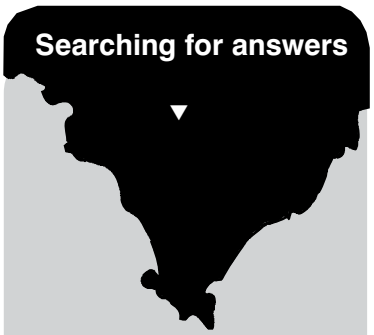
Measuring the Effect of Residual P

Cathy Paterson, Roy Latta, Wade Shepperd and Ian Richter
SARDI, Minnipa Agricultural Centre

RESEARCH



Location:
Minnipa Ag Centre
Rainfall
Av. Annual: 325 mm
Av. GSR: 242 mm
2009 Total: 417 mm
2009 GSR: 330 mm
2010 Total: 410 mm
2010 GSR: 346 mm
Yield
Potential: 4.7 t/ha (W)
Actual: 2.8 t/ha
Paddock History
2009: Wheat
2008: Wheat
2007: Wheat
Soil Type
Red sandy loam
Plot size
1.4 m x 12 m

Key messages

- **A site with high phosphorus (P) reserves needed no applied P fertiliser in 2010 to produce a 2.5 t/ha wheat yield.**

Why do the trial?

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 applied fertilisers contribute to soil reserves.

In order to assess the P response from current and residual fertiliser applications, a 4 year replicated trial was established at MAC with the changes in soil P measured annually as Colwell P, and the comparative crop performances monitored.

How was it done?

A 4 year replicated trial was established in Paddock South 1, Minnipa Agricultural Centre in 2009. The trial aims to measure comparative wheat yields in response to different rates and strategies of P applications over time. Table 1 shows the P application rates on each of the 10 treatments over the 4 years of the study. Deep banded DAP is used as the P supply with the N balanced using urea to give a total at 18 kg N/ha. The trial was sown on 10 June with Wyalkatchem wheat at 60 kg/ha.

Dry matter production was sampled on 9 September (end of tillering). Grain yield and grain quality were measured at maturity. All plots received standard weed management.

What happened?

Colwell P assessments taken before seeding showed a range in P levels (34-53 mg/kg), but with no relationship between 2009 applied P and 2010 measured levels. This was an increase from the 2009 pre-seeding site measure of 27 mg/kg Colwell P. There was a dry matter response where 10 and 20 kg/ha of P was applied; however this did not result in a yield increase. None of the P treatments affected grain quality with test weight more than 80 kg/hL and screenings less than 2.2%. The low protein levels are indicative of a season such as 2010.

Table 1 Phosphorus (kg/ha) applied over the 4 year duration of the project, 2009 - 2012

4 YEAR PLAN	Year 1	Year 2	Year 3	Year 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

Table 2 Dry matter (DM), wheat yield and quality in response to applied P rates in 2009 and 2010

2009 P (kg/ha) Treatment	2010 P (kg/ha) Treatment	DM 9 Sept (t/ha)	Grain Yield (t/ha)	Test Wt (kg/hL)	Screenings (%)	Protein (%)
20	**20**	2.1	2.8	81.5	1.7	9.0
0	**0**	1.4	2.7	80.4	2.1	9.4
10	**0**	1.3	2.7	81.5	2.2	9.2
5	**10**	1.7	2.8	81.3	1.9	9.0
5	**5**	1.8	2.8	81.1	1.6	9.0
5	**5**	1.5	2.7	80.8	2.0	9.0
5	**0**	1.4	2.7	79.6	2.1	9.1
5	**5**	1.5	2.6	80.7	2.1	9.1
5	**5**	1.6	2.7	79.5	2.2	9.2
5	**5**	1.7	2.7	80.9	2.0	9.3
LSD (P=0.05)		*0.4*	*NS*	*NS*	*NS*	*NS*

What does this mean?

Despite the increase in dry matter in response to 20 kg of P (40 kg over 2 years), compared to the nil and several of the 5 kg/ha treatments, this did not equate to a gain in grain yield. This would indicate that the variance measured in the pre-seeding Colwell P tests was adequate to produce a 2-3 t/ha crop. Similar results were found last year in this trial (EPFS 2009 pg 156-157) and in trials done by Sean Mason (EPFS 2009 pg 150-153). Alternatively there may be a constraining issue in this soil type or other nutrient deficiency as yet unidentified resulting in a water use efficiency figure around 60% of optimum.

Soil analysis will continue over the next 2 seasons to continue measuring 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

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