ROTHAMSTED RESEARCH

Report for 1927-28

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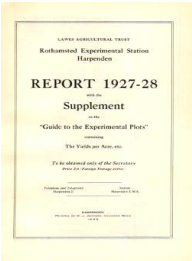

Sugar Beet

Rothamsted Research

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Varying potash, adequate nitrogen 1928.

	Sulphate of Potash.		
	0 cwt.	1 cwt.	2 cwt.
With super	8.26	11.05	10.63
No super	8.00	9.76	9.74
Gain due to super (3-cwt. per acre)	0.26	1.29	0.89

It has now become possible to arrange for a satisfactory investigation into the influence of manuring on the quality and keeping value of potatoes. Dr. Lampitt, Head of Messrs. J. Lyons' laboratories, is conducting cooking tests (boiling and frying) of all our samples fresh from the field and after storage, and with his help we hope also to obtain the percentages of dry matter, starch, nitrogen and other constituents likely to influence quality.

Sugar Beet. The Beet Sugar Factories—Anglo-Dutch Group—generously made grants in 1927, 1928 and 1929, enabling us to carry out extensive fertiliser trials at Rothamsted and Woburn, and to repeat typical experiments elsewhere. These trials, being in much more detail than was previously possible, have brought out a number of important points, but they have also shown that we do not yet properly understand the manuring of sugar beet and, therefore, are not obtaining as large yields as we ought. The Continental recommendations which most farmers follow are not altogether suitable to English conditions.

In 1927, sowing was unavoidably delayed at Rothamsted and the purpose of the experiment was to discover whether in these conditions, which are always liable to arise in a heavy soil, any fertiliser scheme could make up for lost time. Unfortunately, none of the forms or combinations of nitrogen, potash, phosphate proved successful, and we do not yet know how to get over the difficulties of late sowing.

The other experiments of 1927 and those of 1928 were to discover the effects of the various fertilisers on the crop, both on roots and leaves, the latter being important as stock food.

The leaves behave normally towards fertilisers. Nitrogenous fertilisers deepen their colour and increase their size: an additional hundredweight of nitrate of soda gave about one ton of additional leaf per acre.

The roots, however, are much less affected than the leaves and are not nearly so responsive as mangolds. One ton of mangold leaf will commonly give about 4 to 6 tons of root, but one ton of sugar beet leaf may give only one ton of root and sometimes much less. Sulphate of ammonia applied with the seed had but little effect: muriate of ammonia was rather better, but nitrate of soda was best of all. None of the nitrogenous fertilisers, however, did much to increase the yield, while they all lowered the sugar content and the weight of root formed per 100 parts of leaf. Phosphate had but little effect either on yield or sugar content. Potassic fertilisers also had only little action, but, of these, potash manure salts was somewhat better than the muriate.

The results suggest that sodium, perhaps magnesium and chlorine, play some part in the nutrition of the sugar beet, and that the plant cannot make full growth unless they are supplied.

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Rothamsted, 1928.

	Nitrogenous Top Dressing. Nitrochalk.		Potassic Fertilisers.		Phosphatic Fertilisers.	
	2 cwt.	4 cwt.	Muriate of Potash.	Potash Manure Salts.	None.	Super-Phosphate.
Roots, tons per acre	9.25	9.19	9.08	9.23	9.06	9.25
Tops, tons per acre	11.59	12.39	11.26	11.60	11.32	11.54
Sugar, per cent. in root	17.63	17.27	17.61	17.61	17.60	17.63

Woburn, 1928.

	Sulphate of Ammonia. No top dressing.	Muriate of Ammonia. No top dressing.	Sulphate of Ammonia and Nitrochalk.	Muriate of Ammonia and Nitrochalk.
Roots, tons per acre ...	13.82	14.42	14.00	15.10
Tops, tons per acre ...	11.47	11.98	12.49	13.59
Sugar, per cent. in root	18.07	18.00	18.22	17.76

The effect of nitrogenous manure in lowering the efficiency of the leaf as a producer of root is shown by the weight of root made by 100 of leaf :—

Top dressing (Nitrochalk) ...	None	Single dose	Double dose
Muriate of potash	89.4	78.6	73.8
Potash manure salts	88.6	80.5	73.0

The results are disappointing and show that we still have much to learn about the manuring of sugar beet, and about the varieties best suited to our conditions. Our present varieties come from the Continent, and in the long continued process of selection the search has been for roots rich in sugar suitable for the factory, but not necessarily for the farmers. As compared with the sugar beet grown sixty years ago at Rothamsted, the 1928 roots are much richer in sugar, but the yield per acre, both of roots and of sugar, has decreased, and the efficiency of the leaves has fallen considerably. The improvement has apparently been mainly a shrinkage in size of the root, thus compacting the sugar into a smaller space :—

Years.	Yield, tons per acre.		One ton of top made roots in tons.	Sugar.	
	Roots.	Tops.		Per cent. in root	Cwt. per acre.
1871-3 ...	18.9	5.1	3.7	11.0	41.6
1928 ...	9.4	12.2	0.8	17.6	33.1

Apparently there is room for considerable improvement, both in varieties and in management of this crop, the restricted response to fertilisers suggesting some kind of congestion in the plant; it is not always obtained: for example, at one of the outside centres (Durham) muriate of potash was distinctly effective, the yields being in tons per acre :—

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No Potash.	Muriate of Potash, cwt. per acre. 1	1½	2
9.75	10.25	10.87	12.32

Each plot also received 1 cwt. sulphate of ammonia and 4 cwt. superphosphate per acre.

Increase per cwt. muriate of potash—20 cwt. sugar beet.

It is somewhat curious that the factory determinations of the percentage of sugar in the roots were consistently lower than ours made on samples taken direct from the field.

Cereals.

Under British conditions the most important fertilisers for cereals are the nitrogen compounds: these act with considerable uniformity, 1 cwt. sulphate of ammonia giving increases that range about 4½ bushels of wheat, 6 bushels of barley and 8 bushels of oats. The figures vary from season to season, but their relationships to the meteorological data are not yet fully known.

Barley. The experiments on barley are made in conjunction with the Institute of Brewing to ascertain the effect of soil, season and manuring on the yield and malting quality of barley. During 1927 and 1928 they have been continued at Rothamsted, Woburn, Wellingore (Lincs.), Chisleborough (S. Somerset), Fitzhead (Vale of Taunton) and Longniddry: they were, however, discontinued at the other centres, sufficient information having already been obtained. The most striking effect again was the increase given by 1 cwt. sulphate of ammonia per acre; this was greatest in years of low yield and least in years of high yield so that the effect of the fertiliser is to even up the results: the yields have been, in bushels per acre:—

	Lowest	Highest	Range of Variation
Without nitrogenous fertiliser	19.9	47.9	28.0
With nitrogenous fertiliser ...	32.5	44.4	11.9

So far as the data go, the increments of yield seem to be affected by:—

(1) sufficient rainfall in spring to allow of tillering proportionate to the nitrogen supply;

(2) sufficient sunshine in July to allow of head formation proportionate to the nitrogen supply.

The values of the increments for the past eight years have been at Rothamsted:—

	1923.	1927.	1924.	1928.	1921.	1925.	1922.	1926.
Increment of yield, bushels ...	12.6	10.4	7.7	7.0	6.8	6.0	5.0	−3.5
Yield without nitrogenous manure, bushels ...	19.9	23.6	22.1	28.6	27.2	25.0	31.0	47.9
Rainfall in inches:								
March ...	2.48	2.38	1.14	2.40	1.07	1.22	2.29	0.22
April	1.48	1.86	3.18	0.91	1.57	1.70	3.52	2.96
May	1.68	1.19	4.63	1.45	1.45	2.48	1.58	1.95
July sunshine hrs.	223.8	130.4	236.6	276.3	240.0	183.6	149.5	151.1

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