



1978

Phosphorus and sulphur interactions, 1978.

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DEPARTMENT OF AGRICULTURE
Western Australia

EXPERIMENTAL SUMMARY 1978

PHOSPHORUS AND SULPHUR INTERACTIONS

Contents

Phosphorus, Sulphur, Times of Application Interaction Trials

(a) Yield Results:

78AL3, 78KE4, 78MO8, 78BY3, 78BA8,
78BU3, 78NO4, 78A7, 78C4, 78B4, 78MA2

(b) Soil sampling data

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INTRODUCTION

This project commenced in 1978. The aims are:

1. To determine yield responses to simultaneous applications of phosphorus and sulphur on pastures in W.A.
2. To relate these to soil and climatic data.
3. To review experimental results relating to sulphur in pastures in W.A.
4. To ultimately develop a model to quantitatively predict sulphur requirements on W.A. pastures.

RESULTS

1978 Field Programme

A total of 11 trials were conducted this year as part of the above programme. Seven trials were located in >625 mm rainfall zone; three in deep (>80 cm) white sand, (78AL3, 78KE4, 78BY3), one in deep brown sand (78BU3) and one in deep yellow sand (78MO8) and two others in gravels (78B4, 78MA2). The remaining four trials were conducted in lower rainfall sites which had received no super for a number of years (78NO4, 78A7, 78C4, 78BA8) and on which sulphur deficiency symptoms had been recently observed.

The aims of the trials were:-

1. To obtain data on plant growth and nutrient uptake in response to simultaneous application of rates of P and S at different times (P x S x time factorial).
2. Monitor through soil sampling the movement of applied P and S through the soil with time and relate this to meteorological data.
3. Monitor base levels of S in unfertilized plots over time.
4. Obtain information on soil sampling technique, times, etc., and analysis techniques for planning future work.

Three trials (78AL3 Redmond; 78MO8 Lancelin; 78KE4 Keysbrook) in deep sand expected to be strongly leached over winter were intensively monitored for P and S movement down the profile. Other sites were sampled twice for soil P and S levels during the season. The deep sand, extreme examples of potentially seasonally sulphur deficient sites, were considered to be important in developing an understanding of nutrient movement under field conditions.

Data from 78AL3 showed little pasture response to autumn applied P or S applications, but marked responses to spring applications of both. Soil analysis results show rapid leaching of both these nutrients out of the root zone over winter at this site (and 78KE4, 78BY3) and provides a reason for the lack of response to autumn dressings. The results indicate the rapid leaching of P and particularly S will prevent build-up of either nutrient in a mineral (c.f. organic) form on this site.

Trial : 78AL3
Title : Phosphorus x sulphur x times of application on pastures
Location : R. Reed, Redmond
Soil : 0-10 cm organic grey-black fine sand
 10->100 cm fine white sand

	0-10 cm	10-20 cm	20-40 cm	40-60 cm
pH (1 + 5)	4.8	4.6	4.7	4.8
Coarse sand (%)	6.6	5.7	5.7	4.5
Fine sand (%)	83.9	88.6	91.6	94.3
Silt (%)	<0.5	<0.5	<0.5	0.5
Clay %	1	1	1	1
Organic C (%)	3.57	2.18	0.81	0.42
Total S (%)	0.014	0.010	0.0035	0.0021
C : S	255:1	218:1	231:1	200:1
Bicarb P (ppm)	7	6	4	2
Sulphate S (ppm)	4	3	1	1
P sorb	-13	-7	-4	-3
P.B.C.	0.8	0.2	0.2	0.2
Δ QS	-4	-3	-1	-1

Vegetation : Stunted jarrah, redgum, banksia

History : Old pasture

Seasonal : The trial was seeded with 50 kg/ha Mt Barker sub-clover and autumn treatments hand topdressed on 20/4/78. Spring treatments were hand topdressed 28/8/78. A basal of 100 kg/ha KCl + Cu, Zn, Mo was applied at both times. The plots were mowed once, prior to spring topdressing.

Results : The trial was assessed twice for dry matter production. Soil samples (0-10, 10-20, 20-40, 40-60 cm) were taken from selected treatments at weekly intervals following treatment applications, to monitor P and S leaching through the profile (see Appendix).

At both yield assessments samples were taken for pasture analysis, and composition samples were taken at the second assessment.

Yields are expressed as t/ha. The first assessment was a calibrated rating, the second a calibrated plate metering.

Autumn applied P, spring applied S. Legume % 19/10/78

P kg/ha S kg/ha	0	10	20	40	80	Mean
0	43	31	65	49	61	50
10	50	49	-	60	56	54
20	63	-	47	56	66	58
40	56	65	-	67	61	62
Mean	53	48	56	58	61	

Split application: Spring P & S on 20 kg/ha P + 20 kg/ha S autumn; Yield 19/10/78

P kg/ha S kg/ha	0	10	20	40	Mean
0	1.9	2.7	2.7	2.8	2.5
10	-	2.7	3.0	3.1	3.0
20	-	2.4	2.6	2.5	2.5
40	-	3.2	2.7	2.8	2.9
Mean	1.9	2.8	2.8	2.8	

Split application: Spring P and S on 20 kg/ha P + 20 kg/ha S autumn; Legume %

P kg/ha S kg/ha	0	10	20	40	Mean
0	49	48	48	75	55
10	-	-	61	66	64
20	-	64	68	76	69
40	-	58	61	52	57
Mean	49	57	60	67	

Split application (Spring S on 40 kg/ha P + S rates autumn): Yield 19/10/78

Autumn S kg/ha Spring S kg/ha	0	10	20	40	Mean
0	1.9	2.4	1.9	1.9	2.0
10	2.1	2.7	2.1	2.1	2.3
20	2.7	2.6	2.3	1.9	2.4
40	2.4	2.1	2.8	1.9	2.3
Mean	2.3	2.4	2.3	1.9	

Trial : 78KE4
Title : Phosphorus x sulphur x times of application on pastures
Location : G.W. Elliot, Keysbrook
Soil type : Coarse grey sand with low OM over coarse white sand.
Gravel at 100 cm.

	0-10 cm	10-20 cm	20-40 cm	40-60 cm
pH (1 + 5)	5.3	5.6	5.3	5.3
Sand (%)	98.4	98.6	99.2	99.3
Silt (%)	0.5	0.5	1.0	<0.5
Clay (%)	1.5	1.5	1.0	1.5
Organic C (%)	0.90	0.61	0.23	0.13
Total S (%)	0.004	0.002	0.001	0.001
C:S	225:1	305:1	230:1	130:1
Bicarb P (ppm)	7	6	3	<2
Sulphate S (ppm)	3	1	<1	<1
P sorb	-5	-5	0	0
B.C.	0.8	0.8	0.4	0.3
ΔQS	-3	-1	0	0

Vegetation : Jarrah, redgum, banksia, she-oak

History : Cleared 1976. Oats 1977. 200 kg/ha Super in 1977.

Seasonal : Trial seeded and established 3/5/78. 50 kg/ha Seaton Park (inoculated and lime pelleted) and 100 kg/ha KCl + Cu, Zn, Mo were scratched in. Autumn treatments were hand topdressed after seeding.

Spring treatments were hand topdressed 10/8/78 and 100 kg/ha KCl was also applied. Plots were ungrazed throughout the season.

Results : The trial was rated twice for dry matter production. Soil samples (0-10, 10-20, 20-40, 40-60 cm) were taken from selected treatments at weekly intervals for two months after the autumn and spring treatment applications (see Appendix).

The site was unfavourable for clover growth. A stand was established early, but was drought stressed during August and in spring, resulting in uneven growth. Treatment effects were apparent on some plots, but were difficult to assess. At the final assessment (October) half the trial was hayed off.

Though observations were unreplicated a response to autumn and split P and spring S was obvious on some plots. No response to autumn S was observed (results not presented).

Trial : 78M08
Title : Phosphorus x sulphur x times of application on pastures.
Location : J. Woods, H. Fels, Lancelin.
Soil type : 0-10 cm grey yellow coarse sand with organic staining
 10-30 cm coarse yellow sand (over limestone).

	0-10 cm	10-20 cm	20-40 cm	40-60 cm
pH (1 + 5)	6.7	6.4	6.2	6.1
Sand (%)	95.6	96.0	95.5	94.9
Silt (%)	1.5	1.5	0.5	0.5
Clay (%)	3.0	3.5	4.5	5.5
Organic C (%)	0.82	0.50	0.27	0.13
Organic S (%)	0.0055	0.004	0.002	0.0015
C:S	149:1	125:1	135:1	87:1
Bicarb P (ppm)	8	4	2	<2
P sorb.	1	7	11	16
B.C.	0.9	1.0	1.2	2.2
Sulphate S (ppm)	<1	1	<1	<1
Δ QS	0	-1	0	0

Vegetation : Banksia, coastal blackbutt
History : Cleared 1967, 1080 kg/ha super total applied up to 1977.
Seasonal : Trial seeded and established 2/5/78. 50 kg/ha Seaton Park subclover and 100 kg/ha KCl + Cu, Zn, Mo were scratched in. Autumn treatments were hand topdressed 4/5/78.

Spring treatments were hand topdressed 10/8/78 and 100 kg/ha KCl was again applied. Prior to top dressing plots were grazed off by sheep to attempt grass control.

Results : The trial was assessed twice for dry matter production. Soil samples (0-10, 10-20, 20-40, 40-60 cm) were taken from selected treatments at weekly intervals for two months following treatment applications to monitor P and S movement through the profile (see Appendix). At both assessments samples were taken for pasture analysis and at the second assessment composition samples were taken. No visual yield differences between treatments were seen at any time during the season. The plots were totally brome grass dominant throughout the year, despite hard grazing by sheep over winter.

Yields are expressed as t/ha D.M. Both assessments were made with a lawnmower strip cut. Only one rep was cut at each assessment.

A small sulphur trial will be conducted at the site in 1979.

Trial : 78M08
Title : Phosphorus x sulphur x times of application on pastures.
Location : J. Woods, H. Fels, Lancelin.
Soil type : 0-10 cm grey yellow coarse sand with organic staining
 10-30 cm coarse yellow sand (over limestone).

	0-10 cm	10-20 cm	20-40 cm	40-60 cm
pH (1 + 5)	6.7	6.4	6.2	6.1
Sand (%)	95.6	96.0	95.5	94.9
Silt (%)	1.5	1.5	0.5	0.5
Clay (%)	3.0	3.5	4.5	5.5
Organic C (%)	0.82	0.50	0.27	0.13
Organic S (%)	0.0055	0.004	0.002	0.0015
C:S	149:1	125:1	135:1	87:1
Bicarb P (ppm)	8	4	2	<2
P sorb.	1	7	11	16
B.C.	0.9	1.0	1.2	2.2
Sulphate S (ppm)	<1	1	<1	<1
Δ QS	0	-1	0	0

Vegetation : Banksia, coastal blackbutt
History : Cleared 1967, 1080 kg/ha super total applied up to 1977.
Seasonal : Trial seeded and established 2/5/78. 50 kg/ha Seaton Park subclover and 100 kg/ha KCl + Cu, Zn, Mo were scratched in. Autumn treatments were hand topdressed 4/5/78.

Spring treatments were hand topdressed 10/8/78 and 100 kg/ha KCl was again applied. Prior to top dressing plots were grazed off by sheep to attempt grass control.

Results : The trial was assessed twice for dry matter production. Soil samples (0-10, 10-20, 20-40, 40-60 cm) were taken from selected treatments at weekly intervals for two months following treatment applications to monitor P and S movement through the profile (see Appendix). At both assessments samples were taken for pasture analysis and at the second assessment composition samples were taken. No visual yield differences between treatments were seen at any time during the season. The plots were totally brome grass dominant throughout the year, despite hard grazing by sheep over winter.

Yields are expressed as t/ha D.M. Both assessments were made with a lawnmower strip cut. Only one rep was cut at each assessment.

A small sulphur trial will be conducted at the site in 1979.

Spring applied (Spring treatments on 20 kg/ha P + 20 kg/ha S Autumn) Yield 12/10/78

P kg/ha S kg/ha	0	10	20	40	Mean
0	5.2	5.1	4.9	4.8	5.0
10	-	4.7	4.7	5.6	5.0
20	-	4.8	5.0 [12]	4.7	4.8
40	-	4.5	5.2	5.1	4.9
Mean	5.2	4.8	5.0	5.1	

* 2 reps

Numbers in round brackets : coarse gypsum (2 reps)

Numbers in square brackets : % clover

Notes : (i) No P or S response - low clover %?

Spring Applied Yield 11/9/78

S kg/ha \ P kg/ha	P kg/ha			Mean
	0	20	40	
0	1.7	2.1	2.0(46)	1.9
10	2.2	1.8	2.0	2.0
20	1.9	1.9	1.8	1.9
40	2.0(78)	1.9	1.9(61)	2.0
Mean	2.0	1.9	1.9	

Numbers in brackets are % clover

Split application (Spring treatments on 20 kg/ha S + 20 kg/ha Autumn)

Yield 11/9/78

S kg/ha \ P kg/ha	P kg/ha		Mean
	0	40	
0	2.2	2.4	2.3
10	2.4	2.2	2.3
20	2.1	2.1	2.1
40	2.3	2.2	2.3
Mean	2.3	2.2	

Notes

- : (i) Small response to autumn applied P.
- (ii) No response to spring or split P.
- (iii) Little or no S response.
- (iv) A reduction in clover % at high P (increased capeweed %).

Autumn Application Yield 4/10/78

P kg/ha S kg/ha	0	20	40	80	Mean
0	1.7(44)	2.4	3.4	3.3	2.7
20	1.8	3.0(48)	2.9	3.4	2.8
40	2.3	2.7	2.9(51)	3.3	2.8
80	2.1(47)	2.7	2.7	3.4(51)	2.7
Mean	2.0	2.7	3.0	3.4	

Spring Applied (18/8/78) Yield 4/10/78

P kg/ha S kg/ha	0	10	20	40	Mean
0	1.7(44)	2.1	2.3	2.5(48)	2.2
10	2.2	2.3(50)	-	2.8	2.5
20	2.3	-	2.4(52)	2.4	2.4
40	2.1(44)	2.5(49)	2.1	2.5(52)	2.3
Mean	2.1	2.3	2.3	2.6	

Split Application (Spring treatments applied to 40 kg/ha P + 40 kg/ha S
Autumn) Yield 4/10/78

P kg/ha S kg/ha	0	40	Mean
0	2.9(51)	3.2(56)	3.1
10	3.1	3.7	3.4
20	3.1	3.3	3.2
40	3.2(63)	3.5(56)	3.4
Mean	3.1	3.4	

Numbers in brackets refer to % clover

- Notes :
- (i) Large autumn P response, smaller spring P response
 - (ii) No additional response to split vs autumn P
 - (iii) A small S response to autumn spring and split S (up to 20 kg/ha autumn? and 10 kg/ha spring and split S, at nil P).
 - (iv) At higher P levels, no S response. S in TSP (1.5%) may be blanketing the response - ?
20 kg/ha P as TSP = 1.5 kg/ha S.
 - (v) Little variation in clover % between treatments.

Autumn Applied Yield 22/8/78

P kg/ha S kg/ha	0	10	20	40	80	Mean
0	2.1*	2.0	2.4	2.2	2.2*	2.2
10	2.5	2.4	-	2.3	2.6	2.4
20	2.4	2.6	2.6	2.9	2.7	2.6
40	2.5*	2.4	-	2.5	2.6*	2.5
Mean	2.4	2.4	2.5	2.5	2.5	

Autumn Applied Yield 4/10/78

P kg/ha S kg/ha	0	10	20	40	80	Mean
0	2.1*	1.9	2.8	3.2	3.3*	2.7
10	2.7	2.7	-	2.7	3.1	2.8
20	2.5	2.8	2.8	3.2	2.9	2.8
40	2.8*	2.5	-	2.6	2.8*	2.7
Mean	2.5	2.5	2.8	2.9	3.0	

Spring Applied Yield 4/10/78

P kg/ha S kg/ha	0	40	Mean
0	2.1	2.3	2.3
10	2.2	2.5	2.4
20	1.7	2.1	1.9
40	2.1	2.4	2.2
Mean	2.0	2.3	

* Means of 4 reps.

Split Application (Treatments applied to 20 kg/ha P + 20 kg/ha S Autumn Treatments) Yield 4/10/78

P kg/ha S kg/ha	0	40	Mean
0	2.8	3.1	2.9
10	2.8	2.7	2.8
20	2.6	2.5	2.5
40	2.6	3.2	2.9
Mean	2.7	2.9	

4/10/78: 70% Erodium, 10-20% clover, 10-20% ryegrass.

Trial : 78A7

Title : Phosphorus x sulphur x times of application on pastures

Location : Avondale Research Station

Soil type : Red brown sandy loam to depth
0-10 cm P sorb. 2 ppm B.C. 1.9 ppm

Vegetation : York gum and jam.

History : Old land. No P or S for at least 5 years, cropped in 1977.

Seasonal : Trial established and autumn treatments hand topdressed 21/4/78. Spring treatments hand topdressed 15/8/78. Plots were grazed by sheep prior to spring topdressing.

Results : The trial was assessed twice for dry matter production. Soil samples were taken in July and at the second assessment (0-10, 10-20, 20-40, 40-60 cm) for P and S analysis from selected treatments, (see Appendix). No pasture samples were taken for composition and analysis as plots contained a lot of capeweed and doublegee, (first year after crop).

Yield results are expressed in t/ha D.M. (means of two reps). Plots were assessed by rating (first assessment) and plate meter and calibration cuts (assessment two). The site will be monitored in 1979 for P and S residual effects.

Autumn Applied 21/4/78 Assessed (Rated) 19/7/78

P kg/ha S kg/ha	0	10	20	40	80	Mean
0	0.6	0.5	2.0	2.0	1.8	1.4
10	1.0	1.0	-	1.5	2.0	1.4
20	0.5	1.5	1.1	2.0	1.5	1.3
40	0.5	1.0	-	1.0	1.8	1.1
Mean	0.6	1.0	1.6	1.6	1.8	

Autumn Applied. Yield 28/9/78

P kg/ha S kg/ha	0	10	20	40	80	Mean
0	2.1*	2.7	2.3	2.8	2.1*	2.4
10	2.3	2.4	-	2.5	2.6	2.4
20	3.0	2.7	2.1	2.4	2.8	2.6
40	2.3*	2.2	-	2.2	2.5*	2.3
Mean	2.4	2.5	2.2	2.4	2.5	

* 4 reps.

Trial : 78C4

Title : Phosphorus x sulphur x times of application on pastures

Location : Chapman Research Station

Soil type : Red brown sandy loam

Vegetation : York gum and jam

History : Old land. No P or S for at least 5 years. Pasture for a number of years.

Seasonal : Trial was commenced and autumn treatments hand topdressed 18/4/78. Spring treatments were hand topdressed 10/8/78. Plots were grazed by sheep prior to spring assessment.

Results : The trial was assessed twice for dry matter production. Yields are expressed as t/ha D.M. (means of two reps). Plots were assessed with a plate meter and calibration cuts.

The site will be monitored in 1979 for P and S residual effects.

Autumn Applied Yield 31/7/78

P kg/ha S kg/ha	0	10	20	40	80	Mean
0	1.0	1.2	1.2	1.4	1.5	1.3
10	1.1	1.0	-	1.5	1.6	1.3
20	1.0	1.1	1.2	1.4	1.6	1.3
40	1.1	1.1	-	1.7	1.4	1.3
Mean	1.0	1.1	1.2	1.5		

Autumn Applied Yield 18/9/78

P kg/ha S kg/ha	0	10	20	40	80	Mean
0	2.0	2.4	2.4	2.3	2.7	2.4
10	1.7	1.8	-	2.0	2.5	2.0
20	1.8	2.1	2.3	2.1	3.0	2.3
40	1.9	2.0	-	2.9	3.0	2.4
Mean	1.9	2.0	2.3	2.3	2.8	

Trial : 78B4

Title : Phosphorus x sulphur interactions on pastures

Location : Bramley Research Station

Soil type : Forest Grove gravel

Vegetation : Jarrah/redgum forest

History : Old land, long term pasture. No super for at least 5 years.

Seasonal : The trial site was sprayseeded 4/5/78 and seeded with Larissa (30 kg/ha) 8/5/78. Basal fertilizer (100 kg/ha KCl) and treatments hand topdressed 9/5/78. The plots were grazed off by sheep during winter.

Results : The trial was assessed once only for dry matter production. In July and at the assessment (5/10/78) soil samples (0-10, 10-20, 20-40, 40-60 cm) were taken from selected treatments (see Appendix) for P and S analysis. Samples were taken for whole pasture (clover and grass tops) P and S analysis at assessment.

Yield results are t/ha D.M. Assessment was made with a plate meter and calibration cuts. The site will be monitored in 1979 for P and S residual effects.

Autumn Applied Assessed 5/10/78					
P kg/ha \ S kg/ha	0	20	40	80	Mean
0	2.7	2.9	3.2	3.5	3.1
10	2.7	2.9	2.6	2.6	2.7
20	2.5	2.9	3.0	2.9	2.8
40	2.3	3.0	2.9	3.3	2.9
Mean	2.6	2.9	2.9	3.1	

Notes :

- (i) Considerable variability was evident between replicates.
- (ii) A response to P.
- (iii) No response to S.

Split Application (Spring treatments on 40 kg/ha P + 40 kg/ha S Autumn Applied)

<u>P kg/ha</u> S kg/ha	0	20	80	Mean
0	1.7	1.6	2.8	2.0
20	1.4	2.6	3.2	2.4
40	2.6	2.0	2.9	2.5
Mean	1.9	2.1	2.9	

- Notes :
- (i) Very large autumn P response.
 - (ii) Very small spring P response.
 - (iii) Response to split P small.
 - (iv) No sulphur response, despite no past super applications.

Trial: 78KE4

Treatments as for 78AL3 (0-10 cm)

AUTUMN APPLICATION (24/5/78)

DATE	RAIN FALL AFTER APPL ^N (mm)	ppm bicarb P			ppm SO ₄ ⁼			
		NIL	40 KG/HA	80 KG/HA	NIL	6 KG/HA	43 KG/HA	80 KG/HA
24/5	0	10.0*	31.0*	54.0*	5.0*	9.0*	40.0*	65.0*
31/5	23.3	9.8	25.3	27.2	3.3	3.3	16.5	25.8
6/6	46.6	5.3	11.8	18.4	1.5	2.0	6.5	21.3
13/6	53.0	6.8	13.5	18.2	1.8	2.5	4.0	17.5
21/6	83.3	3.8	11.0	15.1	1.3	1.3	3.0	5.0
28/6	169.6	4.5	8.3	8.9	<1	1.0	<1	<1
19/7	304.4	5.0	-	10.3	-	-	-	-
23/8	391.5	-	5.0	6.0	-	-	-	2.0
30/8	421.3	4.6	4.0	6.2	<1	-	-	-
13/9	459.4	2.9	4.0	7.5	<1	-	-	-
25/9	513.0	2.8	2.0	4.5	1.5	-	-	-
4/10	569.4	-	6.5	6.5	<1	-	-	-

SPRING APPLICATION (10/8/78)

DATE	RAIN FALL (mm)	40 KG/HA	3 KG/HA	40 KG/HA
16/8	0	28.0*	2.3*	31.0*
30/8	29.8	15.0	<1	11.7
13/9	67.8	19.5	2.7	8.7
25/9	121.5	11.3	2.2	2.9
4/10	177.9	9.5	<1	2.3

SPRING APPLICATION (21/8/78)

			40 kg/ha				40 kg/ha	
DEPTH (cm)				30/10				30/10
0-10				6.0				11.5
10-20				2.0				5.5
20-40				3.5				4.0
40-60				-				-

Trial: 78BA8 (< 2 mm)

AUTUMN APPLICATION (11/5/78)

	ppm bicarb P				ppm SO ₄ =			
	Nil		80 kg/ha		Nil		40 kg/ha	
DEPTH (cm)	5/7	12/9	5/7	12/9	5/7	12/9	5/7	12/9
0-10	7.5	4.3	20.8	11.0	1.5	<1	2.8	1.0
10-20	4.5	3.7	10.8	9.8	1.0	2.7	3.0	1.3
20-40	2.8	4.5	6.5	8.3	3.3	4.3	3.8	4.0
40-60	<2	-	3.3	-	4.5	-	5.4	-

SPRING APPLICATION (11/9/78)

			40 kg/ha				40 kg/ha	
DEPTH (cm)				12/9				12/9
0-10				11.5				6.0
10-20				5.5				2.0
20-40				4.0				3.5
40-60				-				-

Trial: 78BU3

AUTUMN APPLICATION (2/5/78)

	ppm bicarb P				ppm SO ₄ =			
	Nil		80 kg/ha		Nil		80 kg/ha	
DEPTH (cm)	28/7	10/10	28/7	10/10	28/7	10/10	28/7	10/10
0-10	10.5	9.5	26.0	37.7	<1	<1	3.0	<1
10-20	2.5	2.1	4.0	9.3	1.5	<1	5.5	<1
20-40	2.0	<2	<2	<2	2.5	<1	7.5	1.5
40-60	4.0	<2	<2	<2	2.0	<1	10.5	3.0

SPRING APPLICATION (15/8/78)

	40 kg/ha				40 kg/ha			
DEPTH (cm)			28/9				28/9	
0-10			28.5				7.5	
10-20			16.8				4.0	
20-40			5.3				2.8	
40-60			3.0				3.0	

Trial: 78B₄ (2 mm)

AUTUMN APPLICATION (9/5/78)

	ppm bicarb P				ppm SO ₄			
	Nil		80 kg/ha		Nil		80 kg/ha	
DEPTH (cm)	28/7	10/10	28/7	10/10	28/7	10/10	28/7	10/10
0-10	37.0	28.4	64.5	39.0	21.0	12.5	29.7	11.5
10-20	18.5	11.7	18.0	14.0	23.3	23.3	36.8	19.0
20-40	5.0	3.1	7.5	2.8	23.8	38.9	43.5	33.5
40-60	2.5	2.2	2.5	2.2	25.8	38.4	40.0	37.5

Note: All figures are means of 4 or 2 replicates. Each replicate was sampled by bulking 5 cores/plot.