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89/R/CS/10 and 89/W/CS/10 Long-term Liming - S. Beans

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89/R/CS/10 and 89/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, J.M. McEwen, D.P. Yeoman.

The 28th year, s. beans.

For previous years see 'Details' 1967, 1973 and 74-88/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** Residual 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	0	P2	P2	P1	P1
P3	P	P3	P1	P1	P2	P4	P3	P3

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

Sub plots

3. **MANGNESE** Manganese in 1989, 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, 1987 and 1989).
- (2) Manganese was applied at 0.19 kg Mn, as 'Vytel', in 200 l on 17 May, 1989 (R), in 220 l on 22 May (W) repeated at 0.10 kg Mn in 200 l on 13 June (R), in 220 l on 15 June (W).

89/R/CS/10 and 89/W/CS/10

Basal applications:

Sawyers I (R): Weedkillers: Simazine at 0.17 kg and trietazine at 1.2 kg in 200 l. Fungicides: Benomyl at 0.55 kg in 200 l. Fenpropimorph at 0.75 kg in 200 l. Insecticides: Deltamethrin at 7.5 g in 400 l applied on two occasions. Pirimicarb at 0.14 kg in 200 l.

Stackyard C (W): Weedkillers: Simazine at 0.14 kg and trietazine at 1.0 kg in 220 l. Alloxym-sodium at 1.5 kg in 220 l. Fungicides: Fenpropimorph at 0.75 kg in 220 l. Benomyl at 0.55 kg applied with a wetting agent in 220 l. Insecticides: Deltamethrin at 6.2 g in 220 l and at 7.5 g in 220 l on a second occasion. Pirimicarb at 0.14 kg in 220 l.

Seed: Alfred, sown at 200 kg (R & W).

Cultivations, etc.:-

Sawyers I (R): Ploughed: 20 Dec, 1988. Heavy spring-tine cultivated, rotary harrowed: 29 Mar, 1989. Rotary harrowed, seed sown, harrowed, rolled: 30 Mar. Weedkiller applied: 31 Mar. Deltamethrin applied: 10 May and 31 May. Pirimicarb applied: 14 June. Benomyl and fenpropimorph applied: 14 July. Combine harvested: 14 Aug.

Stackyard C (W): Ploughed: 14 Dec, 1988. Spring-tine cultivated: 28 Mar, 1989. Rotary harrowed, seed sown: 31 Mar. Simazine and trietazine applied: 21 Apr. Deltamethrin applied: 22 May and 7 June. Alloxym-sodium applied: 7 June. Pirimicarb applied: 22 June. Benomyl and fenpropimorph applied: 12 July. Combine harvested: 22 Aug.

- NOTES:** (1) Establishment counts were made and components of yield were measured at maturity.
 (2) Soils were sampled for pH, P, K and Mg.
 (3) Most CHALK 0 plots failed and yields of the rest of these plots were negligible. They have been omitted from the analysis.

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

GRAIN TONNES/HECTARE

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

	P	0	P1	P2	P3	Mean
CHALK						
15		0.80	0.71	0.94	1.16	0.90
24.5		0.84	1.22	1.06	1.03	1.04
52.5		1.12	1.48	1.52	1.47	1.40
Mean		0.92	1.14	1.17	1.22	1.11
MANGNESE						
CHALK						
15		0.96	0.84	0.90		
24.5		1.06	1.01	1.04		
52.5		1.50	1.30	1.40		
Mean		1.17	1.05	1.11		

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

GRAIN TONNES/HECTARE

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

MANGNESE P	O	MN	Mean
0	0.95	0.89	0.92
P1	1.17	1.10	1.14
P2	1.29	1.05	1.17
P3	1.29	1.15	1.22
Mean	1.17	1.05	1.11

	MANGNESE P	O	MN
CHALK 15	0	0.78	0.82
	P1	0.67	0.75
	P2	1.18	0.69
	P3	1.21	1.11
24.5	0	0.93	0.75
	P1	1.05	1.38
	P2	1.03	1.08
	P3	1.24	0.82
52.5	0	1.13	1.11
	P1	1.80	1.16
	P2	1.64	1.39
	P3	1.42	1.52

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

	CHALK	P	MANGNESE	CHALK P
	0.203	0.234	0.099	0.405
	CHALK MANGNESE	P MANGNESE	CHALK P MANGNESE	
	0.236	0.273	0.472	
Except when comparing means with the same level(s) of				
CHALK	0.171			
P		0.198		
CHALK.P			0.342	

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	11	0.405	36.5
BLOCK.WP.SP	12	0.342	30.8

GRAIN MEAN DM% 87.4

SUB PLOT AREA HARVESTED 0.00200

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

GRAIN TONNES/HECTARE

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

P	0	P1	P2	P3	Mean
CHALK					
9	0.68	0.58	0.34	0.85	0.61
25.5	1.17	0.50	1.01	1.33	1.00
45.5	1.17	1.44	1.21	1.38	1.30
Mean	1.01	0.84	0.85	1.19	0.97
MANGNESE					
O	MN		Mean		
CHALK					
9	0.59	0.64	0.61		
25.5	0.97	1.04	1.00		
45.5	1.21	1.39	1.30		
Mean	0.92	1.02	0.97		
MANGNESE					
O	MN		Mean		
P					
0	0.91	1.10	1.01		
P1	0.84	0.84	0.84		
P2	0.76	0.95	0.85		
P3	1.19	1.19	1.19		
Mean	0.92	1.02	0.97		
MANGNESE					
O	MN				
CHALK					
P					
9	0	0.75	0.61		
	P1	0.59	0.57		
	P2	0.29	0.39		
	P3	0.73	0.97		
25.5	0	0.97	1.37		
	P1	0.57	0.43		
	P2	0.96	1.05		
	P3	1.36	1.30		
45.5	0	1.01	1.33		
	P1	1.35	1.52		
	P2	1.01	1.40		
	P3	1.46	1.31		

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

GRAIN TONNES/HECTARE

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

	CHALK	P	MANGNESE	CHALK
	0.162	0.187	0.052	P 0.324
	CHALK	P	CHALK	
	MANGNESE	MANGNESE	P	
	0.174	0.201	MANGNESE 0.348	
Except when comparing means with the same level(s) of				
CHALK	0.090			
P		0.104		
CHALK.P			0.180	

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	11	0.324	33.3
BLOCK.WP.SP	12	0.180	18.5

GRAIN MEAN DM% 88.8

SUB PLOT AREA HARVESTED 0.00265