BIO VOLT!

Introduction

Materials

Hypothesis

Method

1. **Gather materials** including moss, soil, copper and zinc metal plates, wires with alligator clips, a multimeter, and empty ice cream tubs for the setup.
2. **Fill the ice cream tubs with moist soil**, then place healthy moss on top of the soil.
3. **Let the moss climatize** for at least 24 hours before starting the experiment.
4. **Attach alligator clips** to the copper and zinc metal plates, then insert them into the moss in different spots, making sure they are not touching each other.
5. **Connect the wires** from the alligator clips to a multimeter to measure the voltage being produced.
6. **Record voltage readings** during the experiment to track how much electricity is being generated.
7. **Swap the moss slightly moist** by adding some water, rewired and place the setup under regular light (**we used sunlight**)
8. **Connect a small LED bulb** to the setup to test if it can power a device.
9. **Change one variable** (such as water) while keeping the others the same and repeat the experiment. We tested using **river water, tap water, seawater, and rainwater** to see which one produced the best results.

Results

We ran four experiments for each water type on each of the four types of moss used in this experiment.

Before running the experiments, we let the moss climatize to the water for approximately 24 all moss's to stay moss 2 healthy, and we rotated their to rank in 3 properly, We placed the tube in sunlight, but not direct sunlight, to ensure to ong is maintaining

Conclusions

In our project, we tested four types of moss: Delicate Fern, Red Skeletal Feather, Mountain Fern, and Percushion Moss. All produced small positive voltages. Mountain Fern performed best, especially with river water, reaching 0.41 V after one hour. Delicate Fern also gave high and consistent voltages with river and rainwater. Red Skeletal Feather did well, with river water again giving the best results. Percushion Moss had the lowest voltage, particularly in seawater, likely due to salt, but remained stable. Overall, river water influenced bioelectric output, while seawater reduced it. This suggests moss remains works best in freshwater and species with better water retention and ion exchange produce stronger signals.

The moss acted as an electrolyte, completing the circuit between zinc (anode) and copper (cathode). Electrons flowed through the moss, creating a small voltage measured by the multimeter. We noticed that voltage increased the longer the experiment ran.

While the power wasn't enough to light an LED, more sensitive equipment or other plants could make it possible — potatoes, for example, have been used to power LEDs because of their high water content. Our project showed that moss has potential as a green electricity source if the technology improves.

We really enjoyed this experiment and learned about plants, chemical reactions, and electricity. It was exciting to see how nature and science connect, and we hope more people explore sustainable energy ideas in the future.

Analysis

Background Research

Moss Species and Water Tested

In this project, we investigated four moss types could produce electricity.

Moss types:

- Fountain dicranoloma (Delicate Fern Moss) - grows in moist, shady environments (British Biological Society)
- Percushion schistidium (Red Skeletal Feather Moss) - found in acidic forest soils (British Biological Society)
- Hillscreen spiridens (Mountain Fern Moss) - thrives in damp, hilltop rock soils
- Lincolnshire glacicum (Percushion Moss) - prefers humid, shaded areas with acidic soil.

Moss works through biophotovoltaics, where sunlight powers photosynthesis and releases electrons (Cambridge University Press). And, Christopher Howe from the University of Cambridge helped develop some of the first moss-based BPV systems, showing moss can produce electricity in real-life experiments.

Water types:

- **River water:** minerals and microbes could power (UK Geological Survey).
- **Tap water:** chlorine reduced output (Environmental Protection Agency).
- **Rainwater:** soft, chemical-free, keeps moss healthy (National Weather Service).
- **Seawater:** salt damaged voltage (NOAA Ocean Service).

Mountain Fern Moss with river water produced the highest voltage, while Percushion Moss showed the lowest. These results show that moss could become a small but promising green energy source for the future.

Recommendations