



DC Statewide IPM Project
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Kochia, *Kochia scoparia*, photo by Jack Kelly Clark.

Does The Preference To Either Taproot Or Rhizomatous Plants By Terrestrial Arthropods Affect The Nitrogen Content In Soils?



Introduction

In northern Colorado on the grassland steppe, lays a piece of land next to the Poudre River. This land has been recently tilled and seeded with 14 types of plants in the last year. Two particular kinds of plants that I will work with are a taproot and a rhizomatous plant.

Question

Does the preference to either taproot or rhizomatous plants by terrestrial arthropods affect the nitrogen content in soils?

Hypothesis

The soil nitrogen around the taproot will be lower in content, thus species diversity of terrestrial arthropods will be lower. A taproot grows deeper in the soil, thus grows mostly in an area that contains less nitrogen content. Most of the nitrogen found in soil is found in the upper horizon of the soil since most of the organic, decomposed, matter is found here. I will neglect the fact that there could be deposited layers of soil over time since the land has recently been tilled and seeded.

Observations

This piece of land consists of 95% weed plants vs. 5% planted grasses, along with native species being about 50%. The areas that are closer to rhizomatous plants are considerably easier to dig the pitfall trap holes. Site 1 and 2 seem to have considerably the same types of plants and was very challenging to single out just one taproot or rhizomatous plant to place the pitfall trap next to. Two days were given to allow for terrestrial arthropods to land in the pitfall traps; and during those days, the temperature was about 80 degrees Fahrenheit and overcast.



Methods/Materials

My site samples will come from a site area with a transect line that is run directly from three different ant hills. From each ant hill, there is a pitfall trap at 1.5 meters, 3 meters, 5 meters, and 10 meters. Each trap is specifically placed by either a rhizomatous or a taproot plant. The plant type is specific to the field site, Site #1 Rhizomatous and Site #2 Taproot. The pitfall trap protocol will be taken from the Ecoplexity website: <http://ecoplexity.research.pdx.edu/>.

Next, I will have to test the soil Nitrogen content under each plant where the pitfall trap lies. This will follow the Nitrogen Soil testing protocol also from the test kit.

Finally, wait two days and then count the quantity of arthropods in each pitfall trap. This will be accurately counted by type of arthropods and the quantity of each type.

The materials that were used are:

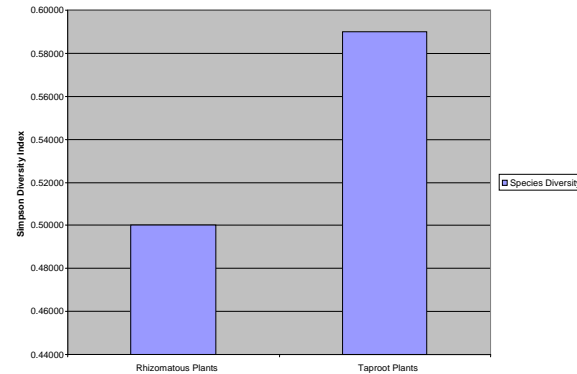
16 plastic cups
16 Ziploc Bags
1 shovel
16 Rubber bands
1 tape measure (meters)
Microscope

1 bottle of anti-freeze
8 Petri Dishes
2 flags
Small Paint Brush
Tweezers
Nitrogen Soil Test Kit



Results

Taproot vs. Rhizomatous Plant Species Diversity



Site #1

Distance from Ant Pile (m)	Root System Type	Nitrogen Content (ppm)	Abundance of Arthropods
1	Rhizomatous	0.5	49
3	Rhizomatous	0.5	55
5	Rhizomatous	0.5	135
10	Rhizomatous	0.5	43

Site #2

Distance from Ant Pile (m)	Root System Type	Nitrogen Content (ppm)	Arthropods
1	Taproot	0.5	55
3	Taproot	0.5	35
5	Taproot	0.5	63
10	Taproot	0.5	29

Average Species diversity using Simpson's Diversity index for Rhizomatous plants = 0.5. The Average for taproots is 0.59.

Using the T-test: T stat = 0.04129

T = P value of 0.484



Conclusion

The results of this experiment are supporting my null hypothesis: The soil around Site 1, taproot plants, and Site 2, rhizomatous plants had the same nitrogen content level and terrestrial arthropod species diversity. The Nitrogen Soil Test data did not support the hypothesis and showed no significant difference between the soils at both sites. The test indicated two things: 1.) The nitrogen content was between 0 and 5 ppm 2.) The soil test was not sensitive enough to indicate there was a change in content.

The small amount of nitrogen in the soil may just be taken up by the few living plants. Therefore, there is no supporting evidence that the terrestrial arthropods in these sites actually affect the nitrogen content of the soil.

The statistical evidence of the data shows that using a t-test on the species diversity between the Rhizomatous Plants and Taproot plants is not significant. At a 90% confidence level, the t-test analysis (0.0413) showed no statistical significance when comparing it to the p-value of 0.484. The Taproot vs. Rhizomatous plant species diversity graph shows that taproots are statistically similar to Rhizomatous plants when an average of the species diversity at each site was taken.

Bibliography

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- 4.) Lamotte Company. Soil NPK Kit Code 5880. Chestertown, MD. 12/03.
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