

BOOKS AND BEANS

Books and Beans:

Reading to Plants and Why It Works

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Challenge A Science Fair

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Books and Beans:**Reading to Plants and Why It Works****Research Problem**

When my mom brought home the most bedraggled, 50% off narcissus that was not expected to live from the grocery store, I decided that it would not look like the most bedraggled, 50% off narcissus that was not expected to live that I had ever seen when I was done with it. I had just heard that reading to your plants makes them grow better, and that sounded a little fishy to me, but I tried it. To my surprise, it started doing much better just about the time the book, *When You Reach Me*, by Rebecca Stead, was due back at the library. After this, I figured there was something to the urban myth, but that only made me ask more questions. What was making the plant react to the reading? Was it the carbon dioxide being breathed on it, or was it actually being stimulated by my reading? If that was so, could the plant actually *hear* me? I needed to find out more.

Research Question

What is it that makes plants grow better when they are read to?

Background Research

The first thing I found was about Cleve Backster, a pioneer of the polygraph machines which are sometimes called “The Lie Detector”. He claimed that when he hooked up his philodendron to a polygraph trying to measure how fast water coming from the roots would get to the leaves, the water measurement was unsuccessful, but what he did notice is that the plant would react when he did things around the room (Bacon, 1969). His conclusions: plants can hear, have emotions, and are “psychic”. His work was later discredited when other skeptic people tried to replicate his results and they did not notice their plants reacting or acting psychically to things they did around the room (Pollan, 2013). I think they should have used “The Lie Detector” on Cleve Backster.

The next thing I found was more scientific. At the University of Missouri, Heidi Appel and Reginald “Rex” Corcroft (2014) researched more on the subject of plants hearing using a recording of chomping caterpillars. They found that when they introduced actual caterpillars into plant groups, those groups that had heard the recording reacted by releasing defensive chemicals to a greater degree than other plant groups that had not been exposed to the recording. This led me to believe that my narcissus actually had been hearing me. Whether my reading was merely stimulation, or that it was actually enjoying the book, (which I highly doubted) was another question.

I also found that in a more recent study, Monica Gagliano (2016), an evolutionary biologist at the University of Western Australia, experimented with pea plants in upside-down Y-shaped pots. There were two groups: in the first group, one branch of the pots had dry soil and the other branch had water flowing in it. In the second group, one branch of the pots, again, had dry soil and the other had water passing through completely enclosed in a pipe. In both groups,

the roots grew toward the branch with water, whether or not they could access it, suggesting that they were drawn toward the sound of the water.

Another study from Tel Aviv University (Vetis, et al, 2019) found that when they simulated bee buzzing, the sugar concentration in the nectar of flowers became higher as it does with real bees.

This last reference was more anecdotal than scientific. The Royal Horticultural Society experimented along these lines (Grant, 2019). In a month long study, they read to tomato plants. Each had a dedicated reader and a different literary selection. The wining plant's dedicated reader was Ms. Sara Darwin, great-great granddaughter of Charles Darwin (Vanderlinden, 2021). She claimed that her “dulcet tones” might have been beneficial to this tomato plant. She read *The Origin of Species and the Decent of Man* by Charles Darwin to her tomato plant. The reason this study was not scientific is because each tomato plant “heard” not only a different voice, but also a different book. Although the experiment was not strictly scientific, it still suggests that plants can hear.

Hypothesis

Plants will grow taller when read to, not because carbon dioxide is being breathed on them, but because the sound is a stimulus to the plant.

Procedure

Type that is underlined means that it is not mandatory, but that it is done exactly as I did.

Planting

1. I soaked my bean seeds in water overnight.
2. Then, I filled sixteen pots with dirt and planted two seeds at one inch deep in each of the pots.
3. I divided the pots into four groups and placed each group of four pots on a separate tray to germinate.

Location & Labeling

4. Next, I arranged the plant groups in their trays on a table next to a sunny window.
5. I labeled the trays for each group: 1 Control, 2 Breathed On, 3 Recording Played To, and 4 Book Read To.
6. At this point, I realized I did not need the Recording group. I eliminated it.

Care

7. I watered the seeds with one T of water per day in each pot. After the seeds germinated and began to increase in size, I increased the water amount to 2T. After a month I increased to ¼ cup of water per pot.
8. I rotated the positions of the trays on the table each day for equal sunlight.

Observations

9. I measured the height of the tallest plant in each pot with a ruler at the end of each week.
10. Each week, I wrote down these height measurements in my lab journal.

11. At the end of five weeks, I plotted each group's data on a line graph.
12. I kept my raw data to see how much the beans' growth changed.

Experimenting

13. Six days each week, I took Group 4 Book Read To into another room so that the other groups were not contaminated with the same exposure
14. I read aloud one chapter of *The Westing Game* while sitting facing Group 4 Book Read To. As I read, I leaned over with my mouth about six inches from the plants.
15. Then, I took Group 4 Book Read To back to the table and put it in its new space for sunlight rotation.
16. I repeated the two steps above with Group 2 Breathed On, substituting mouthing the words and exhaling the same chapter of the book.
17. I repeated the same two steps with Group 1 Control, still sitting next to the plants for the same amount of time it had taken to read/mouth the chapter.

Materials List

- One 21 gram package of Ferry Morse organic Blue Lake 274 Beans (Bush)
- 16 Jiffy peat pots, 3” diameter
- Four plastic clam shell lids (trays)
- *The Westing Game*, by Ellen Raskin, 1978 Scholastic paperback edition
- 12” wooden ruler (for measuring plant height.)
- Watering can with thin spout (To be able to pour into a measuring spoon.)
- T measuring spoon
- Water
- folding table

Risk and Safety

There was no safety risk in this experiment.

Data Analysis Method

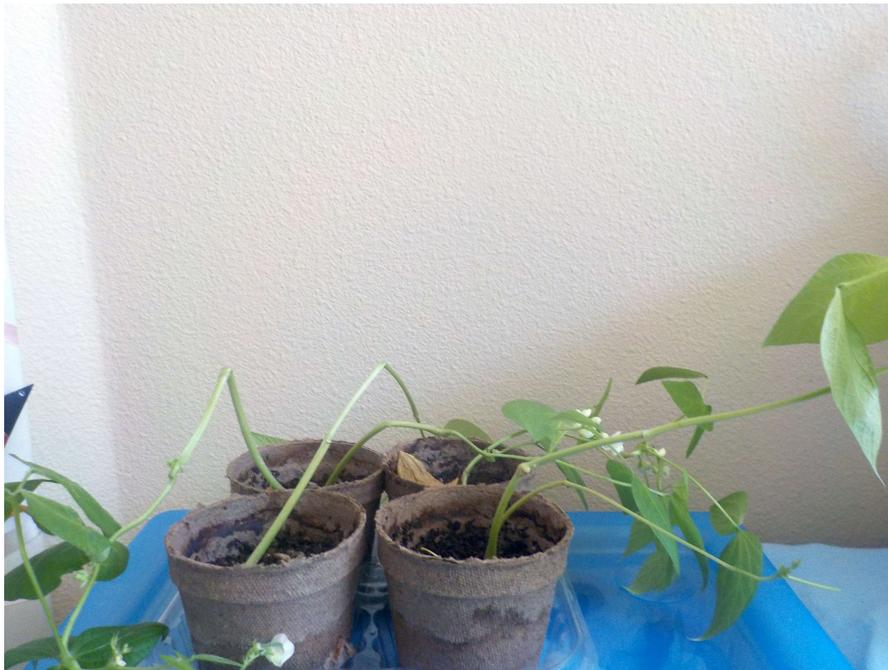
Because they were not mature plants, I had decided that the way I was going to show how the plants were reacting and the most measurable difference would be their height. For five weeks, I recorded the height of the tallest plant in each pot at the end of each week. I put the measurements in my lab journal, and also on sticky notes on the wall, so I would not have to be constantly be flipping back and fourth in my lab journal. Then, I plotted each group's height on a line graph.

Results

Group 1 Control was nearly the same Group 4 Book Read To, except that the control group was taller on average, but the stems were sometimes broken. Group 1 blossomed first and eventually formed beans, but not until after Group 4 Read To.

Group 2 Breathed On reacted terribly; I noticed that some days the leaves would be soft and curled, even though the soil was not dry. Also, sometimes I would find that the stems were broken, as was the case with Group 1 Control. This could have happened if they were top-heavy with extra leaves, but they were not. Each of these two groups had a normal, if not fewer than normal, amount of leaves. Group 2 Breathed On did not blossom during the testing period.

Group 4 Read To grew well—until I forgot to move the stems out of the way of the window blinds, which resulted in rather smashed bean plants. Other than that, Group 4 Read To was the healthiest looking group because the stems were not breaking, and the beans formed quickly after blossoming, making this group the first to form pods.



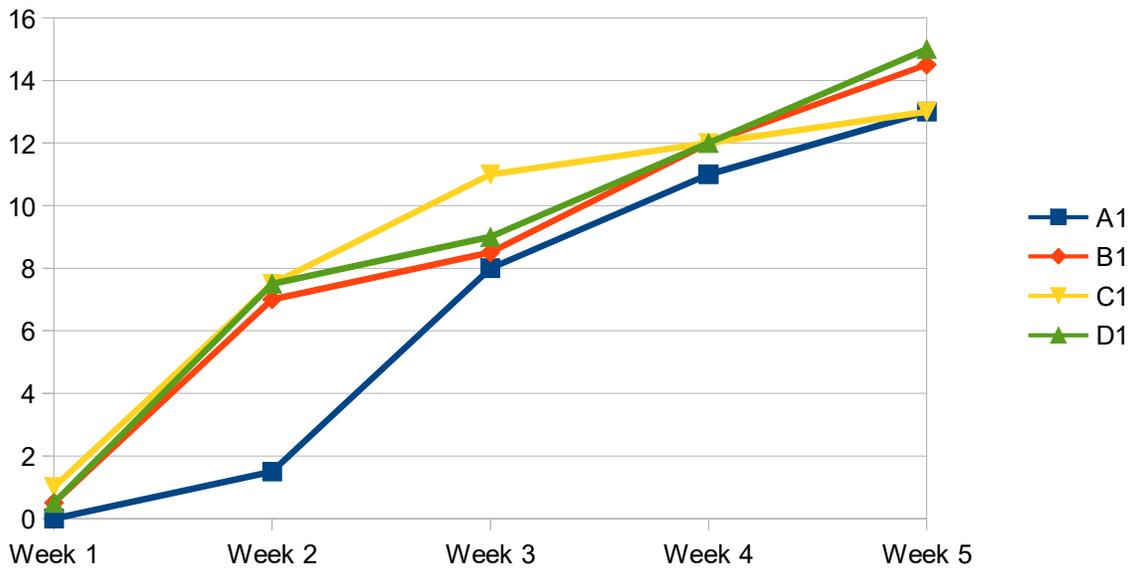
Group 1 Control at experiment end



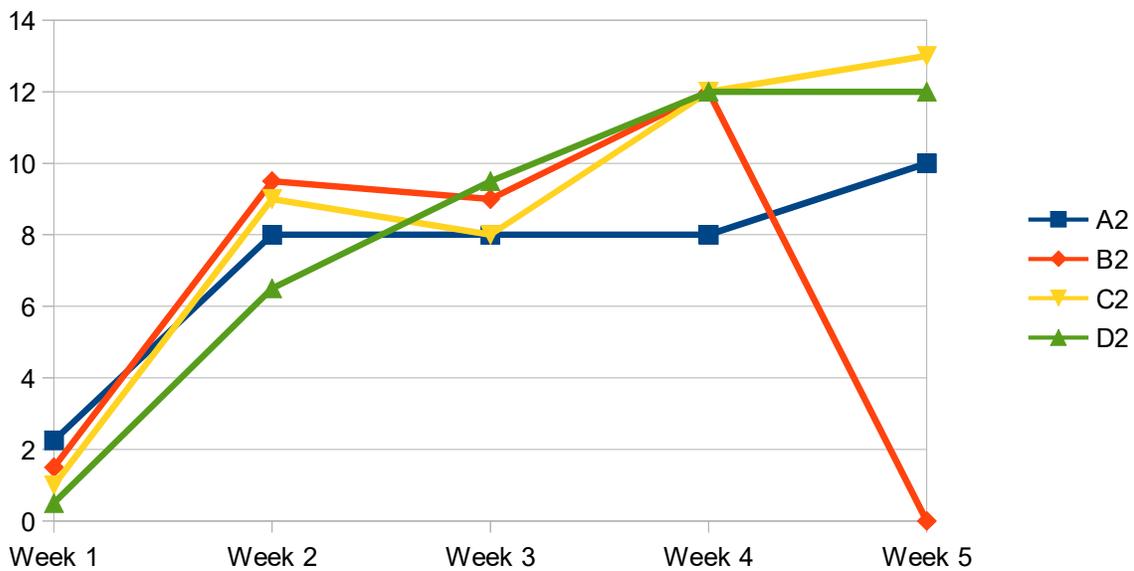
Group 2 Breathed On at experiment end



Group 4 Read To at experiment end

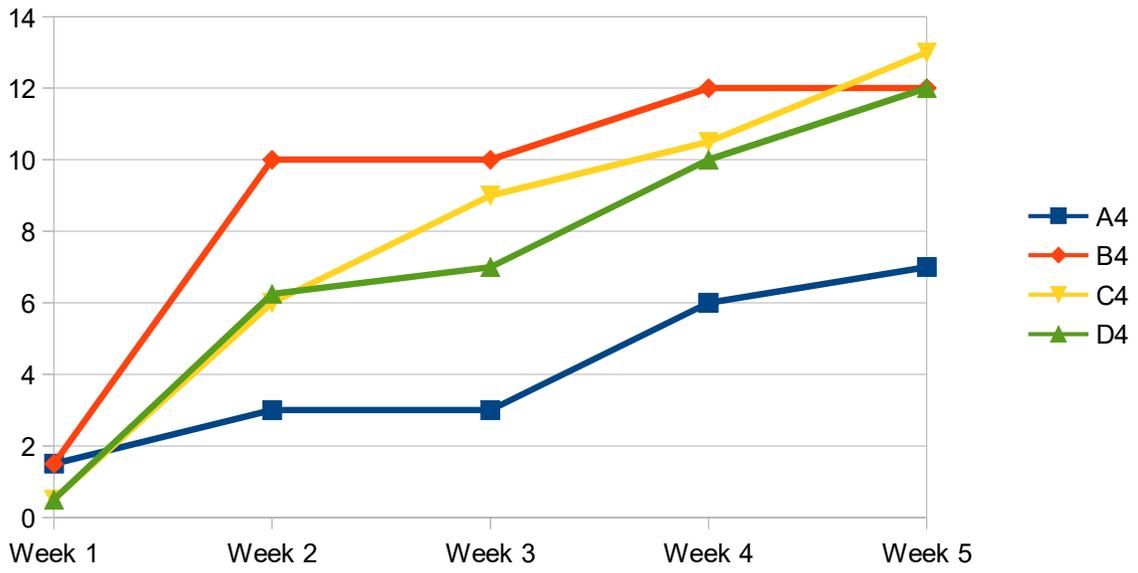


Group 1 Control—Height in inches of tallest plant in each pot



Group 2 Breathed On—Height in inches of tallest plant in each pot

Notes: The plant in pot B died before week 5 measurements were taken. Also, I later noticed that the measurements in week 3 were of the wrong plant in pots B2 and C2.



Group 4 Read To—Height in inches of tallest plant in each pot

Conclusion

According to my hypothesis, Group 1 Control and Group 2 Breathed On would grow at the same rate, and less than Group 4 Read To. This was not the case; however, one positive effect of reading to Group 4 Read To was that the plants seemed stronger and healthier overall. Anyone growing beans might want to have an earlier yield and might be interested in this result.

Although read-to plants probably won't grow any taller than most plants, they may have much stronger stems, and will probably be healthier than the average plant. I made the assumption that responding positively to the reading would mean that those bean plants would grow taller, but they didn't. If I did this experiment again, I would measure how long the stems took to break, when the plants blossomed, and when they formed pods. It would be interesting to see if the content of the reading material had an effect, although I don't expect that it would. What might influence the plants is if the sound was live versus recorded. I would also like to see what effect playing my cello has on plants, since other research has shown that plants respond to vibrations.

Even though this experiment did not go completely as I expected it to, it was interesting and I enjoyed doing it.

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