ROTHAMSTED RESEARCH

Rothamsted Report for 1932

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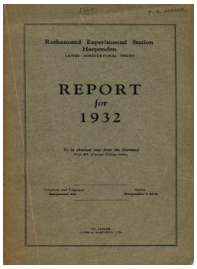

Six Course Rotational Experiment

Rothamsted Research

Rothamsted Research (1933) *Six Course Rotational Experiment ;* Rothamsted Report For 1932, pp 30 - 31 **- DOI: https://doi.org/10.23637/ERADOC-1-64**

encouraged by the discovery in our laboratory that some cultures which had been carried on for a long period without apparent change suddenly broke up into new forms. These are being studied in the hope of finding among them strains which are either more efficient in healthy soil conditions, or more resistant to soil acidity, than the forms we already possess.

In the laboratory, considerable attention has been given to the problem of finding out why nitrate of soda which benefits non-leguminous plants should be detrimental to the formation of nodules on the roots of leguminous plants. Experiments both at Rothamsted and elsewhere have shown that nitrate of soda in small doses reduces the size of the nodules and in larger doses reduces their numbers, and the problem is to find out how this happens. Previous work in the department has shown how the nodule bacteria get into the roots of the lucerne plant from the soil ; the first step is that the plant roots, immediately after the formation of the first leaves, excrete something which apparently stimulates the bacteria in the soil around the roots. Next the bacteria secrete a substance which causes the root hair to curl : then at the bend, where the cell wall is now weakened, they make their entry. If, however, sodium nitrate is present in the soil, the curling is prevented so that bacteria cannot enter. The action of the nitrate is either on the root hair or on the substance secreted by the bacteria ; it is not a direct effect on the bacteria because it stops the action of the secretion even after the bacteria are removed. Further investigations on these remarkable secretions are proceeding.

THE VALUE OF GRASS AND OTHER FODDER CROPS

One great difficulty in experiments on grass and fodder crops is to put a value on to the herbage developing as a result of the treatment. It can, of course, be weighed and analysed, but no figures yet obtained completely express its value to the animal. Feeding experiments are the only safe guide, but these are exceedingly difficult to carry out properly ; the errors are numerous and difficult to estimate ; in general it is impossible to say what degree of significance attaches to the results.

Attempts are being made to overcome these difficulties by new methods of experiment based on the principles of replication and randomisation, and therefore permitting a valid estimate to be made of the error of the experiment. A pig feeding experiment is being made to test the value of green food, of dry as compared with wet food, and the effect of crowding ; the interest is for the present as much in the method as in the results. A grazing experiment is also being made to compare indigenous with commercial strains of grasses ; sheep are used, tethered as in the Aberystwyth experiments.

THE SIX COURSE ROTATION

This rotation is : sugar beet, barley, clover, wheat, potatoes, fodder mixture (rye, vetches and beans) ; the purpose of the experiment is to test the effect of different combinations of nitrogen potash and phosphate on the yield of crops.

At Rothamsted the yields in 1932 were above those of 1930 and 1931, but the effect of fertilisers was in general less. Sulphate of ammonia benefited potatoes, clover hay and sugar percentage in

https://doi.org/10.23637/ERADOC-1-64

beet; it had no significant effect on barley or the fodder mixture. It increased the straw but the yield of grain was reduced, probably owing to bird damage. Muriate of potash benefited potatoes, barley straw and sugar percentage in beet; it was without effect on the barley grain, clover and fodder crop. Superphosphate benefited none of the crops.

At Woburn the yields were all lower than before, but the response to fertilisers differed from those obtained at Rothamsted. Sulphate of ammonia benefited barley (grain only), potatoes and fodder crops, had no significant effect on sugar beet, barley straw or wheat grain or straw, but injured clover hay. Muriate of potash benefited sugar beet (roots and tops) and barley (grain and straw), but had no significant effect on clover, wheat, potatoes, or fodder crops. Superphosphate had no effect.

The average yields of all the plots and significant responses during the three years 1930-1932 have been:

	Mean yields		Fertilisers to which the crop responded significantly					
			Rothamsted			*Woburn.*		
	Rothamsted	*Woburn*	1930	1931	1932	1930	1931	1932
Barley—								
Grain, cwt. per acre	27.3	20.2	N	N	—	N	N	N, K
Straw, cwt. per acre	31.8	41.7	—	N	K	N	—	K
Clover Hay—								
Dry Matter, cwt. per acre ..	24.7	15.9*	N	—	N	**	—	N–
Wheat—								
Grain, cwt. per acre	24.6	8.2*	—	N	N–	**	N	—
Straw, cwt. per acre	55.9	27.4*	—	N	N	**	N, K–	—
Potatoes—								
Tons per acre ..	7.18	9.40	P–, K	K	N, K	N	—	N
Forage—								
Dry Matter, cwt. per acre ..	36.5	34.2*	N	N	—	**	N	N
Sugar Beet—								
Roots, tons per acre	6.80	5.58	—	N	—	N, P–	N, K	K
Tops, tons per acre	11.27	6.84	N	—	—	N, P–	K	K
Sugar percentage	17.15	17.09	—	—	N, K	N–, P	K	—

— No response.
– Negative response.
* Two experiments only (1931 and 1932).
** No experiment.

Wheat and potatoes thus appear at opposite ends of the test, for while Woburn is much the better for potatoes, Rothamsted excels for wheat; for clover hay, barley, sugar beet, and fodder crops there is not much to choose between the centres and manuring has smoothed out the differences due to soil type.

THE CEREALS

Corn Growing Under Mechanised Conditions

Further experiments have been made to discover how best to maintain fertility on a corn farm cultivated as far as possible by machinery and making little or no farmyard manure. The problems under investigation include the return of straw to the land, and the preparation of the land for the crop.

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