Hypothesis-Experiment Summary (Ruby)

If we provide the cucumber seeds with appropriate sunlight and water, then they will grow in the moon regolith. Moon regolith is very dry and cannot be watered carelessly. If it is watered too much it will become cement and harden making it impossible for anything to grow in it. This is why we must add other nutrients such as Earth soil and organic potting material. The approximate amount of soil and organic potting material is 25% of each mixed with 50% moon regolith. This will theoretically allow the moon regolith to retain nutrients and water without it turning into cement. Moon regolith by itself is too barren and brittle to grow anything, so additives will improve its ability to grow vegetation. The soil will help retain the water, keeping the seeds hydrated, while the organic potting material provides the necessary nutrients for plants to grow. Cucumbers specifically are an easier plant to grow, therefore the soil should be able to grow them as long as enough sunlight is provided. Although cucumbers usually require fertile soil, which is not accommodated for in moon regolith, the organic potting material and soil can be added to mimic the nutritional value of normal soil.

Independent variable: amount of water and frequency of watering

Dependent variable: the measured growth of each plant

The Citation

Research and Reasoning (Jeremy)

The reason we used cucumber is because of the amount of potassium and magnesium they make. It is greatly beneficial for the human body once it is consumed. These cucumbers must have hot weather and plentiful water in order to grow successfully. 

Citation

Planting Method per pots (Katei)
P0: We only used organic potting soil in pot 0. This is our control pot.
P1: Soil, (25%) organic potting material (25%) and moon rock (50%)
P2: Soil, (25%) organic potting material (25%) and moon rock (50%)
P3: Soil, (25%) organic potting material (25%) and moon rock (50%)
P4: Soil, (25%) organic potting material (25%) and moon rock (50%)
P5: Soil, (25%) organic potting material (25%) and moon rock (50%)

The seeds are placed at the bottom of each pot, which is 400 ml deep. Every morning two of our team members come to the plants and they are watered with the specific amount of water that is required. In order for our plants not to get ruined, that is it done, if the plants are overwatered they'll probably end in plant death; they are only watered according to schedule with the varying amounts of water.

Current procedures including data collection: (water, plant growth, pH) (Adrian)
We are collecting data daily by watering our plants, measuring their length, and checking the pH levels after watering in the morning. We are using this data to determine the optimal way to grow our cucumbers in a healthy state. There have been slight modifications to our project design in which we were originally also measuring light exposure. However, due to trouble to maintain consistent light exposure to assigned pots we had to remove this variable. We will further proceed with our project until our crops are ready to be harvested to determine which of our methods was the best.

Updated 3/25 - the plants are at the blossoming stage and there is not crop to be harvested at the end of our experiment. (However, it is hopeful that this could lead to a successful crop of cucumbers if the test period were longer.)

At Mid Growth progress as below:

<table>
<thead>
<tr>
<th></th>
<th>watering amount</th>
<th>pH</th>
<th>growth</th>
<th>date</th>
</tr>
</thead>
<tbody>
<tr>
<td>p0</td>
<td>20ml</td>
<td>8pH</td>
<td>12cm</td>
<td>2/26/24</td>
</tr>
<tr>
<td>p2</td>
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<td>8pH</td>
<td>15cm</td>
<td>2/26/24</td>
</tr>
<tr>
<td>p3</td>
<td>25ml</td>
<td>7.5pH</td>
<td>15cm</td>
<td>2/26/24</td>
</tr>
<tr>
<td>p4</td>
<td>30ml</td>
<td>7.5pH</td>
<td>10cm</td>
<td>2/26/24</td>
</tr>
<tr>
<td>p5</td>
<td>15ml</td>
<td>7.5pH</td>
<td>17cm</td>
<td>2/26/24</td>
</tr>
<tr>
<td>p6</td>
<td>10ml</td>
<td>7.5pH</td>
<td>13cm</td>
<td>2/26/24</td>
</tr>
</tbody>
</table>

**Reflection on data tracking (Jocelyn)**

Our current approach to tracking and recording our data is using an excel chart. We have also had 2 of our teammates coming in every morning to water the plants and track their growth, where they would compare and analyze the plant growth and pH levels. We’ve also had other team members coming in to take pictures of the plant growth. This method of tracking our data has worked fairly well.

**MidPoint Current Results (Angie):** Our current results for planting the moon challenge are looking very good. Our cucumber plants are all growing at a good pace. They are mostly between 15-17 cm tall. Our watering schedule seems to be working out fairly well too. We come in every day and put approximately 25 ml of water into each pot. Our plants look very healthy. They are tall and green. The cucumber stems seem to be very sturdy and in place. If we compare them though pot 1 and 2 are growing very tall and not tipping over. The rest of them are getting less water and seem to be droopy and not looking as well as pot 1 and 2.
UPDATED Analyze Data and reflection 3/19/24 (Adrian): Our current plants appear to be growing and developing well. A majority of them appear to be in the blossoming stage of their lifecycle. The only exception is pot number 1 as it appears to be weak and thin compared to its peers. The average height for our plants is 21cm. The average ph is also 7, a decrease from 8ph about a week ago. Overall, our plants are becoming more strong and durable with developing structured follicles on their stems. The plants that have the most water have the greatest growth pattern. It appears the amount of water has a direct impact on the plant growth.

UPDATED DATA Collected: Data charts, graphs, label axis (Darius)

https://docs.google.com/spreadsheets/d/1Pdq6FJeq2zDrmCaYCAL9E_LXdT_4AvJjxvfvU1cDSg/edit?usp=sharing

Current Assessment of plant growth (Evelyn)

Pot 0: Has one plant, it’s the thickest compared to the other ones. Big and healthy leaves. Pot 1: has two cucumber plants growing in it, the taller one is slightly thinner and also broken in three places. The leaves are also smaller compared to the other plant. The other plant in this pot is looking nice and healthy, and it's growing straight. Pot 2: Neither one is growing straight. One is slightly thinner than the other one. The thinner one has smaller leaves. The thinner one is also a bit taller. One of the plant's roots was showing, so it was covered with a bit of dirt. Pot 3: Also has one plant, it's looking nice and healthy. The leaves are quite big. Pot 4: Has only one plant in it, it’s not growing straight. The leaves are looking healthy. Pot 5: Has two plants. One slightly taller than the other. Both are just as thick and healthy looking leaves.

They are getting enough water but barely enough sunlight due to where the classroom is located in the school. They are mostly not growing straight, so that can lead to them breaking. But it's more likely that they'll continue to get bigger and healthier.

Observation of plant growth (Natalie): All of the pots are in the second stage of growing where more vines are formed and the leaves will get bigger and take on their distinctive shape. This is also when the cucumber plant's vines might start to meander around their planting spot or send up vines on their stake or trellis, depending on their location site-


Accept or reject hypothesis (Adrian) -

I accept the hypothesis because it aligns with our needs to grow our cucumbers at a healthy pace. As it has the requirements to maintain our cucumbers while also stating clear measurements that we are recording and looking for.

Images documenting growth