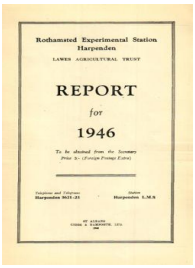
ROTHAMSTED RESEARCH

Rothamsted Report for 1946

Full Table of Content



Biochemistry Department

N. W. Pirie

N. W. Pirie (1947) *Biochemistry Department ;* Rothamsted Report For 1946, pp 65 - 66 **- DOI: https://doi.org/10.23637/ERADOC-1-88**

DEPARTMENT OF BIOCHEMISTRY

By N. W. PIRIE

At the invitation of the Worcester Foundation for Experimental Biology Mr. N. W. Pirie went, in February, 1946, to spend a year there as Associate Professor. Dr. J. Gregoire, who had been working in the Department, returned to France in January. Some of the work done has been carried out in collaboration with the Departments of Plant Pathology, Crop Physiology and Chemistry.

The main line of work has been to find the effect of mineral fertilisers on virus infected and healthy plants. Glasshouse-grown tobacco plants infected with tobacco mosaic virus and potato infected with potato virus ffi were examined. Sugar beet from a field experiment with healthy, mosaic-infected and yellows-infected plants was analysed at six different stages of growth. Broadbalk wheat plots were sampled on two occasions.

With local multiplication of tobacco mosaic in tobacco there was no consistent difference between infected and healthy plants, whereas with systemic infection significant differences were found. These included an increase in the nitrogen, phosphorus and potassium content as a percentage of the dry matter in infected plants, however as the weight of plants in infected groups was less than those of healthy the total amount of these elements taken up was smaller.

Mosaic infection in sugar beet led to an increase in the nitrogen and phosphorus content as percentage dry matter while yellows infection caused a decrease.

There were large differences in the pectase content of tobacco plants with different fertiliser treatments, the amount varying with the nitrogen content of the plants.

A sensitive method for the estimation of protease which allows its determination in small quantities of saps (of the order of 1 ml.) in spite of its usual very low level has been developed.

The protease content of all the plants with different fertiliser treatments and virus infection was determined. It was found that the use of potassium as a fertiliser had little effect on the protease content per gram dry matter in tobacco plants but that phosphorus led to an increase in protease per gram dry matter and nitrogen to a decrease. Systemic infection increased protease per gram of dry matter. The protease of the green leaves of a number of plants has been examined and some progress in its purification and the elucidation of its properties has been achieved.

Work has been continued on an alkali producing mechanism that occurs in the minced leaves of certain plants that have a high calcium content. It was found that these plants have an exceptionally high insoluble inorganic phosphorus content. The pH rise can be produced with the fibre of leaves that do not normally show it by soaking in neutral phosphate solution and milling with calcium carbonate.

It has been shown that pyrophosphate is as effective an extractant (at least on organic soils) as the almost universally used NaOH and has the advantage that it does not degrade what it extracts. Degradation of the organic matter in NaOH extracts is

https://doi.org/10.23637/ERADOC-1-88

indicated by production of free ammonia, the formation of an easily dialysable fraction and an uptake of oxygen. Activated charcoal has been found to adsorb nearly all the nitrogen remaining in solution after acidification of the organic-matter extracts. Preliminary tests have indicated that about 2 per cent. of the nitrogen of soils is amino-sugar nitrogen.

A close correlation has been shown between the ability of certain compounds to extract metals from soils and their ability to extract the organic-matter of soils. The metals estimated in the extracts were copper, manganese and iron and the nitrogen content of the extracts was used as an index of their organic-matter content. Pyrophosphate and various hydroxycarboxylic acid salt solutions proved to be good extractants both of metals and of organic-matter, whereas orthophosphate and the corresponding unsubstituted carboxylic acids which do not form soluble complexes with the metals also proved comparatively ineffective as extractants of organic-matter. This suggests that some of the polyvalent metal of soil exists as insoluble metallo-organic complexes with some of the organic-matter. The hypothesis is strengthened by finding that the precipitates obtained by the addition of manganese, copper or iron salts to preparations of soil organic-matter show just the same type of solubility as is shown by the organic-matter in the soil.

It has previously been shown that neutral solutions of sodium pyrophosphate extract considerable amounts of manganic manganese from soil in the form of a pyrophosphate manganiate complex. Further work has shown that neutral solutions of the sodium salts of various hydroxy carboxylic acids also form soluble complexes with the manganic manganese of soils. It is suggested that such acids may be of importance in maintaining manganese in an available form in soils.

Results from differential poisoning techniques carried out in the new perfusion apparatus have indicated that copper plays some essential part in nitrification in soil. Zinc is a powerful inhibitor.

Publications (including Summaries), page 109.

https://doi.org/10.23637/ERADOC-1-88