




Concentrated PK Fertilisers

TRIAL REPORT 4

Sulphur in Fibrophos

Carried out By:	LA Project 627
Levington Agriculture Ltd Levington Park Ipswich Suffolk IP10 0LU	Trial work commenced: 05.12.1995 Trial work completed: 03.07.1996 Lab work completed: 31.07.1996
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FIBROPHOS AS A SOURCE OF SULPHUR - POT TRIALC O N T E N T S

	<u>Page No.</u>
Contents	2
Abbreviations	2
Objective	3
Summary	3
Treatments	3
Methods	3
Results	4
Practical conclusions	5

TABLES

1	Trial Diary	6
2	Soil details	7
3-6	Results sheets	8-11

Project Plans

ABBREVIATIONS

cm	centimetre
CV%	Co-efficient of Variation
g	gram
GM	General Mean
ha	hectare
kg	kilogram
l	litre
LA	Levington Agriculture Ltd
LSD	Least Significant Difference
mg	milligram
mls	millilitres
mm	millimetre
NS	not significant
ppm	parts per million
SE	Standard Error
+	(P=0.10)
*	(P=0.05)
**	(P=0.01)
	significant at 0.10 probability level
	significant at 0.05 probability level
	significant at 0.01 probability level

FIBROPHOS AS A SOURCE OF SULPHUR - POT TRIAL**OBJECTIVE**

To assess Fibrophos as a source of sulphur in comparison with other products by assessing leaching over winter and subsequently growing ryegrass to measure uptake of residual sulphur.

TREATMENTS

1	Control	
2	Ammonium sulphate	24 % S
3	Calcium sulphate	16.2 % S
4	Tiger 90	90 % S
5	Fibrophos	2.49 % S

Materials

Supplied by John Hatcher & Co Ltd:

Fibrophos 0-24-14 Ref QCS095
Ammonium sulphate Ref QCS010
Gypsum (calcium sulphate) Ref QCS110

METHODS

Two replicated trials were conducted by Levington Agriculture using two light textured soils of relatively low sulphur status. Pots were filled with the two soils, the treatments were applied to the surface at 0.1 g sulphur per 10" diameter pot and cultivated into the top 5 cm. This rate is equivalent to 20 kg S/ha.

The soils were brought to field capacity then leached by fortnightly applications of demineralised water over winter. The leachates were collected, the volumes measured and leachates analysed for potassium and sulphur.

Soil samples were taken in the spring and ryegrass sown. Three cuts were taken of the grass for dry matter yield and sulphur uptake.

Full details are shown in the attached Project Plans.

RESULTS**Leaching experiment**

The two soils were both leached by seven additions of one litre of demineralised water and just over 6.4 litres of leachate collected per pot over the winter. In trial 6270, the potassium leached from the soil was significantly increased by the addition of ammonium sulphate and calcium sulphate, but not by Tiger 90 or Fibrophos. However, in trial 6271 Fibrophos also significantly increased the amount of potassium leached compared with control. In both trials the amount of sulphur that was leached was significantly greater due to ammonium sulphate, calcium sulphate and Fibrophos treatment. The addition of Tiger 90 did not significantly affect the amount of sulphur leached.

The total sulphur leached in trial 6270, omitting Tiger 90 treatments, above that of control was approximately 0.1 g/pot equivalent to that applied, and the sulphur in the soil at the end of the leaching exercise was 4.5 ppm (low status). In trial 6271, again omitting Tiger 90 treatments, the amount of sulphur leached above control was 0.12 g/pot similar to trial 6270 and the sulphur measured in the soil was 4.95 ppm (low).

In both trials the available sulphur added was leached from ammonium sulphate, calcium sulphate and Fibrophos. Tiger 90 sulphur was not leached and not picked up in the soil analysis, possibly because of the small tablet size and each pot being cored in three places to take the soil samples with a good chance of tablets still in the soil being missed.

Ryegrass experiment

In trial 6270 there were no significant differences in grass dry matter yields or sulphur uptakes from the treatments compared with control.

In trial 6271 there were significant increases in grass dry matter yield and sulphur uptake from treatment with calcium sulphate and Tiger 90. These increases appear to be roughly in line with the available sulphur measured in these soils after the leaching experiment. However, these differences are small and none of the treatments resulted in adequate S being available after leaching.

The sulphur contents of the grass, below, show that only the first cut had an adequate supply of sulphur for the grass and that in subsequent cuts the grass was S deficient.

		<u>Cut 1</u>		<u>Cut 2</u>		<u>Cut 3</u>	
		<u>6270</u>	<u>6271</u>	<u>6270</u>	<u>6271</u>	<u>6270</u>	<u>6271</u>
1	Control	0.18	0.20	0.13	0.12	0.10	0.09
2	Ammonium sulphate	0.20	0.25	0.12	0.12	0.10	0.09
3	Calcium sulphate	0.20	0.23	0.13	0.12	0.10	0.08
4	Tiger 90	0.20	0.23	0.12	0.12	0.10	0.09
5	Fibrophos	0.22	0.22	0.13	0.12	0.10	0.09

PRACTICAL CONCLUSIONS

The sulphur in Fibrophos appeared to be as readily available as that in ammonium sulphate or calcium sulphate. As a consequence, where Fibrophos is applied in the autumn, the sulphur content may leach and be lost to the crop over winter. Spring applied Fibrophos, on the other hand, should be a good source of sulphur. Sulphur in Tiger 90 did not appear to be available in any significant amounts during the course of the trial.

Results also indicate that some of the potassium content of autumn applied Fibrophos may leach over winter. This is to be expected as a proportion of the potassium is water soluble. Leaching of the potassium would only occur on light soils and should not present a problem in practice.

The effect of ammonium sulphate and calcium sulphate treatments in increasing potassium leaching is probably due to substitution of adsorbed potassium in the soil by ammonium and calcium ions. This would release potassium into solution where it would be subject to leaching.

TABLE 1 TRIAL DIARYTrial 6270

5.12.95	Soil potted up
7.12.95	Treatments applied
8.12.95	Demineralised water used to bring the soils up to field capacity. One litre added to leach though.
12.12.95	Leachate collected
18.12.95	One litre added to leach though.
19.12.95	Leachate collected
2.1.96	Freezing conditions ended, further leachate collected
	One litre added to leach though.
3.1.96	Leachate collected
16.1.96	One litre added to leach though.
18.1.96	Leachate collected
30.1.96	One litre added to leach though.
31.1.96	Leachate collected
14.2.96	One litre added to leach though.
16.2.96	Leachate collected
27.2.96	One litre added to leach though.
28.2.96	Leachate collected
	Soils allowed to dry to aid sampling
19.3.96	Soil samples taken
	Uniform fertilizers added to top of soil and cultivated in
	Seed sown
8.4.96	Grass germinating
24.5.96	Grass cut
31.5.96	Topdressed
13.6.96	Grass cut and topdressed
3.7.96	Grass cut

Trial 6271

5.12.95	Soil potted up
7.12.95	Treatments applied
8.12.95	Demineralised water used to bring the soils up to field capacity. One litre added to leach though.
12.12.95	Leachate collected
18.12.95	One litre added to leach though.
19-20.12.95	Leachate collected
2.1.96	Freezing conditions ended, further leachate collected
3.1.96	One litre added to leach though.
4.1.96	Leachate collected
16.1.96	One litre added to leach though.
17.1.96	Leachate collected
30.1.96	One litre added to leach though.
31.1.96	Leachate collected
13.2.96	One litre added to leach though.
14.2.96	Leachate collected
27.2.96	One litre added to leach though.
28.2.96	Leachate collected
	Soils allowed to dry to aid sampling
19.3.96	Soil samples taken
	Uniform fertilizers added to top of soil and cultivated in
	Seed sown
9.4.96	Grass germinating
24.5.96	Grass cut
31.5.96	Topdressed
12.6.96	Grass cut and topdressed
3.7.96	Grass cut

TABLE 2 Soil details

Trial Id:	6270	6271
Soil no:	PT 182	PT 183
Date collected:	16.11.95	27.11.95
Kg moist soil/pot:	9.8	9.8
Soil texture:	Sandy loam	Sandy loam
Clay %	13	13
Silt %	12	11
Sand %	75	76
Nutrients		
P mg/l (index)	151 (5)	131 (4)
K mg/l (index)	187 (2)	159 (2)
Mg mg/l (index)	34 (1)	38 (1)
S mg/kg dry soil (ppm)	7.0	4.5
pH	6.8	7.5
Organic carbon %	0.8	0.9
Organic matter %	1.4	1.6
Calcium carbonate %	0.5	1.2

Trial Id: 6270

Client & Client Ref: John Hatcher & Co Ltd

LA Project 627

TABLE 3

MAIN EFFECTS

	TOTAL VOLUME OF LEACHATE (MLS)	K IN LEACHATE PPM	TOTAL LEACHATE mg OF K	S IN LEACHATE PPM	TOTAL LEACHATE S (mg)	SOIL CORE S PPM 2/4/96
Treatments						
Control	6409 a	10.15 ab	65.06 ab	11.15 a	71.5 a	4.55 a
Ammonium sulphate 24% S	6465 a	11.50 c	74.35 d	25.48 b	164.6 b	4.10 a
Calcium sulphate 16.2% S	6439 a	11.18 cd	71.96 cd	24.93 b	160.5 b	4.70 a
Tiger 90 90% S	6438 a	9.83 a	63.20 a	10.25 a	66.0 a	4.70 a
Fibrophos 2.49% S	6351 a	10.70 bc	67.96 bc	25.43 b	161.5 b	4.48 a
LSD (0.05)	128.6	0.610	4.111	2.143	13.00	0.944
LSD (0.01)	180.2	0.856	5.762	3.004	18.22	1.323
SIGNIFICANCE	NS	**	**	**	**	NS
CV%	1	3.71	3.89	7.15	6.8	13.59
GM	6420	10.67	68.51	19.45	124.8	4.51
SE PER PLOT	83.4	0.396	2.668	1.391	8.44	0.612

Trial Id: 6271
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TABLE 4

MAIN EFFECTS

	TOTAL VOLUME OF LEACHATE (MLS)	K IN LEACHATE PPM	TOTAL LEACHATE mg OF K	S IN LEACHATE PPM	TOTAL LEACHATE S (mg)	SOIL CORE S ppm
Treatments						
Control	6455 a	8.90 a	57.45 a	2.88 a	18.7 a	3.83 a
Ammonium sulphate 24% S	6518 a	10.43 b	67.88 b	22.05 b	143.6 b	4.63 a
Calcium sulphate 16.2% S	6461 a	10.23 b	66.11 b	20.35 b	131.4 b	5.98 a
Tiger 90 90% S	6471 a	9.35 a	60.51 a	1.63 a	10.5 a	6.25 a
Fibrophos 2.49% S	6449 a	10.50 b	67.71 b	20.65 b	133.2 b	4.05 a
LSD (0.05)	153.4	0.708	4.778	3.391	21.46	2.922
LSD (0.01)	215.1	0.993	6.698	4.753	30.08	4.096
SIGNIFICANCE	NS	**	**	**	**	NS
CV% GM	2 6471	4.65 9.88	4.85 63.93	16.29 13.51	15.9 87.5	38.35 4.95
SE PER PLOT	99.6	0.460	3.101	2.201	13.93	1.896

Trial Id: 6270

Client & Client Ref: John Hatcher & Co Ltd

LA Project 627

MAIN EFFECTS

TABLE 5

	TOTAL DRY WEIGHT (g) 24/5/96	TOTAL DRY WEIGHT (g) 12/6/96	TOTAL DRY WEIGHT (g) 3/7/96	GRASS TOTAL DRY WEIGHT (g)	GRASS S UPTAKE MG/POT 24/5/96	GRASS S UPTAKE MG/POT 12/6/96	GRASS S UPTAKE MG/POT 3/7/96	GRASS TOTAL S UPTAKE MG/POT
Treatments								
Control	10.20 a	11.68 a	6.89 a	28.77 a	18.46 a	14.60 a	6.82 a	39.89 a
Ammonium sulphate 24% S	10.49 a	12.53 a	6.89 a	29.91 a	21.29 a	15.42 ab	6.68 a	43.39 a
Calcium sulphate 16.2% S	10.07 a	12.93 a	7.02 a	30.01 a	20.15 a	16.29 b	7.23 a	43.66 a
Tiger 90 90% S	9.24 a	12.37 a	7.12 a	28.73 a	18.66 a	15.34 ab	7.12 a	41.12 a
Fibrophos 2.49% S	10.29 a	12.91 a	7.25 a	30.45 a	22.11 a	16.53 b	6.89 a	45.53 a
LSD (0.05)	2.993	1.228	0.666	3.108	5.878	1.535	0.665	5.766
LSD (0.01)	4.196	1.722	0.933	4.357	8.240	2.152	0.932	8.083
SIGNIFICANCE	NS	NS	NS	NS	NS	NS	NS	NS
CV%	19.32	6.38	6.14	6.82	18.95	6.37	6.21	8.76
GM	10.06	12.49	7.03	29.57	20.13	15.63	6.95	42.72
SE PER PLOT	1.943	0.797	0.432	2.017	3.815	0.997	0.431	3.742

Trial Id: 6271

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TABLE 6

MAIN EFFECTS

Treatments	TOTAL DRY WEIGHT (g) 24/5/96	TOTAL DRY WEIGHT (g) 12/6/96	TOTAL DRY WEIGHT (g) 3/7/96	GRASS TOTAL DRY WEIGHT (g)	GRASS S UPTAKE MG/POT 24/5/96	GRASS S UPTAKE MG/POT 12/6/96	GRASS S UPTAKE MG/POT 3/7/96	GRASS TOTAL S UPTAKE MG/POT
Control	9.12 ab	13.92 a	7.74 a	30.77 a	18.24 a	16.98 a	6.73 a	41.94 a
Ammonium sulphate 24% S	7.11 a	15.25 a	8.56 ab	30.92 a	17.92 a	18.30 a	7.27 ab	43.49 a
Calcium sulphate 16.2% S	10.75 b	14.96 a	8.14 ab	33.85 bc	24.94 a	17.95 a	6.51 a	49.40 b
Tiger 90 90% S	9.57 ab	15.75 a	9.71 b	35.03 c	21.53 a	18.90 a	8.54 b	48.97 b
Fibrofos 2.49% S	9.86 ab	14.48 a	8.15 ab	32.49 ab	21.89 a	16.94 a	7.01 a	45.84 ab
LSD (0.05)	2.907	1.858	1.661	2.159	6.531	2.217	1.421	4.342
LSD (0.01)	4.075	2.604	2.328	3.026	9.155	3.108	1.991	6.087
SIGNIFICANCE	NS	NS	NS	**	NS	NS	+	**
CV%	20.33	8.11	12.75	4.30	20.28	8.08	12.78	6.14
GM	9.28	14.87	8.46	32.61	20.90	17.81	7.21	45.93
SE PER PLOT	1.887	1.206	1.078	1.401	4.239	1.439	0.922	2.818