ROTHAMSTED RESEARCH

Report for 1931

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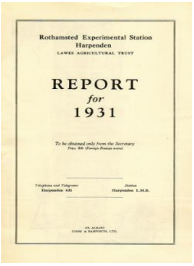


Other Experiments at Rothamsted

Rothamsted Research

Rothamsted Research (1932) *Other Experiments at Rothamsted ;* Report For 1931, pp 141 - 159 **- DOI: https://doi.org/10.23637/ERADOC-1-65**

REPLICATED EXPERIMENTS AT ROTHAMSTED

HAY

Temporary Ley Experiment: Preparation for Wheat in 1932.

R H—Long Hoos (Section 5) 1931.

N.E.

I.	CR(2)	CR(1)	C (2)	C (1)
II.	C (1)	CR(2)	CR(1)	C (2)
III.	CR(1)	C (2)	C (1)	CR(2)
IV.	C (2)	C (1)	CR(2)	CR(1)

SYSTEM OF REPLICATION: 4×4 Latin Square.
AREA OF EACH PLOT: .121 acre.
TREATMENTS:
C=Clover.
CR=Clover and Ryegrass.
First crop cut: July 1st-2nd. On plots marked (2), a second crop was cut on Aug. 27th.
Previous crop: Barley.

Actual Green weights in lb.

Row	First Crop.				Second Crop.	
	C (1)	C (2)	CR (1)	CR (2)	C (2)	CR (2)
I	2059	2171	1899	1696	316	442
II	1534	1856	1922	1824	271	422
III	2072	2219	1417	1921	265	401
IV	2188	1310	1981	1793	436	395

Summary of Results—Dry Matter.

Average yield.	Clover.	Clover and Ryegrass.	Mean.	Standard Error.
First Crop.				
Cwt. per acre ..	39.8	37.3	38.6	1.08
Per cent. ..	103.2	96.8	100.0	2.80
Second Crop.				
Cwt. per acre ..	12.5	16.1	14.3	—
Per cent. ..	87.3	112.7	100.0	—

The difference between the mixtures is not significant for either crop.

https://doi.org/10.23637/ERADOC-1-65

BARLEY

Undersowings for temporary ley of clover and ryegrass. Nitrogenous Fertiliser. Sulphate of Ammonia.

R B—Fosters, 1931.

N.E.

I.	R	—	— O	—	C	CR	—
II.	—	O	R	—	CR	—	C	—
III.	—	CR	— C	R	—	O	—
IV.	C	—	CR	—	O	—	— R

SYSTEM OF REPLICATION: 4×4 Latin Square, with split plots
AREA OF EACH SUB-PLOT: .05355 acre.
VARIETY: Plumage Archer undersown with Italian Rye Grass (R) and Broad Red Clover (C).
TREATMENTS: Sulphate of Ammonia at the rate of 0.2 cwt. N per acre, applied to one out of each pair of sub-plots (indicated by the treatment symbol occurring on that half).
Manures applied: March 23rd.
Seed sown: Barley, March 23rd; Rye Grass and Clover, April 23rd.
Barley Harvested: August 27th.
Previous crop: Temporary Ley.

Actual weights in lb.—Grain.

Row.	Without Sulphate of Ammonia.				With Sulphate of Ammonia.			
	O	C	R	CR	O	C	R	CR
I. ..	106.50	70.50	108.00	68.75	95.25	98.25	90.00	97.25
II. ..	112.25	82.00	100.50	76.25	112.50	99.50	120.50	61.75
III. ..	81.00	111.75	77.75	134.00	87.00	117.50	83.25	130.25
IV. ..	80.00	119.00	86.00	91.00	97.25	131.50	93.00	110.75

Actual weights in lb.—Straw.

Row.	Without Sulphate of Ammonia.				With Sulphate of Ammonia.			
	O	C	R	CR	O	C	R	CR
I. ..	145.00	106.50	147.25	94.75	128.75	119.25	164.25	122.75
II. ..	151.50	105.00	128.00	114.75	164.00	117.50	163.00	155.75
III. ..	86.00	156.75	88.25	165.00	129.50	166.00	119.25	179.75
IV. ..	98.25	152.75	109.25	122.50	130.75	159.50	116.25	159.00

Summary of Results.

Average Yield	Cwt. per acre.					Per cent.				
	No Ley	Clover	Ryegrass	Clover + Ryegrass	Mean.	No Ley	Clover	Ryegrass	Clover + Ryegrass	Mean
Grain—										
Without S./Amm.	15.8	16.0	15.5	15.4	15.7	97.0	97.9	95.1	94.5	96.2
With S./Amm.	16.3	18.6	16.1	16.7	16.9	100.2	114.2	98.8	102.2	103.8
Mean ..	16.1	17.3	15.8	16.0	16.3	98.6	106.0	97.0	98.4	100.0
Straw—										
Without S./Amm.	20.0	21.7	19.7	20.7	20.5	90.1	97.7	88.6	93.2	92.4
With S./Amm.	23.0	23.4	23.5	25.7	23.9	103.7	105.4	105.5	115.7	107.6
Mean ..	21.5	22.6	21.6	23.2	22.2	96.9	101.6	97.1	104.5	100.0

	Grain.	*Straw.*
Standard Errors: Single treatment	=1.01 cwt. or 6.2%	1.05 cwt. or 4.7%
Mean of S./Amm. and No S./Amm.	=0.80 cwt. or 4.9%	0.82 cwt. or 3.7%

The effect of Sulphate of Ammonia on the straw is definitely significant, but the difference does not reach the 5% level of significance for grain. There are no other significant effects.

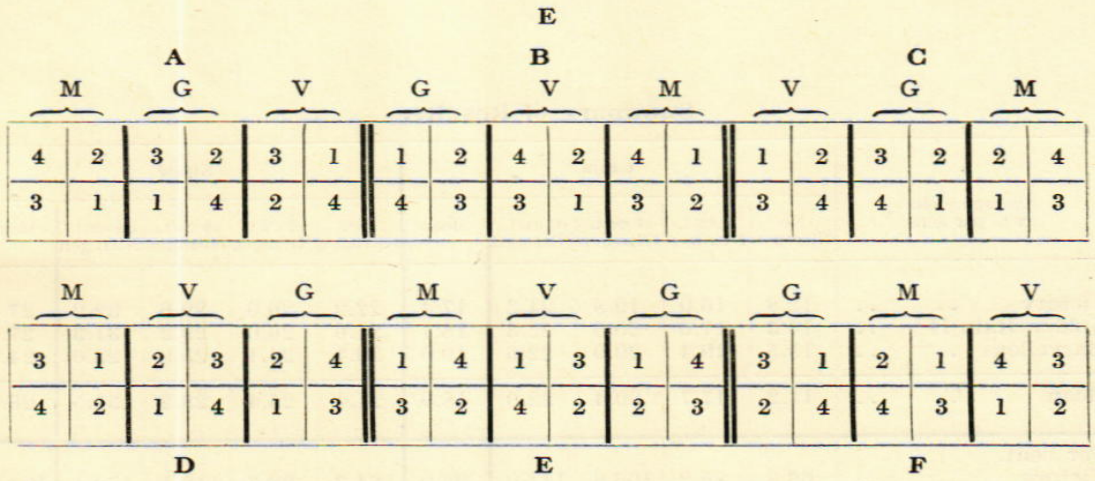
https://doi.org/10.23637/ERADOC-1-65

OATS

Variety Trial.

Nitrogenous Fertiliser: Sulphate of Ammonia at four levels.

R O—Gt. Harpenden, 1931



System of Replication: 6 randomised blocks of 3 plots, each sub-divided into 4.
Area of Each Plot: 1/80th acre.
Treatments (sub plots):
1=No Nitrogen.
2=S/Amm. at the rate of 0.2 cwt. N per acre.
3=S/Amm. at the rate of 0.4 cwt. N per acre.
4=S/Amm. at the rate of 0.6 cwt. N per acre.
Manures applied: Feb. 25-26th.

Varieties (main plots): V=Victory.
G=Golden Rain II.
M=Marvellous.
Seed sown: February 25th.
Oats Harvested: August 18-20th.
Previous crop: Temporary Ley: 1st crop taken for hay, aftermath eaten off by sheep given turnips and corn.

Actual weights in lb.—Grain.

Block.	M				G				V			
	1	2	3	4	1	2	3	4	1	2	3	4
A	15.75	17.50	27.25	24.75	20.00	20.50	23.50	31.50	15.50	22.50	25.00	29.00
B	22.25	32.25	33.00	31.00	15.00	25.50	22.25	24.00	17.00	16.00	28.00	21.50
C	24.25	24.75	29.75	30.25	22.25	20.50	21.50	26.00	13.25	18.50	29.50	28.25
D	26.25	35.00	29.50	39.00	29.25	28.50	40.25	35.25	27.75	32.50	39.25	43.50
E	17.50	22.25	26.00	29.25	16.00	25.75	33.00	33.25	18.50	22.25	20.25	30.50
F	24.00	31.00	30.25	36.00	17.50	27.00	31.50	37.25	15.25	22.75	24.25	25.00

Actual weights in lb.—Straw.

Block.	M				G				V			
	1	2	3	4	1	2	3	4	1	2	3	4
A	23.50	28.00	38.50	35.25	28.00	30.75	40.75	42.00	31.50	32.00	37.50	41.25
B	32.75	39.75	38.00	42.50	25.00	37.75	38.50	39.75	36.50	34.50	43.75	38.25
C	34.50	35.75	41.50	40.75	40.50	36.00	43.00	41.75	26.50	37.50	41.00	45.25
D	28.50	36.75	35.00	44.25	28.75	35.00	40.50	43.50	31.75	47.25	42.50	44.75
E	21.50	27.75	31.00	33.50	32.00	34.75	43.00	47.25	30.00	31.75	38.50	49.75
F	30.50	34.75	33.25	39.25	27.25	44.00	39.50	48.75	30.50	35.50	45.25	51.25

https://doi.org/10.23637/ERADOC-1-65

Summary of Results.

Average yield cwt. per acre	Grain					Straw				
	No Nitrogen	.2 cwt. Nitrogen	.4 cwt. Nitrogen	.6 cwt. Nitrogen	Mean	No. Nitrogen	.2 cwt. Nitrogen	.4 cwt. Nitrogen	.6 cwt. Nitrogen	Mean
Victory	12.8	16.0	19.8	21.2	17.4	22.2	26.0	29.6	32.2	27.5
Golden Rain II ..	14.3	17.6	20.5	22.3	18.7	21.6	26.0	29.2	31.3	27.0
Marvellous	15.5	19.4	20.9	22.6	19.6	20.4	24.1	25.9	28.0	24.6
Mean	14.2	17.7	20.4	22.0	18.6	21.4	25.4	28.2	30.5	26.4
Per cent.										
Victory	68.8	86.2	106.6	114.0	93.9	84.3	98.6	112.1	122.1	104.3
Golden Rain II ..	76.9	94.7	110.3	120.1	100.5	81.9	98.5	110.7	118.7	102.4
Marvellous	83.4	104.4	112.7	122.0	105.6	77.3	91.5	98.0	106.3	93.3
Mean	76.4	95.1	109.9	118.7	100.0	81.2	96.2	107.0	115.7	100.0

Standard Errors.

	cwt. per acre.			per cent.		
	Single treatment.	Mean of 3 varieties.	Mean of 4 treatments	Single treatment.	Mean of 3 varieties.	Mean of 4 treatments.
Grain ..	1.23	0.56	0.89	6.6	3.0	4.8
Straw ..	1.22	0.62	0.78	4.6	2.4	3.0

The response to nitrogen is definitely significant, but the experiment is not sufficiently precise to show any difference between the varieties, either in differential response or in average yield.

https://doi.org/10.23637/ERADOC-1-65

WHEAT.

Comparison of Sulphate and Muriate of Ammonia in early and late top dressings.

R W—Little Hoos, 1931.

	A			E	B			
	S.E.	M.E.L.	S.E.L.	O(1)	S.L.	S.E.L.	M.E.	O(1)
	M.E.	O(2)	S.L.	M.L.	M.E.L.	M.L.	S.E.	O(2)
C	M.E.L.	M.L.	S.E.	M.E.	M.E.	O(1)	S.E.	S.E.L.
	S.E.L.	S.L.	O(1)	O(2)	S.L.	M.E.L.	O(2)	M.L.
	M.E.L.	O(1)	O(2)	S.E.L.	O(1)	M.E.	S.E.	S.L.
	M.L.	M.E.	S.L.	S.E.	S.E.L.	M.L.	M.E.L.	O(2)
		E				F		D

System of Replication: 6 randomised blocks of 8 plots each.

Area of Each Plot: 1/60th acre.

Treatments: Sulphate or Muriate of Ammonia applied early or late, or neither or both, making 8 combinations, of which two (without either dressing) are identical.

Basal manure: 13-16 tons farmyard manure per acre.

Early manures applied: March 20th.

Late manures applied: May 1st.

Wheat sown: October 10th.

Wheat harvested: August 22nd.

Variety: Million.

Previous crop: Oats.

Actual weights in lb.—Grain.

Block	O(1)	O(2)	S.E.	M.E.	S.L.	M.L.	S.E.L.	M.E.L.
A	35.00	38.25	40.00	47.00	39.75	42.25	37.50	36.50
B	43.75	41.75	43.50	41.75	41.00	46.50	41.50	44.75
C	38.50	36.25	38.00	41.00	37.75	41.25	43.75	44.00
D	45.75	38.25	42.00	45.00	38.00	38.50	40.25	48.25
E	37.00	39.50	34.00	34.25	29.50	37.00	38.50	39.00
F	35.50	32.50	37.50	41.25	33.50	37.00	38.00	38.75

Actual weights in lb.—Straw.

Block	O(1)	O(2)	S.E.	M.E.	S.L.	M.L.	S.E.L.	M.E.L.
A	70.25	70.50	76.50	81.25	81.75	89.75	91.50	88.00
B	71.00	68.75	88.50	88.25	86.00	90.50	99.50	99.50
C	71.25	73.00	77.75	93.50	82.75	82.25	90.25	98.50
D	86.75	62.00	82.50	99.75	81.50	68.75	100.75	96.75
E	72.00	75.00	73.50	79.75	71.50	79.25	96.00	98.75
F	81.00	60.50	76.75	92.00	84.75	73.75	90.00	78.50

https://doi.org/10.23637/ERADOC-1-65 *pp 6*

Summary of Results.

Average Yield.	No Nitrogen.	Sulphate Early.	Sulphate Late.	Muriate Early.	Muriate Late.	Sulphate Early and Late.	Muriate Early and Late.	Mean.	Standard Errors.
Grain—									
cwt. per acre	20.6	21.0	19.6	22.3	21.6	21.4	22.4	21.2	0.624
per cent.	97.3	98.9	92.4	105.4	102.1	100.8	105.8	100.0	2.94
Straw—									
cwt. per acre	38.5	42.5	43.6	47.7	43.2	50.7	50.0	44.3	1.496
per cent.	86.8	95.8	98.3	107.6	97.5	114.4	112.8	100.0	3.37

Mean of Sulphate and Muriate.

Average yield.	Grain.			Straw		
	Not applied early.	Applied early.	Mean.	Not applied early.	Applied early.	Mean.
cwt. per acre.						
Not applied late ..	20.6	21.7	21.1	38.5	45.1	41.8
Applied late	20.6	21.9	21.3	43.4	50.4	46.9
Mean	20.6	21.8	21.2	40.9	47.7	44.3
per cent.						
Not applied late ..	97.3	102.2	99.7	86.8	101.7	94.2
Applied late	97.3	103.3	100.3	97.9	113.6	105.8
Mean	97.3	102.7	100.0	92.4	107.6	100.0

Standard Errors: Grain—Single Treatment 0.44 cwt. or 2.08%. Straw—1.06 cwt. or 2.39%.
Mean of 2 Treatments 0.31 cwt. or 1.47%. 0.75 cwt. or 1.69%.

Taking the average of sulphate and muriate, both grain and straw are increased significantly by the early application, but only straw by the late application. The plots receiving muriate have given higher yields than those receiving sulphate in both grain and straw, the difference in grain being decidedly significant.

https://doi.org/10.23637/ERADOC-1-65

Wheat: Comparison of Sulphate of Ammonia and Cyanamide in small repeated top dressings and two spring top dressings.

R W—Long Hoos (Section 4) 1931

NE

I.	S.C.	O.	S.S.	R.S.	R.C.
II.	R.S.	R.C.	O.	S.S.	S.C.
III.	S.S.	R.S.	S.C.	R.C.	O.
IV.	R.C.	S.C.	R.S.	O.	S.S.
V.	O.	S.S.	R.C.	S.C.	R.S.

System of Replication: 5 × 5 Latin Square.
Area of Each Plot: 1/100th acre.
Variety: Yeoman.
Treatments: Repeated Sulphate of Ammonia (RS) *v* Cyanamide (RC) each in 8 applications at end of October, November, December, January, February, March, April, May. Spring Sulphate of Ammonia (SS) *v* Cyanamide (SC) in 2 applications, March 20th and May 1st. The fifth treatment consists of no top dressing. Quantity Sulphate of Ammonia and Cyanamide at the rate of 0.4 cwt. N per acre.
Seed sown: Oct. 3.
Harvested: Aug. 21st.
Previous crop: Temporary Ley.

Actual weights in grammes.

Row.	Grain.					Straw.				
	O.	R.S.	R.C.	S.S.	S.C.	O.	R.S.	R.C.	S.S.	S.C.
I.	360	479	357	446	482	678	986	739	910	982
II.	340	488	375	408	524	676	868	776	839	980
III.	319	507	308	441	396	612	982	597	842	720
IV.	356	399	390	422	520	710	815	781	847	976
V.	416	449	378	452	430	755	851	763	875	860

Summary of Results.

Average yield.	No Nitrogen.	Repeated S/Amm.	Repeated Cyanamide	Spring S/Amm.	Spring Cyanamide	Mean.	Standard Error.
Grain—							
cwt. per acre	15.6	20.2	15.7	18.9	20.5	18.2	0.688
per cent.	85.8	111.2	86.6	103.8	112.6	100.0	3.73
Straw							
cwt.per acre	29.9	39.2	31.8	37.6	39.4	35.6	1.39
per cent.	84.0	110.2	89.5	105.6	110.6	100.0	3.91

For the two types of nitrogen taken together, spring dressings are significantly superior to repeated dressings. For the two methods of application taken together sulphate of ammonia is superior to cyanamide. Repetition treatment is strikingly unfavourable in the case of cyanamide.

https://doi.org/10.23637/ERADOC-1-65

Wheat Cultivation Experiment

R W—Little Hoos, 1931

E

A				B							
S		P		O		O		S		P	
H	N	N	HR	N	R	N	R	H	N	N	R
HR	R	R	H	H	HR	HR	H	HR	R	H	HR
O		S		P		S		O		P	
HR	R	HR	H	HR	H	R	N	HR	H	N	HR
N	H	R	N	R	N	H	HR	N	R	R	H
C						D					

SYSTEM OF REPLICATION: 4 randomised blocks of 3 plots, each plot sub-divided into 4.
AREA OF EACH SUB-PLOT: 1/60th acre.
CULTIVATIONS (main plots):
O=Ordinary plough.
S=Simar.
P=Pulverator plough.

CULTIVATIONS (sub-plots):
H=Harrowed.
R=Rolled.
HR=Harrowed and Rolled.
N=Neither Harrowed nor Rolled.
Basal Manure: 13-16 tons farmyard manure per acre.
Variety: Million.
Seed sown: October 10th.
Harvested: August 24th.
Previous crop: Winter oats.

Actual weights in lb.—Grain.

Block	S				P				O			
	H	R	N	HR	H	R	N	HR	H	R	N	HR
A	23	20	16	22	30	26	20	34	29	28	22	31
B	28	28	29	28	35	32	32	38	30	30	26	32
C	28	25	27	31	36	30	32	34	32	31	29	24
D	30	32	28	34	32	32	31	34	34	30	34	32

Actual weights in lb.—Straw.

Block	S				P				O			
	H	R	N	HR	H	R	N	HR	H	R	N	HR
A	72	76	70	59	72	79	75	67	55	70	58	66
B	68	73	78	67	75	85	76	74	67	64	64	75
C	65	76	64	76	74	68	67	63	79	90	82	85
D	74	71	64	70	70	93	88	75	88	88	78	71

https://doi.org/10.23637/ERADOC-1-65

Summary of Results.

Average yield.	Ordinary.	Simar.	Pulverator	Mean.	Standard Single Treatment.	Errors. Mean.
Grain—cwt. per acre.						
Neither Harrowed nor Rolled	14.9	13.4	15.4	14.6	} 0.795	0.403
Rolled only	15.9	14.1	16.1	15.4		
Mean	15.4	13.7	15.7	15.0	0.624	0.285
Harrowed only ..	16.7	14.6	17.8	16.4	} 0.795	0.403
Harrowed and Rolled ..	15.9	15.4	18.8	16.7		
Mean	16.3	15.0	18.3	16.5	0.624	0.285
General Mean	15.9	14.4	17.0	15.8	0.517	
Grain—per cent.						
Neither Harrowed nor Rolled	94.4	85.0	97.8	92.4	} 5.05	2.56
Rolled Only	101.2	89.3	102.1	97.5		
Mean	97.8	87.2	99.9	95.0	3.96	1.81
Harrowed only ..	106.3	92.7	113.1	104.0	} 5.05	2.56
Harrowed and Rolled ..	101.2	97.8	119.1	106.0		
Mean	103.8	95.2	116.1	105.0	3.96	1.81
General Mean	100.8	91.2	108.0	100.0	3.28	
Straw—cwt. per acre.						
Neither Harrowed nor Rolled	37.8	37.0	41.0	38.6	} 2.36	0.932
Rolled only	41.8	39.6	43.5	41.6		
Mean	39.8	38.3	42.2	40.1	2.06	0.659
Harrowed only	38.7	37.4	39.0	38.4	} 2.36	0.932
Harrowed and Rolled ..	39.8	36.4	37.4	37.9		
Mean	39.2	36.9	38.2	38.1	2.06	0.659
General Mean	39.5	37.6	40.2	39.1	1.90	
Straw—per cent.						
Neither Harrowed nor Rolled	96.6	94.5	104.8	98.6	} 6.03	2.38
Rolled only	106.8	101.4	111.3	106.5		
Mean	101.7	97.9	108.0	102.6	5.28	1.68
Harrowed only ..	99.0	95.5	99.6	98.0	} 6.03	2.38
Harrowed and Rolled ..	101.7	93.2	95.5	96.8		
Mean	100.3	94.3	97.6	97.4	5.28	1.68
General Mean	101.0	96.1	102.8	100.0	4.86	

For the grain pulverator cultivation is significantly superior to simar cultivation. The pulverator is not significantly superior to ordinary cultivation, and the inferiority of the simar to ordinary cultivation is barely significant. Harrowing significantly increases grain. For the straw the significant loss due to harrowing is only shown on the rolled plots.

https://doi.org/10.23637/ERADOC-1-65

FORAGE CROPS

Correction to 1930 Experiment. (See p. 156.)

The conclusions drawn from this experiment stand without alteration, with the exception that the response to potash for grain and straw should have been stated to be significant on the oats mixtures as well as the barley mixtures, this response not being in fact significantly different for the two cereals. In the table showing Effect of Potash and Superphosphate (p. 144) the yields of the different mixtures are based on different numbers of plots, and are not equalised for rows and columns.

There is, also, an arithmetical error in the same table (Effect of Potash and Superphosphate). The yields for straw, barley with peas, without and with potash should read 26.2 and 28.8 respectively, instead of 20.9 and 34.1. The corresponding means of all mixtures now become 27.8 and 29.8 instead of 26.5 and 31.2.

The systematic arrangement of the strips of vetches and peas, and oats and barley, not commented on in the 1930 report, was an error in sowing. In the original design the layout consisted of *randomised* pairs of strips, after the manner of the 1929 experiment on sugar beet.

Forage Crop: Comparison of Oats and Wheat, Vetches and Peas. Basal Crop of Beans.

Effect of Sulphate of Ammonia and Nitrate of Soda.
Effect of Muriate of Potash and Superphosphate.
R F—Little Hoos, 1931.

N.E.

	O	W	W	O	O	W	O	W	W	O	W	O	
I.	4	8	6	2	10	7	5	11	1	3	12	9	V
II.	11	3	7	5	9	2	4	8	6	12	1	10	P
III.	3	7	1	12	8	10	6	4	11	5	9	2	P
IV.	7	10	4	11	6	9	2	3	5	1	8	12	V
V.	12	5	8	6	3	1	9	10	4	11	2	7	V
VI.	6	1	10	9	4	3	8	5	12	2	7	11	P
VII.	5	6	9	4	12	11	10	1	2	7	3	8	V
VIII.	1	4	5	3	7	12	11	2	8	9	10	6	P
IX.	10	11	2	7	5	8	12	9	3	4	6	1	P
X.	9	2	12	1	11	6	3	7	10	8	4	5	V
XI.	8	9	3	10	2	5	1	12	7	6	11	4	V
XII.	2	12	11	8	1	4	7	6	9	10	5	3	P

Key to Treatments.

1	2	3	4	5	6	7	8	9	10	11	12
—	—	—	—	S/A	S/A	S/A	S/A	N/S	N/S	N/S	N/S
—	K	—	K	—	K	—	K	—	K	—	K
—	—	P	P	—	—	P	P	—	—	P	P

System of Replication: 12×12 Latin Square, with randomised pairs of rows and columns allotted to different seedings.
Area of Each Plot: 1/50th acre. Half cut for hay, half harvested.
Manurial Treatments: No Nitrogen *v.* Sulphate of Ammonia (S/A) at the rate of 0.2 cwt. N per acre *v.* Nitrate of Soda (N/S) at the rate of 0.2 cwt. N per acre. Potash *v* Muriate of Potash (K) at the rate of 0.5 cwt. K_2O per acre. No Phosphate *v* Superphosphate (P) at the rate of 0.5 cwt. P_2O_5 per acre.
O=Oats at the rate of 3 bushels per acre.
W=Wheat at the rate of 2 bushels per acre.
V=Vetches at the rate of 1 bushel per acre.
P=Peas at the rate of 1 bushel per acre.
Basal Crop: Beans at the rate of 1 bushel per acre.
All plots received Adco at the rate of 14 tons (approx.) per acre (September 12th).
Manures sown: March 24th-25th.
Beans, peas and vetches sown: October 9th-10th.
Other crops: October 11th.
Peas redrilled: Mar. 25th.
Half-plots cut for hay: July 9th-14th.
Remainder harvested: August 17th-21st.
Previous crop: Winter Oats.

https://doi.org/10.23637/ERADOC-1-65

Actual weights in lb.—Hay (Dry Matter).

Row.	1	2	3	4	5	6	7	8	9	10	11	12
I.	69.9	74.8	59.3	73.3	69.6	80.5	77.0	64.9	70.6	80.8	66.4	72.1
II.	55.0	67.4	69.7	63.2	65.6	74.7	78.6	60.7	63.8	66.6	64.8	72.1
III.	70.3	56.3	67.8	58.8	58.6	64.6	58.9	66.2	58.4	64.8	69.7	63.8
IV.	66.6	55.7	51.7	47.6	53.5	68.6	65.1	58.8	63.8	68.8	65.5	68.3
V.	46.5	60.8	53.8	59.7	57.9	61.0	64.9	47.4	70.1	70.7	61.2	63.1
VI.	39.5	47.1	41.1	43.7	47.6	55.9	45.2	47.7	57.7	53.8	49.4	56.2
VII.	40.4	44.7	42.0	48.7	55.5	58.5	50.5	53.6	54.8	51.4	51.6	61.9
VIII.	54.6	43.0	54.2	44.1	56.7	58.0	58.0	50.2	54.7	58.0	56.8	53.7
IX.	54.3	46.4	37.6	42.2	51.1	52.7	56.5	53.2	57.3	64.1	55.1	57.1
X.	52.3	53.5	51.8	46.7	54.8	60.5	56.8	58.9	59.9	52.6	63.6	59.6
XI.	47.8	46.5	53.5	43.0	59.4	59.3	55.9	60.8	56.5	68.1	61.8	58.3
XII.	46.2	47.5	50.4	43.4	51.4	52.5	51.7	53.2	51.9	58.9	59.0	54.0

Actual weights in lb.—Grain and Pulse.

Row.	1	2	3	4	5	6	7	8	9	10	11	12
I.	24	20	28	28	22	20	18	24	21	18	20	24
II.	17	22	28	26	20	20	20	18	20	20	18	17
III.	24	24	21	23	17	17	21	22	16	18	18	22
IV.	28	30	24	24	22	28	25	25	24	25	23	22
V.	23	24	29	24	24	21	26	23	28	26	22	24
VI.	26	25	22	28	18	18	14	18	21	25	16	20
VII.	28	25	20	30	27	27	24	24	24	30	22	26
VIII.	18	22	22	22	22	18	19	21	16	13	15	18
IX.	24	29	22	29	22	19	20	22	20	18	21	20
X.	22	18	24	18	17	24	18	21	20	21	24	21
XI.	22	31	24	16	25	19	20	20	24	24	15	19
XII.	16	21	24	24	14	21	18	22	20	20	21	22

Actual weights in lb.—Straw.

Row.	1	2	3	4	5	6	7	8	9	10	11	12
I.	44	54	50	62	54	60	67	62	61	59	52	62
II.	42	48	45	44	54	49	54	50	54	58	55	50
III.	53	46	48	48	52	50	56	56	51	54	56	53
IV.	42	48	44	46	47	53	52	52	58	55	55	54
V.	57	50	60	54	62	62	52	62	61	64	52	65
VI.	51	44	44	48	46	55	50	51	61	58	46	50
VII.	49	46	48	55	61	62	46	52	61	58	54	56
VIII.	46	36	44	42	54	53	50	44	43	47	47	52
IX.	43	50	46	38	54	48	76	54	53	76	53	48
X.	50	51	49	49	51	54	54	61	58	62	54	51
XI.	42	49	49	42	55	44	46	48	51	56	40	45
XII.	49	45	49	46	48	49	46	52	48	60	54	58

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SUMMARY OF RESULTS.

Separate yields. Mean of all seed mixtures.

Average yield in cwt. per acre.		No Nitrogen.		Sulphate of Ammonia.		Nitrate of Soda.	
		Without Mur.Pot.	With Mur.Pot.	Without Mur.Pot.	With Mur.Pot.	Without Mur.Pot.	With Mur.Pot.
Hay—Dry matter	No Super ..	47.9	47.9	50.7	55.6	53.5	56.4
	Super	47.1	45.7	53.5	50.3	53.9	55.1
Grain and Pulse	No Super ..	20.2	21.6	18.6	18.8	18.9	19.2
	Super	21.4	21.7	18.1	19.3	17.5	19.0
Straw	No Super ..	42.3	42.2	47.5	47.5	49.1	52.6
	Super	42.9	42.7	48.3	47.9	46.0	47.9

Standard Errors : Hay, Dry Matter : 1.23 cwt. or 2.39 per cent.
Grain and Pulse : 0.69 cwt. or 3.54 per cent.
Straw : 1.05 cwt. or 2.26 per cent.

Mean of all manurial treatments.

Average yield in cwt. per acre.	Hay, Dry Matter.			Grain and Pulse.			Straw.		
	Oats.	Wheat.	Means (a)	Oats	Wheat .	Means (a)	Oats.	Wheat.	Means (a)
Vetches	54.1	51.7	52.9	21.4	20.1	20.8	47.8	47.7	47.8
Peas	50.7	49.4	50.0	18.2	18.4	18.3	45.7	44.3	45.0
Means (b)	52.4	50.5	51.5	19.8	19.3	19.5	46.8	46.0	46.4
Standard Errors—									
Means (a)		0.301			0.447			0.287	
Means (b)		1.277			0.745			1.290	

Mean of potash and no potash.

Average yield.	Cwt. per acre.				per cent			
	No Nitrogen	Sulphate of Ammonia	Nitrate of Soda	Mean	No Nitrogen	Sulphate of Ammonia	Nitrate of Soda	Mean
Hay, Dry Matter—								
No Super ..	47.9	53.1	55.0	52.0	93.0	103.2	106.8	101.0
Super	46.4	51.9	54.5	50.9	90.2	100.8	105.9	99.0
Mean	47.1	52.5	54.7	51.5	91.6	102.0	106.4	100.0
Grain and Pulse—								
No Super ..	20.9	18.7	19.0	19.6	107.2	95.6	97.5	100.1
Super	21.6	18.7	18.2	19.5	110.5	95.8	93.3	99.9
Mean	21.3	18.7	18.6	19.5	108.8	95.7	95.4	100.0
Straw—								
No Super ..	42.2	47.5	50.9	46.9	91.0	102.4	109.6	101.0
Super	42.8	48.1	46.9	45.9	92.2	103.7	101.2	99.0
Mean	42.5	47.8	48.9	46.4	91.6	103.0	105.4	100.0

Standard Errors : Hay, Dry Matter : 0.869 cwt. or 1.69 per cent.
Grain and Pulse : 0.488 cwt. or 2.50 per cent.
Straw : 0.741 cwt. or 1.60 per cent.

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Mean of nitrogen and no nitrogen.

Average yield.	cwt. per acre.			per cent.		
	No Potash.	Potash.	Mean.	No Potash.	Potash.	Mean.
Hay, Dry Matter—						
No Super	50.7	53.3	52.0	98.5	103.6	101.0
Super	51.5	50.4	50.9	100.1	97.8	99.0
Mean	51.1	51.8	51.5	99.3	100.7	100.0
Grain and Pulse—						
No Super	19.2	19.9	19.6	98.5	101.7	100.1
Super	19.0	20.0	19.5	97.3	102.5	99.9
Mean	19.1	19.9	19.5	97.9	102.1	100.0
Straw—						
No Super	46.3	47.4	46.9	99.7	102.2	101.0
Super	45.7	46.2	45.9	98.5	99.5	99.0
Mean	46.0	46.8	46.4	99.1	100.9	100.0

Standard Errors : Hay, Dry Matter : 0.709 cwt. or 1.38 per cent.
Grain and Pulse : 0.399 cwt. or 2.04 per cent.
Straw : 0.605 cwt. or 1.30 per cent.

Differences of seed mixtures : In all cases the vetch mixtures give higher yields than the pea mixtures, and the oats mixtures give higher yields than the wheat mixtures, but the first of these differences only reaches the level of significance in the hay green weights, and the second only in the hay green weights and hay dry matter. (The experiment is not capable of giving a very precise verdict on these points.)

Manurial Effects : Nitrogen is significantly beneficial in the case of the hay and the straw, but significantly depresses the yield of grain and pulse. Nitrate of soda gives a significantly higher yield than Sulphate of Ammonia in the case of the hay and the straw ; in the case of the grain and pulse there is no significant difference. Potash significantly increases the yield of grain and pulse, and of hay weighed in the green state, but it has no significant effect on the straw, and no average effect on the hay dry matter. Phosphate shows no general effects.

For the hay dry matter the higher yield of plots receiving either potash or phosphate compared with those receiving neither or both is statistically significant, as is the higher yield in straw of the nitrate of soda plots receiving no phosphate compared with those receiving phosphate. There is no evidence that the manures act differently on the different types of crop.

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POTATOES

Nitrogenous Fertiliser: Sulphate of Ammonia.

Potassic Fertilisers: Sulphate and Muriate of Potash and Potash Salts (30%).

Each in single and double dressings.

Superphosphate.

R P—Pastures, 1931

N.W.

	G			D			A			
	— / 8M	— / 7S	— / 4S	2 / —	— / 6P	8S / —	6S / —	— / 8P	3 / —	
	— / 1	3 / —	5P / —	— / 1	— / 9M	7P / —	— / 9S	— / 7M	— / 4P	
	2 / —	6M / —	— / 9P	— / 3	4M / —	5S / —	— / 1	— / 2	5M / —	
	1 / —	4M / —	7M / —	7S / —	— / 6S	— / 5M	— / 8S	1 / —	9M / —	
H	5S / —	— / 8P	— / 9S	— / 1	— / 4P	8M / —	3 / —	— / 4S	2 / —	B
	— / 2	6P / —	3 / —	— / 3	9P / —	— / 2	7P / —	6M / —	5P / —	
	3 / —	9M / —	4P / —	— / 2	— / 5P	9S / —	9P / —	— / 8M	— / 1	
I	— / 5M	8S / —	2 / —	— / 6M	8P / —	— / 3	— / 7S	3 / —	4M / —	C
	1 / —	— / 7P	— / 6S	— / 7M	— / 4S	— / 1	5S / —	— / 2	6P / —	

F

SYSTEM OF REPLICATION: 9 randomised blocks of 9 plots each. Each plot divided into 2 sub-plots.

AREA OF EACH SUB-PLOT: 1/100th acre.

TREATMENTS: Testing 0, 0.2 and 0.4 cwt. per acre N in form of Sulphate of Ammonia, 0, 0.4 and 0.8 cwt. per acre K_2O in the form of Sulphate of Potash, Muriate of Potash and Potash Salts.

Superphosphate at the rate of 0.5 cwt. per acre P_2O_5 applied to one out of each pair of sub-plots, indicated by the treatment symbol occurring on that half.

Farmyard manure: 14 tons per acre, approximately, applied to previous crop of Kale.

Manures applied: April 10th.

Potatoes planted: April 13th.

Potatoes lifted: Sept. 30th-Oct. 6th.

Variety: Ally.

Previous Crop: Kale fed off by sheep.

Key to Treatments.

Treatment No.	1	2	3	4	5	6	7	8	9
Sulph./Amm.	0	1	2	0	1	2	0	1	2
Potash ..	0	0	0	1	1	1	2	2	2

Actual weights in lb.—Sub-plots with Phosphate.

S/Amm	Potash	Blocks. A	B	C	D	E	F	G	H	I
Quantities										
0	0	256.00	253.00	251.25	213.75	264.50	255.00	199.00	275.00	255.00
0	1	198.75	284.00	297.50	189.00	259.50	236.75	171.50	253.50	263.75
0	2	213.25	326.75	327.50	216.25	239.00	157.25	183.25	243.75	163.25
1	0	243.00	271.75	291.75	212.75	298.75	287.75	223.75	239.75	306.00
1	1	243.75	267.25	340.25	223.00	258.75	286.75	227.25	257.25	245.00
1	2	236.75	321.00	303.50	218.50	274.50	306.25	187.75	280.25	310.75
2	0	247.50	329.00	355.25	228.25	317.50	326.25	227.50	329.25	282.75
2	1	256.50	306.00	305.50	222.50	259.25	298.00	258.50	294.50	233.75
2	2	279.50	250.25	350.25	256.50	308.50	289.00	263.00	313.00	285.00

https://doi.org/10.23637/ERADOC-1-65

Actual weights in lb.—Sub-plots without Phosphate.

S/Amm	Potash	A	B	C	D	E	F	G	H	I
Quantities										
0	0	244.75	241.50	252.75	194.75	251.50	275.50	176.25	249.00	151.25
0	1	210.75	262.25	302.00	207.50	226.00	262.25	206.25	242.00	256.50
0	2	238.25	337.00	334.75	204.00	224.50	264.00	207.25	225.50	249.75
1	0	250.00	250.25	303.75	200.00	283.00	261.00	241.25	232.50	266.00
1	1	221.00	282.00	300.25	232.50	256.75	264.00	194.50	255.50	256.75
1	2	217.75	294.00	330.25	203.25	301.50	280.00	211.00	240.25	266.25
2	0	251.50	318.75	354.25	188.00	279.50	319.00	216.50	286.25	258.50
2	1	262.50	318.75	277.00	183.25	243.75	299.75	261.50	275.50	285.50
2	2	249.25	244.25	347.75	203.75	283.50	307.00	207.50	281.75	289.00

Summary of Results.

Effect of Quantity of Nitrogenous and Potassic Fertilisers, in relation to Superphosphate.

		Average yield in tons per acre.				Average yield per cent.			
		No S/Amm.	Single S/Amm.	Double S/Amm.	Mean.	No S/Amm.	Single S/Amm.	Double S/Amm.	Mean.
Without Super	No Potash ..	10.11	11.35	12.26	11.24	87.4	98.1	106.0	97.2
	Single Potash ..	10.79	11.23	11.94	11.32	93.3	97.1	103.3	97.9
	Double Potash	11.33	11.63	11.97	11.65	98.0	100.5	103.5	100.7
Mean		10.74	11.40	12.06	11.40	92.9	98.6	104.3	98.6
With Super	No Potash ..	11.02	11.78	13.11	11.97	95.3	101.9	113.4	103.5
	Single Potash ..	10.69	11.65	12.08	11.47	92.4	100.8	104.4	99.2
	Double Potash	10.27	12.10	12.87	11.75	88.8	104.6	111.3	101.6
Mean		10.66	11.84	12.69	11.73	92.2	102.4	109.7	101.4
Mean of super and no super		10.70	11.62	12.37	11.57	92.5	100.5	107.0	100.0

Standard Errors: Single treatment : 0.385 tons or 3.33%.
Mean of 3 treatments : 0.222 tons or 1.92%.
Mean of Super. and no Super. : 0.189 tons or 1.64%.

Effect of Quantity and Quality of Potassic Fertilisers, in relation to Superphosphate.

		Average yield in tons per acre.			Average yield per cent.		
		Sulphate of Potash.	Muriate of Potash.	Potash Salts.	Sulphate of Potash.	Muriate of Potash.	Potash Salts.
Without Super	No Potash ..		11.24			97.2	
	Single Potash ..	11.46	11.74	10.76	99.1	101.5	93.0
	Double Potash ..	11.75	11.45	11.74	101.6	99.0	101.5
Mean of Single and Double Potash		11.60	11.59	11.25	100.3	100.2	97.3
With Super	No Potash ..		11.97			103.5	
	Single Potash ..	11.22	11.66	11.54	97.0	100.8	99.7
	Double Potash ..	12.31	10.77	12.16	106.4	93.1	105.1
Mean of Single and Double Potash		11.77	11.21	11.85	101.7	97.0	102.4

Standard Errors: Single treatment = 0.385 tons or 3.33%.
Means = 0.272 tons or 2.35%.

Definitely significant response to sulphate of ammonia and significant response to superphosphate. No response to Potash.

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SUGAR BEET

Correction to 1929 Experiment.

A further examination of this experiment revealed certain defects which vitiate the original analysis. A new analysis has now been made. The principal correction is that the standard errors given in the original summary of results (1929 Report, p. 103-5) are considerably too small.

No standard errors applicable for all comparisons can be assigned to the tables (*a*), of separate treatments. The standard errors of table (*b*), comparing Sulphate of Ammonia, Nitrate of Soda and no nitrogen, should be :

	Roots.	Tops.	Sugar Percentage.
Tons per acre	0.093	0.070	
Per cent.	1.25	1.30	0.068

and the summary under (*b*) stands without correction.

No response to or interaction with phosphate is significant. Table (*c*) should therefore read as follows :

(*c*) **Effect of Salt and Chloride of Potash, averaging for Variety, Phosphate and Nitrogen.**

	Roots.			*Tops.*		
Average yield— tons per acre.	Without Mur./Pot.	With Mur./Pot.	Mean.	Without Mur./Pot.	With Mur./Pot.	Mean.
Without Salt ..	7.28	7.38	7.33	5.13	5.35	5.24
With Salt	7.54	7.52	7.53	5.56	5.60	5.58
Mean	7.41	7.45	7.43	5.34	5.48	5.41
Standard Error ..		0.107			0.081	

The summary should read :

The increase of yield due to salt is barely significant in the case of the roots, but is definitely significant in the case of the tops. Muriate of Potash shows no significant effects.

The standard errors given in Table (*d*) do not apply to the comparisons shown, and no effect of phosphate or variety can claim to be clearly significant. The same applies even more strongly to the possible interactions discussed at the foot of p. 105 ; none of these seem to produce effects of any importance.

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Sugar Beet: Comparison of Dunging immediately before ploughing, and three weeks previously. Test of loosening sub-soil by hand digging. Variation in spacing.

R S—Great Harpenden—1931

	A			N.E.		B		
	7	5	8	3	2	7	1	5
	6	1	4	2	4	8	3	6
C	6	5	8	3	1	4	2	5	D
	2	4	1	7	6	3	7	8
	6	4	1	2	2	7	3	5
	3	8	7	5	8	6	4	1
	E					F		

Key to Treatments.

1	2	3	4	5	6	7	8
D 1 P S1	D2 P S1	D1 H S1	D2 H S1	D1 P S2	D2 P S2	D1 H S2	D2 H S2

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

AREA OF EACH PLOT: .00368 acre.

Variety: Kuhn.

TREATMENTS: All combinations of: dunged three weeks before ploughing (D1) *v* dunged immediately before ploughing (D2). Ploughed only (P) *v* Ploughed and hand dug (H), Spacing 16 ins. by 16 ins. (S1) *v* Spacing 24 ins. by 10 2/3rd ins. (S2). Dung at the rate of 20 tons per acre.

Basal Dressing: Sulphate of Ammonia at the rate of 0.4 cwt. N per acre, K cl at the rate of 0.6 cwt. K_2O per acre, Superphosphate at the rate of 0.3 cwt. P_2O_5 per acre.

Seed sown: May 8-9th.

Beet lifted: Oct. 31-Nov. 3rd.

Previous crop: Temporary ley, 1st crop taken for hay. Aftermath eaten off by sheep, which were also fed on turnips and corn.

Actual weights in lb.

Block.	Roots (dirty)							
	1	2	3	4	5	6	7	8
A ..	117	127	110	120	108	118	104	108
B ..	111	130	112	126	96	112	106	119
C ..	128	127	124	128	112	118	118	117
D ..	126	128	122	124	109	121	110	102
E ..	126	132	118	122	113	119	116	115
F ..	119	132	114	122	100	112	111	122
	Tops.							
A ..	127	143	118	138	120	129	113	134
B ..	120	136	126	142	109	134	118	144
C ..	130	135	115	162	126	132	138	128
D ..	132	146	134	132	134	140	130	126
E ..	141	154	119	143	121	140	133	136
F ..	128	150	120	124	108	128	131	143

https://doi.org/10.23637/ERADOC-1-65

Block.	Sugar Percentage.							
	1	2	3	4	5	6	7	8
A ..	19.26	19.38	19.38	19.53	19.20	19.61	18.86	19.32
B ..	18.76	18.98	19.47	19.43	18.76	18.70	19.20	18.81
C ..	19.03	19.09	20.06	19.50	20.06	19.61	18.86	19.38
D ..	19.32	18.53	19.61	19.38	18.92	19.03	19.90	19.20
E ..	19.32	19.26	19.61	19.67	19.26	18.98	19.61	19.09
F ..	19.61	18.52	19.06	19.38	20.06	18.86	18.70	19.26

Summary of Results.

Average yield.		tons per acre.			per cent.		
		Spacing 16″ × 16″	Spacing 24″ × 10⅔″	Mean.	Spacing 16″ × 16″	Spacing 24″ × 10⅔″	Mean.
Dunged Early	*Roots* (washed) Ploughed only ..	13.07	11.47	12.27	103.3	90.6	97.0
	Ploughed and hand dug	12.58	11.96		99.4	94.5	
	Mean	12.83	11.71		101.4	92.6	
Dunged Late	Ploughed only ..	13.95	12.58	13.04	110.2	99.4	103.0
	Ploughed & hand dug	13.34	12.28		105.4	97.0	
	Mean	13.64	12.43		107.8	98.2	
Mean of dunged early and late ..		13.24	12.08	12.66	104.6	95.4	100.0
Mean of ploughed only ..		13.51	12.02		106.8	095.	
Mean of ploughed and dug ..		12.96	12.12		102.4	95.8	
Dunged Early	*Tops*— Ploughed only ..	15.73	14.52	15.12	98.6	91.0	94.8
	Ploughed & hand dug	14.80	15.43		92.8	96.7	
	Mean	15.26	14.97		95.7	93.9	
Dunged Late	Ploughed only ..	17.47	16.24	16.78	109.5	101.8	105.2
	Ploughed & hand dug	17.00	16.40		106.6	102.8	
	Mean	17.24	16.32		108.1	102.3	
Mean of dunged early and late ..		16.25	15.64	15.95	101.9	98.1	100.0
Mean of ploughed only ..		16.60	15.38		104.0	96.4	
Mean of ploughed and dug ..		15.90	15.92		99.7	99.8	

Sugar Percentage in Roots.	Ploughed only.		Ploughed and hand dug.	
	Spacing 16″ × 16″	Spacing 24″ × 10⅔″	Spacing 16″ × 16″	Spacing 24″ × 10⅔″
Dunged early	19.22	19.38	19.53	19.19
,, late	18.96	19.13	19.48	19.18
Mean	19.09	19.26	19.50	19.18

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Standard Errors.

	Tons per acre.			Per cent.		
	Single treatment.	Mean of 2 treatments.	Mean of 4 treatments.	Single treatment.	Mean of 2 treatments.	Mean of 4 treatments.
Roots ..	0.210	0.148	0.105	1.66	1.17	0.83
Tops ..	0.417	0.295	0.209	2.62	1.85	1.31
Sugar %	0.145	0.103	0.073	—	—	—

Definitely significant effect of time of applying dung, both on roots and tops, the later application being superior. The square spacing is significantly superior to the rectangular spacing, in general, and the effect is significantly greater on the plots without hand digging, both as regards roots and tops. The sugar percentage is significantly higher on the hand dug plots with square spacing than on the remaining plots. Taken in conjunction with the yields this implies that the total yield of sugar is significantly increased by square spacing, but is not affected by hand digging.

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