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Barley

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statistically significant reversal of this effect. The yields in this experiment were very small, but this does not impugn the significance of the result, which it is hoped to examine more fully by later experiments.

The interaction of response to nitrogenous and phosphatic manures is the only interaction to show itself significantly in this series of experiments; this supplies an *a posteriori* justification for sacrificing information in a group of the remote interactions, for the sake of added precision in the main effects. The actual data, moreover, for each year, show that the interactions sacrificed are in fact unimportant, while the comparisons which have been made more precise are of direct interest.

An effect on which higher precision than that actually attained would be most desirable concerns the contrast between sulphate, muriate and potash salt as sources of potash.

Table V gives the average yields in the five experiments, together with the two comparisons muriate *v.* potash salt, and sulphate *v.* the average of the other two. Only in 1927, when the precision of the experiment was considerably higher than has since been attained, could the results for a single year be judged significant.

TABLE V.

Comparison of Sulphate of Potash (S) with Muriate of Potash (M) and Potash Salt (P) as Fertilisers for Potatoes. Yields of Potatoes, tons per acre.

	S	M	P	M-P	$S - \frac{1}{2}(M+P)$
1927	7.36	7.08	6.59	+.49	+.52
1929	5.47	5.45	5.44	+.01	+.03
1930	9.47	9.42	9.10	+.32	+.16
1931	11.80	11.31	11.68	-.37	+.21
Woburn, 1929..	5.28	5.05	5.20	-.15	+.30
Mean	7.88	7.66	7.60	+.06	+.25

Nevertheless, in all five comparisons sulphate has shown a positive advantage over the two forms of chloride, in such a way as to confirm unmistakably the 1927 result. The average gain is only about $\frac{1}{4}$ ton to the acre, or 2 to 3 per cent. of a fair yield. As between the muriate and the potash salt, however, the five experiments show no significant or consistent advantage.

FERTILISERS AND MATURATION OF BARLEY

Studies by W. E. Brenchley in the Botanical Department have shown that the different fertilisers influence the maturation of barley in different ways.

Phosphatic fertilisers hasten the maturation both of the straw and of the grain. On the other hand, nitrogenous fertiliser and sulphate, whether of potassium, calcium or ammonium, hasten maturity of straw but not of grain.

Mustard is also slightly hastened in maturation by sulphate, but not on all soils; the effect was not shown, for example, on a fen soil from Cambridgeshire.

RELATIVE IMPORTANCE OF NUTRIENTS AT DIFFERENT STAGES OF PLANT GROWTH

In water culture experiments barley deprived of nitrogen during early growth, but receiving it later, was soft and sappy, tillered little and formed little grain, showing that the addition of nitrogen at a later stage did not enable it to make up for the early deficiency, as compared with plants that had had nitrogen from the start. In some instances late additions of extra nitrogen reduced grain formation by promoting fresh tiller formation. Spratt Archer suffered more than the earlier ripening Goldthorpe, which continued filling its grain in spite of the lateness of the nitrogen application.

SUGAR BEET

Sugar beet is included in the new rotation experiments at Rothamsted and Woburn which measure each year the effects of sulphate of ammonia, superphosphate and muriate of potash on crops grown without dung in a six course rotation. In 1931 sulphate of ammonia gave large and significant increases in yield at both Rothamsted and Woburn and muriate of potash a large and significant increase at Woburn; superphosphate gave small non-significant increases at both centres. (Table VI.)

TABLE VI.

Average increased yield in cwt. of sugar beet per acre given by :—

		Sulphate of Ammonia. 1 cwt. per acre.	Muriate of Potash. 1 cwt. per acre.	Superphosphate 1 cwt. per acre.
Rothamsted	Roots ..	12*	4†	2†
	Tops ..	16†	0†	—11†
Woburn	Roots ..	11*	19*	4†
	Tops ..	15†	47*	5†

* Significant. † Non-Significant.

In view of the poor responses to fertilisers sometimes obtained at Rothamsted where the soil is too heavy and sticky to be favourable to sugar beet, different methods of cultivating the crop were tried. Loosening the subsoil had a negligible effect, delay in ploughing under the dung reduced the yield, whilst reducing the distance between the rows increased the yield. The last point has special interest since precautions were taken to have the same number of plants per acre in both comparisons. Other experiments have shown that the yield may be increased by putting the rows closer together but it was not clear whether the advantage was from the closeness of the plants or, what is more likely, from the increase in the total number of plants per acre. In the 1931 Rothamsted experiment the rows were in one case 24 inches apart with plants 10 $\frac{2}{3}$ inches apart within the rows and in the other the rows were 16 inches apart and the plants also 16 inches apart with the rows, thus giving equal numbers of plants per unit area. The fact that there was a significant