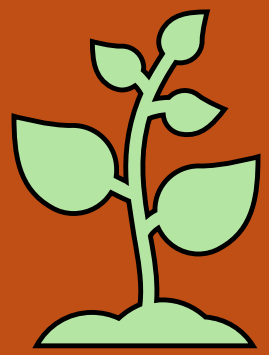
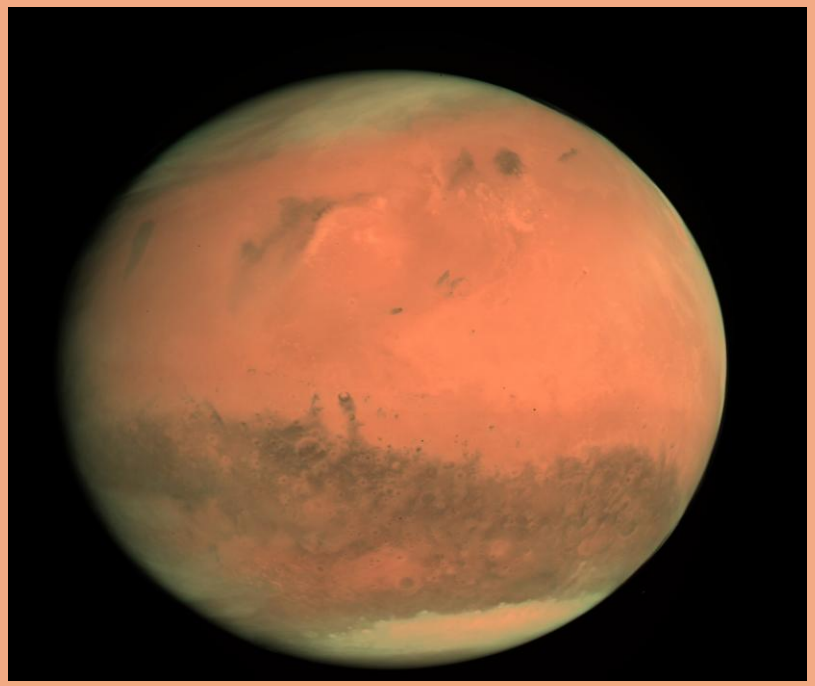
GROWING BEANS IN MARS

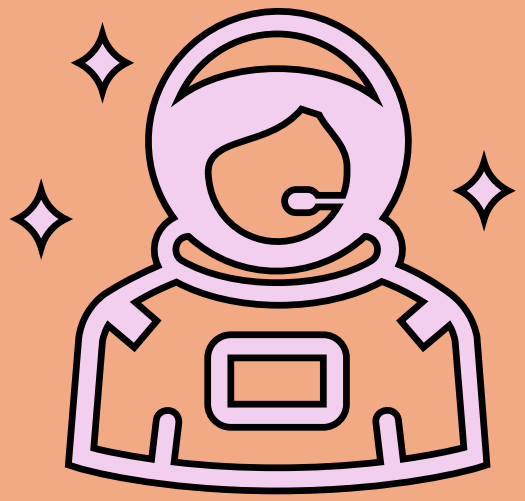
Improving Mars Regolith by Adding Organic Manure for Bean Farming



Humans will be in Mars!

According to NASA, humans are planning to go to Mars in the 2030s to learn more about the planet and to see if people could live there someday.

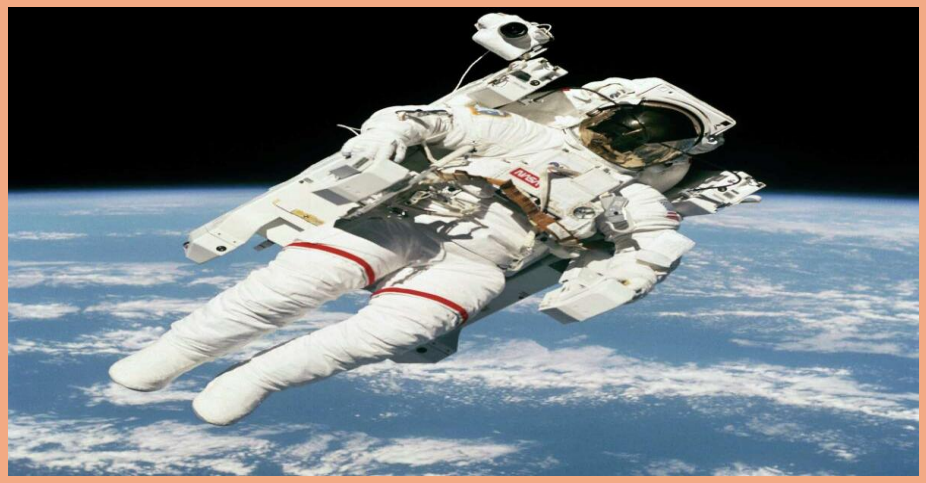




Fun Fact:
A day on Mars is almost the same length as a day on Earth!
A Martian day (called a *sol*) lasts 24 hours and 39 minutes. Just 39 minutes longer than our day. That means if you lived on Mars, bedtime would slowly shift later each day! 🚀

Food Supply is a Challenge During Space Travel

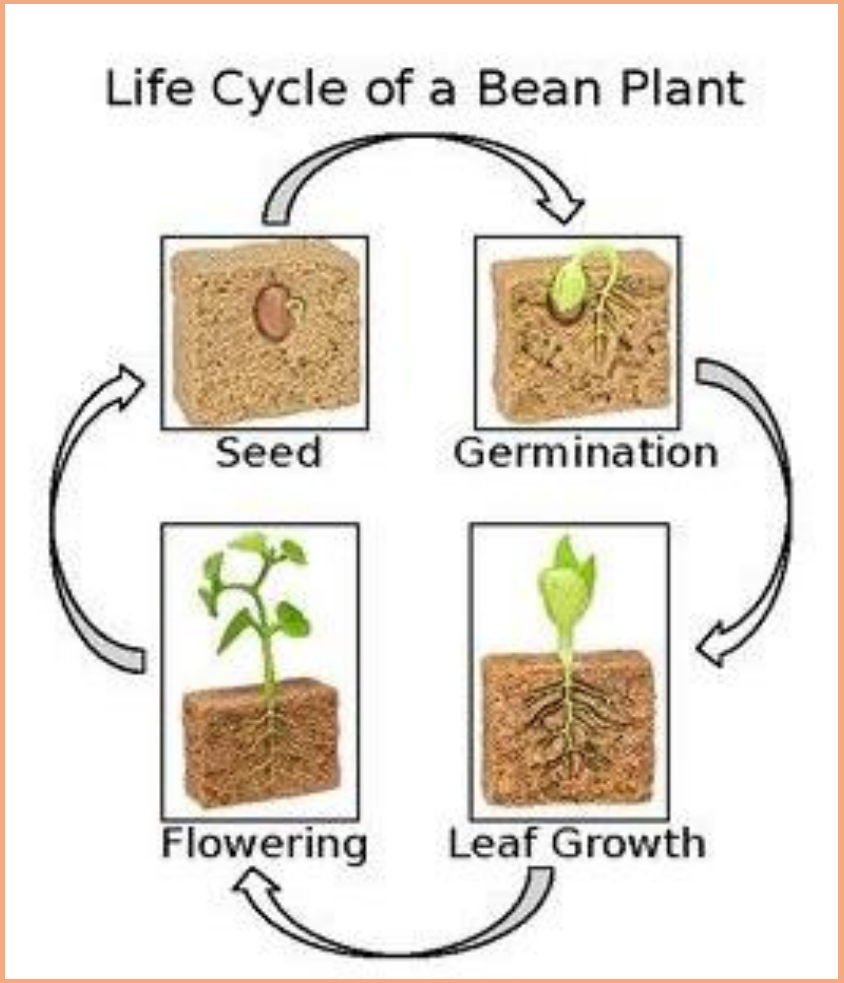
According to NASA, one big challenge of sending humans to Mars is food supply, because astronauts cannot bring enough food for long missions, so scientists are studying how to grow plants, like beans, in Mars soil (regolith) to help feed future astronauts.



Our Mission!
For this project we are thinking of using beans as a main food source for our astronauts. We also want to investigate if it can grow in Mars.

Why Beans Can Be a Good Food Supply?

- According to plant researchers, beans can grow in poor soil and do not need a lot of space, which makes them good for growing in Mars regolith.
- According to nutrition experts, beans provide energy, fiber, and vitamins, helping astronauts stay full and energized.



What Do We Wonder?

My partner and I were wondering about the possibility of growing plants on Mars. In this project, we tried to answer the following questions:

1. Can beans be grown in Mars regolith?
2. Does adding organic manure improve the growth of the beans in Mars regolith?

What Do We Think Will Happen?

According to what we know about plant growth, if increasing amounts of manure are added to Mars regolith, then the beans grown in regolith with some manure will grow better than beans grown with no manure, because manure adds nutrients that help plants grow.

A funny story:

When we were measuring the manure, it smell so bad that we have to wear a mask

Our Variables

Independent variable: The amount of manure added to the regolith
Dependent variable: The growth of the beans
Constants: The amount of regolith, the amount of water, and sunlight

Our Goal

We want to know the amount of manure mixed with Mars regolith that results in the best growth of mung bean plants.

Experiment Time!

Materials

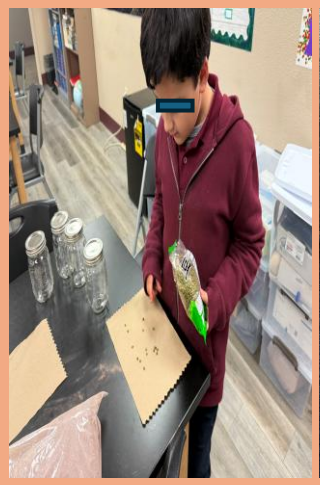
- 12 oz paper cups (3)
- Mars regolith (simulated)
- Manure (fertilizer)
- Mung bean seeds
- Water
- Syringe (for measuring water)
- Ruler (for measuring plant height)
- Weighing scale (for measuring regolith and manure)

Part 1: Preparation of the Beans

1.Mung bean seeds were placed in a **wet paper towel** to begin germination.

2. The seeds were left overnight to allow them to sprout.

3. Only the beans that successfully sprouted were selected for planting.



Experiment Time!

Part 2: Preparation of the Pots

4.Mars regolith was transferred into a larger container to make it easier to measure and place into cups.

5.Using a weighing scale, 6 oz of Mars regolith was added to each 12 oz paper cup.

6.A total of six cups were prepared and labeled Cup 1 to Cup 6.

7.Manure was measured using a weighing scale and added to the cups as follows:

- Cup 1 (Control): 0 g manure
- Cup 2: 0.5 oz manure
- Cup 3: 0.75 oz manure
- Cup 4: 1.0 oz manure
- Cup 5: 1.25 oz manure
- Cup 6: 1.5 oz manure

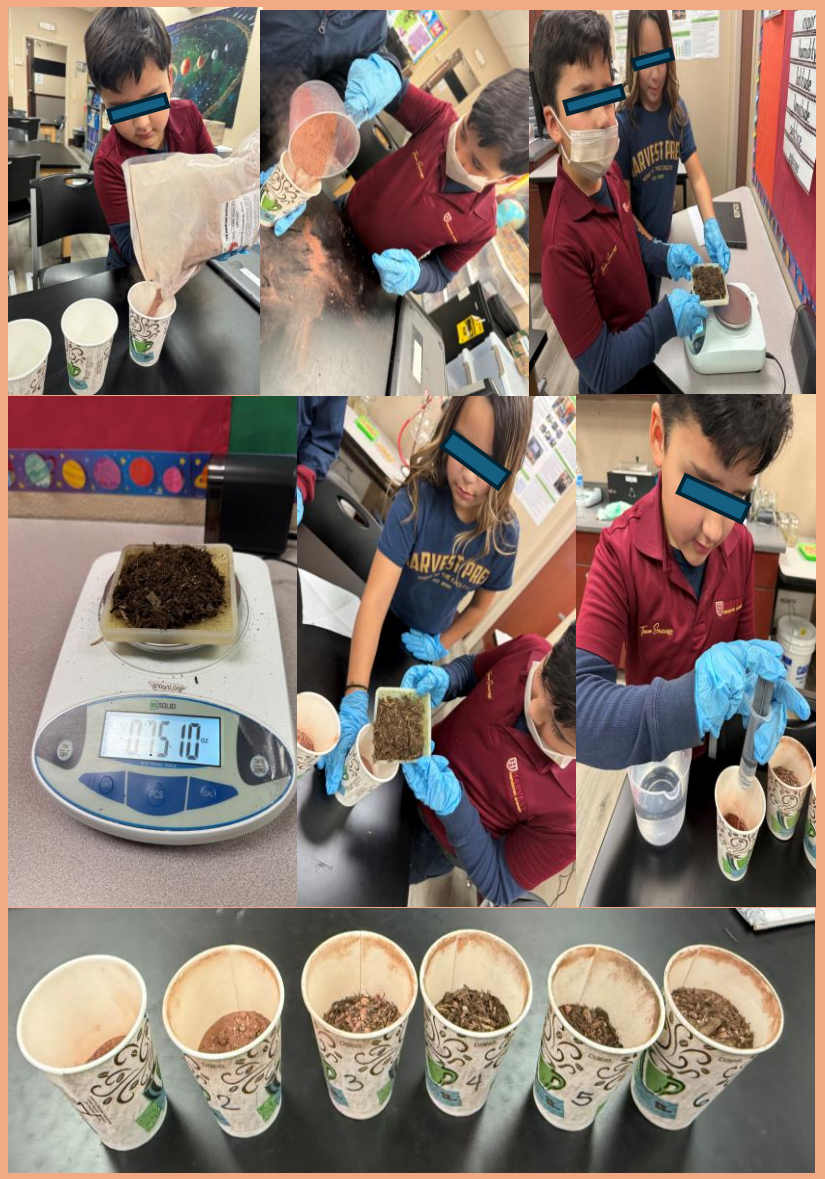
8.The regolith and manure were mixed thoroughly in each cup.

9.One sprouted mung bean seed was planted into each cup.=

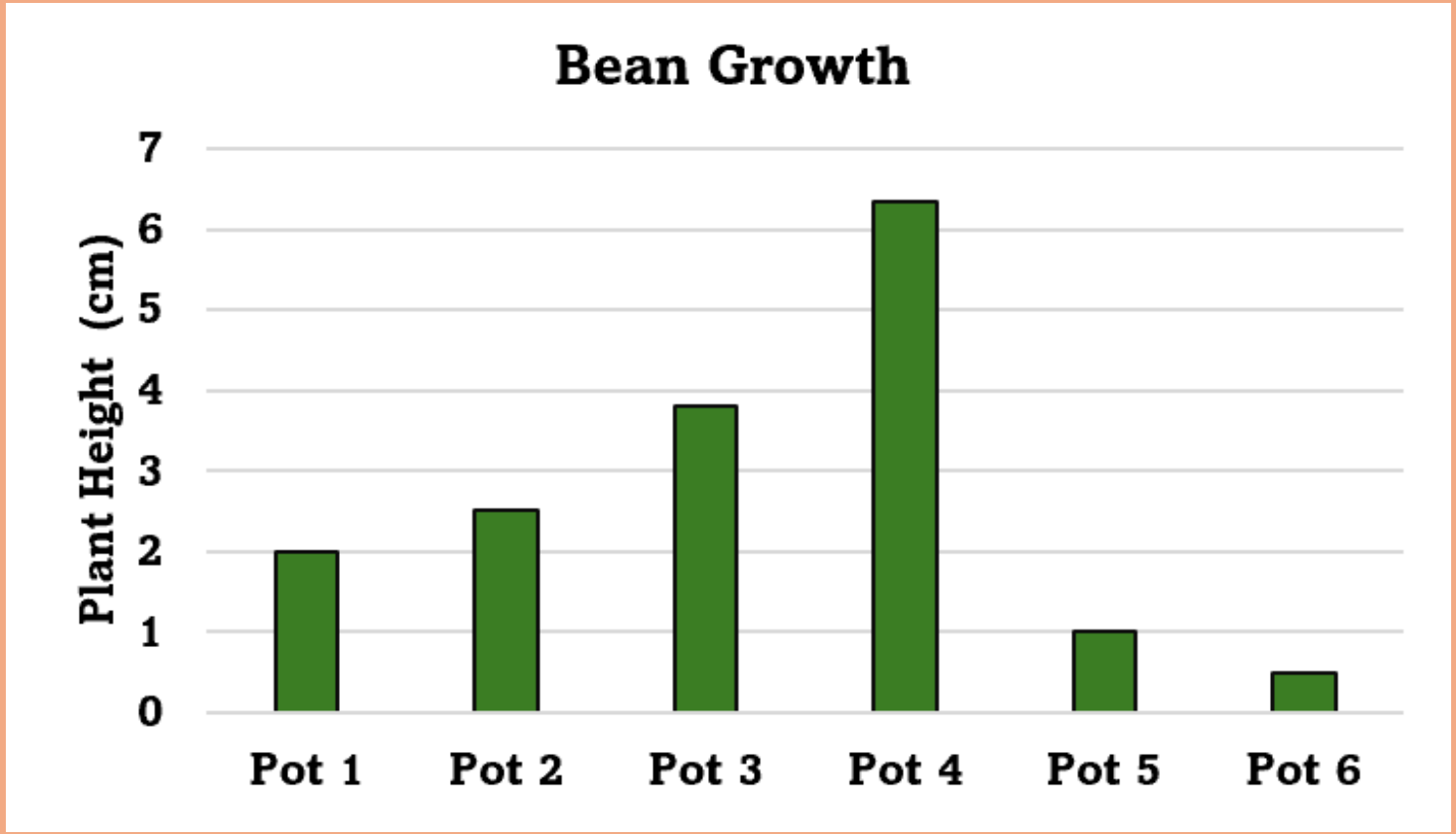
10.Using a syringe, 20 mL of water was added to each cup.

11.The plants were placed in the same location to receive equal light and temperature.

12.The bean plants were observed daily, and their height was measured using a ruler.



Results



We measured the height of the beans and created the graph using Microsoft Excel

Our Observation

Pot	Amount of Manure Added (oz)	Plant Height (cm)	Observation
Pot 1 (Control)	0	2	Plant grew slowly with no added nutrients
Pot 2	0.5	2.5	Slight increase in growth
Pot 3	0.75	3.8	Moderate growth observed
Pot 4	1	6.3	Tallest and healthiest plant
Pot 5	1.25	1	Poor growth observed
Pot 6	1.5	0.5	Very little growth

Some pictures of our experiment

Answer to our Questions

Answer to Question 1:Can beans be grown in Mars regolith?

Yes, beans can be grown in Mars regolith, but their growth is limited without added nutrients.

Answer to Question2: Does adding organic manure improve the growth of the beans in Mars regolith?

Yes, adding a moderate amount of organic manure improved bean growth, while too much manure

Conclusion

- We found that beans can grow in Mars regolith, but they did not grow very well without manure.
- We learned that adding a medium amount of manure helped the beans grow the tallest and healthiest.
- We also discovered that adding too much manure made the beans grow less.
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Our Plans for the Future

In the future, we want to test more types of plants to see which ones grow best in Mars regolith. We also want to try different organic materials and watering amounts to help plants grow even better on Mars.

Resources

- https://www.nasa.gov/moon-to-mars/
- https://www.nasa.gov/humans-in-space/journey-to-mars/
- https://www.nasa.gov/mission_pages/station/research/experiments/explorer/Facility.html
- https://www.fao.org/pulses-2016/news/news-detail/en/c/429320/
- https://www.rhs.org.uk/soil-composts-mulches/manure-fact-sheet