

Team Name: Bessemer, Alabama's Fantastic Ferocious Moon Planters
Team Number: 19427

School Name: Bessemer City Middle School
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Team Members (6th Graders):

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Team Coaches: Ms. Farrah Cureton (Science Teacher) and Dr. Yuvraj Verma (Math Teacher)

Superintendent: Dr. Dana Arreola

Principal: Ms. Lisa Heard

Assistant Principals: Mr. Dominique Moore and Mrs. Sarah Person

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OUR EXPERIMENT:

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What are the nutrients in Earth Soil?

There are a lot of nutrients in Earth soil. One of them is nitrogen. It helps plants grow tall and be green and so does magnesium. Phosphorus helps the roots be strong. Potassium helps plants fight off diseases and so does sulfur. Calcium helps the plants be stronger. The source of this information is kidsgardening.org

What are the nutrients in Lunar Regolith?

The main nutrients on the moon are silicon and iron. They do not help plants grow. There is no water or organic matter (natural leftovers) on the moon. Plants cannot really grow on the moon in lunar regolith. The source of this information is NASA.gov

Do tea grounds help plants grow in soil?

Tea grounds can help plants grow if they're mixed into soil. They add nutrients like nitrogen. Nitrogen helps plants grow tall and be green. Tea grounds can help the texture of soil to make it easier for the plant roots to grow. Tea grounds help the soil hold more water and that is important for thirsty plants. The source of this information is GardnersPath.com

Do coffee grounds help plants grow in soil?

Coffee grounds can help plants grow in soil, but not as much as tea grounds. It can harden and tighten the soil and that would make it difficult for roots to get air and water because the roots could not spread out enough. If you use coffee grounds, you should not use it alone and you should use it with other fertilizers. The source of this information is TheSpruce.com

Hypothesis: If we plant spinach seeds in a mixture of earth and lunar soil and then add a fertilizer of tea grounds to the soil then it will grow more because the tea grounds have nutrients (like nitrogen) that helps plants grow strong.

Independent Variables:

- Tea grounds (fertilizer)
- Coffee grounds (fertilizer)

Dependent Variables: Spinach plant growth

Controls/Constants: The control group was the 3 pots that contained only earth soil and lunar regolith (1-3). The control variables are: room temperature, seed type, water amount, humidity, soil types, etc. They stayed the same across all 9 pots.

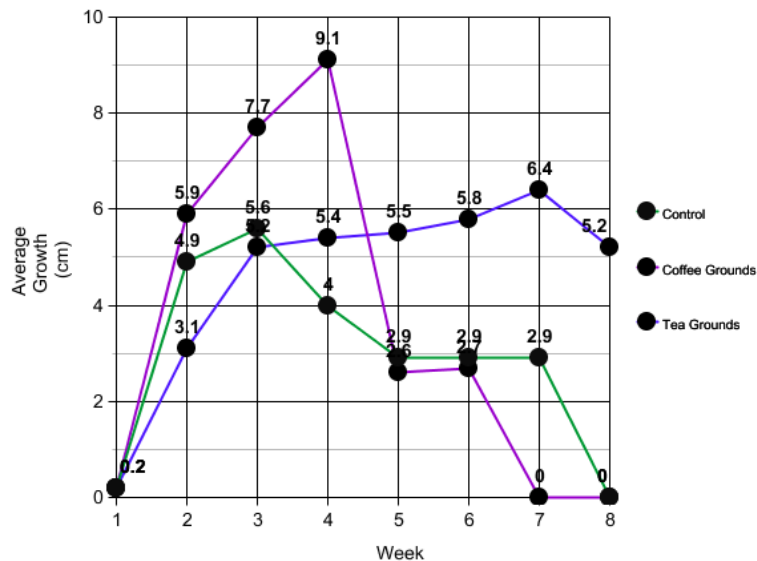
Procedures:

1. Take out 9 pots and label them 1-9.
2. Put 95 kg of earth soil into each pot after measuring it with a triple-beam balance.
3. Put 95 kg of lunar regolith into each pot after measuring it with a triple-beam balance.
4. Mix the earth soil and lunar regolith so there is an equal amount of both at the top and bottom of the pot.
5. Put 12 g of coffee grounds (fertilizer) in 3 pots (4-6).
6. Put 12 g of tea grounds (fertilizer) in the last 3 other pots (7-9).
7. Mix the 6 pots (4-9) where tea and coffee grounds were added into.
8. Measure the spinach seeds and average them. Record that size in the chart in Week 1.
9. Put 2 spinach seeds in each of the 9 pots.
10. Put 40 mL of water in each of the 9 pots every day using a graduated cylinder to measure.
We started to put 20mL every day after the second week, but after the fourth week we only watered the plants on Mondays and Wednesdays because it was too much water.
11. Put the 9 pots under the blue plant lights.

12. On Thursdays, measure the length of each seed in each pot with a ruler using the cm side. Average the value and record that size in the final-chart under the week. Graph all the values at the end of the experiment on the line-graph.

Results: The spinach seeds grew differently in the nine pots depending on the type of fertilizer. In the control pots (1–3), the plants started growing but died before week 8. In the pots with coffee grounds (4–6), some plants grew tall (Pot 5 was 10.5 cm), but most of them died early. The pots with tea grounds (7–9) had the best results! Pot 8 grew to 8.1 cm by the end. Pot 9 grew to 7.5 cm. Tea grounds helped the spinach seeds grow and stay alive longer. They lived!!!

	Control Pots (1-3) (Average cm)	Coffee Ground Pots (4-6) (Average cm)	Tea Ground Pots (7-9) (Average cm)
Week 1	0.2	0.2	0.2
Week 2	4.9	5.9	3.1
Week 3	5.6	7.7	5.2
Week 4	4	9.1	5.4
Week 5	2.9	2.6	5.5
Week 6	2.9	2.7	5.8
Week 7	2.9	0	6.4
Week 8	0	0	5.2



Analysis: The spinach seeds in the pots with tea grounds grew better and lived longer than the pots with coffee grounds or no fertilizer. The coffee grounds helped the spinach seeds grow quickly at first, but they didn't live for long. The control pots (no fertilizer) had the smallest plants. This means that fertilizer is important for growing spinach seeds. Tea grounds helped them grow well and live longer!!!

Conclusion: In conclusion, tea grounds helped spinach seeds grow the best. The seeds in the pots with tea-grounds grew taller and lived longer. This means that tea grounds are a better fertilizer than coffee grounds for growing spinach seeds in a 1:1 mix of earth and lunar soil.

Experimental Rationale: This experiment was done to see if we could grow spinach seeds in a mix of earth soil and lunar soil, like we could do on a moon mission. The tea and coffee grounds were added to see if they would help seeds grow by giving them extra nutrients. Also, we chose lunar soil because we saw on the news before we started that there was a “second moon” around the earth (it was actually an asteroid). We can get oxygen on the moon and maybe live on it by planting because we need oxygen and plants give off oxygen. We can make food on the moon by using what we learned in our experiment.

Future Considerations: In the future, we can change and improve the experiment by using less water to see if the spinach plants can still grow well. This is okay because the moon doesn't have water on it, just some areas of ice. We can do more research of testing other fertilizers and seeds to find the best to use and best seeds to grow on the moon.

Photos:



Diana, Taylen, Jimmy, Delylah, Ne'Veya, and Jeremy measuring 190kg of earth soil.



Qurtez, Jimmy, Taylen, Keoni, and Haleigh identifying the variables and constants of the experiment.



Diana, Jeremiah, Kaleb, Chauncy, Qurtez, Taylen, Josiah, Calieon, Jimmy, and Ne'Veya setting up the pots and fertilizer for the experiment.



Ne'Veya and Haleigh measuring the spinach seeds on the first day.



Experiment set-up



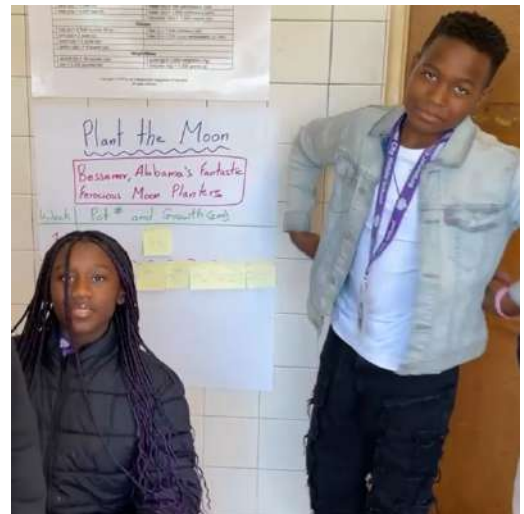
Taylen, Ne'Veya, and Diana writing the measurements of the seeds for the table.

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Calieon, Chauncy, Jeremiah, Qurtez, and Delylah looking for and removing the seeds from the pots to measure them next.



Ne'Veya and Jeremy after posting the growth measurements on our table.