A Study of the Styrofoam-Eating Bacteria in the soil around the OES campus.

Question

Is there any bacteria that can be good at helping dissolve Styrofoam among the bacteria in the soil near the goat fold, near the chicken coop or near the wetlands around OES campus?

Hypothesis

The bacteria in the soil near the Chicken coop may do a better job at dissolving Styrofoam because there are a lot of special bacteria in chicken's body and their feces that I think may have special effects on Styrofoam.

Background

- Styrofoam is the most common plastic product that can be found everywhere every day around the world. It can be used for heat insulation, sound insulation and packing.
- People throw Styrofoam away randomly in daily life because they are inexpensive and usual**, "By volume, the amount of space used up in landfills by all plastics is between 25 and 30 percent"** (http://www.earthresource.org/campaigns/capp/capp-styrofoam.html).
- Polystyrene foam cannot degrade by itself and it is harmful to the environment an may "choke animals and clog their digestive systems" (http://www.earthresource.org/campaigns/capp/capp-styrofoam.html).
- Scientists are trying to find more and more ways to degrade Styrofoam such as using bacteria like ***pseudomonas bacteria that can degrade the styrene oil*** (http://www.scientificamerican.com/article.cfm?id=bacteria-turn-styrofoam-i).
- There are various types of bacteria in the soil, I decided to see if there would be bacteria around campus of my school that can eat Styrofoam.
- Bacteria are **microorganism** which can reproduce by fission quickly in the befitting conditions.

Methods

1) Collected three buckets with the similar shape and volume. Washed them and dried them. Then marked each of them with letter A, B and C to separate them.
2) Brought the bucket A to the wetland spot at the intersection of SW Vermont Street and SW Nicol Road. Collected soil using the shovel.
3) Used the small shovel to avoid the rocks, grass and wood pieces in the soil.
4) Put one layer of soil near the wetland into the first bucket, the later is around 4 to 5 centimeters thick.
5) Count 15 pieces of Styrofoam and added them above the soil and tried to keep them state separately.
6) Covered them with another layer of soil.
7) Used the shovel to make the soil tighter so the space between the soil and the Styrofoam was smaller so the bacteria in the soil could get onto the Styrofoam easily.
8) Added another 15 pieces of Styrofoam onto the soil and then covered with another later of soil. After that added another 15 pieces of Styrofoam and covered with soil. Added the last 15 pieces of Styrofoam on the soil and put soil above them to cover them.
9) Used the shovel to make the soil tighter again. Then spread some water above the soil. Put the bucket cover back on.
10) Used tape to wrap around the edge of the cover to prevent other bacteria from the outside to get in easily.
11) Brought the bucket B to the chicken coop and repeat the methods 3) to 10).
12) Brought the bucket C to the goat fold and repeated the methods 3) to 10).
13) Brought the three buckets to the green house.
14) Rinsed the shovels.

All photos taken by exhibitor

Those were the green Styrofoam peanuts I used for my research. They were very light and were in similar shape and size.

Data

1. The photo above is the piece of Styrofoam was one of the 15 pieces of Styrofoam in the bottom layer of A bucket which contained the soil from wetlands.
2. The photo below is the comparison of one piece of Styrofoam which stayed in the paper box in my room and the one in the picture above. They used to have similar shape and be in similar size. However, now, the right one obviously became much smaller in size and the color was much lighter too comparing the left one. Also when squeezed the right one, the water came out.

Discussion

- The time limitation became a huge problem and it was very hard to get data from the Styrofoam in the soil.
- The soil from the wetland is much wetter and darker than the soil from the goat fold. However the goat fold had thicker soil.
- Unluckily, the changes in size might not because of the bacteria because there was a lot of air inside the Styrofoam, and the surface of those Styrofoam was not destroyed.
- I know how to improve my design in the future: First of all, I will start the experiments much earlier so that there is enough time for bacteria to react with Styrofoam
- If I have to make more changes, I would like to find many more small buckets but put one piece of Styrofoam with enough soil in each bucket so that soil can fully surround the Styrofoam and the bacteria can get to the Styrofoam.
- Future studies should explore soil from much more places which may contain special bacteria.

Abstract

This project studied the Styrofoam-eating bacteria in the soil around the campus. Styrofoam is the most common plastic product that can be used for heat insulation, sound insulation and packing. Because it is very inexpensive and useful in daily life, people tend to throw it away, but it then becomes an environmental concern. The polystyrene foam cannot degrade by itself, so scientists are trying to solve the problem by recycling and reproducing it into other products. There may be species of bacteria in the soil that can corrode or destroy the surface or the structure of Styrofoam, and these bacteria likely exist in the soil around our campus. I collected soil from three places around campus and put them in three different buckets and bury 60 pieces of Styrofoam in each bucket. Then I waited for weeks to see the changes on the Styrofoam. Due to time limitations, there were no obvious and expected results. However, I found that in the three buckets, the Styrofoam on the bottom of the buckets changed their size and their color became lighter. The changes might not be due to the bacteria but might because of the pressure of the mass of the soil above those Styrofoam and the higher content of water at the bottom. However, the Styrofoam at the bottom of the bucket with wetlands soil changed most. Future studies should be based on extension of researching time and use soil from more places.

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