ROTHAMSTED RESEARCH

Report for 1931

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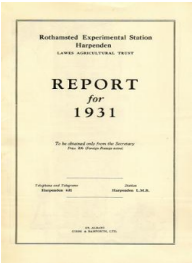

Sugar Beet

Rothamsted Research

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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

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advantage of the square over the oblong spacing shows that the yield of beet depends not only on the numbers of plants but also on their arrangement in the field.

	Yield of roots. tons per acre	Yield of tops. tons per acre
Square spacing (16 ins. rows by 16 ins.) ..	13.2	16.2
Oblong spacing (24 ins. rows by 10⅔ins.) ..	12.1	15.6
Dung ploughed in at once	13.0	16.8
Dung left on land 3 weeks before ploughing under	12.3	15.1
Ploughed only	12.8	16.0
Ploughed and subsoil loosened	12.5	15.9

At Woburn where the soil is lighter and cultivation for sugar beet is easier, experiments were made (1) to compare sulphate of ammonia and nitrate of soda applied at different times, (2) to test the effect of salt, (3) with different methods of incorporating the fertilisers into the soil. On the Continent it is common practice to give nitrogenous fertilisers well in advance of sowing the sugar beet and in some cases even in the autumn. At Woburn in the wet spring and summer of 1931 the application of sulphate of ammonia and nitrate of soda three weeks before sowing gave on the average 1.51 tons per acre less sugar beet roots and 1·58 tons per acre less tops than application at the time of sowing. The reduction of yield was doubtless due to the washing out of nitrate by heavy rainfall on a light soil. Sulphate of ammonia gave more roots and a better sugar content than nitrate of soda, and, contrary to the results of earlier years, common salt had no effect. There was no advantage from thoroughly incorporating the fertilisers into the soil by means of a rotary cultivator as compared with harrowing. A number of experiments over several years at Woburn and elsewhere have shown no very marked differences in comparing nitrate of soda given in the seed bed with that top dressed but on the whole the evidence favours the seed bed application.

Fertiliser experiments on two fenland soils produced only small and uncertain effects. The experiments on mineral soils at other centres were in general harmony with conclusions drawn in earlier years, which may be summarised as follows. For equal amounts of nitrogen there is little difference between the alternative forms of fertiliser except that nitrate of soda tends to produce more top, and to depress the sugar content more than sulphate of ammonia, whilst calcium cyanamide sometimes gives rather inferior results. Potash salt is generally superior to muriate of potash, doubtless on account of the common salt it contains. If low grade potash manures are not used, it is generally advisable to give common salt. On good quality clay and silt loams farmyard manure supplies most of the nutrients needed and only a light dressing of a complete fertiliser mixture is required. On light soils good returns are obtained from complete fertiliser mixtures even when used in conjunction with dung. A suitable mixture would be 2-3 cwt. sulphate of ammonia, 2-3 cwt. potash salt (20 per cent.) and 3-4 cwt. superphosphate per acre.

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