Effects of Spading on Lime and Potassium Response

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Key Messages

- In 2013 there was a 0.3 t/ha lupin response to 100 kg/ha MoP applied in 2012, a 0.15 t/ha response to spading but no response to lime.
- There was no effect of spading on potassium (K) response.
- Plant tests and observations indicate that phosphorus (P) may have been limiting.

Aim

To determine the effects of spading on lime and potassium (K) response.

Background

- Non-wetting soils are typically acidic and low in potassium (K).
- Soil tests indicated marginal K (0-10cm: 48 mg/kg, 10-20cm: 20mg/kg, 20-30cm: 15 mg/kg) and severe sub soil acidity (10-20cm: 4.3, 20-30cm: 4.5).
- This trial was established in 2012 to determine the long term effects of spading on lime and potassium (K) response. 2012 wheat failed due to poor trafficability and crop establishment.
- The farmer sowed the site to lupins in 2013 without fertiliser.

Trial Details

Property	Michael O'Callaghan, Marchagee
Plot size & replication	20m x 2.5m x 4 replications
Soil type	Banksia sand
Soil pH ($CaCl_2$)	0-10cm: 5.4 10-20cm: 4.3 20-30cm: 4.5
EC (dS/m)	0.03
Sowing date	02/05/13
Seeding rate	120 kg/ha Coromup lupins
Fertiliser	No fertiliser applied in 2013; lime and MoP were applied in 2012
Paddock rotation	2010 wheat , 2011 canola, 2012 wheat
Herbicides	19/04/13: 600 g/ha Simazine, 130 g/ha Metribuzin, 1.6 L/ha Glyphosate, 130 mL/ha Alpha Cypermethrin, 2.7 L/ha Treflan, 0.2% Wetter, 1% Sulphate of Ammonia, 0.2% SP700 17/06/13: 410 mL/ha Clethodim, 270 mL/ha Alpha Cypermethrin, 0.7% Uptake, 1% Sulphate of ammonia
Growing Season Rainfall	242.5mm

Treatments

Table 1: Treatments applied to the trial in the 2012 season. Treatments involve Lime, Potash and Spading, or a combination of these.

Treatments		Lime (t/ha)	Potash (kg/ha)	Spading (+/-)	K
1	Control	-	-	-	0
2	Potash only	-	100 MoP	-	50
3	Lime only	3	-	-	0
4	Potash + Lime	3	100 MoP	-	50
5	Spading only	-	-	+	0
6	Spading + Potash	-	100 MoP	+	50
7	Spading + Lime	3	-	+	0
8	Spading + Potash + Lime	3	100 MoP	+	50

Results

Table 2: Plant test results and grain yield (t/ha) of 8 different treatments of lime, potash and spading and a combination of these, on lupins grown in 2013.

Treatments		Yield (t/ha)	Plant Weight (g)	K (%)	K uptake (mg/plant)
1	Control	0.88	0.48	0.70	3.4
2	Potash only	1.22	0.48	0.90	4.3
3	Lime only	0.90	0.45	0.66	3.0
4	Potash + Lime	1.20	0.51	0.86	4.4
5	Spading only	1.08	0.50	0.72	3.6
6	Spading + Potash	1.38	0.55	0.90	5.0
7	Spading + Lime	1.09	0.49	0.69	3.4
8	Spading + Potash + Lime	1.34	0.55	0.90	5.0
	LSD K	0.017**	0.04***	0.20***	0.08***
	LSD Lime	ns	ns	ns	ns
	LSD Spading	0.017**	ns	0.20**	0.08***
	LSD Interactions	ns	ns	ns	ns

* = <0.05
**=<0.01
***=<0.001

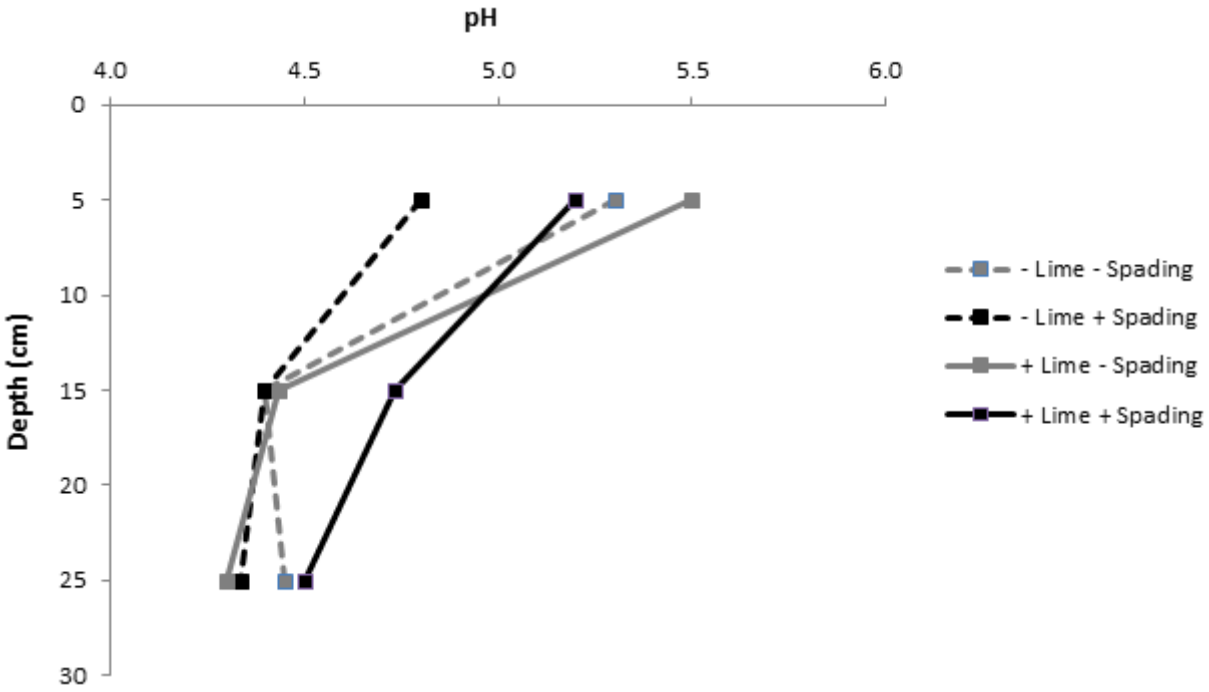

Figure 1: Effect of lime and spading on soil pH (February 2013).

Economics*

Table 3: Yields (t/ha) and economic analysis ($/ha) of different treatments of lime, potash and spading and a combination of these, on lupins grown in 2013. Values are compared to the control.

Treatments		2013 Yield (t/ha)	Response ($/ha)	Cost ($/ha)	Profit ($/ha)
1	Control	0.88	-	-	-
2	Potash only	1.22	69	69	0
3	Lime only	0.90	5	75	-70
4	Potash + Lime	1.20	65	144	-79
5	Spading only	1.08	40	150	-110
6	Spading + Potash	1.38	101	219	-118
7	Spading + Lime	1.09	42	225	-183
8	Spading + Potash + Lime	1.34	93	294	-201

**Economic assumptions: lupins $200/t; lime $25/t, K in MoP $1.40/kg; spading $150/ha.*

Comments

- There was a 0.3 t/ha response to K, a 0.15 t/ha response to spading but no response to lime.
- Spading did not affect the response to potash.
- Plant tissue tests and better growth in the surrounding crop (sown with phosphate fertiliser) indicate responses may have been limited by P deficiency.
- Treatments were implemented in 2012, however, wheat failed due to poor trafficability and crop establishment.

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