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Rothamsted Long-term Experiments Farm Diary and Yields of the Classical and Other Long-term Experiments Weather Summaries 2023



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2023/R/HB/2 - Hoosfield Spring Barley (Hoosfield)

Rothamsted Research

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2023/R/HB/2 HOOSFIELD SPRING BARLEY

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

The 172nd year, spring barley. For previous years see 'Details' 1967 and 1973, Station Report for 1966 and Yield Books for 1974-2022/R/HB/2.

Main Plots

Current and Previous treatments

Plot	Treatment	N treatments 1852-1967	N treatments since 1968	Other treatments 1852-2002	Treatments since 2003
11	---	None	N	-	-
21	-P-	None	N	P	(P)
31	--K	None	N	K (Na) Mg	K (Mg)
41	-PK	None	N	P K (Na) Mg	(P) K (Mg)
12	A--	A	N	-	-
22	AP-	A	N	P	(P)
32	A-K	A	N	K (Na) Mg	K (Mg)
42	APK	A	N	P K (Na) Mg	(P) K (Mg)
61	-	None	N	-	-
71	(FYM)	None	N	(FYM)	(FYM)
62	(Ashes)	None	N	(Ashes)	(Ashes)
72	FYM 1852	None	N	FYM	FYM
63	P2KMg		N	P2 K Mg	P2 K Mg
73	FYM 2001		N	FYM	FYM

Notes

Plots 63 and 73 established in 2001.

Current and Previous treatment codes

Current	
N	Plots split into 4 Sub-Plots for N0, N1, N2, N3: N as calcium ammonium sulphate (27%N; Nitro-Chalk) at 0, 48, 96, 144 kg N, cycling annually since 1974 (N3>N2>N1>N0>N3...) (applied cumulatively 1968-1973)
P2	44 kg P as triple superphosphate (plot 63 only; since 2001)
K	90 kg K as sulphate of potash
Mg	35 kg Mg as kieserite (plot 63 only; since 2001)
FYM	Farmyard manure at 35 t (fresh weight)
Previous	
A	48 kg N as sulphate of ammonia (1852-1967)
P	35 kg P as triple superphosphate in 1974 and 1988-2002, single superphosphate in other years
(P)	P withheld since 2003 - under review
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)
(Mg)	Mg withheld since 2003 - under review
(Na)	16 kg Na as sulphate of soda until 1973
(FYM)	Farmyard manure at 35 t (fresh weight) 1852-1871 only
(Ashes)	Weed ash 1852-1916, furnace ash 1917-1932, none since

Silicate-Test Plots

Current and Previous treatments

Plot	Treatment	N treatments 1852-1967	N treatments 1968-2002	Other treatments 1852-1979	Treatments 1980- 2002	Treatments since 2003
131	AA----	AA	N	-	N	N3
231	AAP---	AA	N	-P	N P	N3 (P)
331	AA-K--	AA	N	- K (Na) Mg	N K (Na) Mg	N3 K (Mg)
431	AAPK--	AA	N	- P K (Na) Mg	N P K (Na) Mg	N3 (P) K (Mg)
132	AA---S	AA	N	-	N Si	N3 Si
232	AAP--S	AA	N	- P	N P Si	N3 (P) Si
332	AA-K-S	AA	N	- K (Na) Mg	N K (Na) Mg Si	N3 K (Mg) Si
432	AAPK-S	AA	N	- P K (Na) Mg	N P K (Na) Mg Si	N3 (P) K (Mg) Si
133	AA--SS	AA	N	- Si	N Si	N3 Si
233	AAP-SS	AA	N	- P Si	N P Si	N3 (P) Si
333	AA-KSS	AA	N	- K (Na) Mg Si	N K (Na) Mg Si	N3 K (Mg) Si
433	AAPKSS	AA	N	- P K (Na) Mg Si	N P K (Na) Mg Si	N3 (P) K (Mg) Si
134	AA—S-	AA	N	- Si	N (Si)	N3 (Si)
234	AAP-S-	AA	N	- P Si	N P (Si)	N3 (P) (Si)
334	AA-KS-	AA	N	- K (Na) Mg Si	N K (Na) Mg (Si)	N3 K (Mg) (Si)
434	AAPKS-	AA	N	- P K (Na) Mg Si	N P K (Na) Mg (Si)	N3 (P) K (Mg) (Si)

Current and Previous treatment codes

Current	
N3	N as calcium ammonium nitrate (27% Nitro-chalk) at 144 kg since 2003
Si	Silicate of soda at 450 kg (S also refers to silicate of soda)
Previous	
AA	48 kg N as sodium nitrate (1852-1967)
(Si)	Silicate of soda at 450 kg (S also refers to silicate of soda) until 1979

Notes

N, P, (P), K, Mg, (Mg), (Na) as listed above in Main Plots Current and Previous treatment codes

Phosphorus-Test Plots

Since 2003 the remaining plots [ex-Castor meal plots 14, 24, 34 & 44) and those testing combinations of NPK with and without Mg (Strip 5 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 application 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.

Treatments

Plots	Treatment since 2003	Plots	Treatment since 2003
142, 143, 144	N3 K*	551, 552	N3 K
242, 243, 244	N3 K*	561, 562	N3 K
341, 342, 343, 344	N3 K	571, 572	N3 K*
441, 442, 443, 444	N3 K	581, 582	N3 K*

Notes

K* 450 kg K as sulphate of potash 2003-2004, then 90 kg K since

N3, K as listed above in Main Plots and Si-Test Current and Previous treatment codes

FARM DIARY

Date		Application	Rate	Units
26/10/2022	f	Applied: Triple Superphosphate (TSP) by Hand: Plots 631-634	215	kg/ha
26/10/2022	f	Applied: Kieserite by Hand: Plots 631-634	233	kg/ha
27/10/2022	f	Applied: Sulphate of Potash (SOP) using Cascade Spreader using JD6830: Plots 141-144, 241-244, 311-314, 321-324, 331-334, 341-344, 411-414, 421-424, 431-434, 441-444, 551-552, 561-562, 571-572, 581-582, 631-634	217	kg/ha
31/10/2022	f	Applied: Silicate of Soda by Hand: Plots 132-133, 232-233, 332-333, 432-433	450	kg/ha
08/11/2022	f	Applied: Farmyard Manure (FYM) using Muck spreader - international using Tym T503: Plots 721-724, 731-734	35	t/ha
13/02/2023	a	Cultivate/level using Cousins Spring Tines using JD6620: all plots	-	-
13/02/2023	s	Drilled: Spring Barley (Diablo) tr. Ranco i-Mix (19847) using Accord Combition Drill No. 4 using JD6830: all plots	350	seeds/m ²
15/02/2023	a	Cambridge/Ring roll using 6m Flexicoil Cambridge Roll using JD5070: all plots	-	-
04/05/2023	f	Applied: Nitrochalk by Hand; Plots 114, 122, 213, 224, 312, 323, 411, 424, 612, 622, 632, 714, 723, 733	177	kg/ha
04/05/2023	f	Applied: Nitrochalk by Hand; Plots 111, 121, 214, 221, 311, 322, 413, 423, 614, 623, 633, 713, 724, 734	355	kg/ha
04/05/2023	f	Applied: Nitrochalk by Hand; Plots 113, 124, 211, 222, 313, 321, 412, 421, 611, 621, 631, 712, 721, 732	532	kg/ha
17/05/2023	p	Sprayed Presite SX (18776) using Agribuggy2 AB30 using Agribuggy2 AB30	75	g/ha
17/05/2023	p	Sprayed Mobius (13395) using Agribuggy2 AB30 using Agribuggy2 AB30	0.6	L/ha
17/05/2023	p	Sprayed Hurler (17715) using Agribuggy2 AB30 using Agribuggy2 AB30	0.75	L/ha
17/05/2023	p	Sprayed Kaster (20008) using Agribuggy2 AB30 using Agribuggy2 AB30	0.75	L/ha
11/06/2023	f	Applied: Yara Bela Extran using Cascade Spreader using JD6830: Plots 131-134, 141-144, 231-234, 241-244, 331-334, 341-344, 431-434, 441-444, 551-552, 561-562, 571-572, 581-582	430	kg/ha
21/06/2023	a	Power harrow using Kilworth Power Harrow 1.3 m using Iseki ISTH4335	-	-
03/08/2023	p	Sprayed Samurai (16238) using Agribuggy2 AB30 using Agribuggy2 AB30	2	L/ha
03/08/2023	p	Sprayed Buffalo Elite using Agribuggy2 AB30 using Agribuggy2 AB30	1	L/ha
25/08/2023	a	Harvest (Combine) using Claas Tucano 430; all Plots	-	-
07/09/2023	a	Harvest (Combine) Straw Yields using Amazone Grass Harvester - Flail Mower Collector with JD5070: Plots 111-114, 121-124, 211-214, 221-224, 311-314, 321-324, 411-414, 421-424, 611-614, 621-624, 631-634, 711-714, 721-724, 731-734	-	-

Notes

- Samples of grain and straw were taken for chemical analysis. Unground grain and straw samples from selected treatments were archived.
- Grain quality analyses completed on all grain samples.
- Soil sampling for chemical analysis and archiving: Main Plots (all plots); 0-23 cm depth; 19/09/2023.

YIELDS

MAIN PLOTS: SPRING BARLEY: GRAIN YIELD (t/ha; 85% DM)

Treatment	N (kg)				Mean
	0	48	96	144	
---	0.74	0.76	1.01	0.83	0.83
-P-	0.31	0.95	1.11	1.45	0.96
--K	0.07	0.50	1.11	0.78	0.62
-PK	0.12	0.44	1.25	1.20	0.75
A--	0.46	0.84	0.77	0.81	0.72
AP-	0.84	2.06	1.03	1.08	1.25
A-K	0.49	0.89	0.57	0.39	0.58
APK	0.36	0.68	0.70	0.66	0.60
FYM 1852	3.27	2.90	3.16	2.58	2.98
(FYM)	0.15	1.41	1.02	1.19	0.94
(Ashes)	0.40	0.49	0.77	0.60	0.57
-	0.17	0.54	0.55	0.33	0.40
FYM 2001	1.68	2.43	3.58	3.60	2.82
P2KMg	0.32	1.03	1.39	1.72	1.12
Mean	0.67	1.14	1.29	1.23	1.08
Grain mean DM%					92.5

Notes

- Dry matter, and hence yield, missing for plot 623 ((Ashes) N2). Yield estimated by ANOVA as 0.77 t/ha in yield table. Means for treatment factors (A), N2, and the grand mean, were based on the estimated value.

MAIN PLOTS: SPRING BARLEY: STRAW YIELD (t/ha; 85% DM)

Treatment	N (kg)				Mean
	0	48	96	144	
---	0.98	1.21	1.05	1.16	1.10
-P-	0.64	0.82	0.25	1.49	0.80
--K	0.40	0.71	0.94	0.82	0.72
-PK	0.35	0.63	0.83	0.99	0.70
A--	0.63	0.65	0.87	0.30	0.61
AP-	1.52	0.35	0.34	1.56	0.94
A-K	0.96	0.88	0.80	0.44	0.77
APK	0.32	0.47	1.66	0.79	0.81
FYM 1852	2.61	1.34	2.48	2.58	2.25
(FYM)	0.44	1.32	2.25	0.54	1.14
(Ashes)	1.55	0.14	0.65	0.59	0.73
-	0.58	1.03	0.81	1.16	0.89
FYM 2001	1.97	1.22	2.30	2.80	2.07
P2KMg	0.68	1.29	1.08	2.06	1.28
Mean	0.97	0.86	1.17	1.23	1.06
Straw mean DM%					88.2

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SILICATE-TEST PLOTS: SPRING BARLEY: GRAIN YIELD (t/ha; 85% DM)

Silicate treatment	NPKMg treatment				Mean
	N3--	N3(P)-	N3-K(Mg)	N3(P)K(Mg)	
(-)-	0.79	1.74	0.47	0.35	0.84
(Si)-	0.26	0.72	0.50	0.65	0.53
(-)-Si	1.01	1.38	0.35	0.44	0.79
(Si)Si	1.19	1.22	0.43	0.49	0.84
Mean	0.81	1.27	0.44	0.48	0.75
Grain Mean DM%					88.3

PHOSPHORUS-TEST PLOTS: SPRING BARLEY: GRAIN YIELD (t/ha; 85% DM)

Plot	
142	0.47
143	0.59
144	0.39
242	0.80
243	0.66
244	0.54
341	0.49
342	0.43
343	0.28
344	0.35
441	0.26
442	0.54
443	0.47
444	0.39

551	0.37
552	0.27
561	0.33
562	0.26
571	0.35
572	0.31
581	0.28
582	0.23

Mean	0.41
Grain Mean DM%	88.4