ROTHAMSTED RESEARCH

Report for 1934

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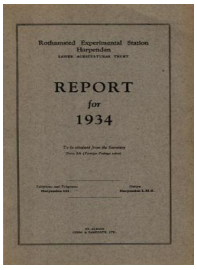

Other Experiments at Woburn

Rothamsted Research

Rothamsted Research (1935) *Other Experiments at Woburn ;* Report For 1934, pp 195 - 205 **- DOI: https://doi.org/10.23637/ERADOC-1-66**

BARLEY

WOBURN

Residual value of poultry manure applied in 1933, sulphate of ammonia, applied in 1934, being used as a standard for comparison

WB—Lansome, 1934

Plan and yields in lb., green weights

1 SW ↑	NP 41.9	S 57.3	NM 55.6	S 64.6	S 72.6	NM 57.3	S 54.4	O 49.9	N 54.4	S 54.4	P 53.3	S 60.1	12
	PM 49.0	S 62.9	O 51.6	S 64.1	S 79.4	PM 57.8	NP 59.5	S 60.7	S 70.3	NPM 76.0	S 75.4	M 62.9	
	S 60.8	M 57.3	S 67.5	NPM 62.4	S 68.6	P 54.4	S 78.2	NPM 66.3	S 73.7	PM 67.5	NM 69.7	S 83.3	
37	P 50.1	S 63.5	N 54.4	S 69.2	M 57.3	S 69.7	N 65.2	S 73.7	O 57.3	S 68.0	S 78.8	NP 68.6	48

SYSTEM OF REPLICATION : 1933 : 6 randomised blocks of 4 plots each, the second order interaction being confounded with block differences. 1934 : plots split for sulphate of ammonia.

AREA OF EACH SUB-PLOT : 0.00643 acre (17½ ft. × 16 ft.).

TREATMENTS : 1933 : All combinations of :

(*a*) No poultry manure, and poultry manure at the rate of 0.6 cwt. N per acre with addition of superphosphate at the rate of 0.116 cwt. P_2O_5 per acre, to give a total of 0.6 cwt. P_2O_5 per acre (M).

(*b*) No sulphate of ammonia, and sulphate of ammonia at the rate of 0.6 cwt. N per acre (N).

(*c*) No superphosphate, and superphosphate at the rate of 0.6 cwt. P_2O_5 per acre (P).

1934 : No sulphate of ammonia, and sulphate of ammonia at the rate of 0.2 cwt. N per acre (S).

BASAL MANURING : Muriate of potash at the rate of 1.0 cwt. K_2O per acre, applied in 1933.

CULTIVATIONS, ETC. : Dug : February 10-24. Seed sown : April 9. Sulphate of ammonia applied : April 11. Cultivated at various dates with the Planet Junior hand hoe. Harvested: July 11. Variety : Plumage Archer. Previous crop : Brussels sprouts.

STANDARD ERRORS : Per whole plot : 6.99 cwt. per acre or 7.97% ; per sub-plot : 6.17 cwt. per acre or 7.04%.

https://doi.org/10.23637/ERADOC-1-66

Individual treatments. Green weights, cwt. per acre

	Sub-blocks A				Sub-blocks B				*Mean*
	O	NM	NP	MP	N	M	P	NMP	
No. Sulph. Amm. 1934 ..	73.5	84.5	78.7	80.7	80.5	82.2	73.0	94.7	*81.0*
Sulph. Amm. 1934 ..	86.3	102.1	91.1	100.0	91.3	95.3	89.0	100.0	*94.4*
Mean (±4.03)	*79.9*	*93.3*	*84.9*	*90.4*	*85.9*	*88.8*	*81.0*	*97.4*	*87.7*
Diff. (±5.04)	*+12.8*	*+17.6*	*+12.4*	*+19.3*	*+10.8*	*+13.1*	*+16.0*	*+5.3*	*+13.4*

The figures in the last row are from differences of the two halves of the same plots, and are not affected by the confounding.

Responses to treatments, cwt. per acre

Fertiliser	*Mean response*	Differential responses							
		Sulph. Amm. 1933		S. Amm. 1934		Superphosphate		Poultry Manure	
		Absent	Present	Abs.	Pres.	Absent	Present	Absent	Present
Sulph. Amm. 1933 ..	*+5.4*[1]	—	—	+7.2[3]	+3.5[3]	+5.3[4]	+5.5[4]	+5.0[4]	+5.8[4]
Sulph. Amm. 1934 ..	*+13.4*[2]	+15.3[3]	+11.5[3]	—	—	+13.6[3]	+13.2[3]	+13.0[3]	+13.8[3]
Superphosphate	*+1.4*[1]	+1.3[4]	+1.5[4]	+1.6[3]	+1.3[3]	—	—	0.0[4]	+2.8[4]
Poultry Man.	*+9.6*[1]	+9.2[4]	+10.0[4]	+9.1[3]	+9.9[3]	+8.2[4]	+11.0[4]	—	—

Standard errors : (1) ±2.85, (2) ±1.78, (3) ±2.52, (4) ±4.03.

Percentage dry matter (bulked replicates)

No sulphate of ammonia, 1934	45.0
Sulphate of ammonia, 1934 ..	43.9

Conclusions

Of the three 1933 treatments, poultry manure (0.6 cwt. N per acre) alone gave a significant increase in yield, the increase being 9.6 cwt. per acre. The 1934 sulphate of ammonia (0.2 cwt. N per acre) gave a significant increase in yield of 13.4 cwt. per acre. There were no significant interactions.

https://doi.org/10.23637/ERADOC-1-66

WHEAT

WOBURN

Effect of sulphate of ammonia applied at six different times

WW—Butt Furlong, 1934

Plan and sample weights in grammes, grain above, straw below

1	**3** 227 913	**2** 300 924	**4** 310 914	**0** 343 627	**6** 332 628	**1** 528 1140	**5** 647 1161	7
	4 253 847	**0** 242 902	**2** 311 837	**5** 259 702	**1** 260 1040	**6** 573 1362	**3** 647 1088	
N ↑	**0** 320 1699	**6** 370 820	**5** 242 629	**1** 391 907	**3** 272 990	**2** 502 1233	**4** 572 1319	
	1 254 1079	**5** 345 1017	**0** 320 720	**6** 390 926	**4** 390 1125	**3** 471 1584	**2** 728 1634	
	2 295 972	**4** 231 844	**6** 367 784	**3** 387 937	**0** 504 1127	**5** 772 1435	**1** 862 1888	
	6 265 835	**3** 255 987	**1** 351 1130	**2** 367 975	**5** 628 1413	**4** 698 1609	**0** 698 1596	
	5 224 724	**1** 227 894	**3** 268 930	**4** 321 904	**2** 411 1197	**0** 518 1330	**6** 696 1383	
43								49

SYSTEM OF REPLICATION : 7 × 7 Latin square.

AREA OF EACH PLOT : 0.01012 acre (44 lks. × 23 lks.).

TREATMENTS : No. sulphate of ammonia (**0**) and sulphate of ammonia at the rate of 0.3 cwt. N per acre, applied on Dec. 4 (**1**), Jan. 15 (**2**), Feb. 26 (**3**), Apr. 9 (**4**), May 7 (**5**) and June 4 (**6**).

CULTIVATIONS, ETC. Ploughed : Nov. 1-2. Harrowed : Nov. 2 and 6. Seed sown : Nov. 6. Hand hoed : May 5-10. Harvested : July 31-Aug. 1. Plots harvested by sampling method (12 metre lengths per plot, drills set 9.1 ins. apart). Variety : Victor. Previous crop : Potatoes.

STANDARD ERRORS PER PLOT : Grain : 2.06 cwt. per acre or 17.4% ; straw : 5.76 cwt. per acre or 18.7%.

Summary of results : cwt. per acre

	No N	Dates of application of sulphate of ammonia (0.3 cwt. N per acre) Dec. 4	Jan. 15	Feb. 26	Apr. 9	May 7	June 4	*Mean of all N*	*St. error*
GRAIN (±0.777)	12.08	11.78	11.95	10.37	11.38	12.79	12.28	*11.76*	*±0.317*
Incr. (*±1.10*)		*−0.30*	*−0.13*	*−1.71*	*−0.70*	*+0.71*	*+0.20*	*−0.32*	*±0.839*
STRAW (±2.18)	32.82	33.14	31.88	30.47	31.02	29.05	27.64	*30.53*	*±0.890*
Incr. (*±3.08*)		*+0.32*	*−0.94*	*−2.35*	*−1.80*	*−3.77*	*−5.18*	*−2.29*	*±2.35*

Conclusions

The average effect of sulphate of ammonia showed no sign of significance either in grain or straw. There are indications of a linear regression of the yield of straw on the date of application, but this, when tested, was not significant.

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SUGAR BEET

WOBURN

Effect of varying spacing of rows, of sulphate of ammonia and of ploughing or harrowing in mineral fertilisers.

WS—Butt Furlong 1934
Plan and yields in lb.

		Roots (dirty)	Tops	Sugar per cent.	Plant number
1	S_{20} — Bl	592	558	17.60	431
	S_{20} N_1 —	614	582	17.25	408
	S_{15} N_2 —	704	734	16.91	617
	S_{10} N_2 Bl	788	750	17.19	948
	S_{20} N_2 Be	630	648	16.76	409
	S_{10} — —	856	802	17.31	985
	S_{15} — Be	802	787	16.33	628
	S_{10} N_1 Be	833	957	16.54	977
	S_{15} N_1 Bl	778	820	16.41	613
	S_{10} N_2 —	802	717	17.89	928
	S_{15} N_1 —	748	649	17.37	593
	S_{20} N_1 Be	612	514	16.91	409
	S_{15} N_2 Be	716	688	16.39	555
	S_{10} — Be	679	561	17.74	986
	S_{20} — —	623	466	16.85	412
	S_{20} N_2 Bl	566	502	17.19	401
	S_{10} N_1 Bl	663	598	16.88	921
	S_{15} — Bl	724	614	17.66	571
	S_{15} N_1 Be	708	550	16.56	563
	S_{10} — Bl	673	464	16.82	936
	S_{20} — Be	542	336	16.76	406
	S_{15} — —	619	390	16.39	578
	S_{10} N_2 Be	660	514	16.42	926
	S_{20} N_1 Bl	529	248	16.96	391
	S_{10} N_1 —	696	406	16.99	892
	S_{15} N_2 Bl	694	574	16.59	589
	S_{20} N_2 —	688	370	17.64	369
	S_{15} N_1 —	665	527	16.99	582
	S_{10} — —	736	506	17.22	977
	S_{20} — Be	676	495	17.83	404
	S_{15} — Bl	780	559	17.48	604
	S_{20} N_2 —	610	545	17.05	412
	S_{20} N_1 Bl	617	518	17.31	405
	S_{15} N_2 Be	697	578	17.08	554
	S_{10} N_1 Be	761	512	17.14	974
36	S_{10} N_2 Bl	728	568	17.08	940

W

		Roots (dirty)	Tops	Sugar per cent.	Plant number
	S_{20} — Bl	578	666	16.30	413
	S_{20} N_2 Be	564	658	15.87	411
	S_{10} N_2 —	738	842	15.81	972
	S_{10} N_1 Bl	800	806	17.17	928
	S_{10} — Be	834	744	17.05	983
	S_{20} N_1 —	626	586	19.44	398
	S_{15} — —	640	591	17.31	562
	S_{15} N_1 Be	708	770	16.99	565
	S_{15} N_2 Bl	704	842	16.62	553
	S_{20} N_1 Be	622	593	20.02	401
	S_{20} — —	640	546	20.31	400
	S_{10} N_1 —	820	713	17.16	979
	S_{15} N_2 —	662	624	19.16	590
	S_{10} N_2 Be	615	590	19.59	950
	S_{15} — Be	771	562	20.02	605
	S_{10} — Bl	672	490	17.11	998
	S_{20} N_2 Bl	605	582	16.10	403
	S_{15} N_1 Bl	766	675	17.14	596

37

54

SYSTEM OF REPLICATION : 6 randomised blocks of 9 plots each. Certain second order interactions are partially confounded with block differences.

AREA OF EACH PLOT (after rejecting edge-rows) : 10-inch spacing : 0.01515 acre ; 15-inch spacing 0.01364 acre ; 20-inch spacing : 0.01212 acre. Plots actually 15.2 links × 120 links rows.

TREATMENTS : All combinations of :

{Rows 10 ins. apart (S_{10}) / Rows 15 ins. apart (S_{15}) / Rows 20 ins. apart (S_{20})} × {No sulph. amm. (—) / 1.4 cwt. sulph. amm. (0.3 cwt. N) (N_1) / 2.8 cwt. sulph. amm. (0.6 cwt. N) (N_2)} × {No basal manures (—) / Basal manures applied early (Be) / Basal manures applied late (Bl)}

The basal manures consisted of 0.5 cwt. P_2O_5 as superphosphate and 1.0 cwt. K_2O as 30% potash manure salt.

CULTIVATIONS, ETC. : Cultivated with tractor and harrowed : November 4th-6th. Three bushels per acre of rye drilled : November 7th. Harrowed : November 7th. Rye ploughed in : March 26th-April 4th. Harrowed : April 11th. Cambridge rolled : April 12th. Spring tine harrowed, and harrowed : April 13th-14th. Cambridge rolled : April 16th. Harrowed : April 27th. Seed sown : April 28th-30th. Cambridge rolled : May 3rd. Horse-hoed : May 14th and 17th. Singled (9 inches apart) : May 31st-June 4th. Horse-hoed : June 4th. Hand-hoed : July 21st-24th. Lifted : November 20th-27th. Variety : Kleinwanzleben E. Previous crop : Potatoes.

STANDARD ERRORS PER PLOT : Roots (washed) : 1.28 tons per acre or 7.0%. Tops : 2.25 tons per acre or 11.4%. Sugar percentage : 0.943. Plant number : 1.33 thousands per acre, or 2.9%. Mean dirt tare : 0.1818.

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Yields of Separate Treatments (block effects eliminated)

ROOTS (washed) : tons per acre

Basal Minerals applied	10 inch spacing			15 inch spacing			20 inch spacing		
	Sulphate of ammonia (per acre)			Sulphate of ammonia (per acre)			Sulphate of ammonia (per acre)		
	None	0.3cwt.N	0.6cwt.N	None	0.3cwt.N	0.6cwt.N	None	0.3cwt.N	0.6cwt.N
None	18.85	18.54	18.63	16.95	19.53	17.60	19.34	17.69	20.23
Early	18.31	18.88	15.63	20.37	19.06	19.53	19.03	18.91	17.00
Late	16.48	17.71	17.94	20.74	19.98	18.82	16.63	17.94	17.96

Main Effects. Interactions of Sulphate of Ammonia with Spacing and Basals

	Spacing (inches)			Basals			*Mean*	*Increase*
	10	15	20	None	Early	Late		
ROOTS (Washed) : tons per acre ($\pm$0.522. *Means : $\pm$0.302: Increases : $\pm$0.426*)								
0.0 cwt. N	17.88	19.36	18.34	18.36	19.22	17.99	*18.52*	
0.3 cwt. N	18.37	19.52	18.18	18.62	18.92	18.53	*18.69*	+0.17
0.6 cwt. N	17.40	18.64	18.40	18.80	17.43	18.21	*18.15*	—0.54
Mean	*17.88*	*19.17*	*18.31*	*18.59*	*18.52*	*18.24*	18.45	
Increase		+1.29	+0.43		—0.07	—0.35		
TOPS : tons per acre ($\pm$0.918. *Means : $\pm$0.530. Increases : $\pm$0.749*)								
0.0 cwt. N	17.52	19.11	18.83	17.99	18.87	18.60	*18.49*	
0.3 cwt. N	19.60	21.78	18.67	19.08	21.21	19.75	*20.02*	+1.53
0.6 cwt. N	19.55	22.04	20.29	20.68	20.34	20.85	*20.63*	+0.61
Mean	*18.89*	*20.98*	*19.26*	*19.25*	*20.14*	*19.73*	19.71	
Increase		+2.09	+0.37		+0.89	+0.48		
SUGAR PERCENTAGE ($\pm$0.385. *Means : $\pm$0.222. Increases : $\pm$0.314*)								
0.0 cwt. N	17.21	17.53	17.61	17.56	17.63	17.16	*17.45*	
0.3 cwt. N	16.98	16.91	17.98	17.53	17.36	16.98	*17.29*	—0.16
0.6 cwt. N	17.33	17.13	16.77	17.41	17.02	16.80	*17.08*	—0.21
Mean	*17.17*	*17.19*	*17.45*	*17.50*	*17.34*	*16.98*	17.27	
Increase		+0.02	+0.28		—0.16	—0.52		
TOTAL SUGAR : cwt. per acre								
0.0 cwt. N	61.6	68.1	64.7	64.6	67.9	61.9	*64.8*	
0.3 cwt. N	62.4	66.0	65.4	65.3	65.6	62.9	*64.6*	—0.2
0.6 cwt. N	60.1	63.8	61.7	65.4	59.1	61.2	*61.9*	—2.7
Mean	*61.4*	*66.0*	*63.9*	*65.1*	*64.2*	*62.0*	63.8	
Increase		+4.6	+2.5		—0.9	—3.1		
PLANT NUMBER : thousands per acre ($\pm$0.543. *Means : $\pm$0.314. Increases : $\pm$0.444*)								
0.0 cwt. N	64.5	43.4	33.9	46.7	47.9	47.2	*47.3*	
0.3 cwt. N	62.4	42.9	33.1	46.0	46.4	46.0	*46.1*	—1.2
0.6 cwt. N	62.3	42.3	33.1	46.4	45.5	45.8	*45.9*	—0.2
Mean	*63.1*	*42.9*	*33.4*	*46.4*	*46.6*	*46.3*	46.4	
Increase		—20.2	—29.7		+0.2	—0.1		

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Interaction of Spacing and Basals

Basals	Spacing (inches) 10	15	20	Spacing (inches) 10	15	20
	ROOTS (washed) : tons per acre (±0.522)			TOPS : tons per acre (±0.918)		
None	18.67	18.02	19.09	19.58	19.18	19.00
Early	17.61	19.65	18.31	19.04	21.47	19.91
Late	17.37	19.85	17.51	18.05	22.28	18.87
	SUGAR PERCENTAGE (±0.385)			TOTAL SUGAR : cwt. per acre		
None	17.06	17.36	18.09	63.7	62.6	69.0
Early	17.41	17.23	17.36	61.2	67.8	63.6
Late	17.04	16.98	16.91	59.2	67.5	59.2

Basals	Spacing (inches) 10	15	20
	PLANT NUMBER : thousands per acre (±0.543)		
None	63.0	43.1	33.0
Early	63.8	42.4	33.5
Late	62.4	43.1	33.6

Conclusions

The 15-inch spacing gave significantly higher yields than the 10 or 20-inch spacings, the last two not being significantly different. The interaction of spacing with basals was significant, the above effect appearing only on the plots receiving basals. The average effect of basals, on the other hand, was small and not significant.

Spacing did not appreciably affect the sugar percentage, and where basal minerals were present, the increase in total sugar of the 15-inch spacing over the mean of the other two spacings was 6.85 cwt. per acre or 11 per cent.

Sulphate of ammonia significantly increased the yield of tops and decreased the plant number.

There were no significant differences between the early and late applications of basals.

The general level of yield was unusually high.

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KALE

WOBURN

The effect of Lupins as green-manure

Wk—Lansome, 1934

Plan and yields in lb. (Green weights)

1	R 63	PT 169	P 134	O 64	4
NW ↑	P 116	O 52	PT 169	R 36	
	O 72	P 132	R 66	PT 160	
13	PT 240	R 111	O 121	P 201	16

SYSTEM OF REPLICATION : 4 × 4 Latin square.
AREA OF EACH PLOT (after rejecting edge-rows) : 0.00973 acre. Plots actually 0.0107 acre.
TREATMENTS : Lupins were grown over the whole area.
O = Whole plant removed.
R = Tops removed, roots only buried.
P = Whole plants buried.
PT = Whole plants and additional tops from plots receiving treatment (R) buried.
CULTIVATIONS, ETC. : Lupin seed sown : May 16. Lupins cut and buried : Aug. 3-13. Rolled : Aug. 18. Harrowed : Aug. 18. Kale sown : Aug. 20. Rows 18 inches apart. Thinned : Sept. 17, 24 and 29 and Oct. 3. Plants 6 inches apart in the rows. Harvested : Apr. 23. Variety : Thousand headed. Previous crop : Plots 1-12, Wheat ; Plots 13-16, Fallow.
SPECIAL NOTE : It is proposed to sow kale on this ground again next year (1935) to determine the residual effect of the lupins as green-manure.
STANDARD ERROR PER PLOT : 0.405 tons per acre or 7.42 per cent.

Treatment.	Nitrogen added per acre (lb.). As tops.	As roots.
O	—	—
R	—	11.31
P	122.34	11.31
PT	244.77	11.31

SUMMARY OF RESULTS

Lupins dug in.	Yield, tons per acre.	*Increase over no dressing.*
Mean ..	*5.46*	
None ..	3.54	
Roots only ..	3.16	*−0.38*
Whole plants	6.69	*+3.15*
Whole plants and extra tops	8.47	*+4.93*
St. error ..	±0.203	*±0.287*

Conclusions

Where whole plants were dug in, lupins proved very successful as a green manure, the increase in yield being 3.15 tons per acre or 89 per cent. The increase was apparantly due to the tops, for the digging in of roots alone produced a slight, though not significant, decrease in yield, whereas with whole plants and double tops a further increase of 1.78 tons per acre was obtained. The yield of kale was small owing to necessarily late sowing after lupins.

https://doi.org/10.23637/ERADOC-1-66

CARROTS

WOBURN

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

WN—Lansome, 1934

Plan and yields in lb. roots (dirty) above, tops below

NW ↑

1	S_1 270 101	O 274 102	R_1 282 120	N_1 300 114	S_2 316 144	R_1 301 106	R_2 334 147	O 358 168	8
	R_2 270 106	N_2 278 129	M_2 319 128	S_2 314 112	N_2 313 140	O 344 130	S_1 333 131	M_1 362 148	
	O 310 120	O 284 112	O 322 112	M_1 303 107	O 310 130	O 326 124	N_1 322 136	M_2 347 152	
	S_1 311 143	M_2 323 136	O 336 120	M_1 314 106	O 312 119	M_1 322 117	R_2 292 122	S_2 358 143	
	R_2 328 146	O 346 130	N_2 354 136	S_2 355 150	N_2 336 149	O 355 125	O 352 127	O 358 128	
41	N_1 311 142	O 318 134	O 346 124	R_1 316 134	S_1 315 140	M_2 305 117	N_1 310 122	R_1 332 171	48

SYSTEM OF REPLICATION : 4 randomised blocks of 12 plots each.
AREA OF EACH PLOT : 1/160 acre (25 lks. × 25 lks.).
TREATMENTS : No nitrogen (O), and sulphate of ammonia (N) half applied in seed-bed and the remainder as a top dressing, poultry manure (M), soot (S) and rape dust (R) applied at the rate of 0.4 cwt. N per acre (1) or 0.8 cwt. N per acre (2).
BASAL MANURING : Superphosphate at the rate of 1.0 cwt. P_2O_5 per acre, muriate of potash at the rate of 1.0 cwt. K_2O per acre and 12 tons of farmyard manure per acre, applied in June, 1933.
CULTIVATIONS, ETC. Ploughed : July 10, 1933. Cultivated : August 30. Harrowed : August 30. Double harrowed : September 1 and 8. Ploughed : October 5-6. Double harrowed : October 14 and January 27, 1934. Harrowed : February 9, March 23, April 7 and 9. Flat Rolled : April 9. Double harrowed : April 24. Harrowed : May 8 and 10. Rolled : May 10. Seed sown : May 11. Manures applied (sulphate of ammonia at half-rate) : May 11. Hand-hoed : June 5. Thinned : June 21-22. Rows 11 ins. apart. Plants 6 ins. apart in the row. Second half of sulphate of ammonia applied : July 9. Hand-hoed : July 14-20. Lifted : September 25. Variety : Garton's Intermediate. Previous crop : Fallow after wheat.
STANDARD ERRORS PER PLOT : Roots (washed) : 1.29 tons per acre, or 5.85%. Tops : 0.985 tons per acre, or 10.7%. Mean dirt tare : 0.0355.

Summary of results

	ROOTS (washed) : tons per acre (±0.646)						TOPS : tons per acre (±0.493)					
	Sulph. Amm.	Soot	Poult. Man.	Rape dust	*Mean*	*Incr.*	Sulph. Amm.	Soot	Poult. Man.	Rape dust	*Mean*	*Incr.*
0.0 cwt. N	22.61[1]				*22.61*[1]		8.95[3]				*8.95*[3]	
0.4 cwt. N	21.41	21.17	22.41	21.20	*21.55*[1]	*−1.06*[2]	9.18	9.20	8.54	9.48	*9.10*[3]	*+0.15*[4]
0.8 cwt. N	22.07	23.13	22.29	21.08	*22.14*[1]	*+0.59*[2]	9.89	9.80	9.52	9.30	*9.63*[3]	*+0.53*[4]
Mean	*21.74*[2]	*22.15*[2]	*22.35*[2]	*21.14*[2]	*22.10*		*9.54*[4]	*9.50*[4]	*9.03*[4]	*9.39*[4]	*9.23*	
Increase		*+0.41*[5]	*+0.61*[5]	*−0.60*[5]				*−0.04*[6]	*−0.51*[6]	*−0.15*[6]		

Standard errors : (1) ±0.323, (2) ±0.457, (3) ±0.246, (4) ±0.349, (5) ±0.646, (6) ±0.493.

Conclusions

There were no significant effects. This was probably due to the previous year's fallow and the dressing of farmyard manure given in June, 1933.

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PYRETHRUM

WOBURN

The effect of lime, fish manure, and artificial fertilisers on the yield of flowers, and their content of Pyrethrins

ROADPIECE—1934

Plan and yields. Dry stalkless heads (grammes) above, Pyrethrin I content per cent centre, total Pyrethrins per cent below

1	LOA1 1325 0.47 0.97	LFO2 1614 0.56 1.14	OFO2 1528 0.54 1.16	LOO1 1326 0.49 1.21	OOA1 816 0.51 1.12	LOO1 1617 0.58 1.26	OOA2 1294 0.55 1.23	OOO2 1080 0.62 1.23	8
NW ↑	LFO1 1421 0.50 1.15	OOA2 1582 0.54 1.06	OOA1 1043 0.67 1.39	OFA2 1608 0.41 1.02	OFO1 1310 0.53 1.16	LOA2 1789 0.58 1.19	LOA1 1540 0.56 1.16	LFA1 1272 0.57 1.32	
	LFA2 1584 0.60 1.26	OFO1 1764 0.51 1.06	LFA1 1170 0.62 1.37	LOA2 1341 0.50 1.08	LFO1 992 0.56 1.22	LOO2 1606 0.56 1.18	LFO2 2033 0.55 1.13	OFA2 1905 0.51 1.07	
25	OOO1 1229 0.58 1.18	LOO2 1472 0.60 1.20	OOO2 1169 0.47 1.08	OFA1 722 0.54 1.17	OFA1 911 0.46 1.11	LFA2 1278 0.64 1.30	OOO1 1745 0.48 1.07	OFO2 1687 0.52 1.14	32

SYSTEM OF REPLICATION : 2 randomised blocks of 16 plots each.

AREA OF EACH PLOT (after rejecting edge rows) : 0.00560 acre. Plots actually 29.6 links × 22.7 links.

TREATMENTS : All combinations of :

{No lime (O), Lime (L)} × {No fish manure (O), Fish manure (F)} × {No complete artificials (O), Complete artificials (A)} × {Manures applied in first year only (1), Manures applied every year (2)}

Lime was applied in the first year only.

RATES OF APPLICATION : Lime, 2.88 tons of ground lime, equivalent to 4 tons $CaCO_3$.

Fish Manure : Where applied in first year only, 5 cwt. per acre (0.4 cwt. N) ; where applied every year half this dressing is given per annum.

Artificials : Where applied in first year only, sulphate of ammonia (0.4. cwt. N), superphosphate (0.4 cwt.P_2O_5) and muriate of potash (0.5 cwt. K_2O) ; where applied every year half the above rates are given per annum.

CULTIVATIONS, ETC. 1933 : Lime applied : April 24th. Raked in : April 27th. Mineral manures applied : May 24th. Pyrethrum planted : May 25-26. First half of nitrogenous manures applied : June 1st. Hoed : June 1st, August 3rd to 5th. Second half of nitrogenous manures applied : August 9th. 1934 : Manures applied : April 17th, Harvested : July 4th to 6th. Previous crop : Grass with lucerne.

SPECIAL NOTE : This is the second year of the experiment and it is intended to continue it for several years.

STANDARD ERRORS PER PLOT : Dry stalkless heads : 0.807 cwt. per acre or 16.4%. Pyrethrin I. content per cent : 0.0568.

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SUMMARY OF RESULTS (2nd year)

Yields of separate treatments

	Manures applied	Neither	Artificials	Fish manure	Artificials and fish manure	*Mean*
	DRY STALKLESS HEADS : cwt. per acre.					
No lime ..	First year ..	4.60[2]	3.27[1]	5.41[1]	2.87[1]	*3.85*[3]
	Both years ..		5.06[1]	5.65[1]	6.18[1]	*5.63*[3]
Mean ..		*4.60*[2]	*4.16*[2]	*5.53*[2]	*4.52*[2]	*4.74*[4]
Lime	First year ..	5.30[2]	5.04[1]	4.24[1]	4.29[1]	*4.52*[3]
	Both years ..		5.50[1]	6.41[1]	5.03[1]	*5.65*[3]
Mean ..		*5.30*[2]	*5.27*[2]	*5.32*[2]	*4.66*[2]	*5.08*[4]
Standard errors : [1] ±0.571, [2] ±0.404. [3] ±0.330, [4] ±0.233.						
	PYRETHRIN I. CONTENT per cent.					
No lime ..	First year ..	0.54[2]	0.59[1]	0.52[1]	0.50[1]	*0.54*[3]
	Both years ..		0.54[1]	0.53[1]	0.46[1]	*0.51*[3]
Mean		*0.54*[2]	*0.56*[2]	*0.52*[2]	*0.48*[2]	*0.52*[4]
Lime	First year ..	0.56[2]	0.52[1]	0.53[1]	0.60[1]	*0.55*[3]
	Both years ..		0.54[1]	0.56[1]	0.62[1]	*0.57*[3]
Mean		*0.56*[2]	*0.53*[2]	0.54[2]	0.61[2]	*0.56*[4]
Standard errors : [1] ±0.0402, [2] ±0.0284, [3] ±0.0232, [4] ±0.0164.						
	TOTAL PYRETHRINS per cent					
No lime ..	First year ..	1.14	1.26	1.11	1.14	*1.17*
	Both years ..		1.14	1.15	1.04	*1.11*
Mean ..		*1.14*	*1.20*	*1.13*	*1.09*	*1.14*
Lime	First year ..	1.22	1.06	1.18	1.34	*1.19*
	Both years ..		1.14	1.14	1.28	*1.19*
Mean ..		*1.22*	*1.10*	*1.16*	*1.31*	*1.19*
	PRYETHRIN I. CONTENT—lb. per acre					
No lime ..	First year ..	2.72	2.20	3.14	1.59	*2.31*
	Both years ..		3.08	3.35	3.21	*3.21*
Mean		*2.72*	*2.64*	*3.24*	*2.40*	*2.76*
Lime	First year ..	3.32	2.92	2.49	2.86	*2.78*
	Both years ..		3.36	3.98	3.48	*3.61*
Mean ..		*3.32*	*3.14*	*3.24*	*3.17*	*3.20*

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Effects of artificals and fish manure

Manures applied	Neither	Artificials	Fish manure	Artificials and fish manure	*Mean*	*Increase*
DRY STALKLESS HEADS—cwt. per acre						
First year	4.94	4.16	4.82	3.58	*4.19*	
Both years		5.28	6.03	5.60	*5.64*	*+1.45*
Standard errors ..	±0.285	±0.404			*±0.233*	*±0.330*
PYRETHRIN I. CONTENT per cent						
First year	0.55	0.55	0.52	0.55	*0.54*	
Both years		0.54	0.54	0.54	*0.54*	*0.00*
Standard errors ..	±0.0200	±0.0284			*±0.0164*	*±0.0232*
TOTAL PYRETHRINS per cent						
First year	1.18	1.16	1.15	1.24	*1.18*	
Both years		1.14	1.14	1.16	*1.15*	*−0.03*
PRYETHRIN I. CONTENT—lb. per acre						
First year	3.02	2.56	2.82	2.22	*2.53*	
Both years		3.22	3.66	3.34	*3.41*	*+0.88*

CONCLUSIONS

The above tables refer to the yields during the second year of the experiment. The yield of flowers in the first year was very small and was not recorded.

Where they were applied in the first year only, both artificials and fish manure depressed the yield of heads in the second year, the depression due to artificials being significant. When half the amounts were given in both years, the manures raised the yields, the increase due to fish manure being nearly significant. The difference between the mean yields due to fish manure and artificials was not quite significant.

The increase in yield of heads due to the liming was not significant.

There was no apparent treatment effect on pyrethrin I per cent. or on total pyrethrins per cent.

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