ROTHAMSTED RESEARCH

Rothamsted Report for 1936

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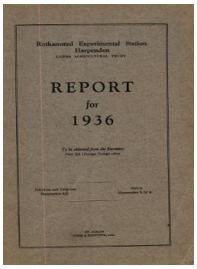

Other Experiments at Rothamsted

Rothamsted Research

Rothamsted Research (1937) *Other Experiments at Rothamsted ;* Rothamsted Report For 1936, pp 205 - 223 **- DOI: https://doi.org/10.23637/ERADOC-1-68**

WHEAT

Effect of sulphate of ammonia applied at five different times

RW—Great Knott, 1936

Plan and yields in lb., grain above, straw below

1	**3**	**5**	**1**	**2**	**0**	**4**	6
	76.9	72.1	81.6	80.3	78.7	75.9	
	129.6	116.2	113.6	133.7	96.0	117.1	
	5	**4**	**0**	**1**	**3**	**2**	
	86.3	82.1	84.0	91.1	88.8	89.2	
	120.7	117.6	106.2	126.4	139.4	140.8	
W	**2**	**1**	**3**	**0**	**4**	**5**	
↑	75.2	84.6	77.9	86.3	77.5	84.3	
	134.6	110.9	141.1	121.4	123.8	126.7	
	4	**0**	**5**	**3**	**2**	**1**	
	82.0	85.4	90.1	83.8	84.5	96.4	
	127.0	117.8	129.6	146.0	148.5	139.8	
	1	**3**	**2**	**4**	**5**	**0**	
	87.8	76.6	85.9	84.2	86.0	88.3	
	120.2	146.4	156.8	136.8	135.2	119.7	
	0	**2**	**4**	**5**	**1**	**3**	
	91.9	77.2	94.5	99.1	95.2	89.3	
31	125.1	148.0	139.0	138.4	148.3	150.2	36

SYSTEM OF REPLICATION : 6 × 6 Latin square.
AREA OF EACH PLOT : 1/40 acre (53.0 lks. × 47.2 lks.).
TREATMENTS : No sulphate of ammonia (**0**) and sulphate of ammonia at the rate of 0.4 cwt. N per acre applied on Oct. 28 (**1**), Jan. 20 (**2**), Mar. 16 (**3**), Apr. 27 (**4**) and May 25 (**5**).
CULTIVATIONS, ETC. : Ploughed on various dates during Sept. Harrowed : Oct. 28 and April 16. Drilled : Oct. 28. Harvested : Aug. 18. Variety : Victor. Previous crop : Beans.
STANDARD ERRORS PER PLOT : Grain : 1.22 cwt. per acre or 4.02% ; Straw : 1.94 cwt. per acre or 4.18%.

Summary of Result : cwt. per acre

	No N	Dates of application of sulphate of ammonia (0.4 cwt. N per acre) Oct. 28	Jan. 20	Mar. 16	Apr. 27	May 25	*Mean of all N*	*Standard error*
GRAIN								
(±0.498)	30.6	31.9	29.3	29.4	29.5	30.8	*30.2*	*±0.223*
Incr. ..(*±0.704*)		*+1.3*	*−1.3*	*−1.2*	*−1.1*	*+0.2*	*−0.4*	*±0.546*
STRAW								
(±0.792)	40.8	45.2	51.3	50.8	45.3	45.6	*47.6*	*±0.354*
Incr. ..(*±1.12*)		*+4.4*	*+10.5*	*+10.0*	*+4.5*	*+4.8*	*+6.8*	*±0.868*

Conclusions

On the average of all times of application, sulphate of ammonia had little effect on the yield of grain, and gave a significant increase in straw. There were, however, significant differences in the yields obtained with the different times of application, the earliest dressing (Oct. 28) producing an increase in the yield of grain which was not quite significant, and the next three times of application (Jan. 20, Mar. 16, and April 27) producing a depression in the yield of grain.

The straw yields at first increased to a maximum and then decreased with later application.

https://doi.org/10.23637/ERADOC-1-68

WHEAT

Effect of fallow and of one-year leys of clover, ryegrass and clover and ryegrass, cut once and followed by bastard fallow or green manure crops of mustard or vetches, or cut twice.

RW—Pastures—1936
Plan and yields in lb.

			Grain	Straw		Grain	Straw
133	OM	N	18.6	48.9	O	11.6	31.2
	C2	O	18.9	43.8	N	15.1	47.9
	O2	N	17.9	44.6	O	8.7	29.8
	R1	O	8.8	29.2	N	12.1	39.4
	OV	O	15.1	39.2	N	16.8	49.4
	RV	O	11.3	37.2	N	10.7	41.8
	CRM	O	12.8	38.2	N	12.2	47.0
	CR2	O	13.4	35.4	N	14.8	47.4
	RM	O	13.2	30.3	N	12.0	43.0
	O1	O	23.1	46.7	N	22.8	55.7
	R2	N	16.3	41.4	O	12.4	28.5
	CR1	O	14.0	37.9	N	13.4	46.6
	CV	N	11.0	63.5	O	9.0	40.2
	CRV	N	10.8	56.4	O	6.7	35.0
	CM	N	10.7	51.8	O	10.6	39.4
	C1	N	13.5	57.0	O	10.5	37.8
	R1	O	9.9	29.5	N	11.8	41.0
	OM	O	14.2	37.3	N	17.4	51.6
	CM	N	14.4	49.1	O	9.6	35.4
	C2	O	21.1	46.0	N	18.6	45.9
	C1	O	17.1	44.8	N	16.0	49.2
	CRV	O	13.0	40.8	N	12.9	49.1
	RM	O	19.2	41.0	N	15.2	45.0
	CR1	O	18.2	40.3	N	17.6	47.9
	O2	N	24.4	51.4	O	18.5	38.2
	O1	N	26.1	56.6	O	17.2	36.3
	CV	O	15.5	40.8	N	12.0	47.5
	CRM	N	17.2	45.8	O	9.0	23.5
	CR2	O	16.7	34.2	N	17.9	41.8
	RV	N	11.9	42.1	O	10.9	26.1
164	OV	N	19.5	54.8	O	17.5	32.5
	R2	O	13.6	30.2	N	16.7	34.8

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E

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			Grain	Straw		Grain	Straw
69	CR2	O	19.5	42.9	N	22.1	46.9
	CR1	N	17.7	45.8	O	17.6	36.9
	O1	O	14.7	34.4	N	23.2	46.8
	CM	N	11.6	46.9	O	15.2	34.3
	CV	O	7.5	33.2	N	13.6	38.4
	CRM	O	12.4	37.1	N	14.8	39.2
	R1	N	14.2	40.0	O	14.5	27.7
	OV	O	15.1	37.6	N	18.8	55.0
	O2	O	13.8	38.1	N	21.2	49.3
	OM	O	16.1	39.2	N	21.5	47.8
	C1	O	12.4	42.2	N	16.4	43.8
	CRV	N	11.6	44.9	O	9.0	31.0
	R2	O	11.8	30.2	N	13.0	31.0
	C2	O	20.6	47.1	N	21.0	49.2
	RV	N	11.8	42.4	O	8.9	33.4
	RM	O	5.5	27.5	N	14.8	40.4
	O2	O	12.9	43.0	N	20.4	55.6
	CR1	N	8.3	34.0	O	9.0	31.7
	OV	O	14.3	45.7	N	19.0	53.0
	R1	N	7.4	28.8	O	9.1	22.0
	OM	N	21.0	50.8	O	14.5	35.5
	R2	N	17.3	42.4	O	9.2	23.8
	RV	O	7.8	28.2	N	6.9	30.4
	C1	O	12.7	36.6	N	13.9	41.8
	CRV	O	8.3	37.7	N	9.1	45.9
	CV	O	10.8	44.7	N	12.3	46.7
	CR2	N	19.4	39.8	O	17.1	31.9
	CM	N	14.1	48.4	O	13.6	31.9
	CRM	N	15.1	43.2	O	12.0	28.2
	RM	N	20.4	42.6	O	14.0	26.2
100	O1	O	24.1	48.3	N	23.9	53.1
	C2	O	20.4	37.9	N	13.4	33.4

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https://doi.org/10.23637/ERADOC-1-68

SYSTEM OF REPLICATION ; 4 randomised blocks of 16 plots each, the plots being split for sulphate of ammonia at the rate of 0.3 cwt. N per acre applied as a top dressing to the wheat.
AREA OF EACH SUB-PLOT ; 0.0099 acre (46.8 lks. × 21.2 lks.)
TREATMENTS : 4 × 4 factorial design.
No ley (O), broad red clover (C), ryegrass (R), ryegrass and clover (CR). Vetches sown after 1st cut. (V), mustard sown after 1st cut (M), I cut taken, followed by summer fallow (1), 2 cuts taken (2).
BASAL MANURING ; Nil.
CULTIVATIONS, ETC. ; Ploughed ; Sept. 28-30. Harrowed ; Oct. 19 and 28. Drilled ; Oct. 28. Sulphate of ammonia applied ; March 28. Harrowed and rolled ; May 5. Harvested ; Aug. 24 and 25. Variety ; Victor. Previous crop ; Ley.
STANDARD ERRORS : Grain : Per whole plot : 2.07 cwt. per acre or 15.7% ; per sub plot : 1.96 cwt. per acre or 14.9%. Straw : per whole plot : 3.62 cwt. per acre or 9.87% ; per sub plot : 3.68 cwt. per acre or 10.0%.

Green manure crops : Nitrogen added lb. per acre.

	Fallow	Clover	Ryegrass	Clover and ryegrass	*Mean*
Mustard	11.8	13.0	10.9	11.7	*11.9*
Vetches	9.2	12.8	12.2	13.0	*11.8*

	No nitrogen				Nitrogen			
	1 cut	2 cuts	Mustard	Vetches	1 cut	2 cuts	Mustard	Vetches
	GRAIN ; cwt. per acre (±1.04[1], ±1.39[2])							
Fallow	15.0		12.7	13.9	20.2		17.7	16.7
Clover	11.8	18.2	11.0	9.6	13.4	15.3	11.4	11.0
Ryegrass	9.5	10.6	11.7	8.8	10.2	14.2	14.0	9.3
Clover and ryegrass	13.2	15.0	10.4	8.3	12.8	16.7	13.3	10.0
	STRAW ; cwt. per acre (±1.81[1], ±2.60[2])							
Fallow	35.4		32.2	34.9	46.4		44.8	47.7
Clover	36.3	39.3	31.7	35.7	43.2	39.7	44.1	44.1
Ryegrass	24.4	25.4	28.1	28.1	33.6	33.6	38.5	35.2
Clover and ryegrass	33.0	32.5	28.6	32.5	39.2	39.6	39.4	44.2

(1) For comparisons involving the mean of nitrogen and no nitrogen.
(2) For comparisons involving the difference of nitrogen and no nitrogen.

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	Fallow	Clover	Ryegrass	Clover and ryegrass	Mean	Standard errors	Fallow	Mustard	Vetches
				GRAIN ; cwt. per acre					
No nitrogen	14.1	12.6	10.2	11.7	*12.2*		*12.4*	11.4	10.2
Nitrogen	18.7	12.8	11.9	13.2	*14.2*		*14.2*	14.1	11.8
Mean	*16.4*	*12.7*	*11.0*	*12.4*	*13.2*	±0.518	*13.3*	*12.8*	*11.0*
Increase		*−3.7*	*−5.4*	*−4.0*		±0.732		*−0.5*	*−2.3*
Difference	*+4.6*	*+0.2*	*+1.7*	*+1.5*	*+2.0*	±0.693	*+1.8*	*+2.7*	*+1.6*
Increase		*−4.4*	*−2.9*	*−3.1*		±0.980		*+0.9*	*−0.2*
				STRAW ; cwt. per acre					
No nitrogen	34.5	35.8	26.5	31.6	*32.1*		32.3	30.2	32.8
Nitrogen	46.4	42.8	35.2	40.6	*41.2*		40.6	41.7	42.8
Mean	*40.4*	*39.3*	*30.8*	*36.1*	*36.6*	±0.905	*36.4*	*36.0*	*37.8*
Increase		*−1.1*	*−9.6*	*−4.3*		±1.28		*−0.4*	*+1.4*
Difference	*+11.9*	*+7.0*	*+8.7*	*+9.0*	*+9.1*	±1.30	*+8.3*	*+11.5*	*+10.0*
Increase		*−4.9*	*−3.2*	*−2.9*		±1.84		*+3.2*	*+1.7*

Conclusions

All three leys produced large reductions in the yield of grain compared with fallow, the reduction being significantly greater for ryegrass than for clover or with the clover and ryegrass mixture. The yields of grain were in all cases substantially better where two cuts of the leys were taken than with only one cut. In fact, where no nitrogen was applied to the wheat, the yields with two cuts of clover or the clover and ryegrass mixture were as good as with fallow.

The yields of grain following mustard were slightly but not significantly below those following the bastard fallow. The yields following vetches were significantly lower than those following mustard.

The response in grain to sulphate of ammonia was significantly greater after fallow than after any of the leys, the response following clover being negligible.

The effects on straw were in general similar to those on grain, except that vetches did not depress the yields of straw.

BARLEY

Soil fumigation experiment. Residual effect of chlorpicrin, chlordinitrobenzene, "seekay" and "cymag," as controls of wireworm infestation.

RB—Pastures, 1936
Plan and yields in lb.

Grain, straw, plant number (four metre rows) (April 23) and number of wireworms (total of four samples) in descending order

31						35
	P	O	N	K	M	
	29.0	27.8	32.1	36.0	45.6	
	48.0	54.4	82.4	66.0	89.9	
	124	120	118	217	153	
	3	2	5	1	4	
36	M	K	O	N	P	
	35.1	41.3	33.1	43.6	42.2	
	68.4	69.7	53.2	78.4	64.8	
	196	187	148	148	152	
	6	0	6	4	4	
S ↑	O	M	K	P	N	
	36.9	36.0	31.6	38.9	41.2	
	59.1	60.0	58.6	54.6	81.8	
	161	208	151	177	151	
	4	9	1	6	5	
	N	P	M	O	K	
	39.3	36.6	34.5	40.3	37.6	
	77.2	60.4	62.0	65.0	55.2	
	150	166	152	177	179	
	17	8	8	9	0	
	K	N	P	M	O	
	35.8	41.1	38.1	32.5	30.7	
	60.7	71.6	64.2	55.0	55.3	
	212	180	182	166	95	
51	4	4	2	4	8	55

Note.—In the field the plots lay in one line, 36 being next to 35, etc.

https://doi.org/10.23637/ERADOC-1-68

SYSTEM OF REPLICATION : 5 × 5 Latin square.
AREA OF EACH PLOT ; 1/60 acre (60.6 lks. × 27.5 lks.).
TREATMENTS : No fumigant (O), chlordinitrobenzene (N) and chlorpicrin (P) at the rate of 2.0 cwt. per acre, "cymag" (M) at the rate of 7.5 cwt. per acre and "seekay" (K) at the rate of 5.0 cwt. per acre applied in 1935. (See 1935 Report, p. 188).
BASAL MANURING ; Nil.
CULTIVATIONS, ETC. ; Ploughed on various dates during February. Springtine harrowed ; March 18. Rolled, Harrowed and Drilled ; March 20. Rolled ; May 2. Harvested ; Aug. 21 and 22. Variety ; Plumage Archer. Previous crop ; Sugar beet.
Sampling for wireworms ; Date ; June 19-July 2. Two random samples per half plot were taken, each sample consisting of 6 ins. × 6 ins. × 5 ins. (deep) of soil.
STANDARD ERRORS PER PLOT ; Grain ; 2.45 cwt. per acre or 12.5%. Straw ; 4.74 cwt. per acre or 13.7%. Plant number : 174.8 thousands per acre or 16.2%.

Summary of Results

	No fumigant	Chlordinitrobenzene	Chlorpicrin	"Cymag"	"Seekay"	*Mean*	Standard error
GRAIN ; cwt. per acre	18.1	21.1	19.8	19.7	19.5	*19.6*	±1.10
STRAW ; cwt. per acre	30.8	41.9	31.3	35.9	33.2	*34.6*	±2.12
PLANT NUMBER ; thousands per acre	930.7	991.8	1063.5	1161.7	1256.0	*1080.7*	±78.2
NO. OF WIREWORMS per square yard	52	63	41	56	11	*45*	

Conclusions

"Seekay" applied in 1935 produced a significant decrease in the number of wireworms in June 1936. This was reflected in a significant increase in plant number, but the corresponding increase in grain was not significant, the grain yields being moderately good even in the absence of any fumigation. The somewhat higher yields of grain and straw given by chlordinitrobenzene may be attributed to an effect of nitrogen.

The other fumigants had apparently no residual effects on wireworms.

https://doi.org/10.23637/ERADOC-1-68

SPRING OATS

Soil fumigation experiment. Residual effect of "cymag," carbon disulphide jelly, chlordinitrobenzene and "seekay." Effect of sulphate of ammonia.

RO—Pastures, 1936

Plan and yields, total produce in grams above, weeds in lb. centre, 3rd cyst count below*

1	O	2CK	1N	1CM	2CM	2S	2CK	O	40
	79	938	106	275	281	4,033	2,461	105	
	88	Nil	128	181	291	230	57	215	
	248	232	272	206	160	114	114	266	
	1S	O	1A	2CM	1CK	1N	1CM	1A	
	4,844	63	171	256	1,238	105	1,068	962	
	57	206	198	192	53	247	199	192	
	154	150	274	264	180	198	106	188	
S	2S	1CK	2A	2N	O	2A	2N	1S	
↑	1,888	621	210	387	65	188	140	2,692	
	197	61	253	284	203	274	250	214	
	229	273	275	212	102	82	120	88	
	1CK	1A	1S	2CK	2CK	2A	1CK	1CM	
	885	385	868	616	338	550	495	555	
	25	147	94	9	32	245	48	191	
	242	358	252	222	160	262	196	230	
	2A	2N	2S	1N	1A	2N	2S	O	
	1,047	30	1,518	205	105	735	3,021	809	
	197	184	137	144	196	201	110	156	
	412	353	258	322	100	116	56	68	
	2CM	O	1CM	O	1S	1N	O	2CM	
	1,425	165	358	285	1,608	1,679	315	1,203	
21	187	147	166	127	121	135	148	204	36
	204	276	224	174	88	52	116	102	

The positions of the blocks in the field were slightly different from those shown above.

*Number of cysts per 400 grams of soil.

AREA OF EACH PLOT ; 1/80 acre (30 lks. × 41.7 lks.).

TREATMENTS ; No fumigant (O), single (1) and double (2) dressings of "cymag" (CM), carbon disulphide jelly (S), chlordinitrobenzene (N) and "seekay" (CK), at the following rates of application per acre for the single dressing ; 1CM, 7.5 cwt. : 1S, 24.3 cwt. : 1N, 2.0 cwt. and 1CK, 5.0 cwt., applied in 1935.

Sulphate of ammonia (A) at the rate of 0.4 cwt. and 0.8 cwt. N per acre. Applied in 1936.

BASAL MANURING ; Nil.

CULTIVATIONS, ETC. ; Ploughed ; Aug. 27-29 and Feb. 10-March 13. Spring-tine harrowed ; March 19. Rolled, harrowed, sulphate of ammonia applied and drilled ; March 20. Harrowed ; May 8. Rolled ; May 9. Harvested ; Aug. 7. Variety ; Marvellous. Previous crop ; Oats. (See 1935 Report, p.176).

SPECIAL NOTES ; The entire produce was weighed, Oats plus weeds. Weight of oats was determined by sampling a strip 30 lks. × 1 yd. Third cyst count ; Dec. 1 and 2. Two random samples of about 50 grms. of soil were taken per half plot.

STANDARD ERRORS PER PLOT ; Weeds ; 22.4 cwt. per acre or 19.8%. 3rd cyst count : sampling error 32.3 or 16.6% ; experimental error 59.9 or 30.7%.

https://doi.org/10.23637/ERADOC-1-68

Summary of Results

	TOTAL PRODUCE ; cwt. per acre[2]					WEEDS ; cwt. per acre ($\pm$11.2. *Means :* $\pm$7.92)				
	Chlor-dinitro-ben-zene	Carbon disul-phide jelly	" Cy-mag "	" See-kay "	Sul-phate of am-monia	Chlor-dinitro-ben-zene	Carbon disul-phide jelly	" Cy-mag "	" See-kay "	Sul-phate of am-monia
None			3.4					115.2[1]		
Single ..	7.6	36.2	8.2	11.7	5.5	116.8	87.0	131.5	33.4	130.8
Double ..	4.7	37.8	11.4	15.7	7.2	164.1	120.4	156.2	17.5	173.1
Mean of single and double ..	*6.2*	*37.0*	*9.8*	*13.7*	*6.4*	*140.4*	*103.7*	*143.8*	*25.4*	*152.0*

Standard error ; (1) $\pm$7.92.
(2) No single standard error is applicable to this table.

	Third cyst count ($\pm$30.0)				
	Chlordini-troben-zene	Carbon disulphide jelly	" Cymag "	" Seekay "	Sulphate of ammonia
None			175[1]		
Single	211	146	192	223	230
Double ..	202	164	182	182	258
Mean of single and double ($\pm$21.2)	*206*	*155*	*187*	*202*	*244*

Standard error : (1) $\pm$21.2.

Conclusions

The effects of the fumigants applied in 1935 on the numbers of cysts in December 1936 were not significant.

The yields of oats were negligible except on the plots which had been fumigated with carbon disulphide jelly. In particular, the application of sulphate of ammonia in 1936 failed to produce a reasonable crop.

" Seekay " produced a large reduction in weeds.

https://doi.org/10.23637/ERADOC-1-68

POTATOES

Effect of Dung, ploughed in in December or applied in the bouts, of Straw and of Sulphate of Ammonia

RP—Gt. Harpenden, 1936

Total produce in lb. above, percentage ware below

W ↑

1	— St N	Dl — —	— St —	Dl St —	De — —	De St —	De — N	Dl St —	8
	206	366	165	344	317	291	352	397	
	58.8	74.8	58.1	75.2	77.0	75.5	73.0	78.1	
	— — N	De St N	Dl St N	De — —	— — —	Dl — —	— St —	De St N	
	249	302	543	200	234	373	169	320	
	68.0	71.4	65.1	64.6	72.1	81.2	56.0	66.1	
	— — —	Dl — N	De St —	De — N	Dl — N	— St N	Dl St N	— — N	
	182	417	266	201	426	322	391	291	
	60.1	80.4	69.3	62.8	81.6	77.6	75.6	71.8	
	— — —	De St N	— St —	— — N	De — —	— St N	— St —	De — N	
	245	370	246	299	342	335	190	335	
	72.5	78.9	72.0	75.9	80.0	78.5	60.7	73.0	
	— St N	De — N	Dl St N	Dl St —	Dl St N	Dl — —	Dl St —	Dl — N	
	238	342	458	408	458	372	277	356	
	66.9	77.2	83.0	80.8	81.8	77.0	71.3	77.5	
	De St —	De — —	Dl — —	Dl — N	De St —	De St N	— — N	— — —	
	230	314	389	336	339	369	322	254	
41	67.6	75.8	80.8	75.5	77.5	77.7	77.7	78.1	48

System of Replication: 4 randomised blocks of 12 plots each.

Area of each Plot (after rejecting edge bouts): 1/48 acre. Plots actually 1/40 acre (45.5 lks. × 54.9 lks.)

Treatments: 3 × 2 × 2 factorial design.

Dung: None, 15 tons per acre ploughed in in December (De), or stored and applied in the bouts (Dl).

Straw: None, 40 cwt. per acre (chaffed), ploughed in in December, except when applied with Dl, for which straw and dung were mixed and stored (St).

Sulphate of ammonia: None, 0.4 cwt. N per acre applied in the bouts (N).

Basal Manuring: 0.5 cwt. P_2O_5 per acre as superphosphate, and 1 cwt. K_2O per acre as sulphate of potash applied in the bouts.

Cultivations, etc.: Applied dung and chaff: Dec. 10. Ploughed: Dec. 19-21. Springtine harrowed: April 7-10. Horse harrowed: April 15. Bouted: April 16-17. Applied stored dung and artificials: April 17-18. Potatoes planted: April 21-22. Harrowed ridges: April 24. Re-ridged: May 5. Grubbed: May 28-June 12. Earthed up: July 1. Sprayed: July 21. Lifted: Sept. 29-Oct. 1. Variety: Ally. Previous crop: Wheat.

Special Note: Potatoes passed through a 1¾ inch riddle to determine the percentage ware.

Standard Errors per Plot: Total produce: 1.00 tons per acre or 15.0%; Percentage ware: 4.87.

Summary of Results: Yields of separate treatments

		No Dung	Dung ploughed in in the bouts	
TOTAL PRODUCE: tons per acre (±0.500)				
No sulph. amm.	No straw	4.83	6.19	7.92
	Straw	4.06	5.94	7.53
Sulph. amm.	No straw	6.13	6.49	8.10
	Straw	5.81	7.19	9.77
PERCENTAGE WARE: (±2.44)				
No sulph. amm.	No straw	70.7	74.4	78.4
	Straw	61.7	72.5	76.4
Sulph. amm.	No straw	73.4	71.5	78.8
	Straw	70.4	73.5	76.4

https://doi.org/10.23637/ERADOC-1-68

Effect of time of application of dung

	No sulph. amm.		Sulph. amm.		*Mean*
	No straw	Straw	No straw	Straw	
TOTAL PRODUCE : tons per acre (±0.707. *Mean : ±0.354*)					
Dung in the bouts minus dung ploughed in	+1.73	+1.59	+1.61	+2.58	*+1.88*
PERCENTAGE WARE : (±3.45. *Mean : ±1.72*)					
Dung in the bouts minus dung ploughed in ..	+4.0	+3.9	+7.3	+2.9	*+4.5*

Effect of Straw

Response to Straw	No Dung	Dung ploughed in	Dung in the bouts
TOTAL PRODUCE : tons per acre (±0.707)			
No sulph. amm.	—0.77	−0.25	−0.39
Sulph. amm.	−0.32	+0.70	+1.67
PERCENTAGE WARE : (±3.45)			
No sulph. amm.	−9.0	−1.9	−2.0
Sulph. amm.	−3.0	+2.0	−2.4

Effect of sulphate of ammonia

Response to sulphate of ammonia	No dung	Dung ploughed in	in the bouts	*Mean*
TOTAL PRODUCE : tons per acre (±0.707. *Mean : ±0.408*)				
No straw..	+1.30	+0.30	+0.18	*+0.59*
Straw	+1.75	+1.25	+2.24	*+1.75*
PERCENTAGE WARE : (±3.45. *Mean : ±1.99*)				
No straw..	+2.7	−2.9	+0.4	*+0.1*
Straw	+8.7	+1.0	0.0	*+3.2*

Conclusions

Dung applied in the bouts gave 1.9 tons per acre more than dung ploughed in, the mean responses being 1.2 tons per acre to dung ploughed in and 3.1 tons per acre to dung applied in the bouts.

Straw gave slight but not significant decreases in yield, except in the presence of both dung and sulphate of ammonia, in which case it gave a significant increase of 1.2 tons per acre.

Sulphate of ammonia produced a significant increase of 1.2 tons per acre. The increase was somewhat greater in the presence of straw than in its absence, particularly where dung was present.

Dung produced a significant increase in percentage ware. Sulphate of ammonia gave a significant increase in the absence of dung, but no increase in its presence, the interaction between sulphate of ammonia and dung being almost significant. The depression due to straw was not significant.

https://doi.org/10.23637/ERADOC-1-68

SUGAR BEET

Effect of muriate of potash and agricultural salt, ploughed in in Autumn or harrowed in in Spring, and of dung.

RS—Great Harpenden, 1936

Plan and yields in lb.

Roots (dirty), tops, sugar percentage and plant number in descending order

1						6
— K A —	— — S —	Na K S D	Na K A D	Na K S —	— — A —	
670	674	733	728	646	600	
584	616	760	629	500	462	
17.42	17.68	17.86	17.71	18.49	17.57	
503	484	500	517	505	498	
— — A —	Na — A —	— K A D	— K S D	Na K A —	Na — S —	
677	730	755	725	701	641	
584	634	744	704	550	534	
17.77	18.26	17.60	17.31	17.77	17.83	
465	478	474	523	523	510	
— K S —	Na K A —	Na — A D	— — A D	Na — A —	— K S —	
604	697	790	788	747	648	
480	570	682	658	480	462	
18.58	17.22	18.20	17.51	18.32	17.80	
537	536	538	541	531	497	
Na K S —	Na — S —	— — S D	Na — S D	— K A —	— — S —	
583	618	770	774	670	634	
448	484	645	724	507	507	
18.81	17.31	18.32	18.18	18.12	18.26	
522	526	529	521	509	506	
— K S D	— — S D	Na K S —	— K A —	Na K S D	— K A D	
703	664	689	662	747	686	
554	556	502	508	689	666	
18.26	17.98	18.24	18.40	18.04	17.70	
519	515	540	528	517	509	
— — A D	Na — A D	Na — S —	— — A —	Na K A D	Na — S D	
721	799	722	649	774	730	
590	609	550	456	638	735	
17.76	17.92	18.20	18.09	17.82	17.92	
518	541	526	532	543	502	
Na — S D	— K A D	— — S —	— K S —	— — S D	— — A D	
804	758	666	659	751	752	
711	649	518	501	563	700	
18.40	18.03	17.88	18.46	17.76	17.52	
470	521	520	520	535	483	
Na K S D	Na K A D	Na — A —	Na K A —	Na — A D	— K S D	
812	798	743	716	812	738	
675	565	490	436	580	623	
18.19	18.14	18.03	18.19	17.99	18.00	
563	580	580	580	560	551	
43						48

NE ↑

SYSTEM OF REPLICATION : 6 randomised blocks of 8 plots each.

AREA OF EACH PLOT (after rejecting edge rows) : 0.01851 acre. Plots actually : 1/45 acre (73.3 lks. × 30.3 lks.).

TREATMENTS : 2^4 factorial design.
Muriate of potash : None, 1.0 cwt. K_2O per acre (**K**).
Agricultural salt : None, 5 cwt. per acre (**Na**).
Minerals ploughed in, in Autumn (**A**). Harrowed in, in Spring (**S**).
Dung : None, 10 tons per acre ploughed in, in Autumn (**D**).

BASAL MANURING : Sulphate of ammonia at the rate of 0.6 cwt. N per acre, superphosphate at the rate of 0.5 cwt. P_2O_5 per acre.

CULTIVATIONS, ETC. : Dung applied : Dec. 9. Autumn artificials applied : Dec. 10. Ploughed : Dec. 19. Spring-tine harrowed : April 7. Rolled and harrowed : April 27. Spring artificials applied : May 1. Harrowed, rolled and drilled : May 1. Harrowed and rolled : May 2. Horse hoed : June 15. Singled : June 16 and 17. Hand hoed : Aug. 13. Lifted : Nov. 19-26. Variety : Kleinwanzleben. Previous crop : Wheat.

STANDARD ERRORS PER PLOT: Total sugar: 2.86 cwt. per acre or 5.36%. Tops: 1.09 tons per acre or 7.74%. Mean dirt tare : 0.138.

https://doi.org/10.23637/ERADOC-1-68

Responses to fertilisers

MEAN YIELDS: Total sugar: *53.3 cwt.*; Roots (washed): *14.84 tons*; Tops: *14.08 tons*; Sugar percentage: *17.98*; Plant number: *28.2 thousands.*

	Mean response	Differential responses: Dung Absent	Dung Present	Salt Absent	Salt Present	Mur. pot. Absent	Mur. pot. Present
TOTAL SUGAR: cwt. per acre (±1.17. *Means ±0.825*)							
Salt ..	*+3.7*	+3.1	+4.2	—	—	+4.4	+3.0
Mur. pot.	*−1.1*	−1.0	−1.2	−0.4	−1.8	—	—
ROOTS (washed): tons per acre							
Salt ..	*+0.90*	+0.81	+0.99	—	—	+1.04	+0.76
Mur. pot.	*−0.32*	−0.39	−0.25	−0.18	−0.46	—	—
TOPS: tons per acre (±0.445. *Means: ±0.314*)							
Salt ..	*+0.34*	−0.01	+0.70	—	—	+0.72	−0.04
Mur. pot.	*−0.12*	−0.54	+0.29	+0.26	−0.50	—	—
SUGAR PERCENTAGE							
Salt ..	*+0.13*	+0.05	+0.22	—	—	+0.20	+0.06
Mur. pot.	*+0.06*	+0.19	−0.07	+0.13	−0.01	—	—
PLANT NUMBER: thousands per acre							
Salt ..	*+0.9*	+1.2	+0.6	—	—	+0.7	+1.0
Mur. pot.	*+0.5*	+0.6	+0.3	+0.3	+0.6	—	—

Effects of time of application of minerals

Minerals applied	None	Salt	Mur. pot.	Salt mur. pot.	No dung	Dung	*Mean*	*Increase*
TOTAL SUGAR: cwt. per acre								
Autumn	51.7[1]	57.9[2]	52.7[2]	54.8[2]	53.1[3]	57.1[3]	*55.1*[4]	
Spring		54.2[2]	49.9[2]	53.8[2]	48.7[3]	56.6[3]	*52.6*[4]	*−2.5*[3]
Standard errors ..	([1])±0.825, ([2])±1.17, ([3])±0.953, ([4])±0.674.							
ROOTS (washed): tons per acre								
Autumn	14.48	15.98	14.76	15.40	14.79	15.97	*15.38*	
Spring		15.06	13.84	14.72	13.37	15.71	*14.54*	*−0.84*
TOPS: tons per acre								
Autumn	13.78[1]	13.97[2]	14.70[2]	13.62[2]	12.76[3]	15.44[3]	*14.10*[4]	
Spring		15.03[2]	13.36[2]	14.37[2]	11.96[3]	16.55[3]	*14.25*[4]	*+0.15*[3]
Standard errors ..	([1])±0.314, ([2])±0.445. ([3])±0.363, ([4])±0.257.							
SUGAR PERCENTAGE								
Autumn	17.84	18.12	17.88	17.81	17.97	17.90	*17.94*	
Spring		17.98	18.07	18.27	18.19	18.02	*18.11*	*+0.17*
PLANT NUMBER: thousands per acre								
Autumn	27.6	29.0	27.4	29.5	28.6	28.7	*28.6*	
Spring		27.5	28.4	28.3	28.1	28.0	*28.1*	*−0.5*

Conclusions

Salt produced a significant increase in sugar per acre, while muriate of potash gave a decrease which was not significant.

The autumn application of salt gave somewhat higher yields than the spring application, but the difference was hardly significant.

Salt and muriate of potash had little effect on tops.

Dung applied to whole blocks gave an increase of 5.7 cwt. sugar per acre and 3.30 tons tops per acre.

https://doi.org/10.23637/ERADOC-1-68

SUGAR BEET

Effect of sowing date, of sulphate of ammonia and of superphosphate and muriate of potash broadcast or drilled with the seed

RS—Great Harpenden, 1936
Plan and yields in lb.

		Roots Sugar beet	Roots Man-golds	Tops Sugar beet	Tops Man-golds	Sugar per cent.			Roots Sugar beet	Roots Man-golds	Tops Sugar beet	Tops Man-golds	Sugar per cent.	
49	*2* Db —	73.5		58.0		18.49			*2* — N	101.5		54.5		18.61	85
	3 Db N	122.7	9.0	101.0	0.5	17.42			*1* P N	142.0		75.0		18.91	
	3 Bs —	93.3		71.5		17.77			*1* Bp —	95.4	4.0	49.5	0.5	18.75	
	1 Bs —	135.7		81.5		18.15			*1* Bs N	159.9	9.5	91.5	0.5	18.52	
	3 — N	115.2	4.5	96.0	0.5	17.80			*3* P N	149.1		113.0		18.46	
	2 Bp —	81.2	3.0	54.5	0.5	17.83			*2* Db N	104.8		69.0		18.61	
	1 Bp N	139.0		113.0		18.20			*2* Bp N	121.0		83.5		18.64	
	3 P —	85.7		66.0		18.29			*2* P —	108.9		70.0		18.46	
	2 — —	88.1		60.5		18.03			*3* Db —	88.5	6.5	58.0	0.5	18.87	
	1 Da —	44.1	98.0	23.0	6.0	18.32			*1* Da N	112.8	26.0	58.0	1.0	18.61	
	2 P N	138.1		103.0		17.74			*2* Da —	92.2	12.5	66.0	0.5	18.44	
	3 Da —	79.0	12.0	67.5	1.0	18.06			*3* Bs N	124.3	7.0	99.0	0.5	17.94	
	2 Bs N	155.7		144.0		17.31			*3* — —	109.0		85.5		17.12	
	1 P —	132.5	6.0	94.5	0.5	17.14			*3* Bp —	94.6		84.0		17.22	
	1 Db N	161.8	58.0	126.5	3.5	17.34			*3* Da N	122.8	15.5	121.0	2.5	17.34	
	3 Bp N	127.9	5.5	126.5	0.5	16.79	W		*2* Bs —	138.0		112.5		17.57	
	2 Da N	156.4	11.5	147.0	1.0	17.28			*1* — —	101.7		63.0		17.05	
	1 — N	153.5		108.0		17.31	↑		*1* Db —	93.0	7.0	61.5	1.5	16.88	
	3 Da —	101.0		108.5		17.05			*2* Bp —	119.6		87.5		17.57	
	3 Bp —	88.7		93.0		17.14			*2* P —	117.9		83.0		18.32	
	2 Bs —	97.2		85.0		17.16			*2* Bs N	157.2		115.5		17.68	
	1 Da —	51.2	118.0	38.5	14.0	16.99			*3* Db —	92.0	7.0	78.5	1.5	17.74	
	3 — N	93.8		103.5		17.16			*1* — —	119.5		66.0		17.48	
	3 Db N	125.6	11.0	126.0	0.5	17.11			*1* Bp N	168.2		115.5		17.74	
	1 P —	130.0		101.0		17.34			*3* Bs —	90.0		79.0		17.94	
	1 Bs N	166.3		130.5		17.37			*3* Da N	143.9	4.0	140.0	0.5	17.40	
	3 P —	91.7	8.0	81.5	0.5	17.28			*1* Bs —	129.7		81.5		17.77	
	1 Db N	128.0	12.0	89.0	0.5	17.60			*2* Da —	91.0	4.0	73.5	0.5	18.03	
	1 Bp —	98.7		68.5		17.34			*2* — N	141.0	4.5	104.0	0.5	17.58	
	2 — —	99.5		76.5		17.11			*1* Da N	136.0	54.5	84.5	3.0	17.80	
	1 — N	182.4		146.0		17.25			*3* — —	87.9		69.5		17.60	
	2 Db —	123.8	4.5	113.5	0.5	16.76			*1* P N	176.3		110.5		17.97	
	2 Da N	116.9	7.5	112.0	0.5	17.05			*3* P N	133.8	6.0	120.0	1.0	17.63	
	3 Bs N	149.0		135.5		16.47			*3* Bp N	120.4	8.5	114.5	1.5	17.37	
	2 Bp N	140.0		102.0		16.96			*2* Db N	134.6	8.0	119.0	1.0	17.40	
84	*2* P N	146.1		67.5		16.30			*1* Db —	81.1	7.5	52.0	1.0	17.48	120

https://doi.org/10.23637/ERADOC-1-68

SYSTEM OF REPLICATION ; 4 randomised blocks of 18 plots each. Certain interactions partially confounded with block differences.

AREA OF EACH PLOT (after rejecting edge-rows) ; 1/190 acre. Plots actually 1/95 (94.8 lks. × 11.1 lks.).

TREATMENTS ; 6 × 3 × 2 factorial design.

Sowing dates ; April 23 (1), May 8 (2), May 26 (3).

Minerals ; None (—), ploughed in (P), broadcast immediately after ploughing (Bp), broadcast at sowing (Bs), drilled below seed (Db), drilled above seed (Da), at the rate of 0.5 cwt. P_2O_5 per acre as superphosphate and 1.0 cwt. K_2O per acre as muriate of potash.

Sulphate of ammonia ; None (—), 0.6 cwt. N per acre drilled where minerals are drilled, otherwise broadcast (N).

BASAL MANURING ; Nil.

CULTIVATIONS, ETC. ; Minerals applied (P) ; March 21 . Ploughed ; March 27-April 1. Minerals applied (Bp) ; April 3. Spring-tine harrowed ; April 7 and 8. Rolled ; April 8. Harrowed ; April 20 and 23. Rolled ; April 23. Minerals applied ; (Bs, Db, Da) ; April 23. Harrowed and rolled ; April 24. Rolled ; May 8. Minerals applied (Bs, Db, Da) ; May 8. Harrowed ; May 8. Harrowed and rolled ; May 26. Minerals applied (Bs, Db, Da) ; May 26. Horse hoed 1st sowing ; May 28. Singled 1st sowing ; June 11. Horse hoed 2nd sowing ; June 12. Singled 2nd sowing ; June 17. Horse hoed 3rd sowing ; June 23. Singled 3rd sowing and hand hoed 1st and 2nd sowings ; July 4. Horse and hand hoed all sowings ; Aug. 8 and 12. Lifted ; Nov. 27-Dec. 3. Variety ; Kleinwanzleben E. Previous crop ; Wheat.

SPECIAL NOTE ; The seed drill used had not been properly cleaned before the experiment and unfortunately contained mangolds seeds, which grew along with the sugar beet on certain plots. The results have been combined by assuming that a sugar beet root weighs one half a mangolds root and that sugar beet tops weigh 2.5 times mangolds tops. The individual weights of sugar beet and mangolds are, however, given in all cases. It will be noticed that the mistake severely affected a few treatments only.

STANDARD ERROR PER PLOT : Roots (Sugar beet + $\frac{1}{2}$ Mangolds) : 1.39 tons per acre or 13.4% ; Tops (Sugar beet + $\frac{5}{2}$ Mangolds) : 1.52 tons per acre or 19.4%.

Conclusions

Later sowing produced a significant decrease in the yield of roots and a significant increase in the yield of tops. The sugar percentage was also slightly lower with the later sowings, so that the yield of sugar per acre dropped by 4.7 cwt. per acre from the first to the second sowing and by a further 2.6 cwt. per acre from the second sowing to the third.

Sulphate of ammonia produced large increases in the yields of roots and tops. Sulphate of ammonia had little effect on the average on sugar percentage and gave an average increase in sugar per acre of 11.6 cwt. or 32 per cent. of the mean yield.

The average response to minerals was not significant in roots, tops or sugar percentage.

https://doi.org/10.23637/ERADOC-1-68

Main effects and interactions of sowings with fertilisers

	Sugar beet			Mangolds			Sugar beet + ½ Mangolds			*Mean Increase*
	S_1	S_2	S_3	S_1	S_2	S_3	S_1	S_2	S_3	
	ROOTS ; tons per acre									
N_0	8.57	8.70	7.79	1.70	0.17	0.24	9.42[1]	8.78	7.91	*8.70*[2]
N_1	12.91	11.40	10.80	1.13	0.22	0.50	13.48	11.51	11.05	*12.01 +3.31*[3]
O	11.81	9.12	8.61	0.00	0.10	0.10	11.81[4]	9.17	8.66	*9.88*[1]
P	12.32	10.84	9.76	0.13	0.00	0.30	12.38	10.84	9.91	*11.04 +1.16*[5]
Bp	10.63	9.79	9.15	0.08	0.06	0.30	10.67	9.82	9.30	*9.93 +0.05*
Bs	12.55	11.62	9.68	0.20	0.00	0.15	12.65	11.62	9.76	*11.34 +1.46*
Db	9.84	9.26	9.09	1.79	0.27	0.71	10.74	9.40	9.44	*9.86 −0.02*
Da	7.30	9.68	9.47	6.29	0.75	0.67	10.44	10.06	9.80	*10.10 +0.22*
Mean							*11.45*[6]	*10.15*	*9.48*	*10.36*
Incr'se								*−1.30*[1]	*−1.97*	
	TOPS ; tons per acre						Sugar beet + 5/2 Mangolds			
N_0	5.52	6.65	6.66	0.17	0.01	0.02	5.94[7]	6.67	6.71	*6.44*[8]
N_1	8.82	8.63	9.87	0.06	0.02	0.06	8.97	8.68	10.02	*9.22 +2.78*[9]
O	8.12	6.27	7.52	0.00	0.01	0.01	8.12[10]	6.29	7.54	*7.32*[7]
P	8.08	6.86	8.07	0.01	0.00	0.03	8.10	6.86	8.15	*7.70 +0.38*[11]
Bp	7.35	6.94	8.86	0.01	0.01	0.04	7.37	6.96	8.96	*7.76 +0.44*
Bs	8.16	9.69	8.16	0.01	0.00	0.01	8.18	9.69	8.18	*8.68 +1.36*
Db	6.98	7.62	7.71	0.14	0.03	0.06	7.33	7.70	7.86	*7.63 +0.31*
Da	4.33	8.45	9.27	0.51	0.05	0.08	5.61	8.57	9.47	*7.88 +0.56*
Mean							*7.45*[12]	*7.68*	*8.36*	*7.83*
Incr'se								*+0.23*[7]	*+0.91*	

	SUGAR PERCENTAGE					TOTAL SUGAR ; cwt. per acre				
	S_1	S_2	S_3	*Mean*	*Increase*	S_1	S_2	S_3	*Mean*	*Increase*
N_0	17.56	17.81	17.67	*17.68*		33.1	31.3	28.0	*30.8*	
N_1	17.88	17.60	17.41	*17.63*	*−0.05*	48.2	40.5	38.5	*42.4*	*+11.6*
O	17.27	17.83	17.42	*17.51*		40.8	32.7	30.2	*34.6*	
P	17.84	17.70	17.92	*17.82*	*+0.31*	44.2	38.4	35.5	*39.4*	*+4.8*
Bp	18.01	17.75	17.13	*17.63*	*+0.12*	38.4	34.9	31.9	*35.1*	*+0.5*
Bs	17.95	17.43	17.53	*17.64*	*+0.13*	45.4	40.5	34.2	*40.0*	*+5.4*
Db	17.32	17.82	17.78	*17.64*	*+0.13*	37.2	33.5	33.6	*34.8*	*+0.2*
Da	17.93	17.70	17.46	*17.70*	*+0.19*	37.4	35.6	34.2	*35.7*	*+1.1*
Mean	*17.72*	*17.70*	*17.54*	*17.66*		*40.6*	*35.9*	*33.3*	*36.6*	
Increase		*−0.02*	*−0.18*				*−4.7*	*−7.3*		

Standard errors : [1] ±0.401, [2] ±0.232, [3] ±0.328, [4] ±0.695, [5] ±0.567, [6] ±0.284, [7] ±0.439, [8] ±0.253, [9] ±0.358, [10] ±0.760, [11] ±0.621, [12] ±0.310.

https://doi.org/10.23637/ERADOC-1-68

MANGOLDS

Effect of sulphate of ammonia, superphosphate, muriate of potash, agricultural salt and dung

RM—GREAT HARPENDEN—1936

Plan and yields in lb., roots above, tops centre, plant number below

1	- PK - D	--- NA D	S - K - -	SPKNAD	- - - - D	- PKNA D	- - K - -	S - - NAD	8
	844	1104	1156	1508	1248	1100	784	1376	
	126	157	139	196	120	136	95	152	
	444	461	471	446	484	448	479	478	
	SP - NA -	- - KNA -	S - - - D	- P - - -	SPK - D	S - KNA -	SP - - -	- P - NA -	
NE	1312	1000	1176	888	1356	1376	1008	964	
	168	150	146	123	158	171	122	130	
	466	472	492	504	478	461	493	472	
	- - K - D	SP - - D	- P - NAD	- PKNA -	S - K - D	SPKNA - - -	KNAD	SP - NAD	
	896	1284	996	860	1328	1292	1008	1324	
	148	174	146	132	180	167	138	176	
	460	490	469	451	487	458	462	471	
	S - - NA -	SPK - -	- - - - -	S - KNA D	- P - - D	- PK - - - - -	NA -	S - - - -	
	1184	984	740	1468	1008	692	780	1108	
25	156	148	110	211	144	110	126	124	32
	439	474	507	448	447	470	492	487	

SYSTEM OF REPLICATION : 4 randomised blocks of 8 plots each. Certain high order interactions are partially confounded with block differences.

AREA OF EACH PLOT (after rejecting edge rows) : 0.02322 acre. Plots actually. 1/45 acre (48.8 lks. × 45.5 lks.)

TREATMENTS : 2^5 factorial design.

Sulphate of ammonia : None, 0.6 cwt. N per acre (S).
Superphosphate : None, 0.5 cwt. P_2O_5 per acre (P).
Muriate of Potash : None, 1.0 cwt. K_2O per acre (K).
Agricultural Salt : None, 5 cwt. per acre (NA).
Dung : None, 10 tons per acre (D).

BASAL MANURING : Nil.

CULTIVATIONS, ETC. : Dung applied : Dec. 11. Ploughed : Dec. 17-19. Spring-tine harrowed : April 7. Artificials applied : May 5. Harrowed : May 5. Rolled : May 5. Drilled : May 5. Horse hoed : June 12, Aug. 12 and 13. Singled : July 2 and 3. Lifted : Nov. 18 and 19. Variety : Yellow Globe. Previous crop : Wheat.

STANDARD ERROR PER PLOT : Roots : 1.91 tons per acre or 7.50%

https://doi.org/10.23637/ERADOC-1-68

Responses to fertilisers

MEAN YIELDS. Roots: *25.50 tons*; Tops, *3.40 tons*; Plant number: *21.2 thousands.*

	Mean response	Differential responses									
		Sulphate of ammonia		Dung		Salt		Muriate of potash		Superphosphate	
		Absent	Present	Absent	Present	Absent	Present	Absent	Present	Absent	Present
ROOTS: tons per acre (±0.955. *Means: ±0.675*)											
Sulphate of ammonia	*+7.73*	—	—	+7.87	+7.59	+6.68	+8.79	+5.93	+9.53	+7.58	+7.88
Dung	*+4.20*	+4.34	+4.06	—	—	+5.17	+3.24	+4.45	+3.96	+4.28	+4.12
Salt	*+3.12*	+2.07	+4.18	+4.09	+2.16	—	—	+1.68	+4.56	+2.50	+3.75
Muriate of potash	*+0.22*	−1.58	+2.02	+0.46	−0.02	−1.22	+1.66	—	—	+0.87	−0.43
Superphosphate	*−0.45*	−0.60	−0.30	−0.37	−0.53	−1.08	+0.17	+0.20	−1.10	—	—
TOPS: tons per acre.											
Sulphate of ammonia	*+0.72*	—	—	+0.64	+0.80	+0.62	+0.83	+0.47	+0.98	+0.69	+0.76
Dung	*+0.50*	+0.42	+0.58	—	—	+0.66	+0.33	+0.46	+0.54	+0.53	+0.46
Salt	*+0.50*	+0.40	+0.60	+0.66	+0.33	—	—	+0.43	+0.57	+0.57	+0.43
Muriate of potash	*+0.19*	−0.06	+0.44	+0.14	+0.23	+0.12	+0.26	—	—	+0.41	−0.04
Superphosphate	*+0.05*	+0.01	+0.08	+0.08	+0.02	+0.12	−0.02	+0.27	−0.18	—	—
PLANT NUMBER: thousands per acre											
Sulphate of ammonia	*0.0*	—	—	−0.6	+0.6	+0.4	−0.3	−0.1	+0.2	−0.3	+0.4
Dung	*−0.4*	−1.0	+0.2	—	—	−0.6	−0.1	−0.4	−0.3	−0.2	−0.5
Salt	*−0.8*	−0.4	−1.1	−1.0	−0.5	—	—	−0.9	−0.7	−0.9	−0.7
Muriate of potash	*−0.7*	−0.8	−0.5	−0.7	−0.5	−0.8	−0.6	—	—	−0.6	−0.8
Superphosphate	*−0.3*	−0.6	+0.1	−0.1	−0.4	−0.4	−0.2	−0.2	−0.4	—	—

Conclusions

Sulphate of ammonia, dung and salt produced significant increases in the yield of roots. The average response in roots to muriate of potash was small and not significant, but the responses to sulphate of ammonia and salt were increased by the presence of muriate of potash, the increase being significant for sulphate of ammonia and almost so for salt. The results for tops were similar to those for roots.

Superphosphate had little effect on roots or tops.

https://doi.org/10.23637/ERADOC-1-68

BEANS

Effect of dung, nitro-chalk, superphosphate and muriate of potash

RE—Gt. Harpenden, 1936

Plan and yields in lb., grain above, straw below

28	**P**	**K**	**D**	**NPK**	**NPK**	**D**	**P**	**DNK**	35
	45.1	55.0	53.1	36.2	43.1	42.2	38.8	34.2	
	78.4	83.0	89.9	87.0	95.2	96.3	81.0	101.6	
N	**DNK**	**DNP**	**DPK**	**N**	**N**	**DNP**	**K**	**DPK**	
↑	41.0	48.4	54.8	41.7	46.9	52.2	50.2	44.5	
	87.8	90.8	81.2	79.0	78.1	99.8	91.0	98.2	
	DP	**NK**	**DK**	**PK**	**NK**	**DP**	**O**	**NP**	
	50.1	44.5	42.6	51.4	42.9	52.4	57.0	39.2	
	86.9	101.2	84.4	80.1	89.4	98.8	73.0	96.0	
	DNPK	**O**	**DN**	**NP**	**PK**	**DK**	**DNPK**	**DN**	
52	44.1	57.5	41.3	49.7	55.8	51.9	54.0	42.5	59
	94.2	87.5	102.2	87.3	114.0	110.8	116.8	110.0	

SYSTEM OF REPLICATION : 4 randomised blocks of 8 plots each. Certain interactions confounded with block differences.

AREA OF EACH PLOT : 1/40 acre. (54.5 lks. by 45.9 lks.)

TREATMENTS : 2^4 factorial design.

Dung : none, 10 tons per acre (D).

Nitrochalk : none, 0.4 cwt. N per acre (N).

Superphosphate : none, 0.6 cwt. P_2O_5 per acre (P).

Muriate of potash : none, 1.0 cwt. K_2O per acre (K).

SPECIAL NOTE : The two right hand blocks failed and were redrilled in the spring with spring beans.

CULTIVATIONS, ETC. : Plots, 32-35, 40-43, 48-51, 56-59. Applied dung and artificials : Oct. 11. Ploughed : Oct. 14-16. Harrowed : Oct. 18. Drilled : Oct. 21. Crop failed. Springtine harrowed : March 16. Harrowed, redrilled and harrowed in : March 19. Horse hoed : May 7 and 29.

Plots, 28-31, 36-39, 44-47, 52-55. Applied dung and artificials : Oct. 11. Ploughed : Oct. 14-16. Harrowed : Oct. 18. Drilled : Oct. 21. Harrowed : March 24. Hand hoed : April 24-27 and June 9. Horse hoed : May 29. All plots harvested : Aug. 24. Previous crop : Wheat.

STANDARD ERROR PER PLOT : Grain : 1.72 cwt. per acre or 10.3%.

Responses to fertilisers

Mean yields : GRAIN, *16.8 cwt ;* STRAW, *32.9 cwt.*

	Mean response	Differential responses: Dung Absent	Dung Present	Nitro-chalk Absent	Nitro-chalk Present	Superphosphate Absent	Superphosphate Present	Mur. pot. Absent	Mur. pot. Present
	GRAIN : cwt. per acre (±0.860. *Means :* ±0.608).								
Dung	*−0.1*	—	—	−0.8	+0.6	−2.1	+1.8	+0.3	−0.5
Nitro-chalk ..	*−2.2*	−3.0	−1.5	—	—	−3.3	−1.2	−1.5	−3.0
Superphosphate ..	*+0.3*	−1.6	+2.3	−0.7	+1.4	—	—	−0.3	+1.0
Mur. pot.	*−0.3*	+0.1	−0.7	+0.4	−1.0	−0.9	+0.4	—	—
	STRAW : cwt. per acre								
Dung	*+3.3*	—	—	+2.6	+4.0	+4.5	+2.1	+5.1	+1.5
Nitro-chalk ..	*+1.8*	+1.0	+2.6	—	—	+1.5	+2.1	+2.2	+1.4
Superphosphate ..	*+0.5*	+1.6	−0.7	+0.2	+0.8	—	—	+0.2	+0.8
Mur. pot.	*+1.8*	+3.6	0.0	+2.2	+1.4	+1.5	+2.1	—	—

Conclusions

The average effects of dung, superphosphate and muriate of potash on the yield of grain were negligible, while nitrochalk produced a significant depression in grain. The interaction between the effects of dung and superphosphate was statistically significant, but in view of absence of any apparent average effects of either dung or superphosphate no weight can be attached to it.

Dung produced a significant increase in the straw yields.

https://doi.org/10.23637/ERADOC-1-68

KALE

Effect of sulphate of ammonia, poultry manure, soot and rape dust

RK—FOSTER'S, 1936 (3rd year)

Plan and yields in lb.

1	R_1 800	N_0 650	M_0 629	M_1 792	M_2 724	R_1 683	R_2 767	N_1 836	8
	S_0 741	S_1 822	N_1 883	M_2 875	S_2 796	M_1 622	M_0 592	N_0 715	
SW ↑	R_2 969	S_2 927	R_0 742	N_2 975	R_0 764	S_0 729	N_2 782	S_1 848	
	R_2 958	N_0 798	M_1 763	S_1 814	R_2 874	R_0 691	R_1 728	M_1 856	
	N_2 868	M_0 746	M_2 876	S_2 918	M_2 785	N_0 776	N_1 828	S_0 756*	
41	R_1 720	S_0 792	R_0 737	N_1 776	S_2 784	N_2 930	S_1 830*	M_0 657*	48

* Estimated.

SYSTEM OF REPLICATION : 4 randomised blocks of 12 plots each.

AREA OF EACH PLOT : 0.028926 acre (10 yds. × 14 yds.)

TREATMENTS, 1936 : No nitrogen ($_0$), sulphate of ammonia (N) half applied in seed bed and remainder as a top dressing, poultry manure (M), soot (S) and rape dust (R), applied in seed-bed at the rate of 0.4 cwt. N per acre ($_1$) or 0.8 cwt. N per acre ($_2$). Plots receiving treatment O in 1936 had treatment 2 in 1935 and *vice versa*. Plots receiving treatment 1 had this in both years. For N_0, S_0, M_0, and R, (see plan) the fertilizer symbols refer to the 1935 treatment.

BASAL MANURING : All plots were made up to 1.0 cwt. P_2O_5 per acre and 1.0 cwt. K_2O per acre, using superphosphate and muriate of potash (an allowance being made for the P_2O_5 and K_2O contained in the organic manures).

CULTIVATIONS, ETC. Ploughed : March 7, 23-26. Springtine harrowed : April 15. Applied manures (sulphate of ammonia at half-rate) : May 2. Harrowed and rolled, before and after seed sown : May 4. Seed resown : May 26. Harrowed and rolled : May 26. Dusted with Derris powder : June 12 and 17. Hand-hoed : July 9. Horse-hoed : July 22. Applied second half of sulphate of ammonia : July 27. Harvested : Dec. 22-Feb. 2. Variety : Thousand head. Previous crop : Brussels Sprouts. (See 1935 Report, p.191).

SPECIAL NOTE : Kale harvested at weekly intervals as food for stock.

STANDARD ERROR PER PLOT : 0.925 tons per acre or 7.59%.

Summary of Results : tons per acre ($\pm$0.462)

Nitrogen, cwt. per acre 1934	1935	1936	Sulph. amm.	Poultry manure	Soot	Rape dust	*Mean* ($\pm$*0.231*)
0.0	0.8	0.0	11.34	10.13	11.64	11.32	*11.11*
0.4	0.4	0.4	12.83	11.71	12.79	11.31	*12.16*
0.8	0.0	0.8	13.71	12.58	13.21	13.76	*13.32*
	Mean ($\pm$*0.267*)		*12.63*	*11.47*	*12.55*	*12.13*	*12.20*

Conclusions

There was a significant response to the 1936 application of nitrogen. Poultry manure gave lower yields than soot or sulphate of ammonia with all three types of dressing, the average differences being significant. Rape dust occupied an intermediate position.

https://doi.org/10.23637/ERADOC-1-68