
A 15

**Project Title: Electricity from Soil Microbes**

---

**a. Selection of Problem and Background Information**

Electricity powers almost everything in our daily lives—homes, schools, hospitals, and more. But most of our electricity comes from **fossil fuels** like coal, oil, and natural gas. These sources release harmful gases into the atmosphere and cause environmental issues like **climate change**, **air pollution**, and **global warming**. That's why scientists and engineers are looking for new, clean, and renewable ways to generate electricity.

One of the most interesting new methods is using **soil microbes** to produce electricity. Microbes are tiny living organisms that we cannot see with our eyes. In soil, they help break down organic matter like dead plants and animals. While doing this, they also release **electrons**, which are particles that can flow through wires and create electricity.

This project explores how microbes in different types of soil can be used to generate electricity through a device called a **Microbial Fuel Cell (MFC)**. It's a fun and environmentally friendly experiment that could lead to future innovations in **green energy**.

This research is important because:

- It introduces a **non-polluting** way to generate electricity.
- It shows how we can use **natural processes** to help solve energy problems.
- It could help **remote areas** that don't have access to traditional power sources.

---

**b. Problem**

The main question this research will try to answer is:

Can soil microbes produce electricity using a microbial fuel cell?
And which type of soil (garden soil, clay, compost, or sandy soil) produces the **most** electricity?

---

**c. Hypothesis**

I believe that soil microbes **can** produce electricity using a microbial fuel cell. My hypothesis is:

If different types of soil are tested in a microbial fuel cell, **soil that is rich in organic material**, like **compost or garden soil**, will produce **more electricity** than sandy or clay soil.

This is because organic-rich soil provides more food and better conditions for microbes to grow and release electrons, which can then be captured as electrical energy.

---

**d. Procedure**

**Materials Needed:**

- 4 small plastic containers (for each type of soil)
- Graphite electrodes or pencil leads (to capture electrons)
- Copper wires
- Small LED light or multimeter (to measure voltage)
- Salt water solution (for better conductivity)
- Nails (optional for cathode)
- Gloves and safety materials
- Labels and notebook

**Step-by-step Method:**

1. **Collect** different soil types: garden soil, compost, clay soil, and sandy soil.
2. **Label** each container with the type of soil used.
3. **Place electrodes** (graphite/pencil lead) into each container—one near the top and one deeper in the soil.
4. **Connect wires** from the electrodes to a multimeter to measure voltage.
5. Add a small amount of **saltwater** to each container to help with conductivity.
6. Make sure each setup is **identical** in size, amount of soil, and placement of electrodes.
7. Place the setups in the same room to maintain equal temperature and light.
8. **Measure and record** the voltage for each soil type **once every day** for **5 days**.

9. Repeat the experiment if time allows to check consistency.

**Extra Details:**

- A **flowchart** of the setup will be drawn to show the connections.
- A **data table** will be used to keep track of voltage readings.
- Photos of the setup may be taken (if allowed) for visual reference.
- A simple **survey** may be created to ask classmates or teachers about their knowledge of renewable energy.

---

**e. Risk and Safety**

This experiment is mostly safe, but the following precautions will be taken:

- **Gloves** will be worn while handling soil to avoid skin irritation or exposure to bacteria.
- **Hands will be washed** after handling any materials.
- The setup will be placed in a **safe corner** of the house or classroom away from food, water, and pets.
- **Wires and electrodes** will be handled carefully to avoid any poking or injury.
- The experiment will be done under **adult supervision**.

---

**f. Data Analysis**

Once the data is collected, the following steps will be taken to analyze it:

- **Create a table** listing daily voltage readings for each soil type.
- Calculate the **average voltage** produced by each soil type over 5 days.
- Use a **bar graph** to compare electricity output between different soils.
- Use a **line graph** to show how the voltage changed over the days.
- Identify which soil performed the best and whether the results support the hypothesis.
- If results are different than expected, try to think of **possible reasons** why.

**Note:** This section will not include any final results or conclusions. It only explains how the data will be handled.

---

**g. Bibliography**

Below are the sources used for understanding and planning this project:


1. **Science Journal**: *Microbial Fuel Cells: A Green Energy Source – Science Kids Weekly*
2. **Book**: *Energy from Nature* by Sarah Watson – explains renewable energy sources for young learners.
3. **Website**: www.sciencebuddies.org – project ideas and how-to guides.
4. **Magazine**: *National Geographic Kids* – special edition on renewable energy.
5. **Book**: *Soil Microorganisms and the Environment* – Junior Science Series.