SOIL MICROBIOLOGY AT ROTHAMSTED

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Soil microbiology is a comparatively youthful and still adolescent branch of soil science. Its beginnings are considerably more recent than those of Rothamsted. In reviewing the contributions made in this field by Rothamsted workers, one should do so against the moving background of soil science itself. Lawes and Gilbert, throughout their lives, were primarily interested in chemical aspects of the great problems of plant nutrition. That microorganisms might be concerned in some essential transformations had been suggested in the 70's and 80's of the last century, but it can hardly be said to have been demonstrated unequivocally until isolations were accomplished in the nineties. By this time both Lawes and Gilbert were very old and for a period of some years before and after their deaths in 1900 and 1901, respectively, the work of the institution was largely confined to routine operations and little new was attempted.

It was not until E. J. Russell commenced his studies on biochemical processes in soil about 1897 that Rothamsted can really be said to have commenced to participate in the then rapidly developing field of soil microbiology. The accomplishments to be reviewed, therefore, are largely those of the past 35 years and are to be associated with the name of Sir John Russell, either directly or during his administration as Director. We are looking back at the immediate past; the critical scientific historian, 50 years from now, will be able to see this work in better perspective. Whether he will point then to this discovery or that as a landmark in the development of soil microbiology remains to be seen. My own impression is that perhaps the chief achievements of the Rothamsted group in this period have been (1) the demonstration of the fact that bacteria are not the sole microorganisms active in affecting soil fertility (2) the initiation of true soil population studies, and (3) the investigation of the inter-relationships between host legume and nodule bacteria in symbiotic nitrogen fixation.

EARLY WORK ON NITRIFICATION

To deal with the recent period exclusively, however, would do less than justice to the careful and detailed work of Robert Warington on nitrification. This is not as well known as it should be, no doubt because his efforts were not crowned by the successful isolation of the nitrifying organisms. However, the principles of the oxidation of ammonia to nitrate in soil were established by him, a chemist, between the years 1878 and 1891. The problem of the source of nitrogen for plants had been particularly a matter of ammonia are sources of nitrate in soil. On hearing of the classical experiments of Schloesing and on the biological formation of nitrate in ammoxidation observed in soils and waters is due to the fact that in the parent field the determination of specific accomplishments on the part of individual organisms was the main object. An organism was regarded as capable of producing a certain specific disease, or accomplishing a well-defined fermentation. The concept of the soil which was developed in consequence, was one of specialists, each with a particular function to perform, some highly beneficial to the growth of certain, some detrimental. The goal of that era was to express fertility as a function of the types and number of organisms present, and if possible to control the growth of some mycoderms.