

“The effects of magnetics and soil composition on the growth of peas and radishes”

Background

Our team is made up of citizen scientists with varying levels of higher education, but all interested in science, gardening, and space exploration. We are a primary level team with four members. We chose simple variables of soil composition differences and added one test pot of each vegetable with the added variable of creating a magnetic field around the plants. We wanted to keep most parameters simple but also include one variable that we could easily implement and track and could also be easily recreated in space. We assumed the pots with higher ratios of earth (inorganic fertilized) soil would have plants with better growth rates. We also assumed that the pots with the magnets would have better growth rates as well.

Experiment Design and Independent Variables

We used 10 pots with two seeds (of the same plant) in each pot. We used that same soil mixtures between the peas and the radishes. We had a control pot consisting of 100% earth soil as controls. We then reduced the amount of earth soil in each subsequent pot by 25%, with the exception of an additional 50/50 pot that included the magnets.

Hypothesis and Dependent Variable

We expected that all seeds planted would germinate and grow and that the pots with more earth soil would grow taller. We also expected that the 50/50 pot with magnets would sprout before the other 50/50 pot and would grow taller at a faster rate. (The incorporation of space figurines was an unexpected addition from our coworkers part way through the experiment.)

Measurements and Controls

We measured plant height every two weeks. The amount of water was equal among all the pots. The temperature and light were not controlled but were the same for all the plants. We did not add any soil after the seeds were planted.

Results and Discussion

We found that the pots with magnets and radishes grew significantly taller than the other radish pots without magnets and had better longevity (no plant deaths) than pots with Mars soil. At the end of the experiment the 50/50 pot with magnets had the second tallest radish at 10.1 cm, but the control pot with earth dirt was the only one with two living radish plants. The second plant in the magnet pot had died by the last week. Both seeds in the control pot sprouted before the other pots with the seeds in the magnet pot closely behind. The seeds in the pot with the greatest amount of Mars soil never sprouted.

Results were similar for the peas plants, though the differences in height were not as drastic. There was only pea plant death in the 50/50 pot without magnets, though its surviving plant was the tallest at 28.1 cm. The heights of the two plants in the magnet pot were 27 cm and 18.9 cm, taller than the other pots. The magnet pot also had the first sprout.

The effect of the magnets was apparent, though not necessarily significant and a much larger experiment would need to be conducted to establish the effectiveness of increasing sprout time and plant growth.

The amount of Mars soil in each pot had different effects than we anticipated. The pots with more Mars soil had better water retention than those with more earth soil. It acted like a clay layer where the water would sit on top of the soil and slowly sink down. The plants with Mars soil seemed less prone to showing signs of water deprivation than the control pots. It was difficult to understand the effects of greater levels of Mars soil as the radishes did not sprout in the pot with the most Mars soil. The peas, however, seemed to grow well in the pot with the least amount of earth soil suggesting that only small amounts of earth (inorganic fertilized) soil would need to be combined with Mars soil to grow crops.

The growth of the radishes was also affected by the intrusion of aphids. Some of the plant deaths could be attributed to the pests as we only discovered their presence toward the end of the experiment. We applied a mixture of water and non-toxic, biodegradable soap to the leaves, which killed the aphids. However, most of the plant degradation had already occurred and most of the radishes were not able to fully recover.

We observed another phenomenon but did not identify what it was before the end of the experiment timeframe. A white crystalline structure formed on the outside of the pots with the most Mars soil. It appears to be salt, though we don't know what it is composed of or what caused its formation.

Conclusion

This was a very basic experiment with few controls or independent variables. Experiments with more plants and more plant varieties would need to be conducted to better understand the best ratios of Mars soil and earth soil. Creating a static magnetic field around seeds may help shorten the time to germination, though more study is needed to understand the effects on plant growth.

References

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Photos

