ROTHAMSTED RESEARCH

Yields of the Field Experiments 2009

Full Table of Content

R/EX/4 Exhaustion Land

Rothamsted Research

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09/R/EX/4

EXHAUSTION LAND

Object: To study the residual effects of manures applied 1856 - 1901, and of additional phosphate applied since 1986, on the yield of continuous s. barley up to 1991, w. wheat since – Hoosfield.

The 154th year, w. wheat.

For previous years see 'Details' 1977, 1973 and Yield Books for 74-08/R/EX/4

Treatments: All combinations of:-

Whole plots (P test)

1. **OLD RES** Residues of manures applied annually 1876 – 1901:

O	None
D	Farmyard manure at 35 t
N	96 kg N as ammonium salts
P	34 kg P as superphosphate
NPKNAMG	N and P as above plus 137 kg K as sulphate of potash, 16 kg Na as sulphate of soda, 11 kg Mg as sulphate of magnesia

2. **P** Maintenance P (20 kg P) applied annually from 2000 to maintain existing levels of available P In the soil. (P1) (P2) and (P3) are residues of P applied annually 1986–1992:

	2000-09	1986-92
O	None	None
P (P1)	20 kg P	44 kg P
P (P2)	20 kg P	87 kg P
P (P3)	20 kg P	131 kg P

NOTE: P treatments were applied at 61.5 kg P in error in 2000.

Plus

Whole plots (K test, previously N test until 1991

1. OLD RES Residues of manures applied annually 1876 – 1901:

O	None
D	Farmyard manure at 35 t
N*	96 kg N as nitrate of soda
PK	34 kg P as superphosphate, 137 kg K as sulphate of potash
N*PK	N, P and K as above

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09/R/EX/4

2. K Potassium applied annually from 2007 as muriate of potash

O	None
K1	75 kg K_2O (62.2 kg K)
K2	150 kg K_2O (124.5 kg K)

Whole plots
Nitrogen: 50 kg N as ammonium sulphate (to supply sufficient S) during first two weeks in March, 200 kg N as ammonium nitrate at GS31/mid-April (whichever comes first) and 50 kg N as ammonium nitrate at GS37 (not later than mid-May)

Experimental diary

K Test:			Rate	Unit
30-Sep-08	f	Basal P (triple superphosphate) – plots 02, 04, 06, 08 and 10	75.00	kg/ha
	f	Muriate of Potash, plots 23, 43, 63, 83 & 103	125.00	kg/ha
	f	Muriate of Potash, plots 24, 44, 64, 84, 104	250.00	kg/ha

P Test			Rate	Unit
30-Sep-08	f	Triple Superphosphate – plots 011 – 013, 031 – 033, 051 – 053, 071 – 073 and 091-093	75.00	kg/ha
	f	Muriate of Potash, plots 01,03, 05, 07 & 09	250.00	kg/ha

All plots			Rate	Unit
06-Oct-08	a	Plough/ N		
11-Oct-08	a	Cultipressed		
16-Oct-08	a	Power Harrowed		
	a	Combination Drilled		
	s	XI-19 tr Redigo Deter	350.00	seeds/m2
18-Oct-08	p	Liberator	0.60	l/200 l/ha
17-Dec-08	p	Stomp 400 SC	3.30	lt/ha
	p	Arelon 500	3.00	lt/ha
	p	Hallmark with Zeon Technology	50.00	ml/ha
09-Mar-09	f	Ammonium Sulphate	238.00	kg/ha
25-Mar-09	f	Kieserite	80.00	kg/ha
14-Apr-09	p	Pacifica	0.40	kg/ha
20-Apr-09	f	Nitram	580.00	kg/ha
	p	Cherokee	1.00	l/ha
02-May-09	p	Splice	1.00	l/ha
	p	Bravo 500	1.00	l/ha
	p	Talius	0.13	l/ha
	p	BASF 3C Chlormequat 720	2.25	l/ha
04-May-09	p	Ally Max SX	42.00	g/ha
	p	Agriguard Fluroxypyr	0.75	l/ha

https://doi.org/10.23637/ERADOC-1-219

09/R/EX/4

			Rate	Unit
13-May-09	f	Nitram	145.00	kg/ha
16-May-09	a	Mow / Rotavate paths		
28-May-09	p	Brutus	1.50	l/ha
	p	Amistar Opti	1.25	l/ha
02-Jun-09	a	Mow / Rotavate paths		
29-Jun-09	a	Mow / Rotavate paths		
15-Aug-09	a	Combine harvest, plots for yield		
	a	Sample, bale and weigh straw		

NOTE: Samples of grain and straw were taken for chemical analysis.

P TEST

GRAIN TONNES/HECTARE

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

P_RES / OLD_RES	O	P(P1)	P(P2)	P(P3)	Mean
O	2.64	5.05	5.21	5.62	4.63
D	4.04	6.74	6.96	7.14	6.22
N	2.23	5.43	6.17	6.30	5.03
P	3.38	5.89	6.78	6.95	5.75
NPKNAMG	3.65	5.46	6.40	7.05	5.64
Mean	3.19	5.71	6.30	6.61	5.45

GRAIN MEAN DM% 84.4

STRAW TONNES/HECTARE

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

P_RES / OLD_RES	O	P(P1)	P(P2)	P(P3)	Mean
O	1.25	2.64	2.94	3.34	2.54
D	2.12	4.02	4.17	4.29	3.65
N	1.32	3.29	3.21	3.63	2.86
P	1.72	3.48	3.85	3.75	3.20
NPKNAMG	1.96	3.38	3.86	4.39	3.40
Mean	1.67	3.36	3.61	3.88	3.13

STRAW MEAN DM% 89.1%

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09/R/EX/4

K TEST

GRAIN TONNES/HECTARE

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

K_Test	K0	K1	K2	Mean
OLD_RES				
O	5.46	7.14	7.36	6.35
D	6.72	7.92	7.93	7.32
N*	5.85	7.00	7.38	6.52
PK	6.90	7.16	7.12	7.02
N*PK	6.44	6.67	7.52	6.77
Mean	6.27	7.18	7.46	6.80
rep.	10	5	5	

Standard errors of differences of means

Table	OLD_RES	K_Test	OLD_RES K_Test	
s.e.d.		0.284	0.634	min.rep
	0.317	0.246	0.549	max-min
		0.201X	0.448	max.rep

(No comparisons in categories where s.e.d. marked with an X)

Grain mean dm% 84.4

STRAW TONNES/HECTARE

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

K_Test	K0	K1	K2	Mean
OLD_RES				
O	2.68	3.89	3.99	3.31
D	3.34	4.20	4.42	3.83
N*	2.86	3.97	4.41	3.53
PK	3.79	4.15	4.04	3.94
N*PK	3.37	3.71	4.37	3.70
Mean	3.21	3.99	4.25	3.66
rep.	10	5	5	

Standard errors of differences of means

Table	OLD_RES	K_Test	OLD_RES K_Test	
s.e.d.		0.229	0.513	min.rep
	0.256	0.199	0.444	max-min
		0.162X	0.363	max.rep

(No comparisons in categories where s.e.d. marked with an X)

Straw mean dm% 89.5

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