ROTHAMSTED RESEARCH

Problems of Potato Growing

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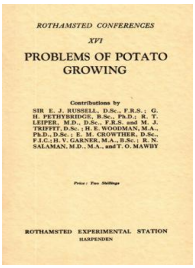

Some Fertiliser Experiments With Potatoes on Fenland Soils

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SOME FERTILISER EXPERIMENTS WITH POTATOES ON FENLAND SOILS

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Thanks to the active co-operation of certain fenland farmers it has been possible in recent years to conduct a series of replicated trials with fertilisers on the potato crop on a number of black soils. The cultivation of the crop has been entirely in the farmers' hands, while the scheme of manuring and the experimental details have been carried out by members of the Rothamsted Staff. The design of the experiments have been such as to enable a valid estimate of the experimental error to be made, and in most cases several levels of the nutrient in question have been tested in the same experiment both alone and in combination with other manures. The trials have been carried out on fifteen fields comprising the following types of soil (1) Deep black land artificially clayed. (2) Black soil almost touching the clay at deep plough depth. (3) Light blowy fen. (4) Black soil grading into silt. A small beginning has thus been made to explore by the new experimental technique the vast and very varied district in which the potato forms the chief crop. The one fertiliser that is in universal esteem in this district is superphosphate. Many farmers consider this to be enough in itself, but an increasing amount of compound fertilisers containing a proportion of the other nutrients, nitrogen and potash, are coming into use. The quantitative effects of these manures, including superphosphate itself does not appear to have been accurately ascertained on a range of soils in the past ; so that the results of these preliminary trials may be of interest. It will be convenient in the first place to discuss the results obtained with the three nutrients in turn.

The Effect of Superphosphate

Eight experiments bear on this point, 6 of them testing superphosphate in an ascending scale of dressings. In every case the increase in crop following the use of superphosphate has been significant (i.e., the observed increase would not occur by chance more than once in 20 trials). The effect is therefore very general and even including the highest dressings the average performance of superphosphate is an increase of nearly 8 cwt. of potatoes for each

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1 cwt. of fertiliser used. The most responsive centres were at Little Downham on a clayed land of excellent quality ; and land of somewhat similar type at Stow Bridge where handsome increases were obtained by increasing the dressing from 5 cwt. to 10 cwt. per acre. On the lighter and poorer soils there is evidence that some falling off in effectiveness of the phosphate occurs after the level of 5 cwt. has been reached.

The Effect of Nitrogen

Nitrogen was tested in 13 experiments and in three of these increasing levels of sulphate of ammonia were included. The yield of potatoes was increased significantly by sulphate of ammonia in 11 of these experiments. The average effect in all trials expressed on a basis of 1 cwt. of sulphate of ammonia was an increase of nearly 15 cwt. of potatoes per acre. At the three centres at which the effect of increasing applications of sulphate of ammonia were examined there was distinct signs of falling off in effectiveness on increasing the sulphate of ammonia from the 2 cwt. to the 4 cwt. level. The increments due to sulphate of ammonia were most marked on the soils of rather heavy character ; those either clayed artificially, or having clay or silt near the surface. The lighter soils gave slightly smaller but very profitable increases.

It appears therefore that both nitrogen and also phosphate give their biggest effects on the heavier soils.

The Effect of Potash

There were 14 experiments involving potash, four of them testing increasing levels of sulphate of potash. Although nitrogen and phosphate showed some signs of different behaviour on the different soils, their action could nevertheless be fairly considered as a whole taken over all soils.

This is not the case with potash so far as these experiments are concerned. On the five heavier soils only one significant response was obtained and this was on the silty fen. At the nine other centres of distinctly lighter or more peaty character eight gave strong and significant responses to potash. At these responsive centres the average increase per 1 cwt. of sulphate or muriate of potash amounted to 18 cwt. of potatoes. At the other five centres it was practically nil.

Interactions

Hitherto we have measured the effect of a manure by its average performance taken over all combinations actually tested. More detailed examination shows that the effectiveness of a manure usually depends on the presence or absence of other fertilisers. Fortunately so far as our results with potatoes are concerned, the fertilisers usually tend to reinforce each others' effects. The effect of (say) nitrogen and phosphate used together is usually greater than the sum of the effects of each fertiliser used alone. In some of these experiments these interactions have been definitely significant.

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	Tons per acre		
	Used alone	*Used with Sulphate of Ammonia*	*Difference (interaction)*
Increase due to Superphosphate.			
Little Downham 1932	2.96	4.40	1.44 ± 0.71
March 1932	1.03	1.92	0.89 ± 0.24
Increase due to Sulphate of Potash			
Thorney 1932 (no dung)	3.49	4.78	1.29 ± 0.52
Thorney 1933 (dung)	0.74	2.19	1.45 ± 0.52

This type of result is observed in greater or less degree in most of the experiments and constitutes an argument in favour of complete fertilisers.

The above series of experiments indicate that the Fenland soils so far examined give handsome responses not only to superphosphate but in most cases to sulphate of ammonia, while the soils containing little clay respond excellently to potash also. These fertiliser effects tend to reinforce each other when mixed manures are used.

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