

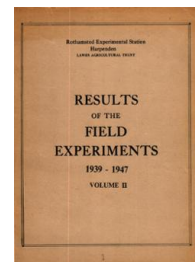
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RESEARCH

# Yields of the Field Experiments 1939-1947 Volume 2

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## J Phosphate Series

### Rothamsted Research

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J/1

PHOSPHATE SERIES

The experiments in this section J form part of a country-wide series of about 250 similar experiments on the effects of various kinds of phosphate. Results for the whole series are given in Ministry of Supply Permanent Records of Research and Development, 11.108 and 11.109

POTATOES

Long Hoos I 1942

Design: 4 randomized blocks of 12 plots.

Area of each plot: 0.0175 acre

Treatments

None, superphosphate at 0.25, 0.50, 0.75 and 1.00 cwt.  $P_2O_5$  per acre, high temperature phosphates (Chem. Dept Ref. Nos. F 347, 348, 349), each at 0.50 and 1.00 cwt.  $P_2O_5$  per acre.

Basal manuring: Sulphate of ammonia: 0.6 cwt. N per acre  
Muriate of potash: 1.0 cwt.  $K_2O$  per acre

Crop Notes

Potatoes planted: May 4. Harvested Nov. 10. Variety: Arran Banner. Previous crop, Barley.

Standard error per plot: Total tubers, 1.21 tons per acre or 8.8%, 34 d.f.

Total tubers, tons per acre. Mean yield: 13.78 tons per acre

cwt. $P_2O_5$ per acre	None	0.25	0.50	0.75	1.00	Mean
				±0.605		±0.428
Superphosphate		14.18	14.25	14.36	13.79	14.02 <sup>b</sup>
H.T. P347			14.00		13.05	13.53
H.T. P348			14.23		12.57	13.40
H.T. P349			14.01		14.01	14.01
Mean ± 0.302	13.45 <sup>a</sup>		14.12		13.36	13.78 <sup>c</sup>

Standard error (a) 0.428

Means (b) of 0.5 and 1.0  $P_2O_5$  levels only, (c) of all plots.



J/2

POTATOES AND BARLEY

Sawyers 1943-1944

Design: 8 randomized blocks of 6 plots each.

Area of each plot: 1943: 0.0133 acre  
1944: 0.0125 acre

1943 - Potatoes

Treatments

None, superphosphate at 0.33 and 0.66 cwt. P<sub>2</sub>O<sub>5</sub> per acre, high temperature phosphate, basic slag and super slag product all at 0.50 cwt. P<sub>2</sub>O<sub>5</sub> per acre.

Basal manuring: Sulphate of ammonia: 0.6 cwt. N per acre  
Muriate of potash: 1.0 cwt. K<sub>2</sub>O per acre

Crop Notes

Potatoes planted: May 4. Harvested: Sept.30. Variety: Majestic  
Previous crop, Wheat.

Standard error per plot. Total tubers: 0.969 tons per acre or 9.7%, 20 d.f.  
High

	Superphosphate			High temp. Phos.	Basic Slag	Super Slag	Mean
	0	0.33	0.66				
Total tubers, tons per acre	9.48	10.08	10.08	10.24	9.86	10.04	9.96
	±0.396						

1944 - Barley

Basal manuring: Sulphate of ammonia: 0.2 cwt. N per acre

Crop Notes

Seed sown: March 9. Harvested: Aug.14-16. Variety: Plumage Archer

Standard errors per plot:

Grain: 2.65 cwt. per acre or 11.2%, 35 d.f.

Straw: 2.72 cwt. per acre or 11.1%, 35 d.f.

Residual effects of

	Superphosphate			High temp. Phos.	Basic Slag	Super Slag	Mean
	0	0.33	0.66				
Grain cwt. per acre	24.2	23.3	23.8	23.7	23.6	23.6	23.7
	±0.94						
Straw cwt. per acre	25.0	23.7	24.8	24.8	24.0	25.3	24.6
	±0.96						



J/3

POTATOES AND BARLEY

Sawyers I 1944 - 1945

Design; 6 randomized blocks of 8 plots each.

Area of each plot: 1944: 0.0111 acre  
1945: 0.0104 acre

1944 - Potatoes

Treatments

Phosphates: None, superphosphate, high temperature phosphate, and basic Bessemer slag

Levels: 0.33 and 0.66 cwt.  $P_2O_5$  per acre

Basal manuring: Sulphate of ammonia: 0.6 cwt N per acre  
Muriate of potash: 1.0 cwt  $K_2O$  per acre

Crop Notes

Potatoes planted: April 14-17. Lifted: Sept. 29  
Variety: Majestic Previous crop, Wheat

Standard error per plot: Total tubers: 0.97 tons per acre or  
8.4%, 36 d.f.

Total tubers: tons per acre

Cwt. $P_2O_5$ per acre	0.33	0.66	Mean
			$\pm 0.28$
			$\pm 0.40$
No phosphate			10.76
Superphosphate	12.13	11.27	11.70
H.T.P.	11.88	12.32	12.10
Bessemer slag	11.21	11.91	11.56
Mean $\pm 0.23$	11.74	11.83	11.53 <sup>a</sup>

Mean (a) of all plots.



J/4

Potatoes and Barley - Sawyer's

1945 - Barley

Basal manuring: Sulphate of ammonia: 0.2 cwt. N per acre

Seed sown: March 14. Harvested: Aug. 17

Variety: Plumage Archer

Standard errors per plot:

Grain: 1.88 cwt. per acre or 5.9%, 36 d.f.

Straw: 2.50 cwt. per acre or 6.6%, 36 d.f.

Residual effects

Cwt. P <sub>2</sub> O <sub>5</sub>	No phosphates	Super	H.T.P.	Basic Bessemer Slag	Mean
	Grain: cwt. per acre				±0.44
	±0.77				
0.33		31.5	31.3	30.2	31.0
0.66		32.5	33.1	32.7	32.8
Mean ±0.54	31.0	32.0	32.2	31.4	31.7 <sup>a</sup>
	Straw: cwt. per acre				±0.59
	±1.02				
0.33		37.8	37.9	35.2	37.0
0.66		40.5	38.7	37.9	39.0
Mean ±0.72	38.6	39.2	38.3	36.6	38.1 <sup>a</sup>

Means (a) of all plots.



J/5

TURNIPS

Appletree 1941

Design; 4 randomized blocks of 12 plots each  
 Area of each plot; 0.00055 acre

Treatments

Types of phosphate; Superphosphate, Basic slag, High temperature phosphates RR1 and RR3F, Metaphosphate

Levels; None, 0.5, 1.0 cwt P<sub>2</sub>O<sub>5</sub> per acre

Basal manuring; 0.4 cwt N per acre as Sulphate of ammonia and  
 0.5 cwt. K<sub>2</sub>O as Muriate of potash

Crop Notes

Sown, Sept. 4 Harvested, Dec.17 Variety, Green Globe

Previous crop, Permanent grass

Standard error per plot, 1.196 tons per acre or 10.2%, 34 d.f.

Roots; tons per acre

Cwt.P <sub>2</sub> O <sub>5</sub> per acre	None	0.5	1.0	Mean
		±0.598		±0.423
Superphosphate		12.11	12.80	12.46
Basic slag		11.67	12.05	11.86
H.T. RR1		12.48	12.07	12.28
H.T. RR3F		11.79	12.80	12.30
Metaphosphate		11.79	12.05	11.92
Mean ±0.267	9.57 <sup>a</sup>	11.97	12.36	11.73 <sup>b</sup>

Standard error (a) 0.423

Mean (b) of all plots.



J/6

TURNIPS

Appletree 1941

Design; 4 randomized blocks of 10 plots each

Area of each plot; 0.00055 acre

Treatments

Types of phosphate; Superphosphate, Florida, Curacao, Gafsa

Levels; None, 0.25 (Superphosphate only), 0.5, 1.0 cwt.  $P_2O_5$  per acre

Basal manuring; 0.6 cwt. N per acre as Sulphate of ammonia and 0.5 cwt.  $K_2O$  per acre as Muriate of potash.

Crop Notes

Sown, Sept. 4 Harvested, Dec.17 Variety, Green Globe

Previous crop, Permanent Grass

Standard error per plot, 1.064 tons per acre or 10.8%, 27 d.f.

Roots; tons per acre

Cwt. $P_2O_5$ per acre	None	0.25	0.5	1.0	Mean
		$\pm 0.532$			
Superphosphate		9.34	10.92	11.22	11.07 <sup>b</sup>
Florida			9.12	9.72	9.42
Gafsa			10.15	10.19	10.17
Curacao			10.25	9.44	9.84
Mean $\pm 0.266$	8.33 <sup>a</sup>		10.11	10.14	9.87 <sup>c</sup>

Standard error (a) 0.532

Means (b) of 0.5 and 1.0  $P_2O_5$  levels only, (c) of all plots.



J/7

TURNIPS

Deacon's Field 1942

Design; 4 randomized blocks of 20 plots each

Area of each plot; 0.0024 acre

Treatments

None, 0.3 and 0.6 cwt.  $P_2O_5$  each of superphosphate, basic slag, calcium metaphosphate, "Metaphos" and triple superphosphate.

Triple superphosphate only; Powdered and granular

Broadcast and placed below drills

Basal manuring; 3 cwt. sulphate of ammonia and 1 cwt. muriate of potash per acre

Crop Notes

Sown, Aug. 18 Lifted, December. Variety, Pomeranian White.  
Previous crop (in 1942), Spring Wheat

Standard errors  
per plot:

Roots, 0.449 tons per acre or 14.9%, 60 d.f.

Tops, 0.865 tons per acre or 13.0%, 60 d.f.



J/8

Turnips - Deacon's

P <sub>2</sub> O <sub>5</sub> , cwt. per acre	Roots, tons per acre			Tops, tons per acre		
	0.3	0.6	Mean	0.3	0.6	Mean
	±0.224		±0.159	±0.432		±0.306
None			2.96 <sup>a</sup>			6.62 <sup>b</sup>
Superphosphate	3.15	3.22	3.19	6.32	6.65	6.49
Basic slag	2.66	2.95	2.81	6.56	6.93	6.74
Calcium metaphosphate	2.90	2.99	2.95	6.74	6.93	6.84
"Metaphos"	2.74	2.95	2.84	5.67	6.79	6.23
Triple superphosphate	2.92 <sup>a</sup>	3.28 <sup>a</sup>	3.10 <sup>c</sup>	6.63 <sup>b</sup>	6.80 <sup>b</sup>	6.72 <sup>d</sup>
Mean	2.89	3.15	3.01 <sup>e</sup>	6.48	6.81	6.64 <sup>e</sup>

Means of 2 levels of triple superphosphate

	Broad-cast	Below drills	Mean	Broad-cast	Below drills	Mean
		±0.158		±0.112	±0.305	
Powdered	2.83	3.05	2.94	6.34	6.82	6.58
Granular	3.09	3.41	3.25	6.56	7.14	6.85
Mean	2.96 <sup>a</sup>	3.23 <sup>a</sup>	3.10	6.45 <sup>b</sup>	6.98 <sup>b</sup>	6.72

Standard errors (a) 0.112 (b) 0.216 (c) 0.079 (d) 0.153

Means (e) of all plots



J/9

SWEDES AND WHEAT

Delharding 1942 - 1943

Design; 5 x 5 Lattice square in 3 replicates

Area of each plot: 1942 0.0100 acre  
1943 0.0125 acre

1942 - Swedes

Treatments

None, superphosphate at 0.25, 0.50, 0.75 and 1.00cwt. P<sub>2</sub>O<sub>5</sub> per acre and the following fertilizers at 0.50 and 1.00 cwt. P<sub>2</sub>O<sub>5</sub> per acre, Bessemer slag, Curacao rock phosphate (65% through 100 mesh), Curacao rock phosphate (85% through 100 mesh), Gafsa rock phosphate (85% through 100 mesh), metaphosphate, high temperature phosphates A, B, C and D.

Basal manuring: Sulphate of ammonia: 0.4 cwt. N per acre  
Muriate of potash: 0.5 cwt. K<sub>2</sub>O per acre

Crop Notes

Seed sown: May 22 Harvested: Nov. 4-9  
Variety: Magnificent Previous crop, Permanent grass

Standard errors per plot:  
Roots, 1.38 tons per acre or 12.1%, 24 d.f.

Plant numbers, 2.89 thousands per acre or 14.2%, 24 d.f.

About one-third of the roots in this experiment were body rotted as a result of infection with *Bacterium carotovorum*; half the roots were in some measure affected.



J/10

Swedes and Wheat - Delharding

1942 - Swedes

Cwt. P <sub>2</sub> O <sub>5</sub> per acre	0.25	0.50	0.75	1.00	Mean
Roots tons per acre					
		±0.800			±0.565
No phosphatic fertilizer		8.03 <sup>a</sup>			8.03 <sup>a</sup>
Superphosphate	10.19	11.01	10.81	12.83	11.92 <sup>c</sup>
Bessemer slag		10.96		13.75	12.36
Curacao rock phosphate (coarse)		10.95		12.35	11.65
Curacao rock phosphate (fine)		11.24		13.14	12.19
Gafsa rock phosphate (fine)		10.98		14.02	12.50
Metaphosphate		9.96		12.10	11.03
High temperature phosphate A		10.77		13.33	12.05
High temperature phosphate B		12.02		13.07	12.54
High temperature phosphate C		11.12		11.67	11.39
High temperature phosphate D		11.92		13.87	12.89
Mean	±0.253			13.01	11.45 <sup>d</sup>
Plant number thousands per acre					
		±1.67			±1.18
No phosphatic fertilizer		19.6 <sup>b</sup>			19.6 <sup>b</sup>
Superphosphate	20.3	21.4	21.5	21.8	21.6 <sup>c</sup>
Bessemer slag		20.7		21.1	20.9
Curacao rock phosphate (coarse)		20.4		20.8	20.6
Curacao rock phosphate (fine)		20.1		21.2	20.6
Gafsa rock phosphate (fine)		20.7		20.4	20.6
Metaphosphate		19.8		19.0	19.4
High temperature phosphate A		19.9		20.8	20.4
High temperature phosphate B		20.4		19.7	20.0
High temperature phosphate C		20.0		18.9	19.4
High temperature phosphate D		20.1		20.8	20.4
Mean	±0.528			20.5	20.3 <sup>d</sup>

Standard errors (a) 0.462, (b) 0.963

Means (c) of 0.5 and 1.0 cwt. P<sub>2</sub>O<sub>5</sub> levels only, (d) of all plots.



J/11

1943 - Wheat

Basal manuring: Sulphate of ammonia, 0.45 cwt. N per acre

Crop Notes

Seed sown: Nov. 19. Harvested: Aug. 9 Variety: Wilma

Standard errors per plot:

Grain: 1.66 cwt. per acre or 5.6%, 24 d.f.

Straw: 2.48 cwt. per acre or 4.2%, 24 d.f.

Cwt. P <sub>2</sub> O <sub>5</sub> per acre	0.25	0.50	0.75	1.00	Mean
Grain: cwt. per acre					
		±0.956			±0.676
No phosphatic fertilizer		27.6 <sup>a</sup>			27.6 <sup>a</sup>
Superphosphate	29.4	29.7	29.1	30.0	29.8 <sup>c</sup>
Bessemer slag		29.7		30.3	30.0
Curacao rock phosphate (coarse)		29.8		30.6	30.2
Curacao rock phosphate (fine)		29.0		30.2	29.6
Gafsa rock phosphate (fine)		29.5		32.4	31.0
Metaphosphate		29.5		30.9	30.2
High temperature phosphate A		28.7		30.4	29.6
High temperature phosphate B		28.7		31.6	30.2
High temperature phosphate C		28.2		28.0	28.1
High temperature phosphate D		29.9		30.6	30.2
Mean	±0.302			29.3	30.5
					29.6 <sup>d</sup>
Straw: cwt. per acre					
		±1.43			±1.01
No phosphatic fertilizer		55.6 <sup>b</sup>			55.6 <sup>b</sup>
Superphosphate	57.6	58.9	59.7	58.0	58.4 <sup>c</sup>
Bessemer slag		57.6		57.4	57.5
Curacao rock phosphate (coarse)		53.9		60.6	57.2
Curacao rock phosphate (fine)		58.9		59.6	59.2
Gafsa rock phosphate (fine)		55.1		60.9	58.0
Metaphosphate		60.5		61.9	61.2
High temperature phosphate A		59.0		60.6	59.8
High temperature phosphate B		58.9		61.7	60.3
High temperature phosphate C		57.8		59.9	58.8
High temperature phosphate D		59.0		61.2	60.1
Mean	±0.453			58.0	60.2
					58.6 <sup>d</sup>

Standard errors: (a) 0.553 (b) 0.826

Means (c) of 0.5 and 1.0 cwt. P<sub>2</sub>O<sub>5</sub> levels only, (d) of all plots



J/12

SWEDES AND BARLEY

Sawyers II 1943-1944

Design: 5 x 5 lattice square in 3 replicates.

Area of each plot: 0.00979 acre

1943 - Swedes

Treatments

None, superphosphate and high temperature phosphate at 0.16, 0.33, 0.66 and 1.00 cwt. P<sub>2</sub>O<sub>5</sub> per acre, basic slag (Bessemer), super slag product, super-lime product, super-serpentine product, super-mineral phosphate (cold mix), super-mineral phosphate (hot mix), Morocco mineral phosphate, all at 0.33 and 0.66 cwt. P<sub>2</sub>O<sub>5</sub> per acre.

Basal manuring. Sulphate of ammonia: 0.4 cwt. N per acre  
Muriate of potash: 0.5 cwt. K<sub>2</sub>O per acre

The crop failed, after three sowings, because of attack by flea beetle. The 1944 results are not included in the published report on the Phosphate Series (see page J/1).



J/13

1944 - Barley

Basal Manuring: Sulphate of ammonia. 0.2 cwt. N per acre

Crop Notes

Seed sown: March 9. Harvested Aug. 14 Variety: Plumage Archer

Standard errors per plot:

Grain: 2.52 cwt. per acre or 8.9%, 24 d.f.

Straw: 1.54 cwt. per acre or 6.0%, 24 d.f.

	Cwt. P <sub>2</sub> O <sub>5</sub> per acre				Mean
	0.16	0.33	0.66	1.00	
Grain: cwt. per acre	±1.45				±1.03
No phosphatic fertilizer					27.5 <sup>a</sup>
Superphosphate	29.3	27.3	28.6	29.9	28.0 <sup>e</sup>
High temperature phosphate	29.1	27.1	29.1	30.1	28.1 <sup>g</sup>
Basic slag (Bessemer)		30.4	28.4		29.4
Super slag product		27.9	26.9		27.4
Super lime product		28.5	30.1		29.3
Super serpentine product		28.9	27.0		28.0
Super min.phosph. (cold mix)		29.1	28.1		28.6
Super min.phosph. (hot mix)		28.4	29.3		28.8
Morroco min. phosph.		28.6	25.4		27.0
Mean	29.2 <sup>b</sup>	28.5 <sup>c</sup>	28.1 <sup>c</sup>	30.0 <sup>b</sup>	28.4 <sup>h</sup>
Straw: cwt. per acre	±0.89				±0.63
No phosphatic fertilizer					24.5 <sup>d</sup>
Superphosphate	25.1	24.5	26.7	27.0	25.6 <sup>g</sup>
High temperature phosphate	25.7	23.3	26.4	27.6	24.8 <sup>g</sup>
Basic slag (Bessemer)		26.1	25.9		26.0
Super slag product		23.5	25.1		24.3
Super lime product		25.5	27.5		26.5
Super serpentine product		29.3	24.3		26.8
Super min.phosph. (cold mix)		27.3	26.3		26.8
Super min.phosph. (hot mix)		25.8	24.4		25.1
Morroco min.phosph.		25.9	22.0		24.0
Mean	25.4 <sup>c</sup>	25.7 <sup>f</sup>	25.4 <sup>f</sup>	27.3 <sup>c</sup>	25.5 <sup>h</sup>

Standard errors (a) 0.84, (b)1.03, (c) 0.48, (d) 0.51, (e) 0.63 (f) 0.30

Means (g) of 0.33 and 0.66 P<sub>2</sub>O<sub>5</sub> levels only, (h) of all plots

61



J/14

SWEDES AND BARLEY

Sawyers I 1944 - 1945

Design: 8 x 8 Latin square.

Area of each plot: 1944 0.00556 acre

1945 0.00602 acre

1944 - Swedes

Treatments

Phosphates: None, superphosphate, high temperature phosphate and basic Bessemer slag

Levels: 0.33 and 0.66 cwt.  $P_2O_5$  per acre

Basal manuring: Sulphate of ammonia: 0.4 cwt. N per acre

Muriate of potash: 0.5 cwt.  $K_2O$  per acre

Crop Notes

Seed sown: June 2. Harvested: Nov. 23

Variety: New Magnificent Previous crop, Wheat

Standard errors per plot: Roots, 0.962 tons per acre or 9.0%, 43 d.f.  
 Tops, 0.302 tons per acre or 14.9%, 43 d.f.  
 Plant number, 1.90 thousands per acre or 6.0%, 43 d.f.

Cwt. $P_2O_5$ per acre	Roots: tons per acre			Tops: tons per acre			Plant No. thous. per acre		
	0.33	0.66	Mean	0.33	0.66	Mean	0.33	0.66	Mean
No phosphates	±0.34		±0.24	±0.11		±0.076	±0.67		±0.48
Superphosphate	11.45	13.16	12.30	2.03	2.48	2.26	32.2	33.2	32.7
H.T.P.	10.83	13.23	12.03	1.81	2.46	2.14	32.5	33.1	32.8
Bessemer Slag	11.11	12.80	11.96	2.01	2.63	2.32	32.6	33.0	32.8
Mean	11.13	13.06	10.67 <sup>a</sup>	2.92	2.52	2.02 <sup>a</sup>	32.4	33.1	31.5 <sup>a</sup>
	±0.20			±0.062			±0.39		

Means (a) of all plots



J/15

1945 - Barley

Basal manuring: Sulphate of ammonia: 0.2 cwt. N per acre

Crop Notes

Seed sown: March 15. Harvested: Aug. 18

Variety: Plumage Archer

Standard errors per plot:

Grain: 1.31 cwt. per acre or 4.3%, 43 d.f.

Straw: 1.92 cwt. per acre or 5.2%, 43 d.f.

Cwt. P <sub>2</sub> O <sub>5</sub> per acre	Grain: cwt. per acre			Straw: cwt. per acre		
	0.33	0.66	Mean	0.33	0.66	Mean
	±0.46		±0.33	±0.68		±0.48
No phosphates			29.9			37.5
Superphosphate	30.8	30.9	30.8	36.5	35.9	36.2
H.T.P.	30.4	29.9	30.2	36.0	37.3	36.6
Bessemer slag	30.8	31.1	31.0	36.4	36.0	36.2
Mean	30.7	30.6	30.5 <sup>a</sup>	36.3	36.4	36.6 <sup>a</sup>
	±0.27			±0.39		

Means (a) of all plots