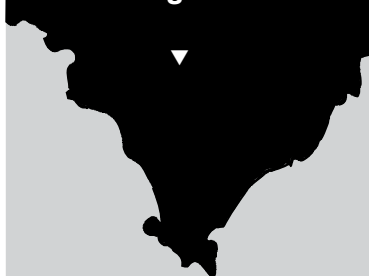
Measuring the Effect of Residual P

Cathy Paterson and Roy Latta

SARDI, Minnipa Agricultural Centre

RESEARCH

Searching for answers



Location: Minnipa Ag Centre

Rainfall

Av. Annual: 325 mm

Av. GSR: 242 mm

2009 Total: 421 mm

2009 GSR: 333 mm

Yield

Potential: 5.2 t/ha (W)

Actual: 4.5 t/ha (W)

Paddock History

2008: Wheat

2007: Wheat

2006: Pasture

Soil Type

Red sandy loam

Soil test

Organic C%: 1.1

Phosphorus: 27 mg/kg

Diseases

Low levels Rhizoctonia

Plot size

12 x 1.48 m x 4 reps

Yield Limiting Factors

Nil

Environmental Impacts

Soil Health

Soil structure: Stable

Disease levels: Low – Medium

Rhizo, Low Crown Rot

Tillage type: No-till

Compaction risk: Low

Perennial or annual plants: Annual

Grazing Pressure: Low

Water Use

Runoff potential: Low

Resource Efficiency

Energy/fuel use: Standard

Greenhouse gas emissions (CO₂,

NO₂, methane): Cropping and

livestock

Social/Practice

Time (hrs): No extra

Clash with other farming

operations: Standard practice

Labour requirements: Standard

Economic

Infrastructure/operating inputs:

High input system has higher input

costs

Cost of adoption risk: Medium

Key message

- A site with high phosphorus (P) reserves needed no extra P fertiliser to maximise the yield of wheat in 2009 at MAC.

Why do the trial?

After a string of poor years resulting in low cash flow and an increase in fertiliser prices, many growers struggled to fit their standard fertiliser rates into their budgets, and therefore reduced the amount of inputs at sowing. While we know soil reserves of phosphorus (P) are an important source of P for crops, we do not have a good understanding of how long soil P reserves last or how well fertilisers contribute to soil reserves.

In order to assess the P response from current fertiliser applications, a four year replicated trial was established at MAC. Changes in soil P will be measured annually with Colwell P and the response on crop performance monitored.

How was it done?

A four year replicated trial was established on Paddock South 1, Minnipa Ag Centre in 2009. The trial aims to measure comparative wheat yields in response to P applications over time. There are 10 treatments as shown in Table 1. In 2009 the 5 and 10 kg/ha P were applied as 25 and 50 kg/ha of DAP respectively with an extra 29 and 20 kg/ha of urea applied to equalize nitrogen, applied in total at 18 kg/ha, as per the high input treatment of 100 kg/ha of DAP (20 kg/ha of P, 18 kg/ha N). The Nil P treatment received 39 kg/ha of urea (18 kg/ha N).

All treatments were replicated 4 times and sown in 1.48 x 12 m plots by direct drill on 7 May 2009. Wyalkatchem wheat was sown at

60 kg/ha. Dry matter production was sampled on 4 August (end of tillering). Grain yield and grain quality were measured at maturity. All plots received standard weed management.

What happened?

2009 was the first year of the trial and therefore there were only 4 different P treatments (Table 1) 0, 5, 10 and 20 kg/ha of P applied in fertiliser. Table 2 shows early biomass production, grain yield and quality in 2009. Screenings were $\leq 1\%$, test weights all > 84 kg/hL and protein 9.9 – 10.1%, regardless of treatments.

What does this mean?

Despite the response in early dry matter production there was no benefit from applied P in terms of wheat grain yield. The residual P levels were sufficient for the first year of this trial. Similar dry matter responses, with little or no yield advantage, are reported in the article by Mason and Bates 'Improving Phosphorous Management on Upper EP using the DGT Soil Test'.

Over the next 3 seasons appropriate soil analysis will be carried out to measure any changes in soil P and if there is any impact of differing P regimes on crop performance. The results from this trial will undergo a financial assessment to evaluate the merits of each system in subsequent years.

Acknowledgements

We gratefully acknowledge the help of Willie Shoobridge, Cilla King and Brenton Spriggs for their help during the year with sampling, harvest and processing grain quality samples. Thanks to Alison Frischke for setting up the trial and Wade Shepperd for technical assistance.

Table 1 Phosphorus (kg/ha) applied over the 4 year duration of the trial

Year	1	2	3	4
Treatment	2009	2010	2011	2012
1	20	20	20	20
2	0	0	0	0
3	10	0	0	0
4	5	10	0	0
5	5	5	10	0
6	5	5	5	10
7	5	0	0	0
8	5	5	0	0
9	5	5	5	0
10	5	5	5	5

Colwell P in the top 0 - 10 cm at the site prior to seeding was 27 mg/kg.

Table 2 Wheat performance with increasing rates of fresh P in 2009

Treatment	Early DM (t/ha)	Grain Yield (t/ha)	Protein (%)	Screenings (%)	Test Weight (g/hL)
O P	1.5	4.0	9.9	1.0	84.6
5 P	1.6	3.9	10.0	1.0	85.3
10 P	2.0	4.0	9.9	1.0	85.8
20 P	2.1	4.0	10.1	1.0	84.9
LSD ($P \leq 0.05$)	0.42	ns	ns	ns	ns