

The Effects Of Neodymium Magnets on Plant Growth

By: Logan Berger

My Topic

My topic is Magneto culture. Magneto culture refers to “ magnetic influences” on plant growth. In this particular experiment, I wanted to test the effects of neodymium magnets on pea plant growth. I wanted to do this experiment because our garden always has issues every spring and summer with plant growth. I thought doing this experiment may help me find a way to better grow the plants. When I researched the use of magnets and their role in the germination of a seedling, I wanted to prove that if I added multiple magnets around seedlings in a pot, the seedlings with the most magnets would have the highest growth rate. This effect on the plants was pretty interesting that the plants did grow more! I decided I was going to prove that magnets can accelerate plants by entering my idea/project into the 2020 STEAM Fair.

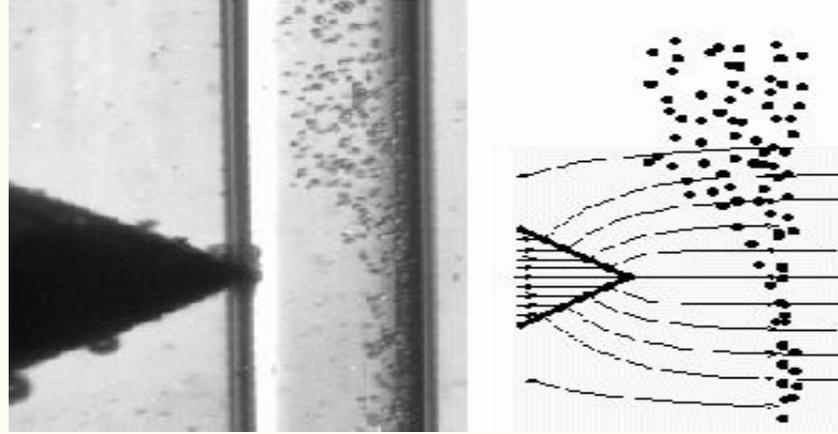
Testable Question

What is the growth rate of pea plants exposed to neodymium magnets over a period of time.

Examples and Explanations

Image courtesy Oleg Kuznetsov,
University of Louisiana at Lafayette.

NASA did a similar experiment to the one I am doing. They used special magnets called a “ferromagnet.” This magnet has the magnetic flux density of 50 kitchen magnets all in one. In the picture to the right, it is showing the ferromagnet creating a high-gradient magnetic field around the seeds.



This USAID agronomist (who is also a farmer) is checking constantly on the plants with the new magnetic technology. His thinking was also similar to mine. Instead, he used electromagnets through a copper pipe, and as the water came through that pipe, salt molecules would break down constantly.

Hypothesis

If pea seedlings are exposed to neodymium magnets, then the seedlings with the greater number of magnets will show the greatest growth rate.

Hypothesis support

Since magnets are said to be able affect humans in a positive aspect to promote the healing process, I was thinking that plants maybe also would benefit in a similar way. Sometimes plants don't grow fast enough, or survive weather conditions. I believe that magnets would help to increase the growth rate of plants with their magnetic exposure.

Variables that may affect the outcome...

- **The varying number of neodymium magnets added into each pot. (Independent Variable)**

Variables

Independent Variable: The independent variable is the number of neodymium magnets amounts added into each pot.



Dependent Variable: The dependent variable is the height of the plants since this was one of the main effects from the magnets.



Constant Variable: The constant variable was the amount of water added to each plant. (5 ML)





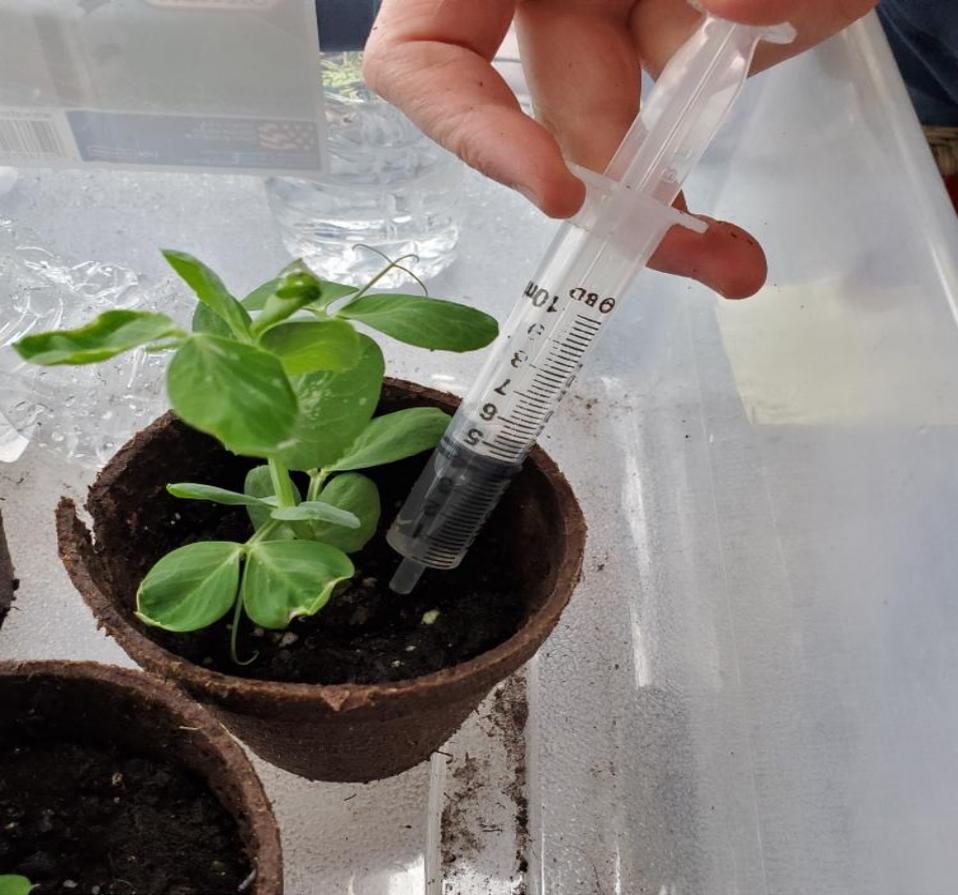
Materials

- Miracle-Gro Organic Choice Potting Mix - exactly 1 $\frac{1}{4}$ cup in each pot
- Jiffy 12 Pack of 3" Pots 3 $\frac{1}{4}$ by 2 $\frac{3}{4}$
- Syringe (Centimeters)
- Neodymium Magnets 2" round
- Plastic Sealed Bin with locking handles
- BURPEE Pea Seedlings
- Ruler
- Calculator



Procedure

1. Take pea seedlings and soak in a dish of room temperature water for 2 hours
2. Fill 3 pots with Miracle-Gro Organic Choice Potting Mix. Use exactly 1 $\frac{1}{4}$ cups of soil in each pot.
3. Plant seeds $\frac{1}{2}$ inch deep in the center of each pot and cover with soil.
4. Add 0 magnets to the 1st pot (this is my control pot) Next-- add 1 magnet to the 2nd pot by placing the magnet $\frac{1}{2}$ inch next to the pea seedling (the north or positive end of the magnet should be facing the seedling), and lastly-- add 2 magnets to the 3rd pot by placing each magnet $\frac{1}{2}$ inch on each side of the pea seedling (one magnet should have the north or positive end facing the seedling and the other magnet should have the negative or south end of the magnet facing the seedling).
5. Add 5 mL of water to each pot everyday for 16 weeks
6. Overtime, pea seedlings will sprout and eventually grow. Measure the height of each plant from the bottom of the shoot to the top of the plant. Record data on chart.
7. Repeat step 5 and 6 daily for 16 weeks. Record data on chart.
8. Analyze data and compare results

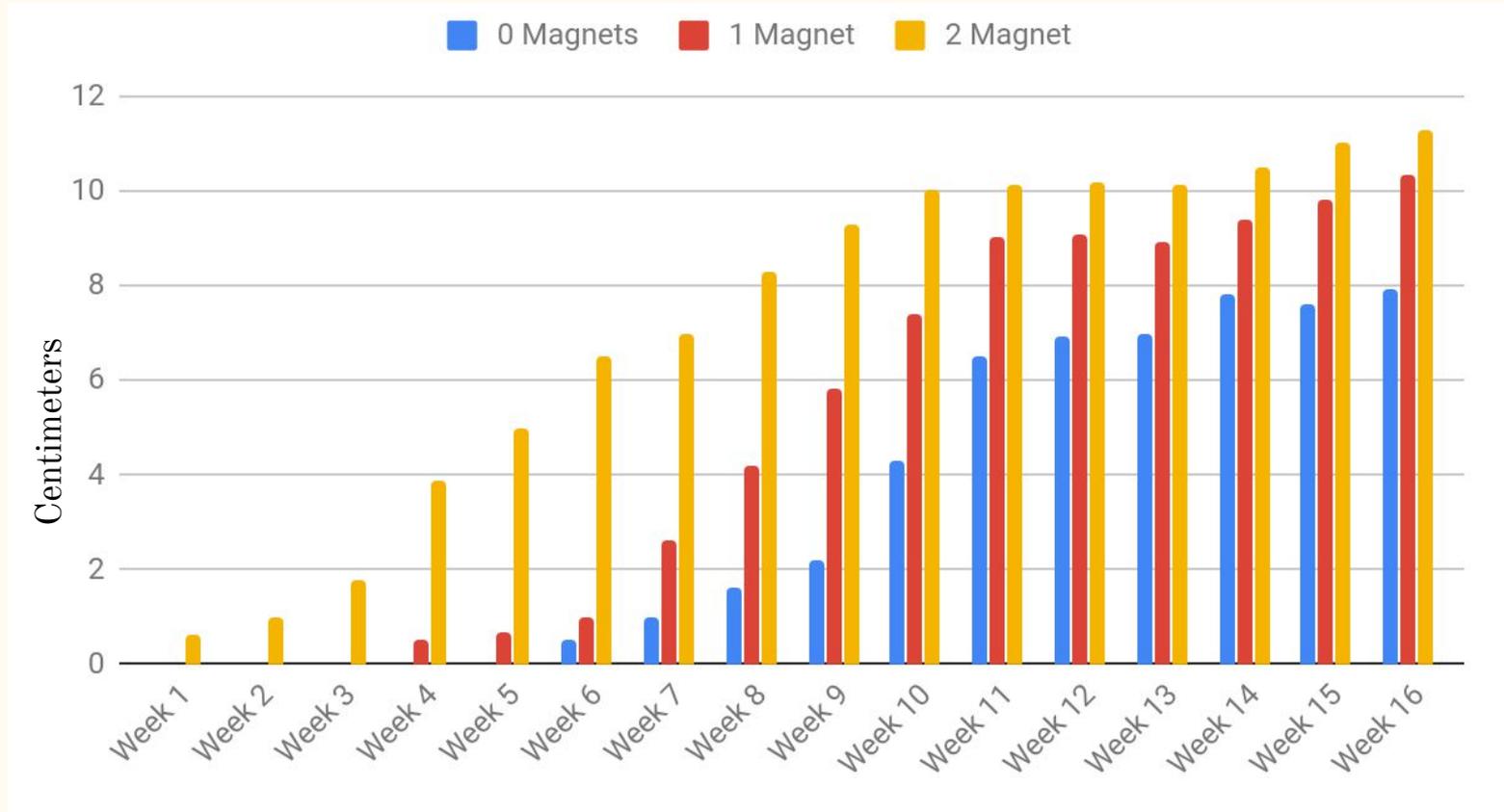


The Experiment

Results	0 Magnets	1 Magnet	2 Magnet
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Week 1	0	0	0.6
Week 2	0	0	1.0
Week 3	0	0	1.8
Week 4	0	0.5	3.9
Week 5	0	0.7	5.0
Week 6	0.5	1.0	6.5
Week 7	1.0	2.6	7.0
Week 8	1.6	4.2	8.3
Week 9	2.2	5.8	9.3
Week 10	4.3	7.4	10.0
Week 11	6.5	9.0	10.1
Week 12	6.9	9.1	10.2
Week 13	7.0	8.9	10.1
Week 14	7.8	9.4	10.5
Week 15	7.6	9.8	11.0
Week 16	7.9	10.35	11.3
Average	3.33	4.92	10.1

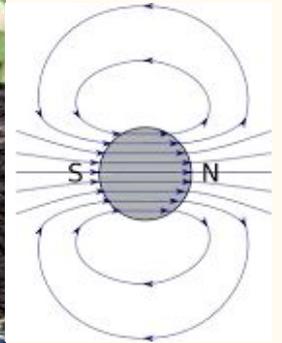
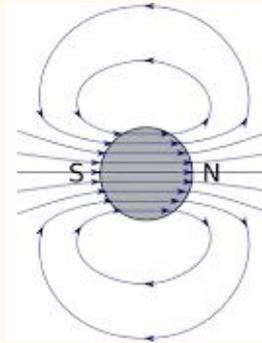
Height of Pea Seedlings Exposed to Neodymium Magnets



Why Did This Happen?

The result that I was able to conclude is that the plants did grow! The increasing growth rate of the plants occurred because plants are in fact quite sensitive to magnets and their magnetic fields. When magnetism first starts reacting with the cells and its mitochondria, it changes the formation of them. Cryptochromes are found in the mitochondria and get even stronger in the mitochondria which then boost the metabolism in the plant. Plants have special proteins inside their cells called cryptochromes, that react to magnets and electricity. In this case it was with magnets instead of electricity. This metabolism helps with growth rate, germination rate, and keeps the plant constant. Both of my previous examples from NASA and Emad Nusseibeh both noticed positive effects on plant growth. My hypothesis did in fact back up this scientific data.

The example to the right shows how the neodymium magnets are creating a magnetic field around the plant.



Conclusion

In conclusion, I did in fact prove my hypothesis. “If pea seedlings are exposed to a magnet, or several magnets then the exposure to neodymium magnets accelerates their growth”. I proved it correctly and learned some new things. I learned how magnets can have positive effects on plants similar to that of humans who benefit from magnets during a healing processes. My experiment raised one big question that I have been thinking all along about this project. With the 2020 “Coronavirus” outbreak that has already spread all over the world, could my magnet techniques and other technology help the world in some way? With the loss of profits many farmers are facing due to the inability to ship to restaurants, or stores, there has been a rise in the amount wasted according to some reports. Maybe in circumstances such as our current situation, the use of magnets would be able to help restore crops. Many are worried their farming season for this year is finished. This magnet technique along with similar magnetic technology could help. Farmers could simply add magnets to crops and have a better return when faced with potential disaster or weather disruptions. The plants could survive longer, have an increased growth rate, and germinate even faster than before. This simple change could have a huge positive impact on farms across and all over the world.

I really enjoyed doing this experiment. I learned alot about how magnets affect plant growth, and some other interesting benefits of magnets. I am happy to say that I will be helping this season with my family's garden and share my new information and techniques to hopefully have a better outcome than our previous years. I enjoyed participating in this year's 2020 STEAM Fair. While the circumstances became quite different than we had planned, and presentation is not able to be in person due to the Coronavirus and shelter in place order, I had a lot of fun!

Thank you for your time and attention to my virtual presentation