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88/R/CS/10 and 88/W/CS/10 Long-term Liming - Linseed

Rothamsted Research

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88/R/CS/10 and 88/W/CS/10

LONG TERM LIMING

Object: To study the effects of different amounts of lime and phosphate on the yields and compositions of a sequence of crops. Rothamsted (R) Sawyers I and Woburn (W) Stackyard C.

Sponsor: S.P. McGrath.

The 27th year, linseed.

For previous years see 'Details' 1967, 1973 and 74-87/R&W/CS/10.

Design: 2 randomised blocks of 16 plots split into 2.

Whole plot dimensions: 6.40 x 18.3.

Treatments: All combinations of:-

Whole plots

1. **CHALK** Residual effects of ground chalk (tonnes CaCO₃) (total applied 1962-87):

R	W	Rothamsted total		Woburn total	
		1962-78	1982-87	1962-78	1982-87
0	0	0	0	0	0
15	9	7	8	6	3
24.5	25.5	15	9.5	14	11.5
52.5	45.5	30	22.5	23	22.5

2. **P** Effects of P fertilizer applied:

	Until 1978		1981	1982	1983		1988	
	R & W	R & W	R & W	R & W	R	W	R	W
0	0	0	0	0	0	0	0	0
P1	0	P1	P1	0	P2	P1	P1	P1
P2	P	P1	0	P2	P2	P1	P1	P1
P3	P	P3	P1	P2	P4	P3	P3	P3

Rates 1981-83 P1, P2, P3, P4 = 25, 50, 75, 100 kg P as superphosphate

Sub plots

3. **MANGNESE** Manganese, cumulative to earlier applications:

0	None
MN	Manganese sprays

- NOTES:** (1) Until 1978 test P was applied cumulatively, rates varied with crop, K was also applied cumulatively, to P1 and P3 plots. Since 1981 K has been applied basally (none in 1986 and 1987).
 (2) On Sawyers I (R) manganese was applied at 0.15 kg Mn, as manganese chelate, in 260 l on 20 June, 1988, repeated in 200 l on 19 July.
 (3) On Stackyard C (W) manganese was applied at 0.16 kg Mn in 220 l on 15 June and at 0.15 kg Mn with sulphur at 0.12 kg S in 220 l on 15 July.

88/R/CS/10 and 88/W/CS/10

Basal applications:

Sawyers I (R): Manures: 'Nitram' at 250 kg. Muriate of potash at 160 kg. Kieserite at 270 kg. Weedkiller: Trifluralin at 1.1 kg in 450 l. Desiccant: Diquat 0.60 kg ion applied with a wetting agent ('Agral' at 0.50 l) in 240 l.

Stackyard C (W): Manures: 'Nitram' at 250 kg. Muriate of potash at 160 kg. Kieserite at 110 kg. Weedkillers: Trifluralin at 0.84 kg in 200 l. Linuron at 0.26 kg in 220 l. Desiccant: Diquat at 0.60 kg ion in 400 l.

Seed: Antares, dressed iprodione and benomyl, sown at 87 kg (R).
Antares, dressed benomyl, sown at 80 kg (W).

Cultivations, etc.:-

Sawyers I (R): P treatments, K and Mg applied: 14 Dec, 1987.

Ploughed: 15 Dec. Heavy spring-tine cultivated: 5 Apr, 1988. N applied: 7 Apr. Weedkiller applied, spring-tine cultivated twice: 12 Apr. Rotary harrowed, seed sown, harrowed: 13 Apr. Desiccant applied: 19 Sept. Combine harvested: 24 Oct.

Stackyard C (W): P treatments, K and Mg applied: 10 Feb, 1988.

Ploughed: 23 Feb. Heavy spring-tine cultivated: 5 Apr. N applied, spike harrowed with crumbler attached, trifluralin applied, spike harrowed with crumbler attached, seed sown: 22 Apr. Linuron applied: 5 May. Desiccant applied: 21 Sept. Combine harvested: 1 Nov.

NOTE: At Rothamsted treatment combinations with **CHALK 0** did not give a measurable yield.

88/R/CS/10 SAWYERS I (R)

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

***** Tables of means *****

P	0	P1	P2	P3	Mean
CHALK					
15	2.53	2.57	2.78	2.89	2.69
24.5	2.57	2.90	2.76	2.84	2.77
52.5	2.62	2.81	2.62	2.59	2.66
Mean	2.57	2.76	2.72	2.77	2.70
MANGNESE	0	MN	Mean		
CHALK					
15	2.73	2.65	2.69		
24.5	2.78	2.76	2.77		
52.5	2.65	2.66	2.66		
Mean	2.72	2.69	2.70		

88/R/CS/10 SAWYERS I (R)

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

***** Tables of means *****

MANGNESE P	O	MN	Mean
0	2.60	2.55	2.57
P1	2.83	2.69	2.76
P2	2.67	2.77	2.72
P3	2.79	2.76	2.77
Mean	2.72	2.69	2.70

CHALK	MANGNESE P	O	MN
15	0	2.59	2.48
	P1	2.52	2.62
	P2	2.85	2.70
	P3	2.95	2.82
24.5	0	2.55	2.59
	P1	3.07	2.73
	P2	2.62	2.90
	P3	2.88	2.80
52.5	0	2.66	2.57
	P1	2.91	2.71
	P2	2.53	2.72
	P3	2.52	2.65

*** Standard errors of differences of means ***

CHALK P	CHALK MANGNESE	P MANGNESE	CHALK P
0.136	0.157	0.047	0.272
CHALK MANGNESE	P MANGNESE	CHALK P	CHALK MANGNESE
0.148	0.171	0.295	
Except when comparing means with the same level(s) of			
CHALK	0.082		
P	0.094		
CHALK.P		0.163	

***** Stratum standard errors and coefficients of variation *****

Stratum	d.f.	s.e.	cv%
BLOCK.WP	11	0.272	10.1
BLOCK.WP.SP	12	0.163	6.0

GRAIN MEAN DM% 59.8

SUB PLOT AREA HARVESTED 0.00177

88/W/CS/10 STACKYARD C (W)

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

***** Tables of means *****

P	0	P1	P2	P3	Mean
CHALK					
0	0.82	1.07	1.72	1.65	1.31
9	2.40	2.90	2.81	2.94	2.76
25.5	2.69	2.69	2.68	3.00	2.77
45.5	2.26	2.48	2.41	2.74	2.47
Mean	2.04	2.29	2.41	2.58	2.33
MANGNESE	O	MN	Mean		
CHALK					
0	1.27	1.36	1.31		
9	2.77	2.75	2.76		
25.5	2.81	2.72	2.77		
45.5	2.42	2.53	2.47		
Mean	2.32	2.34	2.33		
MANGNESE	O	MN	Mean		
P					
0	2.00	2.08	2.04		
P1	2.34	2.23	2.29		
P2	2.36	2.45	2.41		
P3	2.56	2.61	2.58		
Mean	2.32	2.34	2.33		
CHALK	MANGNESE	O	MN		
0	P				
	0	0.74	0.90		
	P1	0.97	1.16		
	P2	1.62	1.81		
	P3	1.73	1.57		
9	0	2.34	2.46		
	P1	2.96	2.85		
	P2	2.81	2.82		
	P3	2.99	2.88		
25.5	0	2.82	2.57		
	P1	2.85	2.53		
	P2	2.64	2.72		
	P3	2.93	3.08		
45.5	0	2.11	2.41		
	P1	2.59	2.37		
	P2	2.39	2.43		
	P3	2.59	2.89		

88/W/CS/10 STACKYARD C (W)

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

*** Standard errors of differences of means ***

CHALK	P	MANGNESE	CHALK P
0.154	0.154	0.057	0.308
CHALK MANGNESE	P MANGNESE	CHALK P MANGNESE	
0.174	0.174	0.348	
Except when comparing means with the same level(s) of			
CHALK	0.114		
P	0.114		
CHALK.P		0.229	

***** Stratum standard errors and coefficients of variation *****

Stratum	d.f.	s.e.	cv%
BLOCK.WP	15	0.308	13.2
BLOCK.WP.SP	16	0.229	9.8

GRAIN MEAN DM% 83.7

SUB PLOT AREA HARVESTED 0.00185