Mycoremediation, Mycofiltration, and Water Pollution Sustainability Lab Activity – Fungi and Lichens

Activity:

Part III: Multitalented Fungi

As you learned in the prelab, fungi perform the important role of acting as decomposers in their environment. In addition to acting as decomposers, fungi have the potential to act as environmental pollutant decontaminators!

Follow the procedure below to investigate how fungi could be used as a water filtration system in polluted waterways.

1. Obtain two 10 ml water samples from the provided water sources in the glass vials provided. One sample should be from the non-filtered water, and one should be from the fungi filtered water. The fungi filtered water has been filtered for the past week.
2. Located the test strip. This strip tests for the presence and approximate level of overall water hardness (or how many minerals are dissolved in the sample), specific mineral contents, and the pH. Reference the key provided at your table to see everything that you are testing. **Then, based on your current knowledge of fungi, develop a hypothesis with your group for how the fungi will affect the water sample.**
3. Using the pipette, place 2-3 drops of the non-filtered water sample to the test strip. After 30 seconds, compare your strip to the key provided and record your results.
4. Repeat step 3 with your fungi filtered water sample.

After recording your results, answer the following questions with your group:

1. Did you support or fail to support your hypothesis? Why or why not?
2. How did fungi filtration affect the water sample?

The experiment you just completed is an example of mycoremediation. **Mycoremediation** is the process of using fungi to remove harmful pollutants from the environment. The fungus used in the filter is *Pleurotus. spp* or the oyster mushroom. Not only is this fungus very common in forests around the world and well known for being incredibly delicious, this fungus also is able to absorb heavy metals in its mycelium from the environment in a process called **biosorption**.

Pleurotus spp. or oyster fungus fruiting bodies.

Conservationists and researchers have used this same procedure to remove harmful pollutants from polluted waterways. In addition to absorbing heavy metals, fungi have also been shown to remove pesticides, ash and harmful bacteria from water as well.

Mycofiltration of a waterway using sacs of fungi and other organic material.

Now, discuss the following questions about mycofiltration and pollution in your group:

- What do you think are some ways heavy metals, such as lead, iron, copper, nickel, or zinc, accumulate in water ways? What about other pollutants?

- What effect do you think these pollutants have on the environment and humans living with contaminated water?
- Do you think mycofiltration would be an effective tactic to use to remove waste from the environment? Why or why not? What are some pros and cons? Feel free to do some of your own research here as well.

Afterwards, you may move on to the next activity after checking in with your TA OR you can complete the fun, optional activity of making fungi paper (YES, you do get to take it home)!

Optional Paper Making Activity:
As shown in the prelab video, there are many sustainable uses of fungi that we were unable to discuss in more depth. One of these is to use fungi to make paper instead of using trees! This could be a more sustainable solution for paper production as some fungi grow quickly and produce many fruiting bodies, rather than cutting down one large tree that took years to grow. Follow the instructions below or watch the video (https://www.youtube.com/watch?v=sa1Y_SWVICA&t=175s) to learn how to make your own fungi paper.

1. Choose which mushrooms you would like to use to make your paper. You will need to select at least two mushrooms.
2. Place your mushrooms in a container and submerge in warm water. Then, use your fingers to break the mushroom into small pieces.
3. Pour the mixture into the blender and blend until it is smooth and a thin consistency. Add more water if needed.
4. Pour your mushroom mixture into the large container provided. Then, use the screen frame to collect mushroom fibers from the mixture. (You should completely submerge your screen frame a couple of times to ensure you have enough fibers on the screen, almost like panning for gold.)
5. After letting the excess water drip off of the screen frame, move the frame onto a towel (paper face up) and let more water drain off of the back of the screen.
6. After about 5 minutes, flip the screen onto the towel and use a sponge on the back of the screen to remove more excess water. The paper will fall off the screen when it is dry enough.
7. Place the towel and paper in the fume hood in the back of the room for about 15 minutes. Once it is dry to the touch, you can take it home!

Post-lab:

In the lab you learned about the process of mycofiltration. Do you think mycofiltration would be an effective tactic to use to remove waste from the environment? Why or why not?

[0.5 pt for explaining mycofiltration, 1 pt for your opinion for why mycofiltration would be effective or not, 0.5 pt for a clear and concise answer that is grammatically correct and in full sentences.]