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Potassium nutrition of pastures on the sandplain soils of Western Australia.

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SUMMARY OF EXPERIMENTAL RESULTS

1989

POTASSIUM NUTRITION

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AND
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Project: Potassium Nutrition Of Pastures On The Sandplain Soils Of Western Australia

Aims: Determine the factors affecting the fate of native and applied potassium on sandplain soils.
Define current and residual response curve parameters for potassium applications.
Develop recommendations for the economic management of soil potassium levels.

Maintenance application rates of potassium on sandplain soils

88BA46/5818 EX

Location: Badgingarra Research Station, new block

Soil type: Deep yellow sand(> 1m)

Fertilizer: Pastures - 200 kg/ha Super topdressed, wheat - 200 kg/ha Super topdressed, 120 kg/ha Agras No 1 drilled, lupins - 200 kg/ha Super Mn drilled.

Seeding date: 22 May

Crop: Aroona wheat, Gungurru lupins, Dalkeith subclover, Serena medic, Tauro and Eneabba serradella.

Treatments: K rates topdressed by hand on 12 June. Treatments applied annually.

Vegetative sampling dates: wheat- 16/8, white lupins-24/8, pastures-6/9 (cont. subclover-23/8)

Results:

Table 1. Effect of K on vegetative growth and grain yield

Crop	Potassium Rate (kg/ha)	Vegetative yield (kg/ha)	Grain yield (kg/ha)
Wheat after lupins	0	1420	1900
	10	1670	2070
	20	1460	1970
	40	1480	2120
	70	1750	1960
	150	1680	1980
		SED 140	SED 120
Wheat after subclover	0	1100	1500
	10	1370	1590
	20	1450	1680
	40	1560	1640
	70	1380	1650
	150	1580	1740
		LSD (p<0.05) 240	LSD(p<0.05) 120

Table 1. (cont.)

Crop	Potassium Rate (kg/ha)	Vegetative yield (kg/ha)	Grain yield (kg/ha)
<u>L. angustifolius</u> after wheat	0	1340	540
	10	1230	550
	20	1350	470
	40	1600	580
	70	1550	540
	150	1620	560
		SED 170	SED 80
<u>L. cosentinii</u>	0	4760	
	10	4980	
	20	5550	
	40	4800	
	70	5390	
	150	4670	
		SED 970	
Continuous subclover	0	1110	
	10	1320	
	20	1540	
	40	1660	
	70	1490	
	150	1260	
		SED 170	
Subclover after wheat (calibrated rating)	0	1470	
	10	1640	
	20	1890	
	40	1980	
	70	2030	
	150	2320	
		LSD(p<0.001) 270	
Continuous medic and serradella	0	1670	
	10	1770	
	20	2180	
	40	2220	
	70	1750	
	150	1890	
		SED 460	

Comments:

The response of wheat to K at this site was affected by the legume grown in 1988. Wheat after subclover was responsive (up to 20 kg/ha K), while wheat after lupins was not. This may indicate that more K is retained in the root zone by lupins than by subclover. The medic/serradella and L. cosentinii plots were not responsive to K applied for the second year.
Trial to be continued.

Maintenance application rates of potassium on sandplain soils

88TS69/5818 EX

Location: R. Halbert, North Eneabba

Soil type: Deep grey sand (>1m)

Fertilizer: Pastures - 100 kg/ha Super, wheat - 120 kg/ha DAP drilled, lupins - 180 kg/ha Super Mn drilled.

Seeding date: 8 June

Crop: Kulin wheat, Gungurru lupins, Dalkeith subclover, Serena medic, Tauro and Eneabba serradella.

Treatments: K rates topdressed by hand on 22 June. Treatments applied annually.

Vegetative sampling dates: wheat-14/8, white lupins-28/8, sandplain lupins-31/8

Results:

Table 2. Effect of K on vegetative growth and grain yield.

Crop	Potassium Rate (kg/ha)	Vegetative yield (kg/ha)	Grain yield (kg/ha)
Wheat after lupins	0	1010	850
	10	1070	990
	20	1210	1020
	40	1050	930
	70	1140	1130
	150	1120	1070
		SED 150	SED 230
Wheat after subclover	0	770	350
	10	930	580
	20	710	490
	40	1050	580
	70	1170	650
	150	1230	580
		LSD(p<0.01) 370	LSD(p<0.001) 150
<u>L. angustifolius</u> after wheat	0	1240	470
	10	1330	480
	20	1320	670
	40	1270	710
	70	1260	840
	150	1400	810
		SED 195	LSD(p<0.05) 220
<u>L. cosentini</u>	0	2440	
	10	4080	
	20	2700	
	40	2680	
	70	3110	
	150	2830	
		SED 560	

Comments: There was a response in wheat to K at this site similar to the response in 88BA46. There was a lupin grain yield response up to 20 kg/ha K applied for the second year. There was a severe weed infestation in the pasture plots. These will be resown in 1990.
Trial to be continued.

Maintenance application rates of potassium on sandplain soils

89K026/5818 EX

Location: Kojaneerup Research Block

Soil type: Deep grey over yellow sand(>1m)

Fertilizer: Trial site - 250 kg/ha Super Cu Zn Mo topdressed, pastures - 150 kg/ha Super drilled
barley - 120 kg/ha Agras No1 drilled, lupins - 250 kg/ha Super Mn drilled.

Seeding date: 14 June

Crop: Stirling barley, Gungurru lupins, Dalkeith subclover, Madeira and Tauro serradella.

Treatments: K rates topdressed by hand on 4 July

Vegetative
sampling date: 26 September

Results:

Table 3. Effect of K on vegetative growth and grain yield.

Crop	Potassium Rate (kg/ha)	Vegetative yield (kg/ha)	Grain yield (kg/ha)
Barley	0	4170	2340
	10	4780	2490
	20	3940	2400
	30	4190	2770
	60	4330	2690
	120	4680	2350
	200	4430	2400
		SED 340	SED 320
Lupins	0	2510	
	25	2810	
	50	2590	
	75	2460	
	100	2540	
	150	2410	
	200	3160	
		SED 720	
Subclover (calibrated rating)	0	2580	
	25	2920	
	50	2980	
	75	3350	
	100	3520	
	150	3390	
	200	3570	
		LSD(p<0.01) 550	

Comments: Subclover was responsive to applied K at this site. Lupin and serradella plots affected by brome grass infestation.
Trial to be continued, with K rates being applied annually.

Residual value of potassium on sandplain soils.

89BA24/5818 EX

Location: Badgingarra Research Station

Soil type: Deep yellow sand (>1m)

Fertilizer: Trial site- 250 kg/ha Super Cu Zn Mo topdressed, wheat - 120 kg/ha Agras No 1 drilled, pastures - 150 kg/ha Super topdressed.

Seeding date: 23 May

Crop: Arona wheat, Dalkeith subclover, Serena and Santiago medic, Madeira serradella.

Treatments: K rates topdressed by hand on 13 June (serradella - 22 June)

Vegetative sampling dates: wheat-17/8, medic-22/8, subclover-5/9, serradella-14/9

Results:

Table 4. Effect of K on vegetative growth and grain yield.

Crop	Potassium Rate (kg/ha)	Vegetative yield (kg/ha)	Grain yield (kg/ha)
Wheat	0	1900	1400
	25	1890	1520
	50	1770	1250
	75	1900	1560
	100	1850	1380
	150	2130	1380
	200	2200	1550
		LSD(p<0.01) 300	SED 160
Subclover (calibrated rating)	0	1880	
	25	1920	
	50	1960	
	75	1990	
	100	1990	
	150	2040	
	200	2080	
		LSD(p<0.001) 50	
Medic	0	1240	
	25	1260	
	50	1350	
	75	1450	
	100	1730	
	150	1330	
	200	1480	
		SED 150	
Serradella	0	1220	
	25	1350	
	50	1200	
	75	1230	
	100	1410	
	150	1230	
	200	1270	
		SED 90	

Comments: While the vegetative growth of wheat was responsive to applied K, the grain yield was not. There was a small growth response in subclover, but the other pasture species were unresponsive, indicating that K levels on new land are adequate for this level of pasture production.
Trial to be continued.

Potassium requirements of sub clover

89MT46/5818 EX

Location: Mt Barker Research Station
 Soil type: Sandy loam, paddock E4 - 114 ppm K, paddock S2 - 47 ppm K (0-10 cm)
 Fertilizer: 100 kg/ha Super topdressed on trial site.
 Pasture: Dalkeith subclover based.
 Treatments: K rates topdressed on 9 May
 Sampling date: 5 July

Results:

Table 5. Effect of K on vegetative growth of subclover.

Pasture	Potassium Rate (kg/ha)	Vegetative yield (kg/ha)
Subclover E4	0	2580
	25	2500
	75	2700
	150	2700
		SED 400
Subclover S2	0	3130
	25	2900
	75	2270
	150	1930
		SED 770

Comments: No visual response throughout the season. The difference in the 0-10 cm K soil test between paddocks did not correlate to differences in dry matter production. Trial completed.

Project: Potassium Nutrition Of Lupins On The Sandplain Soils of Western Australia

Aims: Develop recommendations for optimal K fertilizer application strategies for lupin production.
Further develop soil and tissue test calibrations for lupin grain production.

89EC32/6154 EX

Location: East Chapman Research Station

Soil type: Deep yellow sand (> 1m)

Fertilizer: Trial site - 150 kg/ha Super Cu Zn Mo topdressed, 100 kg/ha Super drilled with seed, 50 kg/ha MnSO₄ topdressed 29/6.

Seeding date: 24 May

Crop: Gungurru lupins

Treatments: K rates topdressed by hand on 7 June.

Vegetative sampling date: 25 August

Results:

Table 6. Effect of K on vegetative growth and grain yield of lupins.

Crop	Potassium Rate (kg/ha)	Vegetative yield (kg/ha)	Grain yield (kg/ha)
Lupins	0	2620	560
	10	2170	600
	20	2350	600
	40	2440	520
	80	2440	470
	160	2280	550
		SED 290	SED 90

Comments: Stunted patches observed in the trial in early August. There was no influence of K treatment on the severity of the patches.
Trial to be sown to barley in 1990 and rates of K applied to fresh plots.

89GE90/6154 EX

Location: Allanooka

Soil type: Deep grey over yellow sand(>1m)

Fertilizer: 200 kg/ha Super Cu Zn Mo drilled with seed, 50 kg/ha MnSO₄ topdressed 7/7.

Seeding date: 6 June

Crop: Gungurru lupins

Treatments: K rates topdressed by hand on 20 June.

Results:

Table 7. Effect of K application on grain yield of lupins.

Crop	Potassium Rate (kg/ha)	Grain yield (kg/ha)
Lupins	0	480
	10	570
	20	480
	40	400
	80	420
	160	350
		SED 220

Comments: Establishment at this site was uneven, possibly due to dry conditions after sowing. Trial to be sown to wheat in 1990 and rates of K applied to fresh plots.

89TS56/6154 EX

Location: G. Boak, West Three Springs
Soil type: Deep grey over yellow sand(>1m)
Fertilizer: 180 kg/ha Super Cu Zn Mo topdressed over site, 180kg/ha Super Mn drilled with the seed.
Seeding date: 8 June
Crop: Danja lupins
Treatments: K rates topdressed by hand on 23 June.
Results:

Table 8. Effect of K application on grain yield of lupins.

Crop	Potassium Rate (kg/ha)	Grain yield (kg/ha)
Lupins	0	510
	10	470
	20	730
	40	760
	80	1280
	160	430
	LSD($p < 0.02$)	510

Comments: Response up to 80 kg/ha of K applied.
Trial to be sown to wheat in 1990 and rates of K applied to fresh plots.

89M051/6154 EX

Location: M. Burns, Lancelin
Soil type: Deep grey over pale yellow sand(>1m)
Fertilizer: 175kg/ha Super Cu Zn Mo topdressed over site, 250kg/ha Super Mn drilled with the seed.
Seeding date: 7 June
Crop: Gungurru lupins
Treatments: K rates topdressed by hand on 21 June.

Results:

Table 9. Effect of K application on grain yield of lupins.

Crop	Potassium Rate (kg/ha)	Grain yield (kg/ha)
Lupins	0	1000
	10	1080
	20	1100
	40	1170
	80	1230
	160	1250
		SED 140

Comments: Plot establishment uneven at this site, possibly due to dry conditions after sowing. Trial to be sown to wheat in 1990 and rates of K applied to fresh plots.