Assessing Ammonia-Oxidizing and Denitrifying Bacterial Abundance in Urban Rooftop Farming Systems Receiving Varied Fertilizer Amendments

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With the rise in popularity of green roof technology, there has also been growing interest in employing rooftops to expand urban farming systems to help address urban food insecurity. Agricultural practices, particularly those involving synthetic fertilizer additions, can be sources of greenhouse gas emissions, such as nitrous oxide (N_2O). The potential contribution of rooftop farms to urban greenhouse gas emissions is currently not well understood. The goal of this study is to characterize the microbial community that plays a role in nitrogen (N) cycling and potentially generating N_2O and nitric oxide (NO) emissions and relate this to N processes (e.g., loss and crop uptake) in rooftop farming systems. Using real-time quantitative polymerase chain reaction (qPCR) assays of functional genes, this project will assess the abundance of ammonia-oxidizing bacteria (AOB) and denitrifying bacteria in rooftop farm media amended with different fertilizers across the 8-week growing season of Swiss chard (*Beta vulgaris*) in a greenhouse. We will investigate rooftop media amended with the following: Scott's Osmocote® fertilizer, NYC Dept. of Sanitation municipal green compost, Lower East Side Ecology Center vermicompost, and Stone Barns Agricultural Center composted chicken manure. Results of this study will be coupled with analyses of crop productivity, crop N uptake, and N loss via leaching associated with each amendment. Environmental parameters, e.g., pH, electrical conductivity, and soil moisture, will also be measured. Preliminary results midway through the experiment (three out of five sampling events) indicate that concentrations of DNA extracted from the media amended with Stone Barns compost (4.11×10^3 ng DNA g^{-1} dry soil, averaged across three sampling events) are higher than in the control and Osmocote® treatment (2.31×10^3 and 2.62×10^3 ng DNA g^{-1} dry soil, average across three sampling events, respectively). Mean pH values ranged from 7.39 – 7.868 across all sampling times and soil amendments. pH values were generally lower in the Osmocote® treatment, but few differences were found among the other treatments at the 2nd and 3rd sampling events. In addition, all treatments showed similar chard biomass at the 2nd and 3rd sampling date. This project will continue through 2013.