

Growing plants on the moon!

Background

Welcome scientists! Get ready to dive into the world of space farming! In this experiment we will explore how plants grow in moon regolith, the dusty material that covers the lunar surface.



Key vocabulary-

Regolith: the layer of loose material that covers the surface of the moon or other celestial body. It is a mixture of dust and broken rock that have accumulated over time due to geological processes.

Germination: The emergence and growth of a seed into a seedling.

Astrobiologist: A scientist who studies the potential for life beyond Earth.

Imagine, someday humans will be living and working on the moon, but how will we have regular access to food? Can we grow our own food? This is a complex question, as there are many factors involved in plant health- light, water, soil, and nutrients to name a few. As an astrobiologist, your job is to help NASA understand how life, including plants, can survive and thrive off our planet. In this experiment, we will specifically investigate lunar regolith, or moon “soil”. How well do you think plants will respond to lunar regolith as a growth medium?

Lunar regolith, with its unique composition of fine dust and rock fragments, poses a challenge for plants accustomed to Earth's soil. Will they adapt? Will they grow as well as they do in our backyard gardens? These are the questions we aim to answer.

You'll be planting seeds in small containers filled with lunar regolith simulant, and observing germination of seed. The simulant you are using is made at NASA, and is a chemical reproduction of regolith found at a future moon landing site. By the end of this experiment, you will have a better understanding of the challenges and possibilities of growing plants on the moon. So let's explore the world of astrobiology!

Question: Will seed germinate in lunar regolith?

What do you think and *why*?

Teacher: prepare regolith

Wear a mask and gloves for preparation of regolith. Regolith dust is a lung irritant and should not be inhaled.

- In disposable bowl:
- Pour about 2/3 of the regolith simulant into a bowl
- One teaspoon at a time, add water to the simulant and mix with stir stick. Continue until simulant is moist, but not runny.
- In the event of overwatering, add some of the remaining dry simulant and mix. Any remaining simulant can be used for a second experiment.
- Do the same for the potting mix, ensure that it is pre-moistened for this experiment
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Students: Gather materials for your group:

- 4 radish seed
- 2 Eppendorf tubes
- 1 heaping teaspoon of moist NASA lunar regolith simulant
- 1 heaping teaspoon of moist potting mix
- Disposable bowls
- Water
- Plastic pipette
- Sharpie
- Small cup

Let's get started!

1. Label disposable cup with group name and date
2. Label one tube Lunar and one tube Earth
3. Fill tube labeled "Lunar" approximately $\frac{3}{4}$ full with moist lunar regolith simulant
4. Tap tubes on table to settle regolith
5. Place 2 radish seed into each tube
6. Cover radish seed completely with moist simulant and tap to settle.
Allow some space between simulant and top of tube for watering
7. Repeat with Potting Mix in tube labeled "Earth"
8. Add a 1-2 drops of water to each tube
9. Leave tubes open and place in disposable container
10. Record daily observations for 5 days, adding a drop of water to the tubes daily

Data Collection- Seed Germination

	Earth Seed (potting mix)			Space seed (lunar regolith simulant)		
	# germinated	sprout height	observations (color, etc)	# germinated	sprout height	observations (color, etc)
Day 1:						
Day 2:						
Day 3:						
Day 4:						
Day 5:						

Final day: Using wooden skewer or toothpick, remove soil from tubes. Wash seed and seedling gently and lay on paper towels. Compare health and length of roots of seedlings.

Illustrate your observations

Earth Seed (potting mix)	Space seed (lunar regolith simulant)

What happened?

Is there a difference in seedling color and root length between those grown in potting mix versus lunar regolith?

Why is there a difference in plant health?

What could scientists do to improve germination rate or health of plants grown in regolith?