Final Experimental Report

Team Name: Oconee Space Agriculturalists

Team Number: 8606

Challenge Category: Elementary

Experimental Parameters Description:

The Oconee Space Agriculturalists chose to test whether the amount of Miracle-Gro All Purpose Garden Soil in relation to the amount of Lunar Highlands Simulant (LHS-1) effected the growth rate of plants. The team experimented using 50% LHS-1, 60% LHS-1, 70% LHS-1, 80% LHS-1, and 90% LHS-1. The control group consisted of 100% Miracle-Gro All Purpose Garden Soil (MGS) and included no LHS-1.

The independent variable was the amount of soil to simulant ratio. This is what we changed. The dependent variable was the growth of the plants, measured in cm. The controls included using the same type of soil from the same package (MGS), the same Lunar Highlands Simulant (LHS-1) from the same package, the same type of plant (Cherokee Wax bean plant) with seeds from the same package, the same light source with the same amount of time exposure to the light source, and the same amount water with the same time schedule for each plant.

Project Hypothesis:

The team's driving research question was: How does the percentage of Miracle-Gro All Purpose Garden Soil versus Lunar Highlands Simulant (LHS-1) affect the growth of Cherokee Wax bean plants?

The team's hypothesis was: If we increase the amount of Lunar Highlands Simulant (LHS-1), then the Cherokee Wax bean plant's growth rate will decrease.

Experimental Design and Procedures:

Materials used for the experiment consisted of the following: 6 terracotta pots, Miracle-Gro All Purpose Garden Soil (75g), Lunar Highlands Simulant (105g), 6 Cherokee Wax bean plant seeds, a graduated cylinder marked in ml, a food scale able to weigh in grams, a ruler able to measure in cm, and water.

Each Cherokee Wax bean plant was grown in their own, individual terracotta pot. Pot #1 consisted of 100% (30g) of Miracle-Gro All Purpose Garden Soil (MGS). Pot #2 consisted of 50% (15g) LHS-1 and 50% (15g) MGS. Pot #3 consisted of 60% (18g) LHS-1 and 40% (12g) MGS. Pot #4 consisted of 70% (21g) LHS-1 and 30% (9g) MGS. Pot #5 consisted of 80% (24g)

LHS-1 and 20% (6g) MGS. Pot #6 consisted of 90% (27g) LHS-1 and 10% (3g) MGS. Weight of LHS-1 and MGS was calculated in grams using a food scale.

Plants were all given 12 hours per day of artificial grow light exposure, from 8 am to 8 pm. Each plant was given 65 ml of water daily at 3 pm. Water was measured using the same graduated cylinder. Plant growth was measured in cm, weekly on Wednesdays at 3 pm, using the same ruler for each measurement. The pH level of each plant was measured weekly as well, on Wednesdays at 3 pm. Data for growth and pH level was recorded in a table chart according to each plant. Growth was also compared in a bar graph upon completion of the experiment, to better give a visual on the difference in growth rates per plant.

Pot	Soil	Amendments	Crop
1	100% Miracle-Gro All Purpose Garden Soil (30g)	None	Cherokee Wax bean plant
2	50% Miracle-Gro All Purpose Garden Soil (15g)	50% Lunar Highlands Simulant (15g)	Cherokee Wax bean plant
3	40% Miracle-Gro All Purpose Garden Soil (12g)	60% Lunar Highlands Simulant (18g)	Cherokee Wax bean plant
4	30% Miracle-Gro All Purpose Garden Soil (9g)	70% Lunar Highlands Simulant (21g)	Cherokee Wax bean plant
5	20% Miracle-Gro All Purpose Garden Soil (6g)	80% Lunar Highlands Simulant (24g)	Cherokee Wax bean plant
6	10% Miracle-Gro All Purpose Garden Soil (3g)	90% Lunar Highlands Simulant (27g)	Cherokee Wax bean plant

Experimental Data: (See data charts attached)

Data was taken each Wednesday at 3 pm, measuring both the height of the plants (in cm) and the ph level of the soil in each pot. Ph level stayed relatively the same throughout the experiment, ranging from 6 to 8. The plants grew quickly, with most growth rates slowing down or stopping by week 7.

Experimental Results:

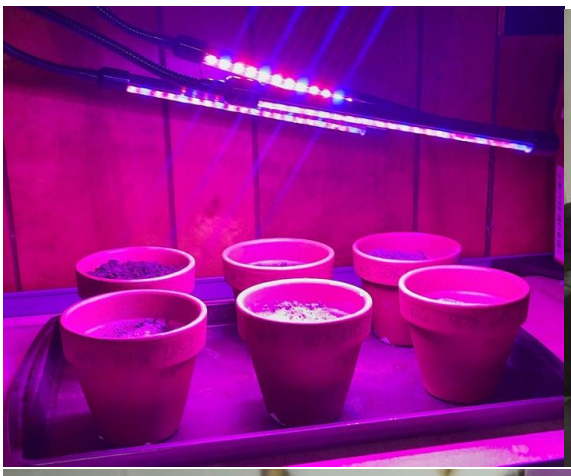
As seen in the data chars, ph levels remained within the 6-8 range throughout the experiment. The plants grew quickly with growth rates slowing during the last few weeks. At the end of the experiment, it was observed that our control (Plant #1), consisting of 100% Miracle Grow Soil and Plant #6, consisting of

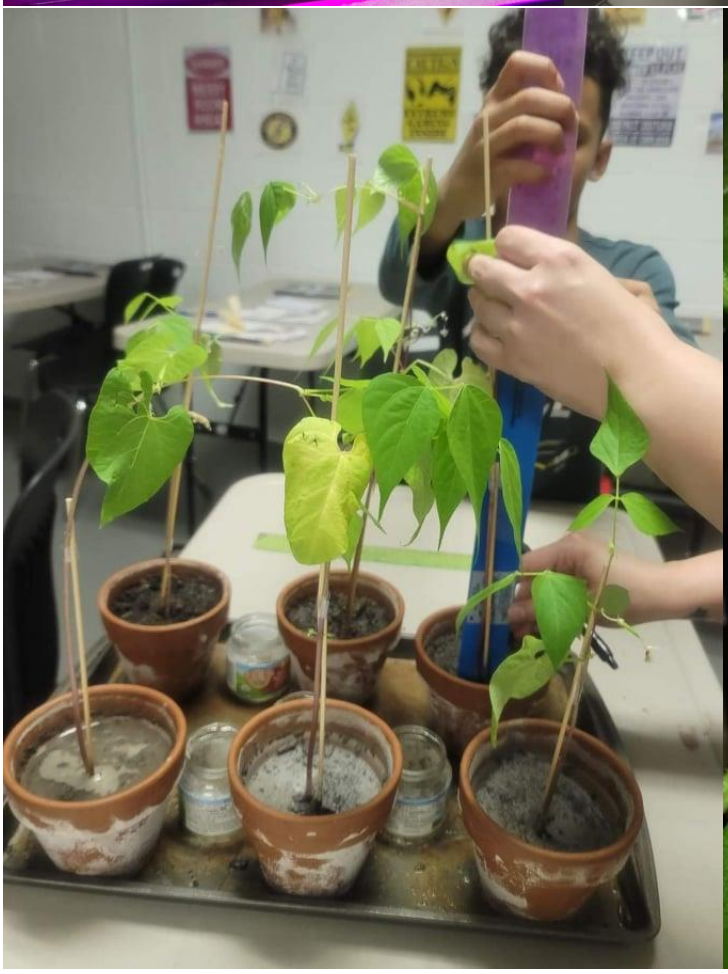
90% Lunar Highlands Simulant Soil and 10% MGS, grew the least. The height of these plants were 34 cm and 32 cm respectively. This was a very surprising result for our group as it did not match our original hypothesis. As discussed in our hypothesis, our group thought the growth rate of the plants would slow as more LHS was added and that the final height of the plants would be shorter for plants with more LHS. However, plant #2, plant #3, plant #4, and plant #5, which all consisted of a mix with both MGS and LHS, ended with similar heights. The height of these plants were 54 cm, 41 cm, 53 cm, and 42 cm. Furthermore, at the end of the grow period, all plants except for the control (100% MGS) had started to grow beans. This was also an interesting and unexpected outcome, as our group thought beans would be more likely to grow in the Miracle Grow Soil and not in the Lunar Highlands Simulant Soil.

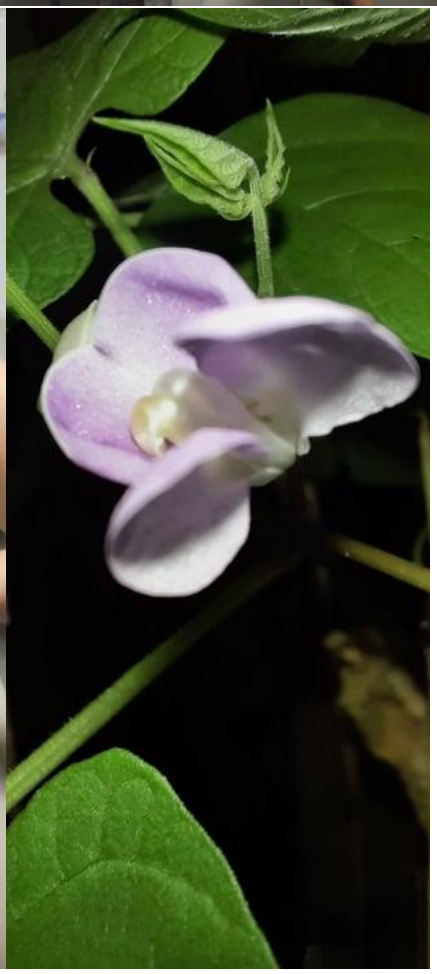
Experimental Conclusion:

Our hypothesis was incorrect because the growth rate and overall height did not decrease as the Lunar Highlands Soil was increased. While plant #6, which consisted of the highest LHS to MGS ratio grew shorter than the other plants, the final height was only 2 cm shorter than our control plant, with 100% MGS. Our plants that consisted of a more evenly distributed ratio of MGS and LHS seemed to grow the best.

Experiment Photos:









Data Charts:

Oconee Space Agriculturalists-Growth Rate Chart

	Week 1 9/29/21	Week 2 10/6/21	Week 3 10/13/21	Week 4 10/20/21	Week 5 10/27/21	Week 6 11/3/21	Week 7 11/10/21	Week 8 11/17/21	Week 9 11/24/21	Week 10 12/1/21
Plant 1 Control100% Soil	0 cm planted today	3 cm	26 cm	34 cm	34 cm	34 cm	34 cm	34 cm	34 cm	34 cm
Plant 2 50% LHS-1	0 cm planted today	5 cm	31 cm	44 cm	45 cm	52 cm	54 cm	54 cm	54 cm	54 cm
Plant 3 60% LHS-1	0 cm planted today	3.5 cm	33 cm	38 cm	38 cm	38 cm	38 cm	41 cm	41 cm	41 cm

Plant 4 70% LHS-1	0 cm planted today	0 cm	0 cm	7 cm	29 cm	36 cm	44 cm	51 cm	53 cm	53 cm
Plant 5 80% LHS-1	0 cm planted today	1.5 cm	26 cm	34 cm	34 cm	34 cm	40 cm	42 cm	42 cm	42 cm
Plant 6 90% LHS-1	0 cm planted today	0 cm	16 cm	16 cm	19 cm	20 cm	25 cm	32 cm	32 cm	32 cm

Oconee Space Agriculturalists-Ph Level Chart

	Week 1 9/29/21	Week 2 10/6/21	Week 3 10/13/21	Week 4 10/20/21	Week 5 10/27/21	Week 6 11/3/21	Week 7 11/10/21	Week 8 11/17/21	Week 9 11/24/21	Week 10 12/1/21
Plant 1 Control100% Soil	pH 6	pH 8	pH 7	pH 7	pH 7	pH 8	pH 7	pH 7	pH 8	pH 7
Plant 2 50% LHS-1	pH 6	pH 6	pH 6	pH 7	pH 6	pH 7	pH 7	pH 6	pH 7	pH 6
Plant 3 60% LHS-1	pH 7	pH 6	pH 7	pH 7	pH 7	pH 6	pH 6	pH 6	pH 7	pH 7
Plant 4 70% LHS-1	pH 7	pH 7	pH 7	pH 8	pH 7	pH 7	pH 8	pH 7	pH 7	pH 7
Plant 5 80% LHS-1	pH 8	pH 7	pH 8	pH 7	pH 8	pH 8	pH 7	pH 8	pH 7	pH 7

Plant 6 90% LHS-1	pH 8	pH 8	pH 8	pH 7	pH 8	pH 8	pH 7	pH 8	pH 7	pH 7

Oconee Space Agriculturalists-Final Growth Bar Graph