Effect of increasing nitrogen deposition on soil microbial communities

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Increasing nitrogen deposition, increasing atmospheric CO\textsubscript{2}, and decreasing biodiversity are three main environmental changes occurring on a global scale. The BioCON (Biodiversity, CO\textsubscript{2}, and Nitrogen) ecological experiment site at the University of Minnesota’s Cedar Creek Ecosystem Science Reserve started in 1997, to better understand how these changes would affect soil systems. To understand how increasing nitrogen deposition affects the microbial community diversity, heterogeneity, and functional structure impact soil microbial communities, 12 samples were collected from the BioCON plots in which nitrogenous fertilizer was added to simulate the effect of increasing nitrogen deposition and 12 samples from without added fertilizer. DNA from the 24 samples was extracted using a freeze-grind protocol, amplified, labeled with a fluorescent dye, and then hybridized to GeoChip, a functional gene array containing probes for genes involved in N, S and C cycling, metal resistance and organic contaminant degradation. Principal component analysis (PCA) of all genes detected was performed to analyze microbial community patterns. The first two axes accounted for 32.3\% of the total variation. The samples fell into two major groups: fertilized and non-fertilized, suggesting that nitrogenous fertilizer had a significant impact on soil microbial community structure and diversity. The functional gene numbers detected in fertilized samples was less that detected in non-fertilizer samples. Response ratio analysis shows that most genes involved in N, S, and C cycling, metal resistance, and organic contaminant degradation decreased in the fertilized samples. Further analysis of GeoChip results is underway to provide an overall picture of microbial community structure in increasing nitrogen deposition environments.

Keywords:

Microbial community, functional gene, increasing nitrogen deposition