



Yields of the Field Experiments 1987

[Full Table of Content](#)



87/R/CS/10 and 87/W/CS/10 Long-term Liming - Lupins

Rothamsted Research

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87/R/CS/10 and 87/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.

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The 26th year, *Lupinus albus*.

For previous years see 'Details' 1967, 1973 and 74-86/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	
	R & W		R & W		R & W		R	W
0	0		0		0		0	0
P1	0		P1		P1		0	P2
P2	P		P1		0		P2	P2
P3	P		P3		P1		P2	P4

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

Sub plots

3. MANGNESE Manganese applied in 1987:

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 as manganese lignin polycarboxylate ('Stoller Manganese' at 3.0 l in 200 l on 5 June, 1987 and at 9.0 l in 200 l on 11 Aug).
(3) On Stackyard C (W) manganese was applied at 0.19 kg Mn on 4 June, 1987 and 0.57 kg Mn on 4 Aug as manganese sulphate in 200 l.

87/R/CS/10 and 87/W/CS/10

Basal applications:-

Sawyers I (R): Weedkillers: Terbutryne at 0.98 kg with terbuthylazine at 0.42 kg in 200 l. Fungicide: Benomyl at 0.50 kg applied with the insecticide and a wetting agent ('Agral' at 0.06 l) in 200 l. Insecticide: Pirimicarb at 0.14 kg.

Stackyard C (W): Weedkillers: Glyphosate at 1.4 kg in 200 l. Terbutryne at 0.56 kg with terbuthylazine at 0.24 kg in 240 l. Fungicide: Benomyl at 1.0 kg applied with the pirimicarb and a wetting agent ('Enhance' at 0.06 l) in 200 l. Insecticides: Deltamethrin at 0.038 kg in 200 l. Pirimicarb at 0.15 kg.

Seed: Sawyers I (R): Vladimir, sown at 260 kg.

Stackyard C (W): Vladimir, sown at 250 kg.

Cultivations, etc.:-

Sawyers I (R): Chalk treatments applied: 13 Nov, 1986. Ploughed: 14 Nov. Spring-tine cultivated, rotary harrowed, seed sown, harrowed: 31 Mar, 1987. Weedkillers applied: 13 Apr. Fungicide and insecticide applied: 9 July. Combine harvested: 17 Nov.

Stackyard C (W): Glyphosate applied: 16 Sept, 1986. Chalk treatments applied: 13 Nov. Ploughed: 28 Nov. Spike harrowed with crumbler attached, seed sown: 6 Apr, 1987. Harrowed, terbutryne and terbuthylazine applied: 13 Apr. Deltamethrin applied: 8 May. Benomyl and pirimicarb applied: 13 July. Combine harvested: 18 Nov.

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

GRAIN TONNES/HECTARE

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

P	0	P1	P2	P3	Mean
CHALK					
0	0.71	1.33	2.28	2.97	1.82
15	2.86	2.25	3.47	2.65	2.81
24.5	2.98	2.24	3.69	2.56	2.87
52.5	2.87	2.31	4.04	3.17	3.10
Mean	2.36	2.03	3.37	2.84	2.65
MANGNESE	0	MN	Mean		
CHALK					
0	1.89	1.76	1.82		
15	2.69	2.92	2.81		
24.5	2.98	2.75	2.87		
52.5	3.04	3.15	3.10		
Mean	2.65	2.64	2.65		
MANGNESE	0	MN	Mean		
P					
0	2.38	2.33	2.36		
P1	2.12	1.94	2.03		
P2	3.32	3.42	3.37		
P3	2.78	2.89	2.84		
Mean	2.65	2.64	2.65		

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

GRAIN TONNES/HECTARE

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

	CHALK	MANGNESE	0	MN
	0	P		
		0	0.66	0.77
		P1	1.41	1.25
		P2	2.25	2.32
		P3	3.24	2.71
15		0	2.73	2.98
		P1	2.27	2.22
		P2	3.52	3.43
		P3	2.26	3.03
24.5		0	3.02	2.94
		P1	2.48	1.99
		P2	3.86	3.52
		P3	2.56	2.56
52.5		0	3.10	2.64
		P1	2.31	2.32
		P2	3.68	4.40
		P3	3.08	3.25

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

Table	CHALK	P	MANGNESE	CHALK P
s.e.d.	0.233	0.233	0.114	0.466

Table	CHALK MANGNESE	P MANGNESE	CHALK P MANGNESE
s.e.d.	0.283	0.283	0.567
Except when comparing means with the same level(s) of			
CHALK	0.228		
P		0.228	
CHALK.P			0.456

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	15	0.466	17.6
BLOCK.WP.SP	16	0.456	17.2

GRAIN MEAN DM% 65.2

SUB PLOT AREA HARVESTED 0.00177

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

GRAIN TONNES/HECTARE

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

P	0	P1	P2	P3	Mean
CHALK					
0	2.17	1.99	1.87	1.81	1.96
9	1.91	1.72	1.66	1.55	1.71
25.5	2.04	1.44	1.38	1.57	1.61
45.5	1.98	1.49	1.68	1.31	1.62
Mean	2.03	1.66	1.65	1.56	1.72
MANGNESE	0	MN	Mean		
CHALK					
0	2.09	1.83	1.96		
9	1.72	1.70	1.71		
25.5	1.57	1.64	1.61		
45.5	1.68	1.56	1.62		
Mean	1.77	1.68	1.72		
MANGNESE	0	MN	Mean		
P					
0	2.12	1.94	2.03		
P1	1.73	1.60	1.66		
P2	1.57	1.73	1.65		
P3	1.66	1.46	1.56		
Mean	1.77	1.68	1.72		
CHALK	MANGNESE	0	MN		
0	P				
	0	2.63	1.72		
	P1	1.82	2.17		
	P2	1.84	1.90		
	P3	2.08	1.54		
9	0	1.95	1.88		
	P1	1.89	1.56		
	P2	1.35	1.97		
	P3	1.71	1.39		
25.5	0	1.78	2.29		
	P1	1.47	1.41		
	P2	1.37	1.40		
	P3	1.67	1.46		
45.5	0	2.09	1.87		
	P1	1.74	1.25		
	P2	1.71	1.66		
	P3	1.17	1.44		

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

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

Table	CHALK	P	MANGNESE	CHALK P
s.e.d.	0.107	0.107	0.098	0.214

Table	CHALK MANGNESE	P MANGNESE	CHALK P MANGNESE
s.e.d.	0.175	0.175	0.351
Except when comparing means with the same level(s) of			
CHALK	0.197		
P		0.197	
CHALK.P			0.393

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

Stratum	d.f.	s.e.	cv%
BLOCK.WP	15	0.214	12.4
BLOCK.WP.SP	16	0.393	22.8

GRAIN MEAN DM% 60.3

SUB PLOT AREA HARVESTED 0.00172