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



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### Effect of Manures on Crop Composition and Quality

#### Rothamsted Research

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farmyard manure has therefore been handed over to a non-profit-making syndicate — the Agricultural Development Company (Pyrford) Ltd., the Chairman of which is Viscount Elveden, M.P., and under these auspices the work is progressing favourably. The results indicate that this is the best method of bringing a new discovery into practical use.

The nature of the gas given off in the fermentation of straw and Nile Sudd (papyrus stems) was studied in the Chemical Department at the request of the Air Ministry. So long as air was present, the gas obtained was carbon dioxide, but when the air supply was cut off methane and hydrogen were obtained in addition. The relative proportions of these two gases depended on the reaction of the medium; if it was kept neutral by means of calcium carbonate there was a considerable quantity of methane along with a certain amount of higher hydrocarbons; if it became acid the total evolution of gas was much diminished and the methane largely disappeared, hydrogen being the chief constituent.

The maximum production of methane was obtained at a temperature of 35°-40° C. and in presence of some nitrogen compound to serve as nutrient to the organisms. In these conditions a yield of 4,400 cubic ft. of gas was obtained per ton of wheat straw, and 9,400 cubic ft. per ton of Nile Sudd; of this gas 38% was carbon dioxide and 62% combustible gas made up of 56 parts of methane and 6 of hydrogen.

The maximum production of hydrogen was obtained when the medium was allowed to become acid, but the total yield of gas was then only 1/30th that given under neutral conditions.

#### EFFECTS OF MANURES ON THE COMPOSITION AND QUALITY OF CROPS.

Fertilisers affect the habit of growth and the quality of the crop, but the changes, though recognisable by the practical expert, are often so subtle that the chemist is as yet unable to characterise them or to connect them up in any definite way with the chemical composition. In the Rothamsted experiments the practical expert is asked to grade the produce, and his reports are used by the chemist in seeking to trace the chemical relationships. Malting barley and potatoes are being studied in some detail.

#### MALTING BARLEY.

The experiments are carried out at 13 different centres as part of the Research Scheme of the Institute of Brewing, and full details are given in their Journal. The same seed and the same manurial treatment are adopted at each centre. The yields are given on p. 104. The samples of grain are valued by a committee of expert buyers and are analysed by an experienced brewers' chemist; certain typical samples are separately malted by a maltster. The results will show how quality is affected by manurial treatment, soil and season; in addition, it is hoped from the data thus obtained to deduce chemical relationships which will enable us to express better than at present the value or quality of barley in chemical terms. The experiment began in 1922, one of

the worst seasons in the last 30 years for quality of barley. When the barleys from the different farms are compared, their values are related to nitrogen content; when, however, barleys from different manurial plots on the same farm are compared, the relationship is less marked; it can be shown statistically that the effect is reduced at least one-half (p. 50).

#### POTATOES.

The relative effects of sulphate of potash, muriate of potash and salt have been studied. The samples were valued by an expert buyer—George Major, Esq., of Major Bros., King's Cross Potato Market.

There was no obvious connection between manuring and valuation. Cooking tests, however, showed certain relationships.

The professional cooking test was kindly carried out by Messrs. Lyons, the well-known caterers, who placed the potatoes in the following order:—

#### MESSRS. LYONS' COOKING TEST: ORDER OF QUALITY.

1. Sulphate of potash.
2. Muriate of potash.
3. Muriate of potash and salt. No potash.

No farmyard manure was used with this set.

A home cooking test gave the following result:—

1. Sulphate of potash.
2. Muriate of potash and salt.
3. No potash.
4. Muriate of potash.

No dung was given to this set. On the dunged plots the differences were smaller.

It will be observed that both agree in placing the sulphate-treated potatoes at the head of the list, and of the others the only fertiliser as to which there is disagreement is the chloride.

Certain differences were detectable in the laboratory. The tubers receiving sulphate of potash had a higher specific gravity and a larger percentage of dry matter than any others, excepting only those from the no-potash plots receiving dung. The quantities of starch are being determined.

#### WHEAT.

The wheats grown at one centre—Seale Hayne, Devon—and receiving respectively sulphate of ammonia, muriate of ammonia and no nitrogen, were examined by Dr. Humphries. The two samples grown on muriate of ammonia contained slightly more gluten than those grown on sulphate, but no difference could be detected by the expert buyer or the miller. The baker in one case put the ammonium chloride plot above, and in the other below, the ammonium sulphate plot, but he preferred the unmanured wheat.