Introduction

Green roofs have received recent attention as a means of mitigating climate change impacts in urban environments (Berardi et al. 2014); green roofs are also known to promote biodiversity as compared to conventional roofs, making them ecological refuges for avian and arthropod species that are accustomed to urban environments (Wooster et al., 2022). Pollinator species richness in particular has declined, making green roofs important tools in maintaining urban biodiversity in the face of habitat loss as the development of urban areas puts pressure on green spaces (Goulson et al., 2015; Braaker et al., 2017). However, green roofs also tend to have harsh environmental conditions such as high winds, extreme temperature fluctuations, and soil erosion (Rowe et al., 2012; Cascone, 2019). As a result, biochar has been proposed as an additive to green roof substrate due to its ability to regulate soil moisture, soil temperature, and enhance microbial growth (Chen et al., 2018), with granulated biochar in particular being effective in improving water discharge quality and mitigating erosion (Liao et al., 2022ab). Despite claims about the impact of green roofs on pollinators and the impact of biochar amendments on green roof infrastructure, there have not yet been studies examining how biochar amendments affect pollinator visitation on green roofs. This project investigates bee visitation on green roof infrastructure, comparing results between native and Sedum plots as well as biochar-amended and control plots.

Methods

This project was conducted on the GRITLab2 facility on the roof of the John H. Daniels building at the University of Toronto. The site has 48 plots (1.8 m x 1.8 m), of which half are amended with 5% biochar by volume. Additionally, half of each type of substrate were seeded with a native seed mix (with supplementary planting) and the other half were planted with commercial (non-native) sedum mats dominated by Pedsimus kamtschaticus with small amounts of Sedum sexangulare and Sedum spathulifolium. The bee surveys were conducted from May to August 2023. Visual survey data was collected twice a week between the hours of 11:00 AM and 6:00 PM. At each plot, the number of bees, type of bee identified to the species or genus level, and species of flowers being visited were noted. Additionally, diurnal survey data was collected twice, where visual surveys were conducted once an hour from sunrise until sunset. Bee visitation data were analyzed using a generalized linear mixed effects model that included fixed effects of vegetation type and biochar treatment and random effects of plot and date, with a negative binomial residual distribution. Pairwise comparisons used a similar model with p-values adjusted using the false discovery rate method.

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References