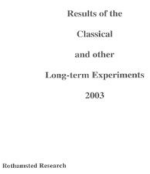
ROTHAMSTED RESEARCH

Yields of the Field Experiments 2003



Full Table of Content

03/R/HB/2 - Hoos Barley

Rothamsted Research

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03/R/HB/2

HOOS BARLEY

Object: To study the effects of organic manures and inorganic fertilisers on continuous s. barley. From 1968 to 1978 a rotation of potatoes, beans and s. barley was practised. The rotation was discontinued in 1979 and continued in s. barley. The experiment was modified for 2003. The Main plots continue as previously. The Silicate Test plots continue but are not split to test rates of N (basal N is applied). The remaining plots are to be used to study the effect on yield of P residues.

The 152nd year, s. barley.

For previous years see 'Details' 1967 and 1973, Station Report for 1966 and 74-02/HB/2.

Main plots

Treatments: ~~All combinations of:-~~

Whole plots

1. **MANURE** Plot Fertilizers and organic manures:

		Form of N 1852-1966	Additional treatments 1852-2002	Treatments since 2003
---	11	None	-	-
-P-	21	None	P	(P)
--K	31	None	K(Na)Mg	K(Mg)
-PK	41	None	PK(Na)Mg	(P)K(Mg)
A--	12	A	-	-
AP-	22	A	P	(P)
A-K	32	A	K(Na)Mg	K(Mg)
APK	42	A	PK(Na)Mg	(P)K(Mg)
D1852	72	None	D	D
(D)	71	None	(D)	(D)
(A)	62	None	(Ashes)	(Ashes)
-	61	None	-	-
D2001[a]	73[a]	-	D	D
P2KMg[a]	63[a]	-	P2KMg	P2KMg

[a] Plots 63 and 73 started in 2001

Form of N: A, sulphate of ammonia to supply 48kg N
P: 35 kg P as triple superphosphate in 1974 and from 1988 to 2002, single superphosphate in other years
(P): (none), P application to be reviewed for 2008
P2: 44 kg P as triple superphosphate since 2001.
K: 90 kg K as sulphate of potash
(Na): (none)16 kg Na as sulphate of soda until 1973
Mg: 35 kg Mg as kieserite every third year since 1974 (applied at 30 kg in 1992, 1995 and 1998)(sulphate of magnesia annually until 1973). Annually to new plot 63.
(Mg): (none), Mg application to be reviewed for 2008
D1852: Farmyard manure at 35 t since 1852.
D2001: Farmyard manure at 35 t since 2001
(D): Farmyard manure 1852 - 1871 only
(Ashes): Weed ash 1852-1916, furnace ash 1917-1932, none since

Sub-plots

2. **N** Nitrogen fertilizer (kg N), as 'Nitro-Chalk', since 1968 (cumulative N applications until 1973, on a cyclic system since 1974):

0
48

96
144

Silicate Test plots

Treatments :

Whole plots
MANURE Plot Fertilizers:

		Additional treatment 1852-1979	Changes since 1980	Treatments since 2003
N----	131	-	-	N3
NP---	231	P	-	N3(P)
N-K--	331	K(Na)Mg	-	N3 K(Mg)
NPK--	431	PK(Na)Mg	-	N3(P)K(Mg)
N--S-	134	Si	Si omitted	N3 (Si)
NP-S-	234	P Si	"	N3(P) (Si)
N-KS-	334	K(Na)MgSi	"	N3 K(Mg)(Si)
NPKS-	434	PK(Na)MgSi	"	N3(P)K(Mg)(Si)
N---S	132	-	Si added	N3 Si
NP--S	232	P	"	N3(P) Si
N-K-S	332	K(Na)Mg	"	N3 K(Mg) Si
NPK-S	432	PK(Na)Mg	"	N3(P)K(Mg) Si
N--SS	133	Si	-	N3 Si
NP-SS	233	P Si	-	N3(P) Si
N-KSS	333	K(Na)MgSi	-	N3 K(Mg) Si
NPKSS	433	PK(Na)MgSi	-	N3(P)K(Mg) Si

N: From 1852-1966 whole plots received 48kg N as nitrate of soda. Between 1968-2002 whole plots were split to test 4 rates of N as "Nitro-chalk"(cumulative applications until 1973, on a cyclic system from 1974).
N3: Basal N, 144kg as "Nitro-chalk" since 2003
Si: Silicate of soda at 450kg (Note: S also refers to silicate of soda)
(Si): Silicate of soda omitted since 1980
P, (P), K, Mg, (Mg), (Na): as above

P Test plots

Treatments:

Since 2003 the remaining plots [ex-Castor meal (plots 14, 24, 34 & 44) and those testing combinations of NPK with and without Mg (plots 55, 56, 57 & 58)] have been used to study the effect of P residues on yield. Previous treatments have resulted in different levels of available P in the soil. Large dressings of K were applied to some plots to increase levels of exchangeable K in the soil such that K should not limit yield; plots 141 and 241 were sacrificed and used as discard areas so that the K applications did not encroach on adjacent no K plots on the Silicate Test. Other plots received the normal rate of K. The level of exchangeable Mg in the soil is such that Mg should not limit yield; the need to apply Mg will be reviewed for 2008.

Whole plots
Manure

Plot	Treatment since 2003
142	N3K*
143	N3K*
144	N3K*
242	N3K*
243	N3K*
244	N3K*
341	N3K
342	N3K
343	N3K

344	N3K
441	N3K
442	N3K
443	N3K
444	N3K
551	N3K
552	N3K
561	N3K
562	N3K
571	N3K*
572	N3K*
581	N3K*
582	N3K*

N3: Basal N, 144kg as "Nitro-chalk"
K : 90kg K as sulphate of potash
K*: 450kg K as sulphate of potash

Experimental diary:

08-Jan-03	**T**	:	K, K*, P2, Si, Mg (to plot 63) applied.
09-Jan-03	**T**	:	FYM, applied.
10-Jan-02	B	:	Ploughed 25 cm wide furrow.
20-Feb-03	B	:	Combination drilled, Optic, tr. Raxil S, at 350 seeds/m^2 with the Accord 1 drill.
21-Mar-03	B	:	Rolled.
31-Mar-03	P	:	Sprayed paths.
03-Apr-03	**T**	:	N (27.5% N) applied by hand.
22-Apr-03	B	:	tm)Ally at 30 g in 200 l.
	B	:	tm)Oxytril CM at 0.75 l in 200 l.
11-May-03	B	:	tm)Opus at 0.25 l in 200 l.
	B	:	tm)Unix at 0.4 kg in 200 l.
	B	:	tm)Amistar at 0.4 l in 200 l.
08-Jun-03	B	:	tm)Acanto at 0.4 l in 200 l.
	B	:	tm)Opus at 0.25 l in 200 l.
02-Jul-03	B	:	Rogued wild oats.
26-Jul-03	B	:	Touchdown at 4.0 l in 200 l.
04-Aug-03	B	:	Combine harvested plots for yield.
	B	:	Combine harvested discards.
	B	:	Sampled and weighed straw.
07-Aug-03	B	:	Combine harvested all remaining barley.
	B	:	Baled straw.

NOTE: Samples of grain and straw were taken for chemical analysis. Unground grain and straw samples from selected treatments were archived.

03/R/HB/2 MAIN PLOTS

GRAIN TONNES/HECTARE

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

N / MANURE	0	48	96	144	Mean
---	0.74	1.05	1.31	0.86	0.99
-P-	2.21	3.63	3.92	4.68	3.61
--K	1.28	2.46	3.19	3.01	2.48
-PK	2.59	4.02	5.82	6.46	4.72
A--	0.52	0.70	0.76	0.82	0.70
AP-	2.67	3.77	3.74	2.97	3.29
A-K	1.08	1.89	1.97	1.86	1.70
APK	2.50	5.04	6.24	6.95	5.18
D1852	8.01	8.79	9.16	8.98	8.74
(D)	1.31	4.07	4.07	3.81	3.32
(A)	1.40	1.85	2.37	2.59	2.05
-	0.68	1.21	1.89	1.76	1.38
D2001	6.10	7.07	8.19	8.30	7.42
P2KMg	1.99	4.81	5.32	6.92	4.76
Mean	2.36	3.60	4.14	4.28	3.60

GRAIN MEAN DM% 87.3

MAIN PLOTS

STRAW TONNES/HECTARE

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

N / MANURE	0	48	96	144	Mean
---	0.25	0.40	0.46	0.13	0.31
-P-	0.83	1.32	1.69	1.94	1.45
--K	0.35	1.03	1.50	1.45	1.08
-PK	0.99	1.77	2.48	2.87	2.02
A--	0.29	0.08	0.12	0.33	0.21
AP-	1.01	1.56	1.87	1.41	1.46
A-K	0.27	0.65	0.94	0.66	0.63
APK	0.59	2.01	2.76	3.52	2.22
D1852	3.38	4.11	5.19	5.50	4.55
(D)	0.55	1.36	1.59	1.72	1.31
(A)	0.54	1.21	0.72	0.81	0.82
-	0.16	0.37	1.03	0.38	0.49
D2001	2.52	2.76	3.93	3.84	3.26
P2KMg	0.39	1.92	1.71	2.60	1.66
Mean	0.87	1.47	1.86	1.94	1.53

STRAW MEAN DM% 88.0

03/R/HB/2

SILICATE PLOTS

GRAIN TONNES/HECTARE

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

PK	N3--	N3P-	N3-K	N3PK	Mean
Silicate					
(-)-	1.49	4.84	2.18	7.46	3.99
(Si)-	2.93	5.13	3.89	7.69	4.91
(-)Si	2.98	6.00	3.90	7.50	5.10
(Si)Si	3.19	5.40	3.95	7.49	5.01
Mean	2.65	5.35	3.48	7.54	4.75

GRAIN MEAN DM% 88.5

PHOSPHATE PLOTS

GRAIN TONNES/HECTARE

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

PLOTS	
142	4.26
143	4.34
144	3.97
242	6.80
243	6.67
244	6.59
341	4.87
342	5.17
343	5.69
344	6.00
441	7.21
442	7.30
443	7.10
444	6.96
551	6.89
552	6.08
561	6.00
562	5.43
571	5.00
572	5.37
581	1.86
582	1.99
Mean	5.53

GRAIN MEAN DM% 89.0