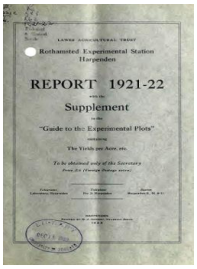
Report 1921-22 With the Supplement to the Guide to the Experimental Plots Containing the Yields per Acre Etc.



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Rothamsted Research (1923) *Summary of Papers Published - II. Technical Papers ;* Report 1921-22 With The Supplement To The Guide To The Experimental Plots Containing The Yields Per Acre Etc., pp 49 - 54 **- DOI: https://doi.org/10.23637/ERADOC-1-110**

LII. W. A. ROACH. *"Studies in the Varietal Immunity of Potatoes to Wart Disease* (SYNCHYTRIUM ENDOBIOTICUM SCHILB., PERC.)." *Part I.—The Influence of the Foliage on the Tuber as shown by Grafting.* Annals of Applied Biology, 1923. Vol. X. pp. 142-146.

Grafting experiments of a preliminary nature have been carried out to throw light on the functions of the various organs of the potato plant in rendering the tubers immune or susceptible to Wart Disease (*Synchytrium endobioticum* Schilb., Perc.).

Composite plants were built up by grafting in the following ways :—

3	plants of the type	Immune	grafted on	Immune	
3	,,	,,	Susceptible	,,	,,
4	,,	,,	Immune	,,	Susceptible
2	,,	,,	Susceptible	,,	,,

The results indicate that the character of the foliage has no influence on the immunity or the susceptibility of tubers to Wart Disease.

It follows that no compound synthetised in the leaves is likely to be responsible for separating potatoes into "immunes" and "susceptibles." The investigation is being continued with the view of finding, if possible, the chemical differences corresponding with the biological differences between immune and susceptible varieties.

TECHNICAL PAPERS.

CROPS AND CROP PRODUCTION.

LIII. E. J. RUSSELL. *"The Barley Crop. A Study in Modern Agricultural Chemistry."* Journal Inst. Brewing, 1922. Vol. XXVIII. pp. 697-717.

Barley, like wheat, flourishes best in relatively dry conditions, and the map showing its distribution in England and Wales is much like an inversion of the rainfall map. In Norfolk it occupies no less than 15% of the land in cultivation and in other counties of low rainfall it occupies between 9% and 14%; in the wetter counties, however, it occupies much less. The yield is chiefly determined by the quantity of nitrogen supplied. When barley is grown year after year on the same ground at Rothamsted the yield steadily falls off for some reason which cannot yet be found. This falling off is less with farmyard manure than with artificial fertilisers. In ordinary farm practice there is no indication of falling yields, but rather the contrary; given adequate manuring, however, the yield is still limited by the season and the strength of the straw.

It is often stated that the quality or malting value of the barley is inversely related to the nitrogen content of the grain, and where large differences are concerned this is generally true. But on any given farm it does not appear that the nitrogen content is much affected by the manuring so long as the conditions are not profoundly altered; the valuation also is not influenced in any regular way.

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High malting value seems to be associated with favourable conditions during the second part of the plant life when vigorous growth is followed by good ripening. These conditions almost necessitate a low nitrogen content since nitrogen assimilation occurs mainly in the early part of the plant life ; if there is vigorous growth afterwards it is mainly an accumulation of non-nitrogenous material. In these conditions, therefore, low nitrogen content would be related to malting value. But a low nitrogen percentage might equally result from a low nitrogen intake in the early life of the plant, and in this case there would be no necessary relationship with malting value.

LIV. E. J. Russell. *"Report on the Experiments on the Influence of Soil, Season and Manuring on the Quality and Growth of Barley, 1922."* Journal Inst. Brewing, 1923. Vol. XXIX. pp. 624-654.

Experiments have been made on a uniform plan on a number of farms known to grow barley well. The yields are given on p. 104, as also are the percentages of nitrogen and the values assigned by the maltsters. As this is the first year of the experiments, no conclusions are drawn ; the following results, however, were obtained :—

Nitrogenous manure (sulphate of ammonia) produced its usual effect of increasing the yield by about 5 bush. for 1 cwt. sulphate of ammonia, excepting only in two or three readily explained cases. The valuation was usually unaltered, but in one case it was increased and in two cases reduced.

Phosphates were ineffective at several centres on heavy soils where they would normally be expected to act. On the very light sand they apparently depressed the crop. We believe this to be a true effect attributable to the well-known action of phosphates in accelerating maturation. If this is confirmed by later observations it will necessitate a modification in the manurial treatment of barley on light land.

Contrary to our expectation in this bad season, potassic fertiliser was without effect on the valuation, although it had in several cases a marked effect in increasing yield.

The indication of this season's experiments are that a farmer can vary his manurial treatment within the limits of usual practice without influencing the maltsters' valuation.

The nitrogen content was usually related to maltsters' valuations when the barleys from different farms were compared, but the relationship was much less marked (only about half) when the barleys from differently manured plots on the same farm were compared. This result agrees with that already recorded above.

FERTILISERS.

ORGANIC MANURES.

LV. E. H. Richards and G. C. Sawyer. *"Further Experiments with Activated Sludge."* Journal of the Society of Chemical Industry, 1922. Vol. XLI. pp. 62T-71T.

If activated sludge is aerated for a short period in an ammoniacal solution there is no loss of nitrogen, any nitrogen not

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found as ammonia or nitrate in the effluent being recovered in the sludge. There is considerable evidence that the extra nitrogen in activated sludge, over and above that found in the old type sludges, is derived from the ammonia of sewage. There is no evidence of fixation of atmospheric nitrogen. The numbers of protozoa in well-activated sludge approximate to 1,000,000 per gram of wet sludge. The cell content of these organisms alone may account for a large proportion of the extra nitrogen. There is complete correlation between the numbers of active protozoa and bacteria in activated sludge under varied conditions of working.

Observations made in working the experimental tank at Harpenden Sewage Works confirm the laboratory experiments designed to find the source of the extra nitrogen content of activated sludge compared with ordinary sewage sludges. They afford no evidence of fixation of atmospheric nitrogen, but suggest that in addition to colloidal nitrogen, ammonia is removed from the sewage by physical or biological means, or both. The proportion of total nitrogen in the Harpenden sewage recovered in normal working by the activated sludge process is greater than in the older methods of sewage purification, *viz.*, 15% compared with 10% by precipitation and 4% by septic tanks. With sewage of half the average strength and supplying twice the normal volume of air per gallon of sewage, the recovery of nitrogen was as high as 27% of the total nitrogen in the sewage. Field trials show that activated sludge has a high manurial value in marked contrast with the old type sewage sludges tested on the Rothamsted farm in past years.

LVI. H. J. Page. *"Green Manuring."* Journal of Ministry of Agriculture, 1922. Vol. XXIX. pp. 104-112; 240-248.

Green manuring is discussed as a substitute for dung, the supply of which is insufficient. Variation in type of soil, climate, system of cropping and the like, necessitates different systems of green manuring; similarly the maintenance of productive soils in good heart by green manuring is a problem distinct from that of building up the fertility of run-down or naturally infertile land. Thus such systems of green manuring as find application in this country vary considerably from district to district. Although the beneficial effect of green manures, and of dung, depends on a variety of factors (which are discussed in detail), the prime function of either is to supply humic material to the soil. Artificials can fulfil most of the other functions of green manures or dung, but not this one.

LVII. H. J. Page. *"Saving Expense by Green Manuring."* Modern Farming, 1923. Vol. VI. No. 9.

In seeking to develop the use of green manuring as a substitute for dung, one of the greatest difficulties encountered is that of fitting the green crop into the rotation, without disturbing the latter. In practice this resolves itself into growing the green crop (i.) during the autumn and winter before roots, (ii.) in early autumn before winter corn. The first method finds application in potato districts (of which instances are quoted), but its feasibility as a preparation for mangolds or swedes is uncertain, and merits

trial. The second method is difficult to apply in many seasons, except at the end of a bare fallow, when mustard is often grown for turning in before winter corn. Various details of green manuring practice are described.

LVIII. E. J. Russell. *"The Possibility of Using Town Refuse as Manure."* Journal of Ministry of Agriculture, 1922. Vol. XXIX. pp. 685-691.

Six types of refuse are sent from four towns :—

1.—"Dry" refuse : the contents of refuse bins and "dry" ashpits.

2.—Separated dust : finely divided material separated mechanically from the dry refuse through a $\frac{3}{8}$in. or 5/16in. sieve.

3.—"Mixed" refuse : the contents of privy middens and ash closets.

4.—Night soil : the contents of pails containing crude fæcal matter only ; this is produced in towns where the pail system is used. When dried and granulated it contains some $5\frac{1}{2}\%$ nitrogen, $5\frac{1}{2}\%$ phosphates and $2\frac{1}{2}\%$ potash.

5.—Mixed night soil : *i.e.*, dry refuse, plus night soil, or separated dust, plus night soil, mixed in certain proportions. A 50% mixture offered at Rochdale contains 2.9% nitrogen, 3.6% phosphates (half being soluble and half insoluble), and 1.2% potash.

Market and slaughter-house refuse are sometimes mixed with 1, 2, 3 and 5.

6.—Street sweepings and other wastes.

Of these, 4 and 6 are well known to farmers.

The dry refuse in the more progressive towns is sorted over for the removal of bottles, metals and other saleable commodities. It is usually in good physical condition for putting on to the ground and for lightening a heavy soil. Its composition, however, is not particularly good in spite of its smell. Improvement is effected by enriching with a certain amount of other waste matter, such as street sweepings, slaughter-house refuse, stable manure, etc., and the final analysis comes out something like the following :—

Organic matter	25 %-40 %
Nitrogen	0.4%-0.6%
Phosphoric acid (P_2O_5)	0.3%-0.5%
Equivalent to tricalcic phosphate ($Ca_3(PO_4)_2$)	0.7%-1.1%
Potash (K_2O)	0.3%-0.5%

Farmers who use this material speak well of it and agricultural experimenters could well include it in their list of substances to be tried on the field.

ARTIFICIAL FERTILISERS.

LIX. H. J. Page. *"The Agricultural Value of Modern Fertilisers."* Raw Materials Review, 1923. pp. 111-112.

A discussion of the relative merits of present-day nitrogenous, potassic, phosphatic and organic fertilisers.

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LX. E. J. Russell. *"Recent Changes in Artificial Fertilisers."* The Field, 1922.

LXI. E. J. Russell. *"The Economical Use of Artificial Manures on the Farm."* Address to Bath and West and Southern Counties Society, June, 1921.

LXII. E. J. Russell. *"Phosphatic Fertilisers."* Journal of Ministry of Agriculture, 1923. Vol. XXIX. pp. 234-240.

LXIII. E. J. Russell. *"Manures for Milk: Lime, Slag, and How to Use Them."* The Milk Industry, 1922.

LXIV. E. J. Russell. *"The Dairyman and his Grass Land."* The Milk Industry, 1923.

LXV. E. J. Russell. *"Manurial Dressings Worth Trying."* Modern Farming, 1922.

LXVI. E. J. Russell. *"Top-dressing as a Modern Farming Operation."* Modern Farming. pp. 1-22.

A series of papers written for farmers giving the results of recent experiments with fertilisers and showing how they may be applied on the farm.

LXVII. E. J. Russell. *"Soil Sterilisation: Why and How to do it."* The Fruit Grower, 1923.

LXVIII. E. J. Russell. *"Agricultural Chemistry and Vegetable Physiology."* Annual Reports of the Chemical Society, 1921. Vol. XVIII. pp. 192-209. (1921: E. J. Russell. 1922: H. J. Page.)

LXIX. E. J. Russell. *"Annual Report on Soils and Fertilisers."* Soc. Chem. Ind. Annual Reports on Applied Chemistry. (1921: E. J. Russell. 1922: H. J. Page.)

LXX. E. J. Russell. *"Science and Modern Farming."* Journal Newcastle Farmers' Club, 1921.

LXXI. E. J. Russell. *"Modern Application of Chemistry to Crop Production."* Inst. Chem. Lecture Publication, 1921.

LXXII. E. J. Russell. *"Science and Crop Production."* Scottish Journal of Agriculture, 1922. Vol. V.

LXXIII. E. J. Russell. *"The Work of the Rothamsted Experimental Station."* Journal of Ministry of Agriculture, 1922. Vol. XXVIII. pp. 777-787.

LXXIV. E. J. Russell. *"Rothamsted and Agricultural Science."* Evening Discourse Royal Institution, February, 1923.

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LXXV. E. J. Russell. *"The Artificial Feeding of Crops."* Discovery, 1923.

LXXVI. E. J. Russell. *"The Influence of Geographical Factors on the Agricultural Activities of a Population."* Geographical Teacher, 1923.

LXXVII. *"Catalogues of Journals and Periodicals in the Rothamsted library."*

BOOKS PUBLISHED DURING 1921-22.

A. D. Imms. *"A General Textbook of Entomology."* Methuen & Co., Ltd. (in the press).

E. J. Russell. *"Farm Soil and its Improvement."* Benn Bros. (in the press).
Written for the working farmer.

E. J. Russell and Members of the Staff of the Rothamsted Experimental Station. *"The Micro-organisms of the Soil."*
A series of lectures delivered at University College, London. Longmans, Green & Co. (Rothamsted Memoirs on Agricultural Science).

Winifred E. Brenchley. *"Manuring of Grass Land for Hay."* Longmans, Green & Co. (in the press).
This monograph embodies a comparison between the aspects of the Park Grass plots at the present time with that about 40 years ago when Lawes, Gilbert & Masters published their accounts of the experiment.
Complete separation of samples of hay from every plot were made in 1914 and 1919, and the analysed results have been compared with those of the four earlier analyses up to 1877. In every case an outline is given of the present condition of the plot, with lists of the species occurring and their relative abundance. The principal changes during the experimental period are outlined, particular attention being given to the effects brought about by regular liming of one half of some of the plots since 1903.
The most striking alteration brought about by liming in the botanical composition of the herbage is the remarkable increase in the amount of foxtail (*Alopecurus pratensis*) on the heavily manured plots, and the corresponding, though less marked, reduction in Yorkshire Fog (*Holcus lanatus*) and vernal grass (*Anthoxanthum odoratum*).
The figures of the botanical analyses are given in the form of tables in which different types of manuring are grouped together, and certain of the results are more clearly indicated by graphs. The results as presented deal solely with the Rothamsted plots on heavy soil and no attempt is made to compare them with other more or less similar work on different types of soil elsewhere.
The intention of the monograph is to attempt to round off and complete the work begun by Lawes & Gilbert in order to suggest possible lines along which future developments of experimental work on meadow land might profitably extend.

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