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Rothamsted Report for 1947

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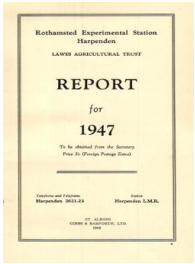

Crop Physiology Department

E. C. Humphries

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DEPARTMENT OF CROP PHYSIOLOGY

By E. C. Humphries

Consequent upon the departure of D. J. Watson in June, for a year in Australia, his duties in connection with the Field Experiments were undertaken by H. V. Garner.

Analysis of growth and yield of field crops

Observations were made on wheat, barley, sugar beet, mangolds and potatoes during a 6-year period, including measurements of size attributes of the plant and density of the plant population (fresh weight, dry weight, plant and shoot number and leaf area per sample) at intervals during growth have been analysed and the results prepared for publication. From the estimates of Net Assimilation Rate obtained from these data, the effects of seasonal trends, year to year variation, differences between species and varieties, and the relation of Net Assimilation Rate to climatic factors were investigated (39). The variation in leaf area within and between years was also computed. Differences in Net Assimilation Rate between species and between varieties of sugar beet and potatoes were established. Variation in Net Assimilation Rate is of minor importance in determining differences in yield between years and between varieties of the same species ; these depend mainly on variation in leaf area.

An analysis was also made (40) of differences in dry matter yield of various crops produced by variation in mineral nutrition. Material from three of the Rothamsted classical field experiments, Broadbalk (wheat), Hoosfield (barley) and Barnfield (mangolds) was used. Nitrogenous fertilisers consistently increased Net Assimilation Rate. The effect of other nutrients on NAR were smaller and more variable. All treatments increased leaf area per plant but the time at which the effects occurred and the manner in which they were produced differed with different nutrients. Generally speaking the effects of varied nutrient supply were relatively greater on leaf area than on Net Assimilation Rate.

Other investigations

The foregoing investigations indicated that leaf area is one of the most important factors influencing dry matter yield and it is of importance to determine the factors that affect it. A. G. Morton investigated certain aspects of this problem and found that of the factors investigated nitrogen was the most important in determining rate of leaf production by the apical meristem of sugar beet.

The considerable amount of data relating to the potato storage experiments outlined in the report for the war years has been analysed, and the first part prepared for publication (42).

E. C. Humphries was appointed in February, 1947, to investigate root problems. The object is to see how soil treatments such as different methods of cultivation or of fertiliser application affect the activity of roots so as to produce differences in crop yield. Preliminary results have been obtained on the nutrient uptake of excised roots from plants grown under controlled conditions of nutrient supply in water culture and it is hoped to extend the method to field material.