Background:

This project could offer several benefits for astronauts tired of freeze-dried food during space travel. Green beans would provide astronauts with a fresh food source, offering a welcome change from the monotony of freeze-dried meals. Fresh produce not only tastes better but also provides essential nutrients that may degrade over time in processed foods. Cultivating plants on the moon could have a positive impact on astronauts, as gardening and tending to plants could be therapeutic and help combat feelings when it comes to psychological boost.

A good thing about green beans is that they are rich in vitamin c, so while the astronauts are completing their mission, they will also be getting the vitamins and minerals their body needs.

The purpose of this project is to find a way to grow vegetables (in our case green beans) in lunar regolith. Our question that we asked was: If we could grow green beans on the moon with blue light?

The team’s goal was to create a way to grow green beans efficiently. If our hypothesis is supported by evidence then it could pave the way for future NASA projects. Possibly by making vegetable farms, flower beds, and fruit trees able to grow in the moon's lunar regolith. It's going to be challenging to plant green beans with the fluctuating temperatures however, it will be worth it. The team has decided that green beans are our best option to plant on the moon because of the benefit of its growth time, nutritional value, and its ability to adapt.

Problem statement: Can we grow green beans in lunar regolith with blue light?

Hypothesis: If we change the color of the light to blue then the plant will grow faster and stronger, because, according to Horticulture LED Lighting - Color Light for Plant Growth, a blue light is best for all plants because it's easy for chlorophyll to absorb and turn into energy. (https://savvygardening.com/growing-green-beans/)

Independent Variable- Color of light
Dependent Variable- Height and mass of plants
Constants: Water and lunar regolith. The Water and Lunar regolith will stay the same throughout the experiment.

Materials:
1. Green bean seeds (4) per pot
2. Pots (10)
3. Lunar regolith
4. Soil
5. Spray bottle (1)
6. Blue light (1)
7. White light  
8. Humidity monitor  
9. Water

Safety Concerns:
1. Use regolith in a well-ventilated area and wear masks.
2. Wear goggles so the regolith does not get into our eyes.
3. Wear gloves and wash our hands after we use the regolith.

Procedures:
-Make sure the plant is planted correctly and does NOT die in the process
-Make sure the temperature isn't too high or too low

1. Mix 50% lunar regolith and 50% soil in a container.
2. Label five pots B1-B5 for blue light 1-5.
3. Fill each pot with 550 ml of regolith/soil mixture.
4. Label five pots W1-W5 for white light 1-5.
5. Fill each pot with 550 ml of regolith/soil mixture.
6. Label two pots RB1 and RW1 for regolith blue light and regolith white light.
7. Fill both pots with lunar regolith.
8. Label two pots SB1 and SB2 for soil blue light and soil white light.
9. Grab the beans out of a package.
10. Plant the bush beans about 1/4-inch in the ground, 2-to-4 inches apart.
11. Plant 5 of the bean seeds in each pot.
12. Water each pot with 90 ml of water.
13. Place the pots on plant grow stands with the blue light or the white light.
14. Observe the plants every day during third period.
15. Spray each plant with water every day during third period.
16. Water more if needed.
17. Once beans grow, measure plant height every Thursday and record.

Results:
The results were that the green beans in blue light grew. We didn't expect the plants under the blue light to grow as tall as they did. The blue light plants also grew healthier than the plants under the white lights because even though the plants under the blue light had some decay/damage to leaves or roots, it wasn't even close to the amount of damage left on the white plants. In the end the plants left under blue light grew better than the plants grown under the white light.
<table>
<thead>
<tr>
<th>Plant Pot #</th>
<th>Color of light</th>
<th>Height of plants</th>
</tr>
</thead>
<tbody>
<tr>
<td>W1</td>
<td>White</td>
<td>18.1cm</td>
</tr>
<tr>
<td>W2</td>
<td>White</td>
<td>18cm</td>
</tr>
<tr>
<td>W3</td>
<td>White</td>
<td>15.7cm</td>
</tr>
<tr>
<td>W4</td>
<td>White</td>
<td>17.4cm</td>
</tr>
<tr>
<td>W5</td>
<td>White</td>
<td>17.5cm</td>
</tr>
<tr>
<td>RW1</td>
<td>White</td>
<td>23cm</td>
</tr>
<tr>
<td>B1</td>
<td>Blue</td>
<td>26cm</td>
</tr>
<tr>
<td>B2</td>
<td>Blue</td>
<td>26cm</td>
</tr>
<tr>
<td>B3</td>
<td>Blue</td>
<td>35cm</td>
</tr>
<tr>
<td>B4</td>
<td>Blue</td>
<td>26cm</td>
</tr>
<tr>
<td>B5</td>
<td>Blue</td>
<td>23.5cm</td>
</tr>
<tr>
<td>B6</td>
<td>Blue</td>
<td>21cm</td>
</tr>
</tbody>
</table>

Our hypothesis was supported by our data because the plants in the blue light grew taller and better than the ones in the white light. They also had less breakage and dying leaves than the white plants.

We controlled the amount of water, and exposure to light. We also placed 50% regolith and 50% soil. We controlled the measuring by measuring all plants in the same units. We know that the color of the lights affects the plants health. This is because the average growth of the plants in the blue light is about 35.67 cm whilst the average height of the plants under the white light is about 28.75 cm tall. The average gram of the white plants is about 15.17 when rounded to the nearest hundredth. The average width of the white plants is 15 cm wide. The average height of the white plants is 28.75 cm tall. The average gram of the blue plants is about 12.83 when rounded to the nearest hundredth. The average width of the blue plants is 12.5 cm wide. The average height of the blue plants is 35.67 when rounded to the nearest hundredth.
These are our blue light plants and these did in fact grow two times faster than with the white light.
Bibliography-


