THE NUMBERS OF AMMONIA-OXIDIZING ORGANISMS IN SOILS AS INFLUENCED BY SOIL MANAGEMENT PRACTICES

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The factors affecting the nitrifying power of soils have been rather thoroughly investigated. The results of these studies have given but little information, however, concerning the abundance of the nitrifying bacteria under field conditions. The important function of these bacteria in the maintenance of soil fertility makes a determination of their presence of particular interest, yet in only a very few instances has any attempt been made to count the numbers of these organisms in the soil.

The nitrate-forming bacteria have received more attention than those which transform ammonia to nitrite. The work of some investigators (2, 12) indicates that the ability to oxidize ammonia may be possessed by many widely different organisms of the soil. The present evidence, however, favors the assumption that the Nitrosomonas group of bacteria is the most important in this process. In the present investigation a study has been made of the numbers of ammonia-oxidizing bacteria in soil as influenced by soil management practices.

Wilson (11) was one of the first investigators to make counts of ammonia-oxidizing organisms of the soil. He found that the numbers varied widely from a few hundred to more than a million per gram. The number of organisms able to oxidize ammonia which were present decreased greatly as the acidity of the soils studied increased. It was also observed that the growth of leguminous crops seemed to favor larger numbers of these bacteria than non-legumes.

Feher (4) studied the nitrifying flora of forest soils. According to his results the pH of these soils exerted no noticeable effect upon the numbers of nitrifying bacteria. They were found in soils varying in reaction from pH 3.96 to 7.98. Some of the highest numbers were found in soils as acid as pH 4.5, while other soils with almost a neutral reaction were occasionally entirely lacking in these organisms. In general, the numbers of nitrifiers present closely paralleled the nitrate content of the soils. The numbers varied from 0 to 145,000 organisms per gram.

EXPERIMENTAL PROCEDURE

In this investigation some of the soil types common to Iowa were employed. Most of the studies were conducted on variously treated soils from the Agronomy farm of the Iowa Agricultural Experiment Station. Different systems of cropping and fertilizer treatments have been followed there on several series of plats for over 20 years.

1Journal paper No. J474 of the Iowa Agricultural Experiment Station, Ames, Iowa, Project No. 406. Received for publication August 3, 1937.
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3Figures in parenthesis refer to "Literature Cited", p. 863.