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Report for 1929

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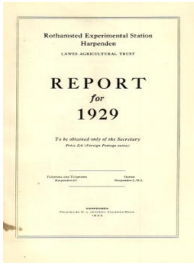

Effectiveness of Basic Slag

Rothamsted Research

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superphosphate gave the best results, followed by high soluble basic slag: low soluble slag was less effective and mineral phosphate still less: indeed in none of our experiments has mineral phosphate proved effective. The results are as follows:—

	Solubility (Warren Method)	Increased yield over Control. Dry matter.	Phosphoric oxide (P_2O_5)	
			per cent. in dry matter.	Total uptake when super. =100
Superphosphate..	90	100	1.15	100
High soluble slag	53	62	0.98	84
Low soluble slag	18	22	0.96	80
Gafsa phosphate	14	5	0.93	76
No phosphate ..	—	—	0.89	74

The figures for yield are to be taken only as showing the order and not the precise amounts. The figures for phosphorus uptake have more significance: they show that in comparison with the phosphate of low solubility, the high soluble fertilisers not only gave more herbage, but more nutritious herbage, containing per ton more of the phosphate essential to the animal. This experiment is being repeated on a more extensive scale in 1930.

(2) *Hay Land.* The slag experiments were continued in Somerset on old hay land and in Norfolk on new hay land: both are in their fourth year after the dressing and the effect is beginning to wear off.

The yields have been in cwt. of hay per acre:—

	Control.	Basic Slag. Low Soluble.	Medium.	High Soluble.
Somerset (Old Grass)				
Average 3 years, 1926-28..	20.9	23.6	26.0	24.9
1929	20.0	22.5	23.5	22.1
Norfolk (New Grass)				
Average 3 years, 1926-28..	26.5	29.8	32.7	36.7
1929	10.9	12.6	13.6	13.9

SOLUBILITY AND EFFECTIVENESS OF BASIC SLAG.

The experiments described above form part of an extended series carried out by the Rothamsted staff during the past eight years, largely under the ægis of the Ministry of Agriculture Basic Slag Committee, to discover the agricultural values of the different kinds of slag on the market.

There are three types of slag in common use:—

	Type 1.	Type 2.	Type 3.
Per cent. Phosphoric oxide	16 to 18	8 to 17	8 to 15
Equivalent to tricalcic phosphate ..	35 to 39	17.5 to 37	17.5 to 33
Per cent. of total phosphoric oxide soluble in 2% citric acid	80 or more	80 or more	40 or less
Process of production	Bessemer	Open Hearth	Open Hearth with addition of Fluorspar

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In this country the Bessemer process of steel manufacture is not at present used, and Bessemer slags on the British market are entirely of foreign origin. So far as solubility is concerned, the slags fall into two groups only, few if any samples having solubility between 45% and 75%.

In practically all our experiments the high soluble slag has given the better results and there is no question that it is of greater value to the farmer. It acts more quickly and gives larger increases than the low soluble slag. Recent changes in steel making have tended to increase the output of this high soluble material, which is all to the good: and, further, the manufacturers are now prepared to offer slag of less than 45% solubility in the old official citric acid test at lower unit price than they ask for slag of 75% or higher solubility.

While the low soluble slags are inferior to those of high solubility as a source of phosphate, nevertheless they have value in certain humid conditions; fortunately these occur near the works where the slags are obtainable cheaply.

A further result of the investigation has been to show the limits of value of the old citric acid test which had fallen into some disrepute. The grading of the slags into two classes is almost entirely satisfactory, and the analysis is sufficiently easy and rapid.

The method is not, however, of a high order of accuracy, and it fails to place slags in their proper order within each class: a slag of 90% solubility may be less effective as a fertiliser than one of 75%. Occasionally it appears even to class a slag wrongly: it puts into the low soluble group a new type of slag which is said to have high agricultural value, and which is now being tested by the Rothamsted staff. A method has been worked out by Mr. R. G. Warren at Rothamsted (extraction with sodium chloride solution) which places the slags within each class more in accordance with their agricultural value; it is, however, less convenient than the citric acid method and is better suited to an experimental station than to an analysts' laboratory.

LUCERNE.

The inoculation process developed in the Bacteriological Department has proved very successful: in 1929 the issue of cultures to farmers again exceeded the previous records, and sufficed to sow 1,300 acres. The demand rose above our power to supply, and accordingly some of the leading biochemical firms were invited to tender for the taking over of the business. Arrangements were finally made with Messrs. Allen & Hanbury, of Bethnal Green, London, E. 2, to prepare cultures under Rothamsted tests and to supply them to farmers at the rate of 3/- for one acre of land. These arrangements have been in force for some months and are working satisfactorily: the demand has been greater than ever. Dr. Thornton has also devised a method for transmitting the cultures over great distances: cultures sent to Western Australia arrived in good condition and successfully increased yields of lucerne there.