Correlating the Biodiversity of Weeds and pH of the Soil in Manhattan-Pumphouse Park and Queens-Astoria Park

Mehjabin Ahmed, Ahmed Chowdhury, Sporsho Chowdhury, Khin Yadanar
Rocheli Apilan
High School of Health Professions and Human Services

ABSTRACT

Weed plants are small invasive plants whose population growth formed over time and is dependent on nutritional sources that allow them to grow in cracks in sidewalk concrete, building brick work, (herein “building structures”) etc.. With factors such as deal soil pH, population density, and pollution all play a role in soil pH. With the frequent rise of pollution,experiment were conducted where by soil samples from two different boroughs were obtained and soil pH was quantified. A comparison was made of species diversity vs. soil pH in different locales around NYC. Attention was paid to the method of weed extraction in certain locations such as Manhattan’s Pumphouse Park (the most populated borough) and Queen’s Astoria Park (the second least populated borough) determining the biodiversity through Protocols I -IV in DNA Barcoding. The Queens locales presented a more ideal pH than Manhattan locales. Presenting various species of weed plants (e.g. Convolvulus Arvensis.SP) steeming from multiple regions across the world.

INTRODUCTION

In New York City's modern landscape, green spaces provide a safe place for city people and nature lovers. Astoria Park in Queens and Pumphouse Park in Manhattan are examples of the city's effort to caring for green areas. A complicated biodiversity takes place in these parks, showing the relationship between the plants and their surroundings. The pH level of the soil is an important component controlling this process. In parks, weeds and other plants have an ideal pH that can be affected through pollution. We studied the relationship between soil pH and weed biodiversity in the two different parks, and we find not only the ecological challenges present, but also possible problems for the organization of urban parks.

METHODOLOGY

To conduct the experiment: we gathered weed samples from targeted sites in Queens and Manhattan, using rubber gloves and 15 plastic ziplock bags for each borough --> We carefully removed a weed plant, keeping the stem intact --> Placed in a ziplock bag --> We collected at least 1.0 g of dirt from each borough --> Each 1.0 g of dirt was weighed --> Concentrated with 100 mL of distilled water in a beaker. We used pH strips to determine the pH level of each dirt sample and analyzed 30 weed samples, 15 from each borough, using the DNA Barcoding Protocol II-IV.

RESULTS

After gathering our samples, it was determined that we were able to get 5 out of the 30 total samples from both boroughs. The only samples we were able to successfully process through a DNA extraction were all located in Astoria Park, Queens. From the 30 samples, KPJ-016. KPJ-017, KPJ-021, KPJ-028, and KPJ-029 had a majority of containing Convolvulus arvensis. Through these five samples, however, there are differences as a few of the samples contained genetic material of Calystegia sepium and Tephrosia nubia. From the pH sample, Pumphouse Park contained a sample of 7 when being diluted and put on a pH strip, while Astoria Park contained a sample of 6 when going through the same process as the Manhattan dirt sample.

CONCLUSION

While having the ideal pH, Astoria Park samples were able to produce a third of the genetic material. In most samples, the Astoria Park samples contained the genetic information of Convolvulus arvensis (bindweeds). Field bindweeds are native to Africa and are grown during the middle of summer (Field Bindweed, Convolvulus Arvensis Solanales: Convolvulaceae, n.d.). The Calystegia sepium, hedge bindweeds, are native plants from the northeast region of America and present themselves with long perennial vines (Calystegia Sepium for WSSA WeedList, n.d.). The Tephrosia nubia is native to the Sarahar desert and across east Africa, while also containing roots from eastern Europe and the Middle East (Tephrosia Nubica (Boiss.) Baker | Plants of the World Online | Kew Science, n.d.). This length of biodiversity can allow a better understanding of the significance of genetic material spreading across the world. Although we can not analyze the samples from Pumphouse Park, Pumphouse Park contained a higher pH level of soil than the regulated level for plant growth. The conclusion of our experiment has been inconclusive, however, the ability to experiment is still a viable option. Being able to modify past safety procedures when carefully testing our samples could have changed the outcome of our experiment. In addition, applying other factors of pollution such as transportation and large factors can change not only the pH soil of the borough but also the diversity of weed plants located in New York City.

DISCUSSION

The experiment yielded an undetermined hypothesis conclusion, with samples from Pumphouse Park lacking genetic material, likely due to extraction errors during DNA processing. Astoria Park samples, despite having suitable pH levels, only produced a third of the expected genetic material, primarily from Convolvulus arvensis, or field bindweeds. Additionally, five samples contained genetic information from other species like Calystegia sepium and Tephrosia nubia, showcasing biodiversity with roots spanning various regions worldwide. The absence of genetic material from Pumphouse Park, possibly due to elevated soil pH levels hindering plant growth, highlights the potential impact of environmental factors on genetic diversity. While the experiment's conclusion is inconclusive, refining safety procedures and considering additional pollution factors could enhance future experiments, shedding light on the dynamics of genetic diversity in urban environments like New York City.