

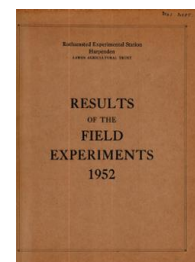
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52/BA/1 Three-course Rotation - Rothamsted

Rothamsted Research

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THREE COURSE ROTATION EXPERIMENT

1st year of revised scheme

This experiment was recast commencing with the crops of 1952 from the old design, full details of which can be found in the 1951 Station report page 135, together with a summary of 18 years results.

The present design is as follows. The rotation is as before - 3 series, each in turn carrying potatoes, barley and sugar beet. The compost and magnesium sulphate treatments are stopped, the present experiment being confined to testing straw. The plots formerly receiving only inorganic fertilizers now test inorganic nitrogen applied as sulphate of ammonia in alternate years. One third of the original plots testing straw or compost continue to receive straw in alternate years, while the remainder test, in the presence and absence of sulphate of ammonia, the effect of an amount of muriate of potash equivalent to the K_2O contained in the straw application. In the original experiment the straw received a quantity of nitrogen at the conventional rate - 0.7% of the dry weight of straw, but in the new experiment the straw receives nitrogen at two rates - 0.4% and 1.2% respectively: the straw plots having the lower rate of nitrogen being supplemented by a direct addition of sulphate of ammonia in the second year. No further nitrogen is added in the second year to the straw plots receiving the high level of nitrogen.

Every plot is divided into two to test an addition of muriate of potash. The half plots are only weighed separately when the crop is potatoes, as this crop is most likely to reveal differences in potash responses in the presence and absence of straw.

The above remarks may be summarised as follows:-

For each of the three crops potatoes, barley, sugar beet there are available:-

- (a) 6 main plots of the former Ar treatment, 3 in each phase.
- (b) 12 main plots of the former St₁ and St₂ treatments, 6 in each phase.
- (c) 6 main plots of the former Ad treatment, 3 in each phase.

The main plot treatments for (a) are

	0 v. 0.4 cwt. N	1950	1951
Phase 1	0.4 N v. 0 v. 0.4 N	(Ar)	Ar
Phase 2	0 v. 0.4N v. 0	Ar	(Ar)

The main plot treatments for (b) are (0 v. 0.4 N) v. (0 v. St0.2N v. K_s) where K_s is muriate of potash supplying as much K₂O as the straw.

						1950	1951
Phase 1	St0.2N v. St0.6N v. 0.4N v. 0 v. K _s 0.4N v. K _s	(St)	St				
Phase 2	0.4N v. 0 v. 0 v. 0.4N v. ^s 0 v. 0.4N v. St		(St)				

N.B. The brackets indicate treatments applied the previous year.

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The main plot treatments for (c) are:

Phase 1	St0.6N v. 0.4N v. K _s 0.4N	1950 (Ad)	1951 Ad
Phase 2	0 v. 0 v. 0	Ad	(Ad)

All main plots will be split in every crop to test 0 v. 0.5 cwt K₂O. To prevent build up of K₂O on one half of the splits the side which received high potash one year will receive low potash the next.

Basal Dressings:-	cwt per acre		
	N	P ₂ O ₅	K ₂ O
Barley	0	0.2	0
Sugar beet	0.2	0.4	0.25
Potatoes	0.4	0.6	0.5

The form of fertilizer is:

- (a) nitrogen as sulphate of ammonia.
- (b) phosphate as superphosphate.
- (c) potash as muriate of potash.

All fertilizers are spring applied, including the potash equivalent of the straw.

Potato fertilizers are broadcast on the flat. The land is ridged and the tubers planted by dropper in the ridges.

Area of each plot: Potatoes (sub-plot) - 0.0092 acre; barley - 0.0200 acre; sugar beet - 0.0204 acre.

Cultivations etc.:

Potatoes: Straw applied, ploughed all plots: Dec 15, 1951.
Fertilizers applied: Apr 18, 1952. Ridged: Apr 22. Potatoes planted with mechanical dropper: Apr 24. Earthed up ridges: July 8. Sprayed with medium volume copper sulphate solution, 5 lb per acre: Aug 12 and again Sept 4. Sprayed with 20% sulphuric acid: Sept 23. Lifted: Oct 6. Variety: Majestic.

Barley: Straw applied, ploughed all plots: Dec 15, 1951 1 ton. Ground chalk per acre applied: Feb 26, 1952. Seed drilled at 3 bushels per acre: Mar 3. Fertilizers applied: Mar 4. Sprayed with low volume MCPA 5 lb per acre: May 10. Harvested: July 30. Variety: Plumage Archer.

Sugar beet. Straw applied, ploughed all plots: Dec 15, 1951. Fertilizer applied, seed drilled at 18 lb per acre: Mar 21, 1952. Singled: May 26. Lifted: Dec 28. Variety: Klein E.

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Summary of Results

Potatoes

Treatments 1952

Previous Treatments 1950 1951	No N			5 3/4 cwt per acre cut straw		0.2 cwt N per acre		0.4 cwt N per acre		0.6 cwt N per acre		K ₂ O in 5 3/4 cwt cut straw		0.4 cwt N per acre as sulph. amm. + K ₂ O in 5 3/4 cwt cut straw		Mean	
	cwt K ₂ O per acre	None	0.5	as sulphate of ammonia	cwt K ₂ O per acre	None	0.5	cwt K ₂ O per acre	None	0.5	cwt K ₂ O per acre	None	0.5	cwt K ₂ O per acre	None		0.5
Art	4.05 [#]	4.49 [#]	4.66 [#]	4.66 [#]	4.66 [#]	4.66 [#]	4.66 [#]	4.66 [#]	4.66 [#]	4.66 [#]	4.66 [#]	4.66 [#]	4.66 [#]	4.66 [#]	4.66 [#]	4.66 [#]	4.80
Straw	3.93	4.41	3.71 [#]	5.00 [#]	5.21 [†]	5.97 [†]	5.09	4.56	4.46	6.55	5.24	4.56	4.36	5.29	4.03	4.17	
Adco	4.22	5.14	4.41	4.75	4.27	4.56	5.09	4.56	4.46	6.55	5.24	4.56	4.36	5.29	4.03	4.17	
Adco	4.87 [†]	4.58 [†]	4.27	4.56	4.27	4.56	5.09	4.56	4.46	6.55	5.24	4.56	4.36	5.29	4.03	4.17	
Mean																	4.80
Total clean tubers: tons per acre																	
Art	51.6 [#]	54.3 [#]	56.5 [#]	62.7 [#]	56.5 [#]	62.7 [#]	65.9	61.6	64.7	72.4	62.2	58.4	60.3	63.9	65.1	61.2	
Straw	58.3	66.4	50.4	60.9 [#]	50.4	60.9 [#]	65.9	61.6	64.7	72.4	62.2	58.4	60.3	63.9	65.1	61.2	
Adco	65.2 [†]	65.6 [†]	65.9 [†]	67.8 [†]	64.4	67.8	65.9	61.6	64.7	72.4	62.2	58.4	60.3	63.9	65.1	61.2	
Adco	62.1	64.5	64.4	67.8	60.8	65.3	65.9	61.6	64.7	72.4	62.2	58.4	60.3	63.9	65.1	61.2	
Adco	63.1 [†]	65.4 [†]	60.8	65.3	60.8	65.3	65.9	61.6	64.7	72.4	62.2	58.4	60.3	63.9	65.1	61.2	
Mean																	62.8
Percentage Ware																	
Art	51.6 [#]	54.3 [#]	56.5 [#]	62.7 [#]	56.5 [#]	62.7 [#]	65.9	61.6	64.7	72.4	62.2	58.4	60.3	63.9	65.1	61.2	
Straw	58.3	66.4	50.4	60.9 [#]	50.4	60.9 [#]	65.9	61.6	64.7	72.4	62.2	58.4	60.3	63.9	65.1	61.2	
Adco	65.2 [†]	65.6 [†]	65.9 [†]	67.8 [†]	64.4	67.8	65.9	61.6	64.7	72.4	62.2	58.4	60.3	63.9	65.1	61.2	
Adco	62.1	64.5	64.4	67.8	60.8	65.3	65.9	61.6	64.7	72.4	62.2	58.4	60.3	63.9	65.1	61.2	
Adco	63.1 [†]	65.4 [†]	60.8	65.3	60.8	65.3	65.9	61.6	64.7	72.4	62.2	58.4	60.3	63.9	65.1	61.2	
Mean																	62.8

[#] means of 2 sub plots
[†] means of 3 sub plots
 remainder means of 1 sub plot only.

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Barley
Treatments 1952

Previous Treatments 1950 1951	No N	53½ cwt per acre cut straw		K ₂ O in 53½ cwt cut straw	0.4 cwt N per acre as sulph. amm.+ K ₂ O in 53½ cwt cut straw	Mean
		0.2 cwt N per acre as sulphate of ammonia	0.6 cwt N per acre			
Art	28.7 [#]	Grain: cwt per acre				
Straw	26.4 [†]	19.8	30.5	29.1	33.9	
Adco	27.4 [†]		35.2		33.6	
Mean	28.1 [†]					29.9
	25.1 [†]	Straw: cwt per acre				
Art	33.3 [#]	20.4	34.5	29.2	41.3	
Straw	31.6 [†]		39.8		37.4	
Adco	34.0 [†]					
Mean	33.8					31.8
	33.9					
Art	27.2 [#]					
Straw	26.3					
Adco	26.2 [†]					
Mean	28.1					
	23.0 [†]					

[#] means of 2 sub plots
[†] means of 3 sub plots
remainder means of 1 sub plot only.

52/Ba/1.5

Sugar Beet
Treatments 1952

Previous Treatments 1950 1951	53½ cwt per acre cut straw			0.4 cwt N per acre as sulph. amm. + K ₂ O in 53½ cwt cut straw	Mean
	No N	0.2 cwt N per acre as sulphate of ammonia	0.6 cwt N per acre		
Art	10.92	12.55	12.75	11.76	11.46
Straw	9.65	13.15	12.75	11.76	
Straw	10.29	12.80	12.75	11.76	
Adco	10.34	12.16	9.76	11.85	
Adco	11.08	12.88			
Mean					11.46
Roots (washed): tons per acre					
Art	16.63	16.53	16.65	16.42	16.51
Straw	16.39	16.56	16.65	16.42	
Straw	16.71	16.24	16.65	16.42	
Adco	16.76	15.55	16.50	16.30	
Adco	16.56	16.59			
Mean					16.51
Sugar percentage					

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Sugar Beet
Treatments 1952

Previous Treatments 1950 1951	53 1/2 cwt per acre cut straw				0.4 cwt N per acre as sulph. amm.+ K ₂ O in 53 1/2 cwt cut straw	Mean
	No N	0.4 cwt N per acre as sulphate of ammonia	0.2 cwt N per acre	0.6 cwt N per acre		
Art	36.3	41.5				
Straw	31.6	43.6				
Adco	34.4	41.5				
	34.7	37.8	30.4	42.4	38.6	
	36.6	42.7		32.2	38.6	
	Total sugar: cwt per acre					
Art	41.5					37.8
Straw	43.6					
Adco	41.5					
Mean	37.8					
	Plant number: thousands per acre					
Art	23.9	23.0				
Straw	28.2	25.2				
Adco	26.6	21.6				
	25.2	26.6	24.8	24.4	19.4	
	25.0	23.9		22.3	25.8	
	Mean					
Mean	24.5					24.5