Department of Biological Sciences

Sara Payne

Mentor: Dr. Krista McGuire

Identification of Heavy Metal Resistant Soil Fungi in NYC Green Roofs and Parks

In urban environments, green roofs provide a number of potential benefits, including decreases in urban heat island effects and reduced energy costs for buildings. Moreover, green roofs may serve as habitats for fungi residing in the urban environment. Although most studies on green roofs have focused on the engineering aspects and energy saving benefits, little is known about their ecological function in maintaining urban biodiversity. One aspect of urban biodiversity that is largely unexplored is soil fungal community composition. Some fungi are known to convert metals from toxic to non-toxic forms, and some facilitate the growth and survival of plants. For study, our objectives were to evaluate: (1) the diversity of heavy metal- resistant fungi in both green roofs and parks, (2) the seasonality of culturable fungi, and (3) the influence of vegetation type on fungal community composition. To accomplish these objectives, soil cores were collected from parks and three replicated experimental green roofs composed of two native plant communities (Hempstead Plains and Rocky Summit plant communities). Fungal community composition was assessed by culturing serially diluted soil samples on unamended media plates and media plates amended with different heavy metals: copper, lead, and arsenic.. The fungal ITS region of the grown colonies was sequenced using colony PCR.

Overall, fungal abundance was highest in arsenic-amended media, followed by non-amended media, lead-amended media, and copper-amended media respectively. Although PCR was performed on all unique cultured fungi, only three amplified PCR products were successfully sequenced from Jackie Robinson in July. An *Aspergillus species* was identified in the Rocky Summit plant community on the Jackie Robinson roof. *Cryptococcus species* and *Sclerotinia homoeocarpa* were identified in the July Jackie Robinson park sample. Fungal communities exhibited significant seasonality in parks and green roofs only during the month of November. Roof fungal communities exhibited significant clustering for lead and arsenic- resistant fungi across seasons, but not for copper-resistant fungi. In addition, park seasonality was observed for arsenic and copper-resistant fungi, but not for lead-resistant fungi. Collectively, fungal communities exhibited seasonal variation rather than spatial variation, and fungi resistant to each of the heavy metals were identified across the city in both parks and green roofs.