The Effect of Soil pH on Insect Biodiversity in Flushing Meadows Corona Park (FMCP)

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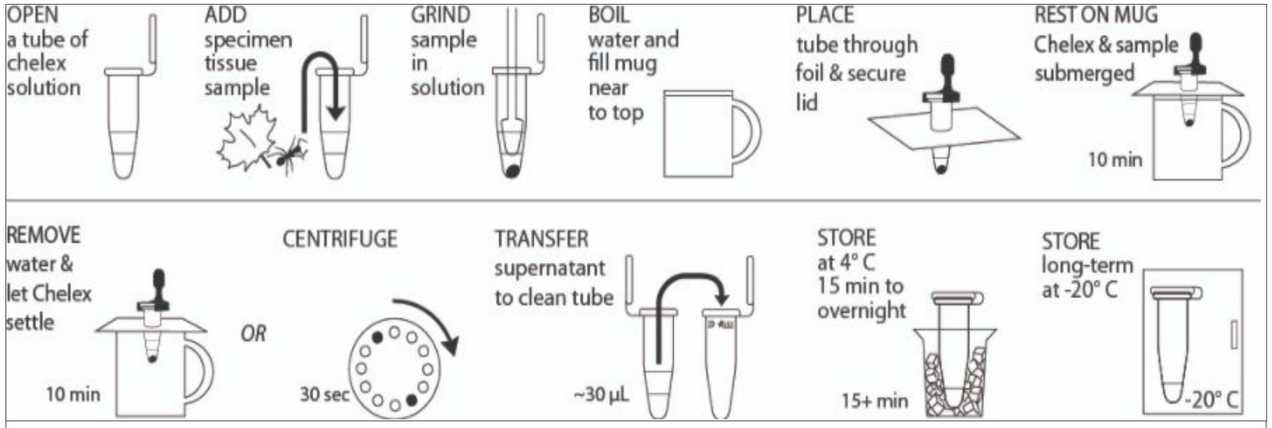
Abstract/Introduction

Soil pH is the measurement of acidity or basicity/alkalinity of soil by measuring the amount of hydrogen ions in the soil. The more hydrogen ions in the soil, the more acidic the soil becomes. The pH scale goes from 0 to 14. The lower the pH, the higher acidity. Soil's optimal pH is between 6 and 7 which is relatively a neutral acid level. Low soil pH leads to the depletion of nutrient availability, decrease of plants, and microbial diversity like bacteria and fungi.

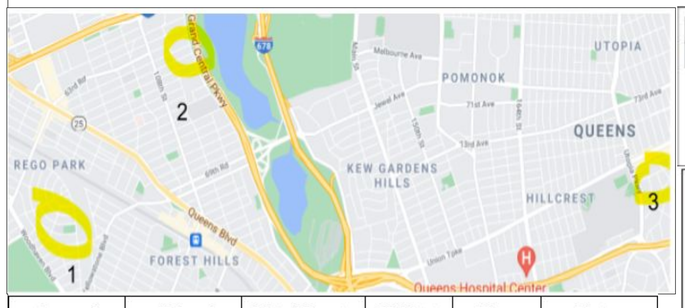
Soil health, plant life, and microbial diversity also associate with insects. The decomposition insects do allow healthy soil, and a growing plant and microbial populations, by distributing nutrients throughout the soil. Insects also feed on high population microbials allowing microbial diversity. Additionally insects use plants as shelter.

In this experiment soil pH was tested in three areas of FMCP and insect samples were collected. The purpose of this experiment is to see if there is a correlation between a high or low insect diversity with soil pH. The hypothesis is if the areas that have a soil pH range level of 6-8 they will have a high diversity of insects because that is the optimal pH range for soil. When soil has a pH range of 6-8 it's not too high or low for microbial diversity and plant life which is good for insects because they find shelter near plants and feed on microbes.

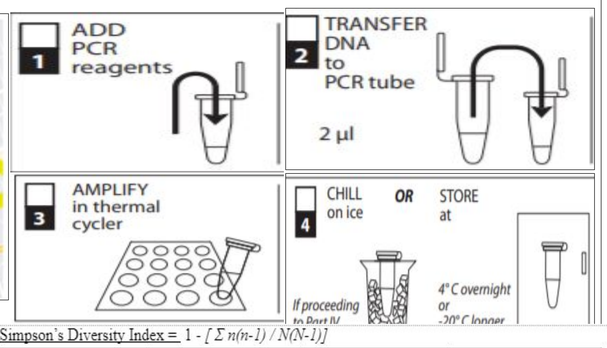


Materials & Methods

Due to uncontrolled circumstances like weather, the original experiment wasn't able to be completed and the project was modified to insect biodiversity in residential areas of Queens. Samples were collected from three different areas of queens and soil pH was tested with litmus paper pH strips. DNA chelex isolation, PCR and barcoding was used to identify samples in order to make sure different samples of insects were collected. Simpson's Diversity index formula was used to calculate diversity.



Areas of Queens	pH Level	List of Insects Collected /#seen	Habitat Description	Time collected/ Time of day	Notes
Area #1	7	Pavement Ant x11 *Fire Ant x7 *Centipede X3 *larvaes X4	developed	Evening	Collected after rain. -In the soil -Under a rock - Under a rock -Under a log
Area #2	6	*Ladybug x3 *Stone centipede x2 *White grub x4	developed	Afternoon	Collected after rain On the grass -Under a rock -in the soil
Area #3	6	Fruit fly x10	developed	Afternoon	-On top of the soil -Collected after rain -Area has a lot of traffic



Simpson's Diversity Index = $1 - [\Sigma n(n-1) / N(N-1)]$

Species	n	(n-1)	n(n-1)
Pavement Ant	11	10	110
*Fruit fly	10	9	90
*Fire Ant	7	6	42
*Stone Centipede	2	1	2
*Ladybug	3	2	6
*White Grub	4	3	12
*Centipede	3	2	6
*Larvaes	4	3	12
Σ n(n-1)			280

*= Hypothesized

N	(N-1)	N(N-1)
44	43	1892

D (Biodiversity) = 1 - (280/1892) = .85

Discussion /Results

It is shown by the Simpson's Diversity Index that the biodiversity of residential areas of Queens has a high biodiversity. Since the value of the Index was 0.85, higher than 0.7, it is a high biodiversity. The data demonstrates that the hypothesis of the experiment was supported. The results imply that in a pH range of 6-8 insects could survive and thrive in Queens, New York. This is most likely due to an availability of microbial populations and plant species, which insects feed on, as in other pH levels would be low.

Only one sample out of nine was able to get sequenced, which is why the species collected were hypothesized. Qualitative data like the physical differences were used to make sure the insects were different species.

For future experiments it is recommended to collect samples for highest insect activity and to test microbial populations to examine for correlations.

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