Investigating How Terrain Affects Moss DNA

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Abstract

For our UBP DNA project, we decided to collect samples of moss and compare their DNA. We hypothesized that moss found in different terrains, but in the same ecosystem, would yield different DNA. After isolating the DNA, and undergoing electrophoresis, no DNA was found; because no DNA showed up, we could not interpret the possible differences in it.

Introduction

New York State is filled with abundant natural environments in which diverse populations of plants flourish. One such environment is found north of New York City, in Black Rock Forest, in Cornwall, NY. One of the common plant species found in Black Rock is moss.

Moss is an abundant, photosynthetic, and multicellular organism found in forests and parks. Moss grows in the crevices of rocks, logs, trees, the ground, and other areas to create a protective nature habitat. It is not an invasive species, as it does not harm its ecosystem. Moss is found in a variety of New York habitats, including Black Rock Forest in Cornwall, New York and Central Park in Manhattan, New York.

For the Urban Barcode Project, eight samples of moss were collected from Black Rock Forest. Four samples of moss were also collected from the East side of Central Park. The moss samples were collected from different areas around the parks in order to compare and contrast our observations made based on where the sample was found. The moss samples are being used in order to answer this group's essential question: is the DNA of the moss greatly impacted by the terrain it grows on?

Figure 1: Sample 1 of moss, found in Black Rock Forest, NY, in a container after the collection.

Materials & Methods

The research project consists of collecting, extracting, and comparing the DNA of moss from a variety of locations in Black Rock Forest, NY, and in Central Park, NYC. Twelve samples were collected, with lengths varying from 2 to 4 inches. During extraction, scalpels were used to scrape the moss off of a variety of bases, including rocks, trees, logs, and dirt. Each sample of moss was collected and placed in a labeled jar for transportation back to school. After collecting, the moss samples were refrigerated and watered every two to four days, with the corresponding water samples.

We placed the samples into a thermal cycler in order to perform DNA amplification. During this process, DNA is copied and increased to prepare for gel electrophoresis.

For extracting DNA, we used the “Isolate DNA from Plant, Fungal, or Animal Samples” section from “Using DNA Barcodes to Identify and Classify Living Things” and we prepared the samples for the gel electrophoresis. For the gel electrophoresis process, an electrophoresis chamber with one side negatively charged and the other positively charged was used. An agarose gel square was placed in an electrophoresis chamber with the wells on the negatively charged side of the chamber. Buffer was added to the chamber until the gel square was completely covered. A micropipette was used to place 5 milliliters of a sample into each well. The gel square contained eight wells including the well in which the ladder is placed, this allowed seven samples to be processed at once. After placing the samples into the wells the chamber was covered and connected to a power source for thirty minutes. Because DNA is negatively charged, while the chamber is connected to the power supply the DNA fragments along with the ladder will move through the gel towards the positively charged side of the chamber.

Figure 2: Sample 6 of Moss, collected in Black Rock Forest, NY, in a container after the collection.

Results

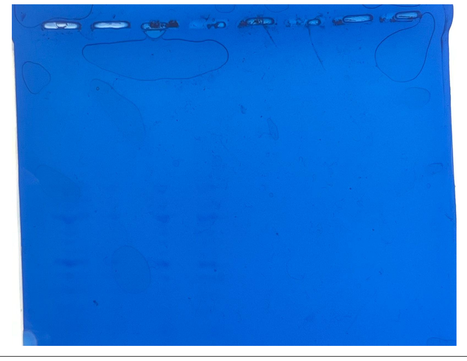
After all of our samples underwent DNA extraction, amplification, and gel electrophoresis, there were no traces of DNA that came through to the end. We were able to collect 12 different samples of moss from separate terrains, however we lost four during or before beginning the DNA extraction.

Tables & Figures

Sample	Location	Coordinates	observations
1	Upper Reservoir	(41.41097,74.0068)	Fluffy, light green spheres
2	Moss on pathway #1	(41.40953, 74.00606)	Dark green, dirty, moist, mushy
3	Moss near tree	(41.40964, 74.00624)	Dark green, almost black, thick
4	Moss on log near trees	(41.40952, 74.00592)	Spikey looking, large chunks, full of dirt, dark green
5	Moss on rock #2	(49.4095, 74.0059)	Looks like hair follicles, spikey looking, dark green
6	Moss on rock, aside from pathway	(41.409,74.00640)	Thin leafy pieces, dark green
7	Moss near trees	(41.40952, 74.00638)	Thick moss strings, dark green
8	Moss on rock	(41.41127, 74.00804)	Dark green, spiky

Figure 3: Sample number, location, coordinates, and observations of the moss found in Black Rock Forest, NY and Central Park, NY.

Figure 4: The ladder is shown having successfully moved from the four wells to the left, wells 1-4, during gel electrophoresis. Wells 5-8 had DNA samples micro pipetted into them, yet the DNA did not move during the electrophoresis process, so we could not see the DNA samples after the gel was put into dye.



Discussion

Our results show that there were significant errors in this experiment. The amount of error shown is likely due to the fragmented manner in which we completed the steps of the experiment. This illustrates how important it is to complete experiments in a timely manner.

The study may not have worked as intended because of our micropipette misuage, taking out too much dissolved primer. We had to remove the dissolved primer because there were too many of the samples in it, due to our micropipette misusage.

Another piece of error that could have affected our results is that the moss had stopped being watered months after we collected them. The samples taken from the moss for DNA extraction were taken after winter break, meaning that our moss was drier than usual when taken for use. In order to improve this experiment, the entire process should have been done at a faster rate, making sure to complete all steps of DNA extraction in 1 or 2 classes, rather than waiting weeks in between. Additionally, by collecting the moss in October and beginning the process of extraction in January, caused our moss to be less fresh, making our group have to preserve it for longer.

A large error that was made during electrophoresis was that wells 2-4 mistakenly had ladder, solution of DNA molecules, added to them. Though this led to defined DNA tracks, the results are not valid because the DNA that showed up was that of the ladder, not the samples themselves. Wells 5-8 were valid, as only the sample and primer were included, however no DNA tracks showed up. We were not able to send out samples to the lab because there was no identifiable DNA recorded in the dyed gel.

References and acknowledgements →