

Plant Mars vs. Plant the Moon

Team Name: Sachsonville Scientists

Team # 16283

Middle School Division

Background and Experimental Design:

Last year, team Sachsonville planted in Lunar regolith. This year, the team planted in Martian regolith. The team wanted to compare the growth rate of microgreens between Lunar regolith and Mars regolith.

Independent Variable(s)

Type of regolith

Dependant Variable(s)

The growth of microgreens measured in grams between Mars regolith and Lunar regolith.

Controls

- The amount of light
- The soil mixture
- The tray size
- The amount of water
- Blackout period
- The weighting of each tray during blackout

Project Hypothesis

Will microgreens produce better in Lunar regolith than Mars regolith?

Experimental Design and Procedures

Grow Period #1

1. Mix 50% of regolith, 25% of expand and grow, and 25% potting soil.
2. Separate the regolith mix into 7 trays.
3. Soak the seeds overnight.
4. Spread the 6 different seeds on top of the 6 different trays.
5. Spray the seeds with water
6. Put the seeds in a weighted blackout for three days
7. Take the seeds out of blackout
8. Turn on grow lights
9. Water every other day
10. Measure and record pH weekly
11. Harvest after 2 weeks
12. Weigh the harvested microgreens in grams

Grow Period #2

1. The leftover plant matter and mixed it in with the leftover soil
2. Repeat steps 3-12 in Grow Period #1

Grow Pot Setup

1: Broccoli

2022 Lunar Regolith

<u>Week 1</u>	<u>Week 2</u>	<u>Week 3</u>	<u>Week 4</u>	<u>Week 5</u>	<u>Week 6</u>
7pH	7pH	7pH	8pH	8pH	7pH

2023 Mars Regolith

<u>Week 1 (10/6)</u>	<u>Week 2 (10/12)</u>	<u>Week 3 (10/20)</u>	<u>Week 4 (11/1)</u>	<u>Week 5 (11/7)</u>	<u>Week 6 (11/17)</u>
7 pH	7.5 pH	7 pH	7.5 pH	7.5 pH	8 pH

Results statement from Grow Period #1 (Mars 2023): During the first growth period, the broccoli grew quickly and it became very thick, which made it hard to harvest. Despite that, it grew successfully. The total weight of the broccoli was 712 grams.

Results statement from Grow Period #2 (Mars 2023): During the second growth period, it was growing slower than the first growth period due to the fact that the broccoli group did not soak the seeds. Despite not soaking the seeds in this growing period, the broccoli still grew successfully. The weight of the Broccoli Microgreens was 523 grams.

Comments: The Broccoli Microgreens grew successfully and astronauts will be able to eat nutritious foods in space. The broccoli had a good flavor and grew perfectly. Compared to the Lunar soil last year, it weighed less compared to the Mars Regolith. In total, the weight of the broccoli in grams was 1,235 for this year.



2022 Lunar



2023 Mars

2: Kale

2022 Lunar Regolith

<u>Week 1</u>	<u>Week 2</u>	<u>Week 3</u>	<u>Week 4</u>	<u>Week 5</u>	<u>Week 6</u>
7 pH	7 pH	9pH	8pH	8pH	9pH

2023 Martian Regolith

<u>Week 1</u>	<u>Week 2</u>	<u>Week 3</u>	<u>Week 4</u>	<u>Week 5</u>	<u>Week 6</u>
7 pH	7 pH	7.5pH	7.5 pH	7.75pH	7.75 pH

Results statement from Grow Period #1: In the first growing period, there were some spots that did not grow as good as others. This was because some seeds were mixed underneath the regolith when the seeds were placed on top.

Results statement from Grow Period #2: Growing was faster than growth period 1, and the results we got back were outstanding. The weight was higher and there were not as many spots that didn't grow as well.

Comments: For the second growing period, we mixed up 1/2 of the regolith mixture, and flipped the other half. Both sides were just as equal. The side that was flipped, was cut in rows vertically and horizontally with a plastic knife to facilitate growth.



Lunar 2022



Mars 2023

3: Dandelion

2022 Lunar Regolith

<u>Week 1</u>	<u>Week 2</u>	<u>Week 3</u>	<u>Week 4</u>	<u>Week 5</u>	<u>Week 6</u>
7pH	7pH	8pH	8pH	8pH	8pH

Watercress

2023 Mars Regolith

<u>Week 1</u>	<u>Week 2</u>	<u>Week 3</u>	<u>Week 4</u>	<u>Week 5</u>	<u>Week 6</u>	<u>Week 7</u>
7.5	7		7	7.5	8	7.5

Results statement from Grow Period #1: The dandelion's did not grow very much throughout the first growth period. The dandelions then started to develop white fungi across the dirt and on their stems. Watercress also did not grow very well in the first period.

Results statement from Grow Period #2: There was no second growth period as the dandelions did not produce enough growth to harvest after the first growing period. So they just continued to grow in the first growth period. Watercress also did not grow very well throughout the second growth period. Watercress were harvested after the first growth period but dandelions were not harvested.

Comments: Watercress and dandelions did not grow well enough to make sure the astronauts have enough to eat.



Lunar 2022



Mars 2023

4: Mung Bean

2022 Lunar regolith

<u>Week 1:</u>	<u>Week 2:</u>	<u>Week 3:</u>	<u>Week 4:</u>	<u>Week 5:</u>	<u>Week 6:</u>
8 pH	8 pH	7 pH	8 pH	8 pH	10 pH

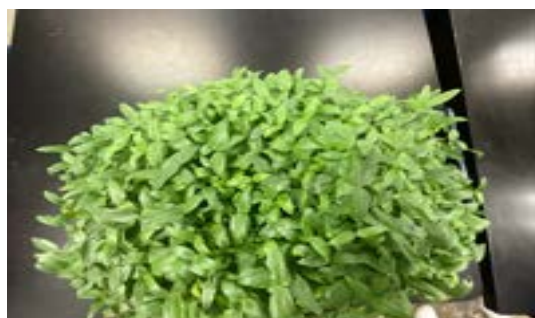
2023 Mars regolith

<u>Week 1</u>	<u>Week 2</u>	<u>Week 3</u>	<u>Week 4</u>	<u>Week 5</u>
7 pH	7 pH	7 pH	7 pH	7.5 pH

Results statement from Grow Period #1: Using a regolith/expand-and-grow mixture, the group planted the microgreens in a container with drainage holes, and the beans were in a blackout period and weighed them down using a book. The beans were watered daily, the pH was measured weekly. The group harvested ¼ of the plants. The group harvested a second time as well.

Results statement from Grow Period #2: After the group harvested the beans from Grow Period #1, the remaining soil was flipped, turned over, and holes were poked in the soil. The group spread the microgreens over the newly flipped soil, and put the beans in a blackout period, using a book to weigh the microgreens down. Again, the plants were watered daily, and the group tested the pH of the beans weekly. In week 7, the group harvested.

Comments: The Mung beans did better in the 1st growth period than the 2nd because the seeds were soaked more. There was also more mold in the second growth period



2022 Lunar



2023 Mars

5: Mustard

2023 Mars Regolith

<u>Week 1:</u>	<u>Week 2:</u>	<u>Week 3:</u>	<u>Week 4:</u> <u>(regrow)</u>	<u>Week 5:</u>	<u>Week 6:</u>
7 pH	7 pH	7.5 pH	7.5 pH	7.5 pH	8 pH

Results statement from Grow Period #1: The first growth period was very successful and the Mustard microgreens grew a lot. There weren't very many problems.

Results statement from Grow Period #2: In the second growth period the Mung Beans grew mold and the overall plant growth staggered. There was more open space throughout the tray and some seeds did not grow all the way. This happened because the seeds were not soaked, unlike the first growth period where they were soaked.

Comments: There was no comparison of mustard in the Lunar soil.



6: Radish

Lunar 2022

<u>Week 1</u>	<u>Week 2</u>	<u>Week 3</u>	<u>Week 4</u>	<u>Week 5</u>	<u>Week 6</u>
7pH	8pH	7pH	8pH	8pH	7pH

Mars 2023

<u>Week 1 (9/29)</u>	<u>Week 2 (10/6)</u>	<u>Week 4 (10/12)</u>	<u>Week 5 (10/20)</u>	<u>Week 6 (10/26)</u>	<u>Week 7 (11/17)</u>
7.5	7.25	7	7.5	7.75	7.5

Results statement from Grow Period #1(Mars 2023): The first harvest went successfully, it weighed 1370 grams, and took two weeks.

Results statement from Grow Period #2(Mars 2023): The second harvest was worse than the first, this happened because the seeds were not soaked prior to planting. Another factor might have been reusing the soil from the prior planting.

Comments: The harvest was very successful and showed the progression over the 8 week period. The microgreens grew much better when they were soaked overnight, the second harvest was not soaked.

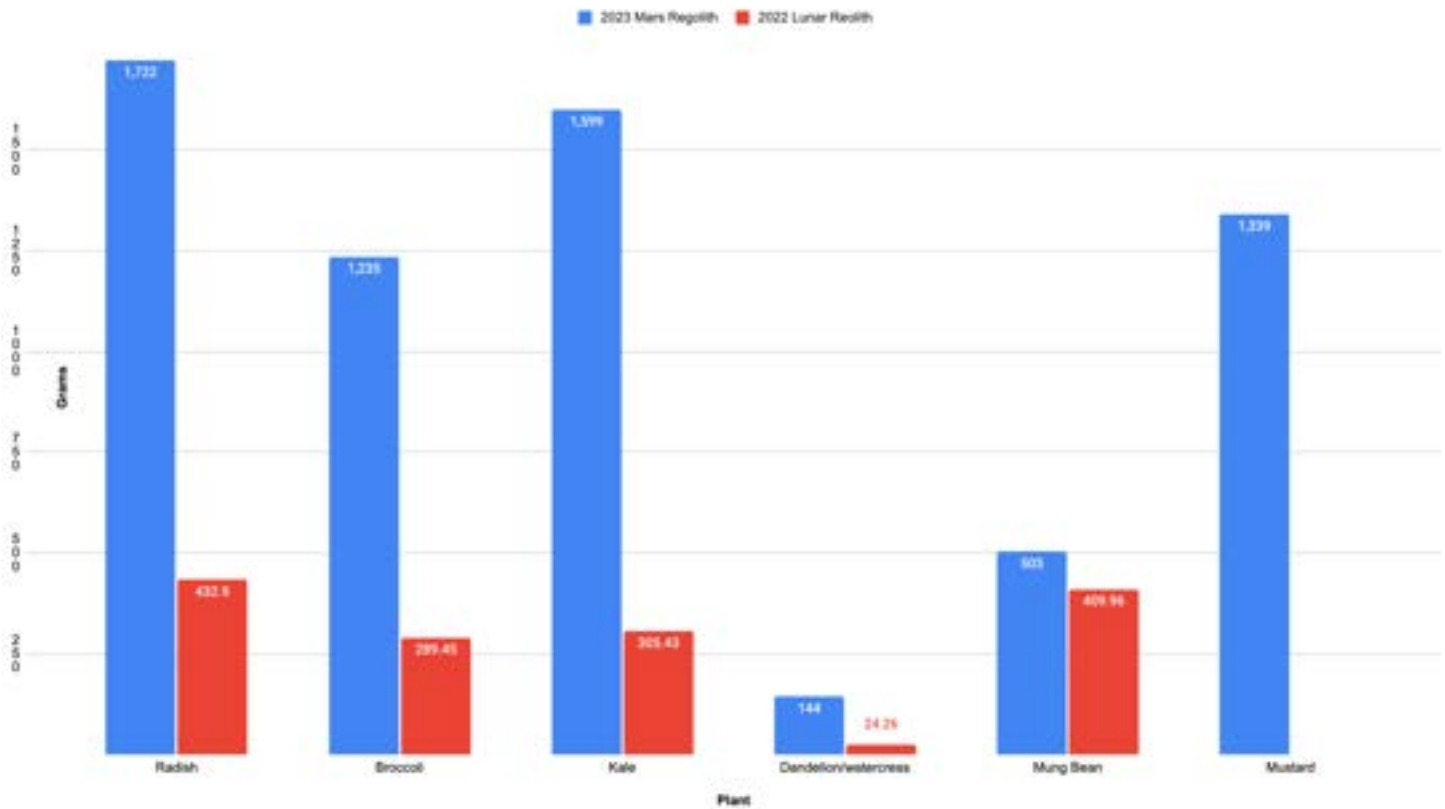


Lunar (2022)



Mars (2023)

Comparison of Microgreen Growth in Lunar and Mars Regolith



Analysis and Conclusions

Overwhelmingly, the microgreens grew substantially better in the Mars regolith, than the Lunar regolith.

The astronauts would have food within 2 weeks. The regolith mix can be reused immediately after harvesting to grow the microgreens again. Radish, Kale and Mung Bean seemed to have the best growth in both Mars and Lunar regolith. The Mars harvest was 6,543 grams and the Lunar harvest was 1,459 grams. This data proves that microgreens grow better in Mars regolith.