ROTHAMSTED RESEARCH

Rothamsted Report for 1932

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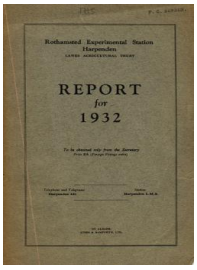

Inoculation of Legumes

Rothamsted Research

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TABLE III.—Yield of Kale cut at different times during winter.

Time of Cutting.	Total yield of fresh material, tons	Total Dry Matter. Leaves lb.	Stems, lb.	Total, lb.	Total Nitrogen. Leaves lb.	Stems, lb.	Total, lb.	Total Fibre. Leaves lb.	Stems, lb.	Total, lb.
Mid-Nov. ..	25.68	2570	5890	8460	70	73	143	277	1248	1525
Mid-Dec. ..	25.30	2450	5770	8220	69	70	139	258	1336	1594
Mid-Jan. ..	27.50	2400	5890	8290	80	72	152	238	1286	1524
Mid-Feb. ..	24.37	2180	5820	8000	71	79	150	209	1229	1438
Mid-March ..	21.22	1740	5370	7110	61	69	130	194	1272	1466

Percentage Composition.

	Dry Matter Leaves.	Stems.	*Nitrogen* * Leaves.	Stems.	*Fibre* * Leaves.	Stems.
November ..	14.3	14.9	2.72	1.24	10.8	21.2
December ..	13.5	15.0	2.79	1.22	10.4	23.2
January ..	11.9	14.2	3.34	1.22	9.9	21.8
February ..	15.7	14.3	3.26	1.26	9.6	21.1
March ..	15.9	14.7	3.50	1.28	11.1	23.7

*Percentage in Dry Matter.

The Autumn and Spring Growth of Forage Crops. An experiment was begun in 1931 to ascertain the productivity of certain hardy crops during autumn, winter, and the following spring. The crops were sown on July 23rd, 1931, the first cut was taken on November 17th, 1931, the second on May 24th, 1932. Rye grass stood out as the best crop to make autumn growth, giving 66 cwt. green weight per acre as compared with 23 cwt. for the mean of the cereals. The addition of beans and vetches gave a further improvement in yield. In the spring cutting, barley and rye came much closer to rye grass. In any case the production of these crops was rather small, the best yield in the two cuts being 209 cwt. of green material by rye grass, beans and vetches, wheat and oats singly giving only 72 cwt. each. The addition of leguminous plants markedly increased the protein per acre, the figures being :

	Protein, cwt. per acre. (First cut)
Cereals alone	0.78
Cereals, beans, vetches	3.23
Cereals, trefoil	1.32
Cereals, beans, vetches, trefoil	3.10

INOCULATION OF LEGUMINOUS CROPS

The great success attending Dr. Thornton's investigations into the inoculation of lucerne has caused the Bacteriological Department to turn its attention to the possibility of inoculating clover to see if a more rapid and extensive growth could be obtained, especially on those soils where it does not thrive naturally. Strains of the appropriate organism has been obtained from various localities in America, Holland, Germany and Sweden and their effects on the host plant have been studied ; some are more efficient than others. Some of the selected strains have been supplied to Prof. Stapledon for use on the Welsh hills ; results are already distinctly promising, and fully justify the further search for better strains. The search for a more efficient strain of the lucerne organism is still going on, and it is

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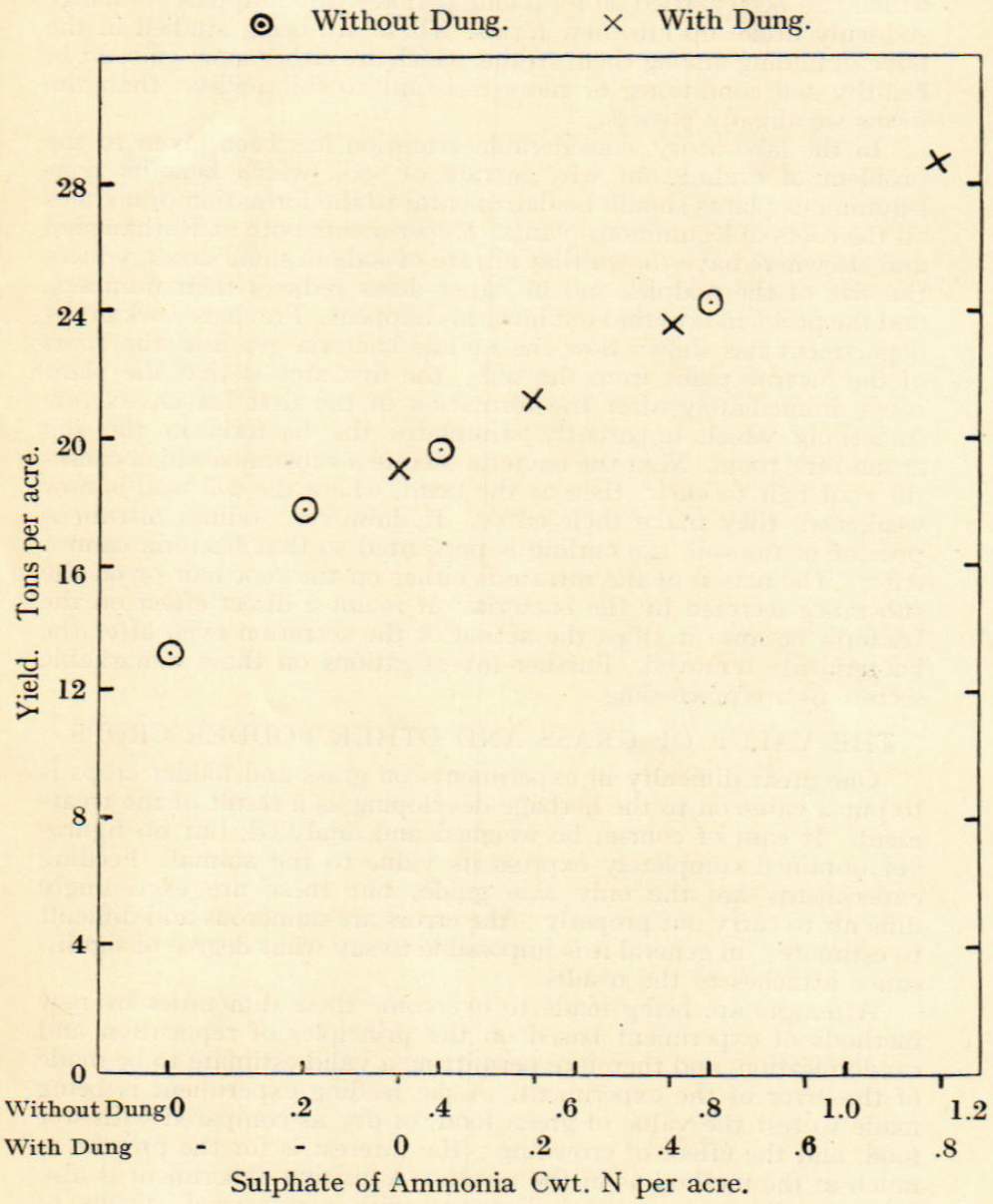

Fig. 2. Relation of Yield and Nitrogenous Dressing in Kale, Woburn, 1932.

The yield of the plots receiving dung (which, like the undunged plots, received 0, 0.2, 0.4, and 0.8 cwt. N as Sulphate of Ammonia) are plotted on the assumption that the dung applied is equivalent to 0.34 cwt. N per acre. This figure was chosen as being the one which most nearly brings the dunged and undunged yields on to the same straight line on the graph. The chemical analysis of the dung gave a total nitrogen content of 1.51 cwt. N per acre so that the results indicate a 22% availability of N in the dung.

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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

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