Mineralization and Immobilization of Soil Nitrogen

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I. BACKGROUND

The N supply is one of the general decisive factors in crop production. In many agricultural systems, it is customary to increase the input of N through fertilization. There is an urgent need to improve the N factor of crop production, both by increasing the efficiency with which N is utilized by crops and by limiting N losses to the external environment.

Underlying the various possibilities for improving the N economy in crop production is a complete understanding of N transformation processes, most of which are performed by microorganisms. Any given transformation can affect the final result, the output of useful plant products.

Individual N transformations have been studied extensively within such basic sciences as biochemistry, microbiology, and plant physiology. The result has been the accumulation of considerable information concerning the various transformations, their environmental demands, their mechanisms, the intermediates, and the end products. In contrast, little is known regarding the ecological unity of the transformations—the complete process of plant production on soils.

Studies of single transformations often provide information that is too isolated and specialized to be informative from an ecological point of view. Specialized knowledge on any given N transformation must be supplemented with integrated research taking into account the entire ecosystem with all of its individual transformations, pathways, pools, and interactions.

A. The Processes of Mineralization and Immobilization

In this chapter the ecological function of two individual N transformation processes in soil will be treated, namely, mineralization and immobilization. Both are biochemical in nature, and both are bound to the activities of the organisms making up the heterotrophic biomass (Bartholomew, 1965; Jansson, 1971).

*N mineralization* is defined as the transformation of N from the organic state into the inorganic forms of NH$_3$ or NH$_4^+$. The process is performed...