

Team Name: Moon planters

Team number: 16297

Challenge category: High School

Challenge: Plant The Moon

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Question

Can mung bean sprouts grow successfully with lunar regolith to help support astronauts living on the moon?

Background

Supplies that exist on the moon consist of arabidopsis (seeds), water, oxygen, titanium, iron, and uranium. The amount of food one person needs to survive on the moon is 87,600,000 calories of food which is 80 years worth of food in calories and 116,800 cups or 7300 gallons of water which again is 80 years worth of water (*Water: How Much Should You Drink Every Day?*2022). There are 158,503,231,414.86 gallons of water on the moon which means 21,712,771 people can live off of the moon's water supply (Society, 2022).

Experiment design

The group used LHS-1 regolith, a mineral based stimulant made by The University of Central Florida. The regolith simulant is made to represent highlands of the moon (*LHS-1 Lunar Highlands Simulant - Center for Lunar & Asteroid Surface Science, 2021*). The soil used with the regolith was an organic seed starter enriched with worm castings, mycorrhizae, kelp, and fully cured compost (Products, n.d.). When picking what plant to grow the goal was to find a fast growing plant that was packed with potassium and vitamins. Mung bean sprouts perfectly fit the requirements. The bean sprouts are organic non-GMO dried sprout seeds.

Sample	Seed starter amount	Regolith amount
Pot 1	½ cup	1 cup
Pot 2	½ cup	1 cup
Pot 3	½ cup	1 cup
Pot 4	½ cup	1 cup
Pot 5	½ cup	1 cup
Pot 6	½ cup	1 cup
Pot 7	½ cup	1 cup
Pot 8	½ cup	1 cup
Pot 9	½ cup	1 cup
Pot 10	½ cup	1 cup

Hypothesis

The mung bean sprouts will grow at an increased accelerated rate when given five tablespoons of water as opposed to lower amounts. When given five tablespoons, the plants will produce bean sprouts more often.

Variables

Independent Variable: Tablespoons of Water

Dependent Variable: Plant height in inches

Control Variable: Mung bean sprouts, Soil, Amount of light

Experiment

Mung bean sprout seeds were placed in ten pots measuring 3 inches in height and 3 ½ inches in length, fifteen bean sprouts seeds per pot. The amount of regolith and seed starter per pot are shown in the table below. All ten plant pots were given a different amount of water matching their labeled number (#1 got one Tbsp, #2 got one Tbsp, etc). For the length of the experiment, the beans were put to rest on a windowsill in our science room to get plenty of sunlight. They were only brought down to be water which happened roughly four times per week.

The testing lasted for two rounds; batch one (September 28-October 13) and batch two (October 19-November 17).



Data and Results









Batch one was successful and grew very well. Pot Nine and Pot Ten had accelerated growth, Pot Eight through Five experienced average growth and pots four through one experienced a delay in growth. Batch Two was the opposite, experiencing a growth of mold and dehydration.









This experiment shows that the best water amount of mung bean sprouts is 8 Tbsp. Any amount higher would drown the plant and make it die faster, while anything lower had slow growth and height. Fruit flies can greatly determine if the plants die before they are ready for harvesting.

While the first batch was unaffected by the flies, the second batch was. Batch two had fruit flies along with the seed starter and regolith mix, and the same soil as the first batch. As a result the second round of plants did not grow as tall as the first one. The plants withered quickly, and the soil grew mold.

Plant Number (Both Batch 1 and 2)	Moisture level
#1	Dry
#2	Dry
#3	Dry
#4	Dry
#5	Moist
#6	Moist
#7	Moist
#8	Moist
#9	Moist
#10	Wet

Sample Number	Water Amount	Batch 1 Pictures	Batch 2 Pictures
Pot 1	1 Tbsp		

Pot 2	2 Tbsp		
Pot 3	3 Tbsp		
Pot 4	4 Tbsp		
Pot 5	5 Tbsp		

Pot 6	6 Tbsp		
Pot 7	7 Tbsp		
Pot 8	8 Tbsp		
Pot 9	9 Tbsp		

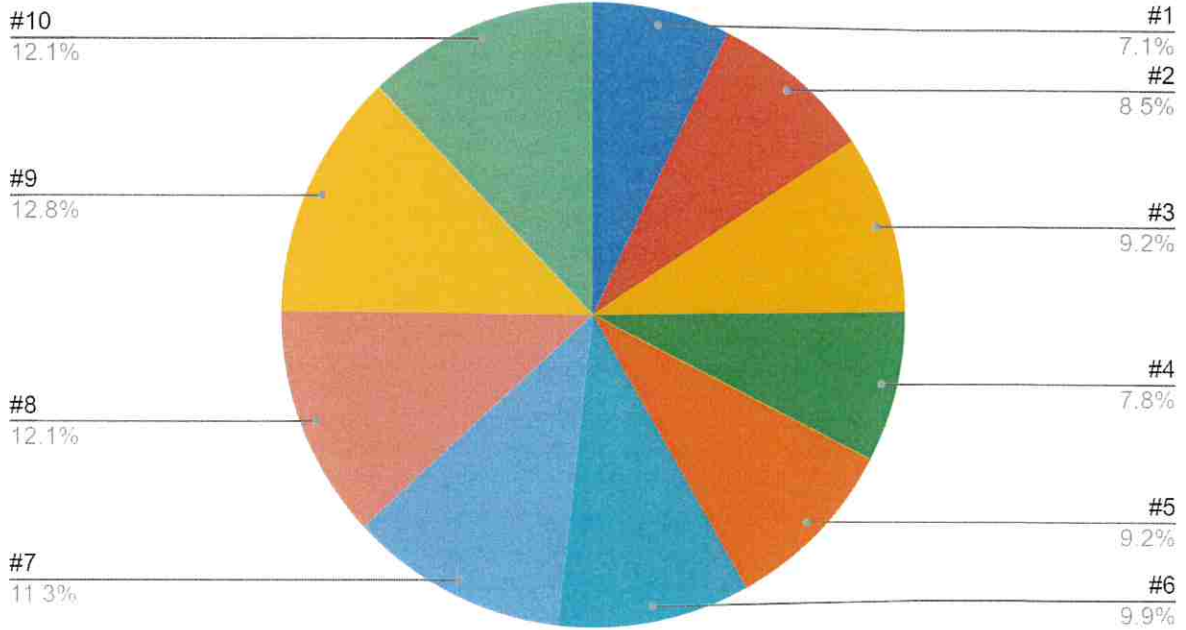
Pot 10

10 Tbsp

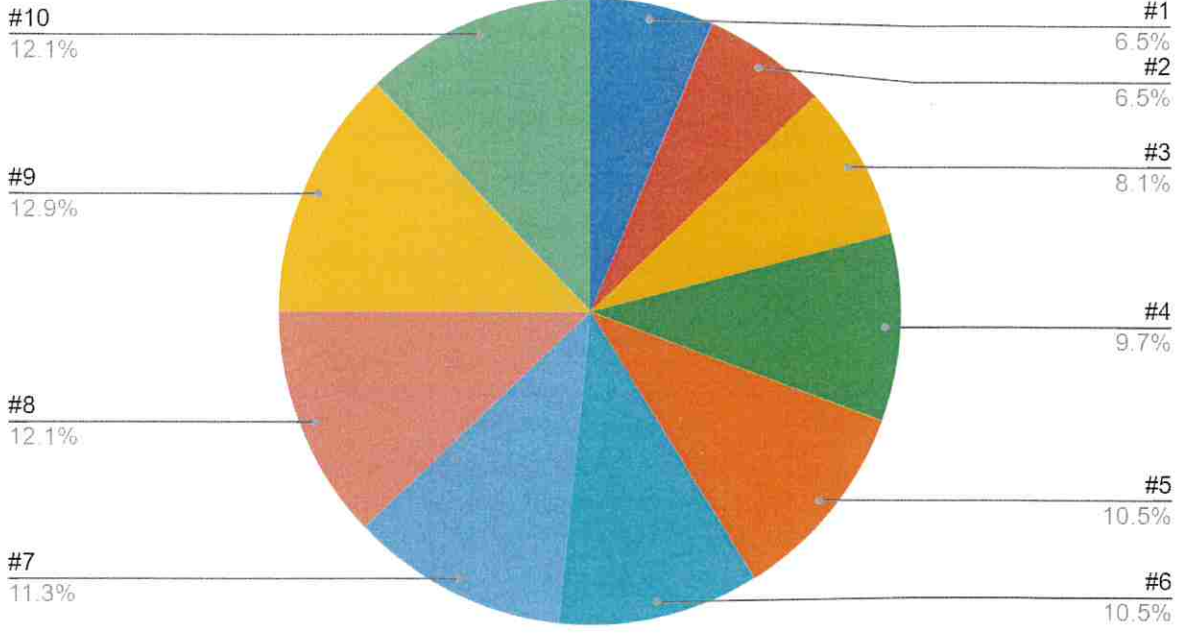


Pie Chart #1 = Batch one
Pie Chart #2 = Batch two

Final Growth (inches)



Final Growth (inches)



Batch one



Batch two

Conclusion

The purpose of this experiment was to figure out what amount of water in Tbsp would be best for growing mung bean sprouts in regolith. From Pot #1 to Pot #10, it is obvious that there was a major difference between the pots. Pot #1 - #4 were very dry, Pot #5 - #9 were moist (which was the perfect moisture level) and Pot #10 was extremely wet. While half of the pots were dry, the other half was moist or wet. Pots #8 grew the tallest out of the group, meaning 8 Tbsp is the best amount for mung bean sprouts in regolith. The hypothesis: "The mung bean sprouts will grow at an increased accelerated rate when given five tablespoons of water as opposed to lower amounts. When given five tablespoons, the plants will produce bean sprouts more often"

was not supported by the experiment. The experiment relied on watering at correct times and relied on whether the sun was out. This experiment could have been improved by making a miniature greenhouse so we could control the amount of sun the plants get each day. An additional study after this experiment could be to test how mung beans grow in regolith instead of mung bean sprouts. It then could be seen how they survive over a longer period of time and are more nutritious than mung bean sprouts. The next study could also involve more seeds than

15.

Works Cited

Growing mung bean sprouts. (n.d.). Sproutpeople.

<https://sproutpeople.org/growing-mung-bean-sprouts/>

LHS-1 Lunar Highlands Simulant - Center for Lunar & Asteroid Surface Science. (2021, August 4). Center for Lunar & Asteroid Surface Science.

https://sciences.ucf.edu/class/simulant_lunarhighlands/#:~:text=The%20LHS%2D1%20Lunar%20Highlands,highlands%20location%20on%20the%20Moon. Date Accessed 1 December 2023.

Products, C. O. M. O. (n.d.). Sprout Island Organic Seed Starter. Coast of Maine Organic Products.

https://shop.coastofmaine.com/products/sprout-island-organic-seed-starter?_pos=1&_sid=13457aaa9&_ss=r Date Accessed 1 December 2023.

Society, P. (2022, August 31). Your guide to water on the moon. The Planetary Society.

<https://www.planetary.org/articles/water-on-the-moon-guide#:~:text=How%20much%20water%20is%20on,240%2C000%20Olympic%2Dsize%20swimming%20pools>. Date Accessed 28 November 2023.

Water: How much should you drink every day? (2022, October 12). Mayo Clinic.

<https://www.mayoclinic.org/healthy-lifestyle/nutrition-and-healthy-eating/in-depth/water/art-20044256>. Date Accessed 28 November 2023.