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A Spatial Autocorrelation Analysis of Green Roof Microbial Communities in New York City

Though green roofs are constructed artificially, they represent dynamic living systems in which studying ecology is now as important as ever. This study aims to characterize the spatial patterning and distribution of fungal communities on green roofs in New York City. Evidence suggests that green roofs have improved problems associated with urbanization, functioning to decrease storm water run-off, provide filtration for waste water, and contribute to temperature control for city buildings, thereby remediating urban heat-island effect. Green roofs have typically been studied from a sustainable and horticultural standpoint, and little thought has been given to the function of green roofs from an ecological standpoint. Green roofs may serve as promoters of biodiversity and migration corridors. The activities of various bacteria and fungi are important for nutrient cycling in soil on green roofs. However, very little is known about the way in which vegetation, substrate, and environmental factors interact and affect microbial communities on green roofs. In this study, spatial autocorrelation was utilized to analyze the similarity structure of green roof microbial communities to help give a clearer picture their variability and spatial structure on multiple scales. Among the hypotheses was the conjecture that differing plant community type, Rocky Summit versus Hempstead Plains, will impact patterns of microbial diversity and/or biomass in different subplots on each green roof. Data collection involved sampling soils on 10 experimental green roof sites throughout New York City. Sampling of soil followed a predetermined scheme, designed to test for spatial patterning of microbial biomass across the two different plant communities in each individual plot of vegetation on each green roof. Fungal DNA was extracted and sequenced using Illumina sequencing of the fungal ITS region. Data analysis will show the nature and degree of spatial autocorrelation in the fungal community. In the future, the spatial autocorrelation of other environmental factors on green roofs can be characterized, which may explain the importance of a number of environmental factors in shaping the similarity structure of green roof microbial communities. Continuing studies like this are essential for a full understanding of the role that green roof microbial communities play in the environment.