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Chapter

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Spatiotemporal Variations in Microbial Mediated Nitrogen (N) Release Under N-Fertilization Experiment from Banaras Hindu University, India

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Abstract

Globally, atmospheric nitrogen depositions due to fossil fuel combustion, industrial, and agricultural activities have been identified as serious threats to soil, water, and vegetation. In soil, N-deposition affects the respiration, microbial activities, enzymes actions, litter decomposition, and N-mineralization. The process of N-mineralization involves ammonification and nitrification. Ammonification is mediated by *Clostridium* sp., *Micrococcus* sp., *Proteus* sp., etc. Nitrification is mediated by the activities of diverse group of microorganisms (*Nitrosomonas europaea*, *Nitrosococcus nitrosus, Nitrosospira briensis*, *Nitrosovibrio*, *Nitrocystis*, *Nitrobacter winogradski*, *Nitrospira gracilis*, *Nitrosococcus mobilis*, *Penicillium, Aspergillus*, *Streptomyces, Nocardia*, etc.). In the present study, spatiality, rates of ammonification, nitrification, and net N-mineralization were governed by the soil properties (pH, moisture, C, N, and litter quality) and temporally these processes are determined by the rainfall pattern. Further, study suggested that the rates of ammonification, nitrification, and net N-mineralization were greater at moderate level of N application. This affinity can be explained as: at low levels of N resource, soil-C and -N are not enough for the activities of nitrifiers to release them in available form. As N increases more, actively participating microorganisms are enabled to release the nutrients in available form through the process of ammonification, nitrification and thus net N-mineralization, at sufficiently high N level, nitrifier population as well as their activities could be limited and thus the process of N-mineralization is limited. On the other hand, excessive N-application may damage the natural flora and fauna of soil which depletes the soil fertility. It could be

also speculated that the N-limited ecosystems keep the deposited N by using it for the growth and developments of plants and microbes, in addition to accumulation in biomass and soil organic matter. At a certain point, the deposited N commences to go beyond the biotic and abiotic needs for N within the system and the ecosystem is predicted to fail its N-retention ability. As the capability to keep N exceeds, surplus N is offered to be vanished from the ecosystem through solution losses and gas flux. Thus, in this study moderate level of N accelerated the process of N-mineralization.

Keywords

Nitrogen deposition Nitrifiers N-mineralization

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