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

Punita Verma, R. Sagar, Kulvip, Dharmendra K. Singh

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, Nitrocytis, 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, the study suggested that the rates of ammonification, nitrification, and net N-mineralization were greater at moderate level of N application. This affinity can be interpreted as: at low levels of N resource, soil-C and -N are not enough for the activities of the microorganisms to release them in available form. As N increases more, actively participating nitrifiers 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

References


SPSS (1997) SPSS base 7.5 application guide. SPSS, Chicago


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

CrossRef (http://dx.doi.org/10.1890/03-5120)


CrossRef (http://dx.doi.org/10.1007/978-81-322-1801-2_50)


CrossRef (http://dx.doi.org/10.1007/s11461-009-0013-7)


About this Chapter

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

Book Title
Microbial Diversity and Biotechnology in Food Security

Book Part
Part IV

Pages
pp 561-570

Copyright
2014

DOI
10.1007/978-81-322-1801-2_50

Print ISBN
978-81-322-1800-5

Online ISBN
978-81-322-1801-2

Publisher
Springer India

Copyright Holder
Springer India

Additional Links

• About this Book

Topics

• Agriculture
• Environmental Engineering/Biotechnology
• Medical Microbiology
• Chemistry/Food Science, general
• Medicine/Public Health, general
• Science, general

Keywords
- Nitrogen deposition
- Nitrifiers
- N-mineralization

Industry Sectors

- Pharma
- Materials & Steel
- Chemical Manufacturing
- Biotechnology
- Consumer Packaged Goods
- Energy, Utilities & Environment

eBook Packages

- Biomedical and Life Sciences

Editors

- R.N. Kharwar
- R.S. Upadhyay
- N.K. Dubey
- Richa Raghuwanshi

Editor Affiliations

- 1. Department of Botany, Banaras Hindu University Centre of Advances Studies in Botany
- 2. Department of Botany, Banaras Hindu University Centre of Advances Studies in Botany
- 3. Department of Botany, Banaras Hindu University Centre of Advances Studies in Botany
- 4. Department of Botany, Banaras Hindu University

Authors

- Punita Verma
- R. Sagar
- Kuldip
- Dharmendra K. Singh

Author Affiliations

- 5. Department of Botany, Banaras Hindu University, Varanasi, 221005, India